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Informed Consent, Shared-Decision Making and a Reasonable Patient's Wishes Based on a National Survey in the United States

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3 Informed Consent, Shared-Decision Making and a Reasonable Patient's Wishes
4 Based on a National Survey in the United States
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7 John T. James¹ and Darwin J. Eakins²
8

9 ¹CEO, Patient Safety America, Houston, TX, and retired NASA Chief Toxicologist, Houston, TX
10

11 ²Private consultant on survey methods, retired statistical expert from the University of Kansas,
12 Lawrence, KS
13
14
15

16 Corresponding Author:
17

18 John T. James
19

20 Patient Safety America
21

22 14503 Windy Ridge Lane, Suite 200
23

24 Houston, TX 77062
25

26 Phone: 713-416-2878
27

28 john.t.james@earthlink.net
29

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Abstract

Objective: In approximately half the states in the U.S., and more recently in the U.K., informed consent has been legally defined as what a reasonable patient would wish to know. Our objective was to discern the information needs of a hospitalized, “reasonable patient” during the informed-consent process.

Design: Survey the intensity using a 5-point scale (4 indicates “probably yes,” and 5 indicates “definitely yes”) by which individuals wish to know specific information if placed in a hypothetical scenario where an invasive procedure may be an option.

Setting: A 10-question survey was administered to three groups: nursing students (n=76), health professions educators (n=63), and a U.S. national population (n=1067).

Primary and secondary outcome measures: The primary outcome measure was the average intensity, on a 5-point scale, by which survey groups wished to have each of 10 questions answered. The secondary outcome was to discern relationships between survey demographics and the intensity by which participants wanted an answer.

Results: Despite substantial demographic differences in the nursing-student group and health-professions-educator group, the average intensity scores were within 0.2 units on 9 of 10 questions. The national survey revealed a strong desire to have an answer to each question (range 3.98 to 4.60 units). It showed that women desired answers more than men and older adults desired answers more than younger adults.

Conclusions: Based on responses to 10 survey questions regarding wishes of people in a situation where an invasive procedure may be necessary, the vast majority want an answer to each question. They wanted to know about all treatment options, risky drugs, decision aids, who

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3 will perform the procedure, and the cost. They wanted their advocate present, periodic review of
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5 their medical record, a full day to review documents, and expected outcomes and restrictions
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7 after the procedure.
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10 **Key Words:** Informed consent, shared-decision making, reasonable patient, overuse of
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Strengths and limitations of this study:

- Based on two targeted surveys and a national survey, findings are consistent across demographic groups and across the United States, making our conclusions robust.
- The findings form a template that could be used by clinicians when engaged in shared-decision making to elicit truly informed consent from the patient.
- The survey questions had to be limited to be practical, so in any specific, real-life situation additional questions may be asked by a reasonable patient.
- Findings about the out-of-pocket costs of a procedure probably apply only to patients in the United States where out-of-pocket costs may be enormous.

Funding statement: The study was supported by Patient Safety America, Houston, TX USA

Competing interests: none

Author's contribution: JTJ conceived the study and developed the questions. DJE formed the survey instrument to suit each of the situations where questions were to be presented to a survey audience. JTJ analyzed the data and wrote most of the paper in close consultation with DJE. Both authors agreed to be accountable for accuracy of the work.

Data sharing statement: National survey data are available at:

<http://patientsafetyamerica.com/survey-data/>.

Health-Professions-Educator survey data available at:

<https://www.surveymonkey.com/results/SM-DQJDBBQ7L/>

Nursing-student survey available at:

https://www.surveymonkey.com/analyze/jmYrcXIIAMk17hFhaVo4UpuCTnh4_2BIXkVDe_2FdYMHIZMUZ_2FkOoWEoDM7zLcCamK8G (use djeakins, password C0nstance\$)

Introduction

While the idea of shared-decision making between patient and clinician has been around many decades, based on PubMed citations, the concept has gained momentum since 2012.¹ The culmination of shared-decision making is that the patient consents to the mutually-agreed procedures to be performed or not performed. The old standard calling for information that “reasonable clinicians” feel their patients need to know is giving way to the new standard defined by what a reasonable patient wishes to know. However, a study of recorded conversations between clinicians and a patients that may need percutaneous coronary intervention (PCI) found that only 3% of the patients received all 8 elements necessary for informed decision making.² A recent court ruling in the U.K has upheld the patient-centered, informed-consent standard and about half of the United States use “reasonable patient” as the basis for administering informed consent.³

The question then becomes, “What does a reasonable patient wish to know?” Typically, that is answered after the fact in specific cases where a patient may allege that he was not given sufficient information to make an informed decision.⁴ One example involved a case where a man’s family was not given enough information about his defibrillator replacement to make an informed decision.⁵ Patient preferences were not elicited by the clinician. A court in the U.K. decided that a woman was not given sufficient information on the 1% risk of shoulder dystocia from a vaginal vs. a Caesarian delivery to make an informed decision.⁶ To our knowledge, no investigators have attempted to define the information needs of a reasonable patient in a general way that applies to care during hospitalization. To some extent the survey was driven by stories of patient advocates who have experienced harm and, in retrospect, wish they had known more

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3 about the risks of their treatment, device, or medication. We hypothesized that such wishes could
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5 be generalized into information a “reasonable patient” would want to know.
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8 **Goal**

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11 Our primary goal was to establish the descriptive intensity (scale of 1 to 5, with 1 being
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13 “definitely no” and 5 being “definitely yes”) by which answers to general questions are desired
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15 by a reasonable patient before giving consent for an invasive procedure, prescription drugs, or
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17 medical devices that could pose a risk of avoidable harm. Our secondary goal was to characterize
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19 heterogeneity, such as gender and age, in the survey groups that may be associated with intensity
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21 variations in what a reasonable patient wishes to know.
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26 **Methods**

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29 Our survey study was approved by the Galveston College Institutional Review Board. Our search
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31 of PubMed using “reasonable patient survey” (15 November 2018) discovered only 2 partially
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33 relevant articles. One involved wishes of patients about anesthesia risks in a Singapore hospital.⁷
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35 Another surveyed patients’ opinions about pre-surgical informed-consent in a Jamaica teaching
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37 hospital.⁸ We created a statement of a generic situation in which a hospitalized patient must
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39 make choices about their care after being stabilized upon entry via the emergency department:
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41 *You are hospitalized in a large, urban, teaching hospital after being brought into its emergency*
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43 *room last night. The condition that brought you to the ER has been stabilized, but additional*
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45 *procedures may be necessary. The following 10 questions determine what you would like to*
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47 *know as a reasonable patient.* We developed a 10-question survey based on adverse experiences
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49 reported by members of the Patient Safety Action Network (formerly members of the Safe
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3 Patient Project of Consumers Union) and our knowledge of shortcomings with current informed
4 consent practices as reflected in medical literature.
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8 The survey was developed in two forms. The first employed demographics to include
9 age, gender, education level, race or ethnicity, and whether the survey taker has worked in a
10 hospital. This survey was administered via cell phone to nursing students (and a few faculty) on
11 April 19, 2018 at Galveston College, Galveston Texas during a presentation by Dr. James. It was
12 also administered to participants in the Health Professions Educators Summer Symposium
13 (HPESS) Community via email request on June 8, 2018. The latter included primarily mature
14 academics involved in educating physicians, nurses, and health-care administrators.
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25 The second form of the survey, which was used for the U.S. national survey, employed
26 an identical scenario and questions, but the demographics were adapted to those offered by
27 SurveyMonkey® (SM) for a national survey. These included age, gender, household income
28 level, and region of the United States. The national platform included survey takers across the
29 U.S. that had been previously recruited by SM. The vast majority of the national survey takers
30 used cell phones to answer the questions. The third survey was administered to the national
31 audience on October 22, 2018.
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42 Each of the 10 questions could be answered at one of 5 intensity levels indicating the
43 degree to which an answer is desired by the person taking the survey. The responses were as
44 follows: definitely no (1.0), probably no (2.0), neutral (3.0), probably yes (4.0), and definitely
45 yes (5.0). Formal statistical analyses were deemed unsuited to the qualitative nature of our study
46 design. Final conclusions are word descriptions of the intensity of desire of a reasonable patient
47 to have answers such as “probably yes” or “definitely yes.” Obvious trends in the data were
48 captured graphically.
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Patient and Public Involvement

The research development of the present study was a direct result of patient advocates' experiences with failed informed consent or lack of provider solicitation of patient preferences. These led to formulation of many of the questions posed in our survey. The study leaders are patient safety advocates. The outcome measures were a direct result of the reactions of putative patients as "reasonable patients" to the survey questions. We intentionally involved providers by surveying the HPESS community that consists of clinicians, nurses, and hospital administrators dedicated to educating the next generation of leaders in their respective disciplines. They were asked to assume the role of a patient as they completed our survey.

Our results will be disseminated to the HPESS community once the study has been published, and we will ask that our findings be presented during the summer symposium in July, 2019. The theme of that symposium is how to best educate millennials. Our national survey data provided a category specifically for responses by millennials. Results will be disseminated to nursing students at Galveston College through a presentation this spring. Our findings and suggested actions from our findings will be disseminated to patient advocates whose shared ideas and experiences powered this study. Those groups include the following: Patient Council of the Right Care Alliance, Patient Safety Action Network, and members of Patient Safety America. We expect to widely share our findings with the general public (represented by our national survey) through media outlets such as ProPublica, with physicians through KevinMD and Veritas Health Care, and with nurses through Quality and Safety Education for Nurses (QSEN).

Results

We targeted two groups from which to obtain responses because of the access we had to them and the expectation that their demographics would be different. The response rate from the nursing students was 99% (76/77) because it was taken during a lecture in which support was available if anyone had difficulty. Only one did. The response rate of the HPESS Community to the email request was 63/146 = 43%. The low response is likely due to busy professionals not having time to read and respond to all emails sent to them. Combined, the response rate of the two targeted studies was 62%. Table 1 shows the diversity of demographics in the two groups that took initial surveys. The primary differences were in age, education level, race or ethnic origin, and hospital work experience.

Table 1. Comparative demographics of targeted groups

Demographic measure	Nursing students (n = 76)	HPESS Community (n = 63)
Under 35 years of age	77%	3%
Female	78%	70%
High school graduate	34%	2%
College graduate	65%	5%
Advanced degree	1%	93%
White or Caucasian	51%	84%
Black or African American	16%	3%
Hispanic or Latino	26%	2%
Asian	4%	6%
Have worked in a hospital	35%	86%

The national survey included 1211 persons who entered the survey and 1067 who completed it for a response rate of 88%. Nine participants did not answer location questions.

The combined results of our three surveys consistently showed that a “reasonable patient” would want to know an answer to each of the 10 questions presented in our survey (table 2).

Table 2. Average response levels in three surveys. 4.0 indicates the person “probably” wants an answer, and 5.0 indicates the person “definitely” wants an answer. The percentage of the 5.0 responses are shown in bold red. In the national survey, 71 % of the reported income levels were from \$10,000 to \$99,000. Of the 9 geographic regions of the U.S., 54% of responses were from 3 of those – east north central, south Atlantic, and Pacific. Footnotes: ^an=75, ^bn=62

Number and description of survey question	Nursing students (n = 76) [% 5.0]	HPES Group (n = 63) [% 5.0]	National Group (n = 1067) [%5.0]	National ranges over 10 income Groups	National ranges over 9 regions of the U.S.
1. Would you like to know all your treatment choices, including alternatives and risks and benefits of each choice for a patient like you. Your choices may include invasive procedures (surgery, endoscopic procedures, insertion of a medical device), non-invasive treatments, and what happens if you do nothing?	4.92 [92%]	4.94 [95%]	4.58 [75%]	4.33-4.97	4.51-4.65
2. Drugs that have not been approved by the Food and Drug Administration for your condition are off-label for you. Drugs prescribed off-label are about twice as likely to cause serious side-effects as drugs prescribed on-label. Would you like to know if any drugs prescribed to you are off-label, and what their side effects may be?	4.89 ^a [89%]	4.51 [67%]	4.40 [67%]	4.07-4.71	4.26-4.57
3. Drugs assigned a “black box” warning by the FDA pose an especially serious risk of harm. If you are prescribed such a drug, would you want to know the reasons for the black box warning and if there are alternatives before you take it?	4.83 [83%]	4.67 [79%]	4.57 [78%]	4.27-4.92	4.43-4.69
4. Decision aids are created to assist patients with complex medical decisions and to help them understand the risks and benefits of treatment options. If there is a decision-aid available for your illness, would you like to review it?	4.66 [73%]	4.65 [70%]	4.41 [61%]	4.07-4.69	4.28-4.57
5. If you are considering an invasive procedure, would you like to know who will be performing it, their skill level, and how trainee doctors, if any, will be involved?	4.83 [84%]	4.78 [84%]	4.49 [68%]	4.34-4.82	4.41-4.63
6. Assuming you have decided on a procedure or treatment, would you like to know what your total, out-of-pocket costs will be?	4.71 [79%]	4.60 ^b [68%]	4.48 [69%]	4.21-4.76	4.41-4.52
7. You have a trusted family member that is willing to act as your advocate. Would you like for that person to be present during shared-decision-making about your medical care?	4.65 ^a [73%]	4.54 [62%]	4.31 [54%]	4.09-4.69	4.20-4.43
8. If you are well enough, would you like to be offered a chance to review and make entries in your medical records each day while you are hospitalized?	4.07 [47%]	4.06 [48%]	3.98 [38%]	3.41-4.23	3.89-4.11
9. Before signing any documents permitting invasive, non-emergency procedures would you like to review these at least one full day in advance of the procedure?	4.29 [49%]	4.19 [52%]	4.18 [47%]	3.91-4.41	3.87-4.34
10. If you are considering an invasive procedure, would you like to know your expected difficulties, recovery times, pain management, and restrictions after the procedure while hospitalized and after discharge from the hospital? This includes the risk of infection from the invasive procedure.	4.84 [86%]	4.89 [90%]	4.60 [76%]	4.32-4.85	4.49-4.70

Discussion

The three distinct surveys compare well regarding the wishes of patients. The highest intensity of desire to have an answer was to question 1 (know all treatment choices) in all three surveys (range 4.58-4.94). In all three surveys, the lowest intensity of desire to have an answer was to question 8 (medical record access) (range 3.98-4.07), and the second lowest intensity was to question 9 (advanced review of documents) (range 4.18-4.29). Even the lowest intensity desire for an answer was near 4.0, which implies that on weighted-average basis, the putative reasonable patient would *probably* want to have access to his medical record and be able to make entries.

Despite the different demographics in the two targeted surveys (table 1), especially in age, education level and hospital work experience, the responses were comparable in the two groups (table 2). Only one of the 10 questions (number 2) had a response level that differed by more than 0.20 units. This was the question of whether a reasonable patient would want to know about any off-label drugs prescribed. The difference was 0.38 units. The higher education level and more hospital experience of the HPESS Community may have made this group slightly less concerned about the additional risk that may be associated with off-label prescriptions.

The results of the national survey regarding demographics of gender (figure 1) and age (figure 2) demonstrated distinct trends for all 10 questions. Without exception, women wanted more information than men, and older adults wanted more information than younger adults. The former may be due to women being higher users of hospital care and hospitals tending to offer many more services targeted to women than to men.⁹ Older adults may be more likely to be cautious compared to younger adults because of more lifetime hospital experiences.

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3 Our survey provides insight into some patient concerns that are not typically part of
4 informed consent. In the wake of the opioid epidemic, the public is more aware of the potential
5 dangers of prescription drugs. Thus, it should not be surprising that patients would want to know
6 if the drugs prescribed to them are off-label or have a black-box warning. The U.S. Food and
7 Drug Administration assigned “black box” warnings to immediate-release opioids in 2016.¹⁰
8 There is also growing attention to surprise medical bills in the U.S., so a reasonable patient
9 would likely to want an estimate of his out-of-pocket costs. Inordinate out-of-pocket costs,
10 especially those that lead to bankruptcy, may have an adverse effect on clinical outcomes.¹¹
11 Hospital administration staff could assist with providing cost information. The opportunity to
12 review and make entries in one’s medical record, while not part of the informed consent process,
13 may relate. Many patients want to ensure that the data being recorded are accurate and complete;
14 moreover, many desire access to their data as a means of gaining a better understanding of their
15 condition and engaging with their providers. Encouraging this access can convey strong support
16 for the view that the patient is an integral part of his care team.
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36 There is an important connection between informed consent and the overuse of medical
37 procedures. The overuse of PCI in the U.S. is a prime example. Patients that may need PCI were
38 less likely to choose this invasive option when they were better informed about their care options
39 during hospitalization.¹² A study of patients in Northern England that may need PCI concluded
40 that there is “a mismatch between legal and ethical principles of informed consent and current
41 practice. The variation in patients’ experiences of the current place of informed consent in
42 service delivery represents a missed opportunity for cardiologists to work in decision-making
43 partnerships with patients. In light of recent changes in the law [to the reasonable patient
44 standard], a new approach to informed consent is required.”¹³
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Limitations

In order to respect the time of responders to our survey, we limited it to 10 questions applicable to an informed consent discussion in a hypothetical situation. In real clinical settings, it is likely that our “template” will need to be augmented with questions specific to the situation the patient faces. These should be designed to elicit the patient’s preferences. We also recognize that some of the answers are out of the clinician’s hands; for example, clinicians in the U.S. are seldom going to know the patient’s out-of-pocket costs. We also recognize that clinicians may need the assistance of pharmacists in conveying the benefits, risks, and alternatives to off-label or black-box-warning drugs.

Conclusions

Through two targeted surveys and a U.S. national survey, we have affirmed that a reasonable patient will want to know far more information than is generally conveyed during typical shared-decision making that leads to no more than a partly informed decision by the patient. Survey respondents wanted to know risks and benefits of all treatment options, the risks and benefits of off-label and box-warning drugs. They wished to view decision aids, know precisely who will perform the procedure, and their anticipated out-of-pocket costs. Their desire was for an advocate to be present during shared-decision making, have periodic opportunities to review their medical record, have a full day to review informed-consent documents, and to be made aware of expected outcomes and restrictions after the procedure. We expect our findings to have implications for what defines a reasonable patient standard for informed consent.

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3 Figure 1. National intensity scores above 4.0 vs. question number for gender differences in the
4 national survey. Responses came from 497 males and 570 females.
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6 Figure 2. National intensity scores above 4.0 vs. question number for age differences in the
7 national survey. Responses came from 297, 230, 343, and 197 people in the four respective age
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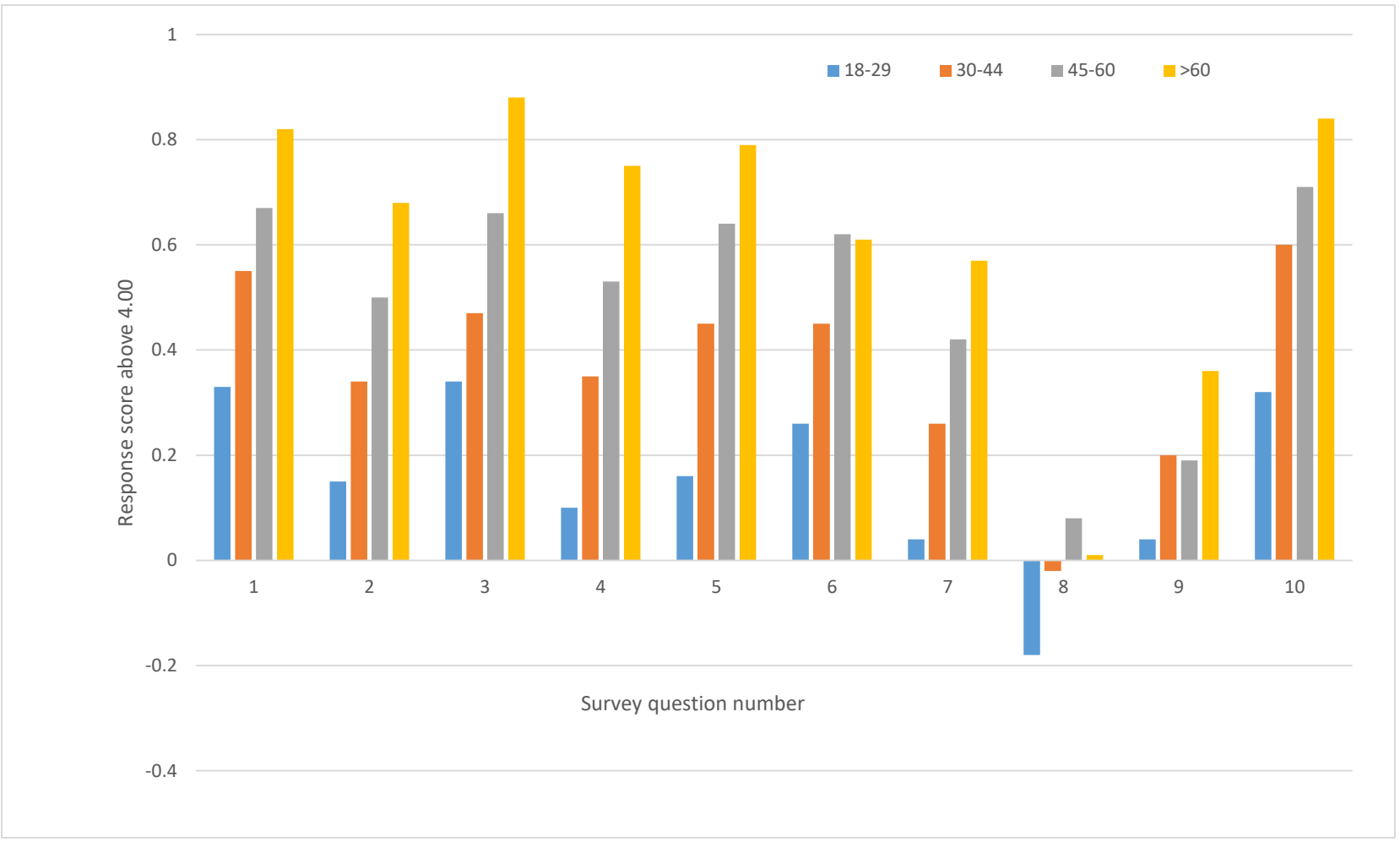
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Figure 1. Effect of gender on survey responses



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6 John T. James¹, Darwin J. Eakins², and Robert R. Scully³
7

8 ¹CEO, Patient Safety America, Houston, TX, and retired NASA Chief Toxicologist, Houston,
9 TX
10

11 ²Private consultant on survey methods, retired statistical expert from the University of Kansas,
12 Lawrence, KS
13

14 ³Private consultant on statistical methods and interpretation
15
16
17

18 Corresponding Author:
19

20 John T. James
21

22 Patient Safety America
23

24 14503 Windy Ridge Lane, Suite 200
25

26 Houston, TX 77062
27

28 Phone: 713-416-2878
29

30 john.t.james@earthlink.net
31

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Abstract

Objective: In approximately half the states in the U.S., and more recently in the U.K., informed consent is legally defined as what a reasonable patient would wish to know. Our objective was to discern the information needs of a hospitalized, “reasonable patient” during the informed-consent process.

Design: Survey the intensity using a 5-point scale (4 indicates “probably yes,” and 5 indicates “definitely yes”) by which individuals wish to know specific information if placed in a hypothetical scenario where an invasive procedure may be an option.

Setting: A 10-question survey was administered from April 19 through October 22, 2018 to three groups: student nurses (n=76), health professions educators (n=63), and a U.S. national population (n=1067).

Primary and secondary outcome measures: The primary outcome measure was the average intensity, on a 5-point scale, by which survey groups wished to have each of 10 questions answered. The secondary outcome was to discern relationships between survey demographics and the intensity by which participants wanted an answer.

Results: Despite substantial demographic differences in the nursing-student group and health-professions-educator group, the average intensity scores were within 0.2 units on 9 of 10 questions. The national survey revealed a strong desire to have an answer to each question (range 3.98 to 4.60 units). It showed that women desired answers more than men and older adults desired answers more than younger adults.

Conclusions: Based on responses to 10 survey questions regarding wishes of people in a situation where an invasive procedure may be necessary, the vast majority want an answer to

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3 each question. They wanted to know about all treatment options, risky drugs, decision aids, who
4 will perform the procedure, and the cost. They wanted their advocate present, periodic review of
5 their medical record, a full day to review documents, and expected outcomes and restrictions
6 after the procedure.
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13 **Key Words:** Informed consent, shared-decision making, reasonable patient, overuse of
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For peer review only

Strengths and limitations of this study:

- Based on two targeted surveys and a national survey, findings are consistent across demographic groups and across the United States, making our conclusions robust.
- The findings form a template that could be used by clinicians when engaged in shared-decision making to elicit truly informed consent from the patient.
- The survey questions had to be limited to be practical, so in any specific, real-life situation additional questions may be asked by a reasonable patient.
- Findings about the out-of-pocket costs of a procedure probably apply only to patients in the United States where out-of-pocket costs may be enormous.

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Competing interests: none

Author's contribution: JTJ conceived the study and developed the questions. DJE formed the survey instrument to suit each of the situations where questions were to be presented to a survey audience. JTJ and RRS analyzed the data. JTJ wrote most of the paper in close consultation with coauthors. All authors agreed to be accountable for accuracy of the work.

Data sharing statement: National survey data are available at:

<http://patientsafetyamerica.com/survey-data/>.

Health-Professions-Educator survey data available at:

<https://www.surveymonkey.com/results/SM-DQJDBBQ7L/>

Nursing-student survey available at:

<https://www.surveymonkey.com/results/SM-5F2SX9W3V/>

Introduction

The human right to self-determination in healthcare is a hallmark of instruments promulgated by the United Nations. Rights are specifically described for children, persons with disabilities and older persons. These call for the highest standards attainable for children's health,¹ for treatment of illness or rehabilitation of the disabled,² and for maintenance of optimum health as people age.³ The patient's right to know certainly extends to knowing the risks and benefits of prescription medications. For example, based on a recent court decision in the U.K. involving off label and unlicensed medication prescribing, consent laws now call for patients to receive all information that a patient deems important, and not just what the physician thinks is important.⁴ However, unless the patient is harmed by denial of sufficient information to exercise their rights to make an informed decision about off-label prescriptions, there is no legal standing for compensation. In our opinion, the human rights of patients to self-determination in healthcare can only be attained through a balanced process of shared-decision making between patient and clinician.

While the idea of shared-decision making between patient and clinician has been around many decades, based on PubMed citations, the concept has gained momentum since 2012.⁵ The culmination of shared-decision making is that the patient consents to the mutually-agreed procedures to be performed or not performed. The old standard calling for information that "reasonable clinicians" feel their patients need to know is giving way to the new standard defined by what a reasonable patient wishes to know. However, a study of recorded conversations between clinicians and a patients that may need percutaneous coronary intervention (PCI) found that only 3% of the patients received all 8 elements necessary for

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3 informed decision making.⁶ A recent court ruling in the U.K has upheld the patient-centered,
4 informed-consent standard and about half of the United States use “reasonable patient” as the
5 basis for administering informed consent.⁷ In the past, the “reasonable patient” standard has been
6 ill-defined and abstract; our intent is to better-define the information wishes of a reasonable
7 person when facing the possibility of an invasive procedure.⁸ There is a natural conflict between
8 respect for patient autonomy in making an informed decision and the practical aspects of how a
9 clinician delivers information to a “reasonable patient” to fulfill the ethical principle of
10 autonomy.
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22 The question then becomes, “What does a reasonable patient wish to know?” Typically,
23 that is answered after the fact in specific cases where a patient may allege that he was not given
24 sufficient information to make an informed decision.⁹ One example involved a case where a
25 man’s family was not given enough information about his defibrillator replacement to make an
26 informed decision.¹⁰ Patient preferences were not elicited by the clinician. A court in the U.K.
27 decided that a woman was not given sufficient information on the 1% risk of shoulder dystocia
28 from a vaginal vs. a Caesarian delivery to make an informed decision.¹¹ To our knowledge, no
29 investigators have attempted to define the information needs of a reasonable patient in a general
30 way that applies to care during hospitalization. To some extent the survey was driven by stories
31 of patient advocates who have experienced harm and, in retrospect, wish they had known more
32 about the risks of their treatment, device, or medication. We hypothesized that such wishes could
33 be generalized into information a “reasonable patient” would want to know.
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50 **Goal**

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53 Our primary goal was to establish the descriptive intensity (scale of 1 to 5, with 1 being
54 “definitely no” and 5 being “definitely yes”) by which answers to general questions are desired
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3 by a reasonable patient before giving consent for an invasive procedure, prescription drugs, or
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5 medical devices that could pose a risk of avoidable harm. Our secondary goal was to characterize
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7 heterogeneity, such as gender and age, in the survey groups that may be associated with intensity
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9 variations in what a reasonable patient wishes to know.
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12 13 **Methods**

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16 Our survey study was approved by the Galveston College Institutional Review Board. Our search
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18 of PubMed using “reasonable patient survey” (15 November 2018) discovered only 2 partially
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20 relevant articles. One involved wishes of patients about anesthesia risks in a Singapore
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22 hospital.¹² Another surveyed patients’ opinions about pre-surgical informed-consent in a Jamaica
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24 teaching hospital.¹³ In the latter study, 67% of the surveyed patients described their consent
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26 process as ‘unsatisfactory.’ We created a statement of a generic situation in which a hospitalized
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28 patient must make choices about their care after being stabilized upon entry via the emergency
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30 department: *You are hospitalized in a large, urban, teaching hospital after being brought into its*
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32 *emergency room last night. The condition that brought you to the ER has been stabilized, but*
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34 *additional procedures may be necessary. The following 10 questions determine what you would*
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36 *like to know as a reasonable patient.* We developed a 10-question survey based on adverse
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38 experiences reported by members of the Patient Safety Action Network (formerly members of
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40 the Safe Patient Project of Consumers Union) and our knowledge of shortcomings with current
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42 informed consent practices as reflected in medical literature.
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49 The survey was developed in two forms. The first employed demographics to include
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51 age, gender, education level, race or ethnicity, and whether the survey taker has worked in a
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53 hospital. This survey was administered via cell phone to student nurses (and a few faculty) on
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55 April 19, 2018 at Galveston College, Galveston Texas during a presentation by Dr. James. It was
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3 also administered to participants in the Health Professions Educators Summer Symposium
4 (HPESS) Community via email request on June 8, 2018. The latter included primarily mature
5 academics involved in educating physicians, nurses, and health-care administrators.
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10 The second form of the survey, which was used for the U.S. national survey, employed
11 an identical scenario and questions, but the demographics were adapted to those offered by
12 SurveyMonkey® (SM) for a national survey. These included age, gender, household income
13 level, and region of the United States. The national platform included survey takers across the
14 U.S. that had been previously recruited by SM. The vast majority of the national survey takers
15 used cell phones to answer the questions. The third survey was administered to the national
16 audience on October 22, 2018.
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27 Each of the 10 questions could be answered at one of 5 intensity levels indicating the
28 degree to which an answer is desired by the person taking the survey. The responses were as
29 follows: definitely no (1.0), probably no (2.0), neutral (3.0), probably yes (4.0), and definitely
30 yes (5.0). Formal statistical analyses were deemed unsuited to the qualitative nature of our study
31 design. Final conclusions are word descriptions of the intensity of desire of a reasonable patient
32 to have answers such as “probably yes” or “definitely yes.” Obvious trends in the data were
33 captured graphically.
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44 ***Statistics and Factor Analyses***

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47 The data subjected to analyses were collected in three surveys (student nurses, HPESS,
48 and the national survey). For each survey, descriptive statistics were obtained and analyses of
49 the results were performed using Stata (version 14.0; Stata Corp., College Station, TX). The
50 means of the responses of the various groups for each subject category (e.g., age, gender, etc.)
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3 were tested for differences using methods that are appropriate for these categorical variables,
4 which are not normally distributed. The nonparametric Kruskal–Wallis one-way analysis of
5 variance by ranks was performed to test for differences between means and the Dunn test was
6 used to identify pairs that differed significantly. Statistical significance, adjusted for false
7 discovery, was established with $p < 0.025$.
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15 Factor analysis with principal component factoring was utilized in all surveys to
16 determine components that can explain the greatest portions of the total variance in responses
17 among the questions. The goal of a factor analysis is to reduce the number of variables to explain
18 and to interpret the results. Factor loadings was achieved by regression of scoring coefficients
19 obtained with varimax rotation. The loaded factors (principal components) generated were
20 analyzed as described above for other variables.
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30 ***Patient and Public Involvement***

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32 The research development of the present study was a direct result of patient advocates'
33 experiences with failed informed consent or lack of provider solicitation of patient preferences.
34 These led to formulation of many of the questions posed in our survey. The study leaders are
35 patient safety advocates. The outcome measures were a direct result of the reactions of putative
36 patients as “reasonable patients” to the survey questions. We intentionally involved providers by
37 surveying the HPESS community that consists of clinicians, nurses, and hospital administrators
38 dedicated to educating the next generation of leaders in their respective disciplines. They were
39 asked to assume the role of a patient as they completed our survey.
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52 Our results will be disseminated to the HPESS community once the study has been
53 published, and we will ask that our findings be presented during the summer symposium in July,
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3 2019. The theme of that symposium is how to best educate millennials. Our national survey data
4 provided a category specifically for responses by millennials. Results will be disseminated to
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6 student nurses at Galveston College through a presentation this spring. Our findings and
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8 suggested actions from our findings will be disseminated to patient advocates whose shared ideas
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10 and experiences powered this study. Those groups include the following: Patient Council of the
11
12 Right Care Alliance, Patient Safety Action Network, and members of Patient Safety America.
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14 We expect to widely share our findings with the general public (represented by our national
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16 survey) through media outlets such as ProPublica, with physicians through KevinMD and
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18 Veritas Health Care, and with nurses through Quality and Safety Education for Nurses (QSEN).
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Results

We targeted two groups from which to obtain responses because of the access we had to them and the expectation that their demographics would be different. The response rate from the student nurses was 99% (76/77) because it was taken during a lecture in which support was available if anyone had difficulty. Only one did. The response rate of the HPESS Community to the email request was 63/146 = 43%. The low response is likely due to busy professionals not having time to read and respond to all emails sent to them. Combined, the response rate of the two targeted studies was 62%. Table 1 shows the diversity of demographics in the two groups that took initial surveys. The primary differences were in age, education level, race or ethnic origin, and hospital work experience.

Table 1. Comparative demographics of targeted groups (2 sample test of proportions)

Demographic measure	Student Nurses (n = 76)	HPESS Community (n = 63)	P values
Under 35 years of age	77%	3%	<0.0001
Female	78%	70%	0.2755
High school graduate	34%	2%	<0.0001
College graduate	65%	5%	<0.0001
Advanced degree	1%	93%	<0.0001
White or Caucasian	51%	84%	<0.0001
Black or African American	16%	3%	0.0151
Hispanic or Latino	26%	2%	0.0001
Asian	4%	6%	0.5161
Have worked in a hospital	35%	86%	<0.0001

The national survey included 1211 persons who entered the survey and 1067 who completed it for a response rate of 88%. Nine participants did not answer location questions.

The combined results of our three surveys consistently showed that a “reasonable patient” would want to know an answer to each of the 10 questions presented in our survey (table 2).

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3 Table 2 allows the reader to view the results in two ways for each of the 10 questions.
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5 The first, shown in bracketed, red highlight, is the fraction of responders that indicated that they
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7 definitely wanted to know information (5.0 response) or have a certain right to access (e.g.
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9 medical record access). The second way to view results, in black lettering, indicates the
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11 numerical mean of all responses in each of the 3 surveys and the ranges of the means sorted by
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13 income groups and regions of the U.S. in the national survey. We used ranges as a measure of
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15 dispersion around the national means because it is likely lay readers will understand this more
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17 readily than the results of our formal statistical analysis. The three distinct surveys compare well
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19 regarding the wishes of patients. The highest intensity of desire to have an answer was to
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21 question 1 (know all treatment choices) in all three surveys (range 4.58-4.94). In all three
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23 surveys, the lowest intensity of desire to have an answer was to question 8 (medical record
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25 access) (range 3.98-4.07), and the second lowest intensity was to question 9 (advanced review of
26
27 documents) (range 4.18-4.29). Even the lowest intensity desire for an answer was near 4.0,
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29 which implies that on weighted-average basis, the putative reasonable patient would *probably*
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31 want to have access to his medical record and be able to make entries.
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Table 2. Average response levels in three surveys. 4.0 indicates the person “probably” wants an answer, and 5.0 indicates the person “definitely” wants an answer. The percentage of the 5.0 responses are shown in bold red. In the national survey, 71 % of the reported income levels were from \$10,000 to \$99,000. Of the 9 geographic regions of the U.S., 54% of responses were from 3 of those – east north central, south Atlantic, and Pacific. Footnotes: ^an=75, ^bn=62

Number and description of survey question	Student Nurses (n = 76)	HPES Group (n = 63)	National Group (n = 1067)	National ranges over 10 income Groups	National ranges over 9 regions of the U.S.
The percentages of individuals that ‘definitely’ (5.0) wanted an answer to each question below is shown in bold red in the columns.	[% 5.0]	[% 5.0]	[%5.0]		
1. Would you like to know all your treatment choices, including alternatives and risks and benefits of each choice for a patient like you. Your choices may include invasive procedures (surgery, endoscopic procedures, insertion of a medical device), non-invasive treatments, and what happens if you do nothing?	4.92 [92%]	4.94 [95%]	4.58 [75%]	4.33-4.97	4.51-4.65
2. Drugs that have not been approved by the Food and Drug Administration for your condition are off-label for you. Drugs prescribed off-label are about twice as likely to cause serious side-effects as drugs prescribed on-label. Would you like to know if any drugs prescribed to you are off-label, and what their side effects may be?	4.89 ^a [89%]	4.51 [67%]	4.40 [67%]	4.07-4.71	4.26-4.57
3. Drugs assigned a “black box” warning by the FDA pose an especially serious risk of harm. If you are prescribed such a drug, would you want to know the reasons for the black box warning and if there are alternatives before you take it?	4.83 [83%]	4.67 [79%]	4.57 [78%]	4.27-4.92	4.43-4.69
4. Decision aids are created to assist patients with complex medical decisions and to help them understand the risks and benefits of treatment options. If there is a decision-aid available for your illness, would you like to review it?	4.66 [73%]	4.65 [70%]	4.41 [61%]	4.07-4.69	4.28-4.57
5. If you are considering an invasive procedure, would you like to know who will be performing it, their skill level, and how trainee doctors, if any, will be involved?	4.83 [84%]	4.78 [84%]	4.49 [68%]	4.34-4.82	4.41-4.63
6. Assuming you have decided on a procedure or treatment, would you like to know what your total, out-of-pocket costs will be?	4.71 [79%]	4.60 ^b [68%]	4.48 [69%]	4.21-4.76	4.41-4.52
7. You have a trusted family member that is willing to act as your advocate. Would you like for that person to be present during shared-decision-making about your medical care?	4.65 ^a [73%]	4.54 [62%]	4.31 [54%]	4.09-4.69	4.20-4.43
8. If you are well enough, would you like to be offered a chance to review and make entries in your medical records each day while you are hospitalized?	4.07 [47%]	4.06 [48%]	3.98 [38%]	3.41-4.23	3.89-4.11
9. Before signing any documents permitting invasive, non-emergency procedures would you like to review these at least one full day in advance of the procedure?	4.29 [49%]	4.19 [52%]	4.18 [47%]	3.91-4.41	3.87-4.34
10. If you are considering an invasive procedure, would you like to know your expected difficulties, recovery times, pain management, and restrictions after the procedure while hospitalized and after discharge from the hospital? This includes the risk of infection from the invasive procedure.	4.84 [86%]	4.89 [90%]	4.60 [76%]	4.32-4.85	4.49-4.70

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3 Below we provide brief descriptions of the statistical analyses and factor analyses for
4 each of the 3 surveys. The details of these analyses are in 'additional files.' Question numbers
5 are found in table 2. Statistical analysis of the responses to survey questions obtained from
6 student nurses revealed no significant differences among age groups, level of education,
7 experience working in a hospital, or between genders, in their responses to any of the 10
8 questions. Not considering 'another race' as a response suitable for comparisons, the only
9 differences in pairs were for question 1. 'White or Caucasian' was different from 'Black or
10 African American' ($p = 0.011$) and 'Black or African American' was different from 'Asian or
11 Asian American' ($p = 0.020$).
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24 Factor analysis with principal component factoring identified 3 factors each with
25 Eigenvalues greater than 1, which cumulatively accounted for 64% of total variance among
26 responses provided by the student nurses. Varimax factor loading of 3 factor variables labeled as
27 "knowledge", "participation", and "total cost" were generated and analyzed as above for
28 differences in responses among groups. No significant differences were found among age
29 groups, levels of education, or between genders, in their responses to any of the factor variables.
30 The only significant differences, again disregarding comparisons to 'Another race,' existed
31 among races and ethnicities in their responses associated with "knowledge" ($p = 0.0091$) where
32 'White or Caucasian' differed from 'Black or African American' ($p = 0.0211$).
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46 The responses of the HPESS survey did not differ significantly between genders, or
47 among various ethnicities for any of the ten questions. Responses differed significantly among
48 age groups only for questions 1 ($p = 0.0171$) and 2 ($p = 0.0024$). Responses differed
49 significantly by education level for questions 1 ($p = 0.0015$), 2 ($p = 0.0139$), 3 ($p = 0.0170$) and
50 10 ($p = 0.0347$). Among respondents to the HPESS survey, significant differences in responses
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3 to questions 1 ($p = 0.003$), 2 ($p = 0.0024$), and 5 ($p = 0.0002$) were provided by respondents who
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5 differed according to their employment as hospital workers.
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9 Factor analysis of the HPESS data with principal component factoring identified no
10 statistically significant differences for either of two factor variables "knowledge" and
11 "participation" when responses were compared by age, gender, or level of education. A
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13 significant difference among ethnic groups was found for "knowledge" ($p = 0.0394$) but post hoc
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15 analysis with Dunn's test failed to identify any pairs of groups that differed significantly.
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20 In the national survey responses differed significantly for all questions among age
21 groups ($p = 0.001$ for questions 1 - 7 and 10; $p = 0.0041$ and 0.0052 for questions 8 and 9
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23 respectively), between genders ($p = 0.001$ for questions 1, 2, 4, 7, 8 and 10; $p = 0.0043$, 0.0002 ,
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25 0.0030 and 0.0014 for questions 3, 5, 6 and 9, respectively). Significant differences for questions
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27 1 ($p = 0.0001$), 2 ($p = 0.0384$), 3 ($p = 0.0047$), 4 ($p = 0.0037$), and 6 ($p = 0.0190$) were found
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29 among groups that differed by income level. Question 9 ($p = 0.0473$) was the only question for
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31 which responses differed significantly among regions of the U.S. Several salient generalizations
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33 from these comparisons are apparent. When comparing responses among various age groups,
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35 differences were found among all ages groups for most questions. When significant differences
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37 were found among response of groups of differing income levels the differences, most often,
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39 were between group 1 and the other groups. Differences between regions, in response to question
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41 9, were most often between regions 1 and 2 and the other regions.
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49 Factor analysis of the national data with principal component factoring demonstrated
50 significant differences among the age categories for both factor variables ("knowledge", and
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52 "other", $p = 0.0001$ for both variables). All groups differed significantly from each other, with
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54 the exception of group 4 vs group 5 for the factor variable "other". For both factor variables the
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3 differences in responses of the genders are very highly significantly different ($p < 0.0001$). When
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5 considering responses from groups of differing income levels, significant differences were found
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7 for the variable "knowledge" ($p = 0.0005$). Most of the differences among pairs are between
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9 group 1 and other groups and between group 3 and other groups. There were no significant
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11 differences in responses to factor variables among regions.
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16 17 **Discussion**

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20 Despite the different demographics in the two targeted surveys (table 1), especially in
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22 age, education level and hospital work experience, the responses were comparable in the two
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24 groups (table 2). Only one of the 10 questions (number 2) had a response level that differed by
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26 more than 0.20 units. This was the question of whether a reasonable patient would want to know
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28 about any off-label drugs prescribed. The difference was 0.38 units. The higher education level
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30 and more hospital experience of the HPESS Community may have made this group slightly less
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32 concerned about the additional risk that may be associated with off-label prescriptions. Statistical
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34 analysis of the nurse-student survey revealed two paired demographic differences. Two
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36 race/ethnic pairs (white vs. black and black vs. Asian) were associated with differences in
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38 intensity of response to question 1, which is about knowing all choices for treatment including
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40 risks and benefits. Statistical analysis of the HPESS community survey disclosed differences
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42 between pairs in the age, education-level and hospital-work-experience groups. While these
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44 statistical findings may be interesting, the reality is that the core message remains unchanged:
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46 patients of all types studied wish to know many details about their care choices when facing the
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48 possibility of an invasive procedure.
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3 The results of the national survey regarding demographics of gender (figure 1) and age
4 (figure 2) demonstrated distinct trends for all 10 questions. Without exception, women wanted
5 more information than men, and older adults wanted more information than younger adults.
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7 Similarly, statistical analysis supported associations between age and gender on the intensity of
8 responses to most questions, and it revealed an effect of income for some of the survey
9 questions. The gender associations may be due to women being higher users of hospital care and
10 hospitals tending to offer many more services targeted to women than to men.¹⁴ Older adults may
11 be more likely to be cautious compared to younger adults because of more lifetime hospital
12 experiences.
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15 Our survey provides insight into some patient concerns that are not typically part of
16 informed consent. In the wake of the opioid epidemic, the public is more aware of the potential
17 dangers of prescription drugs. Thus, it should not be surprising that patients would want to know
18 if the drugs prescribed to them are off-label or have a black-box warning. The U.S. Food and
19 Drug Administration assigned “black box” warnings to immediate-release opioids in 2016.¹⁵
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21 There is also growing attention to surprise medical bills in the U.S., so a reasonable patient
22 would likely to want an estimate of his out-of-pocket costs. Inordinate out-of-pocket costs,
23 especially those that lead to bankruptcy, may have an adverse effect on clinical outcomes.¹⁶
24
25 Hospital administration staff could assist with providing cost information. The opportunity to
26 review and make entries in one’s medical record, while not part of the informed consent process,
27 may relate. Many patients want to ensure that the data being recorded are accurate and complete;
28 moreover, many desire access to their data as a means of gaining a better understanding of their
29 condition and engaging with their providers. Encouraging this access can convey strong support
30 for the view that the patient is an integral part of his care team.
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3 There is an important connection between informed consent and the overuse of medical
4 procedures. The overuse of PCI in the U.S. is a prime example. Patients that may need PCI were
5 less likely to choose this invasive option when they were better informed about their care options
6 during hospitalization.¹⁷ A study of patients in Northern England that may need PCI concluded
7 that there is “a mismatch between legal and ethical principles of informed consent and current
8 practice. The variation in patients’ experiences of the current place of informed consent in
9 service delivery represents a missed opportunity for cardiologists to work in decision-making
10 partnerships with patients. In light of recent changes in the law [to the reasonable patient
11 standard], a new approach to informed consent is required.”¹⁸
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26 The history of legally-defined informed consent for invasive procedures has evolved
27 from a totally physician-centered concept (before the Era of Enlightenment) in which deception
28 of the patient was deemed necessary, to the point where the process has now become patient-
29 centered, in principle. A brief summary of some of the court decisions pertinent to involvement
30 of the patient points to the next step in informed consent, which we feel we have defined with
31 our survey.¹⁹ As early as 1914, a New York court established that an “adult in sound mind has
32 the right to determine what shall be done with his own body.” This was reinforced in 1960 by the
33 decision of a court in Kansas that the patient, not the physician, must make the final decision
34 about any operation. Of course, the patient’s decision may be biased by receiving limited
35 information from the physician. Two court decisions in 1972, one in California and the other in
36 Washington, D.C., determined that the patient must be informed of pertinent risks of surgery and
37 have the alternatives revealed to him or her. In 1983, a New Jersey court ruled that if a surgeon,
38 other than the one the patient selected, performs the surgery, then the surgeon that obtained
39 consent, but did not perform the surgery is liable for malpractice. The surgeon performing the
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3 surgery is liable for battery. The importance of the side effects of a drug (prednisone) came to a
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5 Massachusetts court's attention in 1986 when a patient suffered serious adverse effects of this
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7 drug used after eye surgery. It seems there was controversy about whether the physician should
8
9 have known about the possible side effects, and then disclosed this potential complication of the
10
11 drug to the patient.
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15 While our survey questions originated primarily from adverse experiences of patients, it
16
17 is clear that court decisions have pointed the way to a new era of the patient's voice being heard
18
19 in the context of shared-decision making and informed consent. That voice says to clinicians
20
21 who would perform an invasive procedure, "We patients want to know more than you have been
22
23 telling us." We want to know all of our choices and their risks and benefits, we want to know the
24
25 risks and benefits of drugs prescribed to us and devices placed in us, we want to view decision
26
27 aids when available, we want to know the skill level of the physician(s) performing our
28
29 procedure, and we want to know our costs. Moreover, we want an advocate present during
30
31 shared-decision making, we want full access to our medical records, we want to review consent
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33 documents at least 24 hours before signing them, and we want to know the expected outcomes of
34
35 the invasive procedure to include recovery times, pain management, and infection risks.
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41 **Limitations**

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44 In order to respect the time of responders to our survey, we limited it to 10 questions applicable
45
46 to an informed consent discussion in a hypothetical situation. In real clinical settings, it is likely
47
48 that our "template" will need to be augmented with questions specific to the situation the patient
49
50 faces. These should be designed to elicit the patient's preferences. We also recognize that some
51
52 of the answers are out of the clinician's hands; for example, clinicians in the U.S. are seldom
53
54 going to know the patient's out-of-pocket costs. We also recognize that clinicians may need the
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3 assistance of pharmacists in conveying the benefits, risks, and alternatives to off-label or black-
4 box-warning drugs. Surveys like ours involving a hypothetical scenario may be limited because
5
6 in a real and stressful situation a patient may simply want to trust doctors' recommendations or
7
8 may be afraid to ask too many questions. In a sense, our hypothetical "reasonable patient" has
9
10 become a "frightened patient" when placed in a real situation, but that does not mean that he or
11
12 she does not want to know answers to the all the questions in our survey.
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16 17 **Conclusions**

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20 Through two targeted surveys and a U.S. national survey, we have affirmed that a reasonable
21
22 patient will want to know far more information than is generally conveyed during typical shared-
23
24 decision making that leads to no more than a partly informed decision by the patient. Survey
25
26 respondents wanted to know risks and benefits of all treatment options, the risks and benefits of
27
28 off-label and box-warning drugs. They wished to view decision aids, know precisely who will
29
30 perform the procedure, and their anticipated out-of-pocket costs. Their desire was for an
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32 advocate to be present during shared-decision making, have periodic opportunities to review
33
34 their medical record, have a full day to review informed-consent documents, and to be made
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36 aware of expected outcomes and restrictions after the procedure. We expect our findings to have
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38 implications for what defines a reasonable patient standard for informed consent.
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3 Figure 1. National intensity scores above 4.0 vs. question number for gender differences in the
4 national survey. Responses came from 497 males and 570 females.
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6 Figure 2. National intensity scores above 4.0 vs. question number for age differences in the
7 national survey. Responses came from 297, 230, 343, and 197 people in the four respective age
8 groups.
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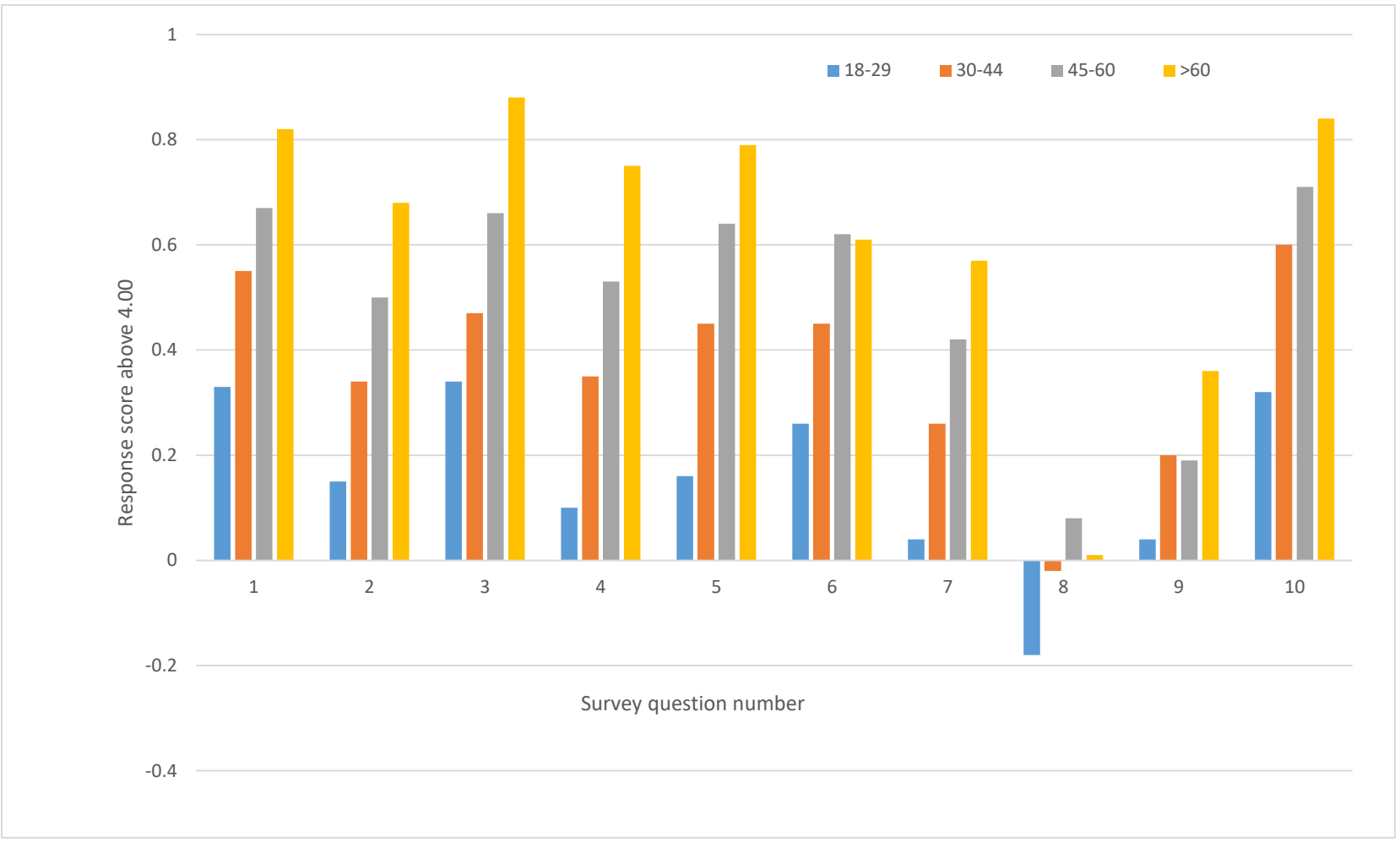
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Figure 1. Effect of gender on survey responses



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BMJ Open

Informed Consent, Shared-Decision Making and a Reasonable Patient's Wishes Based on a National Survey in the United States Using a Hypothetical Scenario

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Keywords:	informed consent, shared-decision making, reasonable patient, overuse of procedures, coproduction, patient autonomy

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3 Informed Consent, Shared-Decision Making and a Reasonable Patient's Wishes
4 Based on a National Survey in the United States Using a Hypothetical Scenario
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6 John T. James¹, Darwin J. Eakins², and Robert R. Scully³
7

8 ¹CEO, Patient Safety America, Houston, TX, and retired NASA Chief Toxicologist, Houston,
9 TX
10

11 ²Private consultant on survey methods, retired statistical expert from the University of Kansas,
12 Lawrence, KS
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14 ³Private consultant on statistical methods and interpretation
15
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17

18 Corresponding Author:
19

20 John T. James
21

22 Patient Safety America
23

24 14503 Windy Ridge Lane, Suite 200
25

26 Houston, TX 77062
27

28 Phone: 713-416-2878
29

30 john.t.james@earthlink.net
31

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Abstract

Objective: In approximately half the states in the U.S., and more recently in the U.K., informed consent is legally defined as what a reasonable patient would wish to know. Our objective was to discern the information needs of a hospitalized, “reasonable patient” during the informed-consent process.

Design: Survey the intensity using a 5-point scale (4 indicates “probably yes,” and 5 indicates “definitely yes”) by which individuals wish to know specific information if placed in a hypothetical scenario where an invasive procedure may be an option.

Setting: A 10-question survey was administered from April 19 through October 22, 2018 to three groups: student nurses (n=76), health professions educators (n=63), and a U.S. national population (n=1067).

Primary and secondary outcome measures: The primary outcome measure was the average intensity, on a 5-point scale, by which survey groups wished to have each of 10 questions answered. The secondary outcome was to discern relationships between survey demographics and the intensity by which participants wanted an answer.

Results: Despite substantial demographic differences in the nursing-student group and health-professions-educator group, the average intensity scores were within 0.2 units on 9 of 10 questions. The national survey revealed a strong desire to have an answer to each question (range 3.98 to 4.60 units). It showed that women desired answers more than men and older adults desired answers more than younger adults.

Conclusions: Based on responses to 10 survey questions regarding wishes of people in a situation where an invasive procedure may be necessary, the vast majority want an answer to

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2
3 each question. They wanted to know about all treatment options, risky drugs, decision aids, who
4 will perform the procedure, and the cost. They wanted their advocate present, periodic review of
5 their medical record, a full day to review documents, and expected outcomes and restrictions
6 after the procedure.
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13 **Key Words:** Informed consent, shared-decision making, reasonable patient, overuse of
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Strengths and limitations of this study:

- Based on two targeted surveys and a national survey, findings are consistent across demographic groups and across the United States, making our conclusions robust.
- The findings form a template that could be used by clinicians when engaged in shared-decision making to elicit truly informed consent from the patient.
- The survey questions had to be limited to be practical, so in any specific, real-life situation additional questions may be asked by a reasonable patient.
- Findings about the out-of-pocket costs of a procedure probably apply only to patients in the United States where out-of-pocket costs may be enormous.

Funding statement: The study was supported by Patient Safety America, Houston, TX USA. A donation (\$1,400) from Dr. James to support the SurveyMonkey® platform provided the funds required. His roles are given below in the “Author’s contribution” section.

Competing interests: Dr. James founded Patient Safety America as a no-budget organization dedicated to educating people about problems in the U.S. healthcare industry. He serves as its unpaid CEO and leader. He has no conflicts of interest, advocating only for improved care.

Author’s contribution: JTJ conceived the study and developed the questions. DJE formed the survey instrument to suit each of the situations where questions were to be presented to a survey audience. JTJ and RRS analyzed the data. JTJ wrote most of the paper in close consultation with coauthors. All authors agreed to be accountable for accuracy of the work.

Data sharing statement: National survey data at: <http://patientsafetyamerica.com/survey-data/>.

Health-Professions-Educator survey at: <https://www.surveymonkey.com/results/SM-DQJDBBQ7L/>

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3 Nursing-student survey available at: <https://www.surveymonkey.com/results/SM-5F2SX9W3V/>
4
5 Available 'Supplementary files' include the research proposal, 2 forms of the survey, and 6
6
7 statistical analysis files.
8
9

10 **Introduction**

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13 The human right to self-determination in healthcare is a hallmark of instruments promulgated by
14
15 the United Nations. Rights are specifically described for children, persons with disabilities and
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17 older persons. These call for the highest standards attainable for children's health,¹ for treatment
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19 of illness or rehabilitation of the disabled,² and for maintenance of optimum health as people
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21 age.³ The patient's right to know certainly extends to knowing the risks and benefits of
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23 prescription medications. For example, based on a recent court decision in the U.K. involving off
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25 label and unlicensed medication prescribing, consent laws now call for patients to receive all
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27 information that a patient deems important, and not just what the physician thinks is important.⁴
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29 However, unless the patient is harmed by denial of sufficient information to exercise their rights
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31 to make an informed decision about off-label prescriptions, there is no legal standing for
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33 compensation. In our opinion, the human rights of patients to self-determination in healthcare
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35 can only be attained through a balanced process of shared-decision making between patient and
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37 clinician.
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44 While the idea of shared-decision making between patient and clinician has been around
45
46 many decades, based on peer-reviewed citations, the concept has gained momentum since 2012.⁵
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48 The culmination of shared-decision making is that the patient consents to the mutually-agreed
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50 procedures to be performed or not performed. The old standard calling for information that
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52 "reasonable clinicians" feel their patients need to know is giving way to the new standard
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54 defined by what a reasonable patient wishes to know. However, a study of recorded
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3 conversations between clinicians and a patients that may need percutaneous coronary
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5 intervention (PCI) found that only 3% of the patients received all 8 elements necessary for
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7 informed decision making.⁶ A recent court ruling in the U.K has upheld the patient-centered,
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9 informed-consent standard and about half of the United States use “reasonable patient” as the
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11 basis for administering informed consent.⁷ In the past, the “reasonable patient” standard has been
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13 ill-defined and abstract; our intent is to better-define the information wishes of a reasonable
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15 person when facing the possibility of an invasive procedure.⁸ There is a natural conflict between
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17 respect for patient autonomy in making an informed decision and the practical aspects of how a
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19 clinician delivers information to a “reasonable patient” to fulfill the ethical principle of
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21 autonomy.
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27 The question then becomes, “What does a reasonable patient wish to know?” Typically,
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29 that is answered after the fact in specific cases where a patient may allege that he was not given
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31 sufficient information to make an informed decision.⁹ One example involved a case where a
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33 man’s family was not given enough information about his defibrillator replacement to make an
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35 informed decision.¹⁰ Patient preferences were not elicited by the clinician. A court in the U.K.
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37 decided that a woman was not given sufficient information on the 1% risk of shoulder dystocia
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39 from a vaginal vs. a Caesarian delivery to make an informed decision.¹¹ To our knowledge, no
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41 investigators have attempted to define the information needs of a reasonable patient in a general
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43 way that applies to care during hospitalization. To some extent the survey was driven by stories
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45 of patient advocates who have experienced harm and, in retrospect, wish they had known more
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47 about the risks of their treatment, device, or medication. We hypothesized that such wishes could
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49 be generalized into information a “reasonable patient’ would want to know.
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54 55 **Goal**

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3 Our primary goal was to establish the descriptive intensity (scale of 1 to 5, with 1 being
4 “definitely no” and 5 being “definitely yes”) by which answers to general questions are desired
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6 by a reasonable patient before giving consent for an invasive procedure, prescription drugs, or
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8 medical devices that could pose a risk of avoidable harm. Our secondary goal was to characterize
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10 heterogeneity, such as gender and age, in the survey groups that may be associated with intensity
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12 variations in what a reasonable patient wishes to know.
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16 17 **Methods**

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20 Our survey-study proposal (Supplementary file 1) was approved by the Galveston College
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22 Institutional Review Board. Our search of peer-reviewed literature using “reasonable patient
23
24 survey” (15 November 2018) discovered only 2 partially relevant articles. One involved wishes
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26 of patients about anesthesia risks in a Singapore hospital.¹² Another surveyed patients’ opinions
27
28 about pre-surgical informed-consent in a Jamaica teaching hospital.¹³ In the latter study, 67% of
29
30 the surveyed patients described their consent process as ‘unsatisfactory.’ We created a statement
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32 of a generic situation in which a hospitalized patient must make choices about their care after
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34 being stabilized upon entry via the emergency department: *You are hospitalized in a large,*
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36 *urban, teaching hospital after being brought into its emergency room last night. The condition*
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38 *that brought you to the ER has been stabilized, but additional procedures may be necessary. The*
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40 *following 10 questions determine what you would like to know as a reasonable patient. We*
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42 *developed a 10-question survey based on adverse experiences reported by members of the*
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44 *Patient Safety Action Network (formerly members of the Safe Patient Project of Consumers*
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46 *Union) and our knowledge of shortcomings with current informed consent practices as reflected*
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48 *in medical literature.*
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3 The survey was developed in two forms. The first employed demographics to include
4 age, gender, education level, race or ethnicity, and whether the survey taker has worked in a
5 hospital (Supplementary file 2). This survey was administered via cell phone, without any means
6 of coercion, to student nurses (and a few faculty) on April 19, 2018 at Galveston College,
7 Galveston Texas during a presentation by Dr. James. It was also administered to participants in
8 the Health Professions Educators Summer Symposium (HPESS) Community via email request
9 on June 8, 2018. The latter included primarily mature academics involved in educating
10 physicians, nurses, and health-care administrators.
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22 The second form of the survey, which was used for the U.S. national survey, employed
23 an identical scenario and questions, but the demographics were adapted to those offered by
24 SurveyMonkey® (SM) for a national survey (Supplementary file 3). These included age, gender,
25 household income level, and region of the United States. The national platform included survey
26 takers across the U.S. that had been previously recruited by SM. The vast majority of the
27 national survey takers used cell phones to answer the questions. The third survey was
28 administered to the national audience on October 22, 2018.
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39 Each of the 10 questions could be answered at one of 5 intensity levels indicating the
40 degree to which an answer is desired by the person taking the survey. The responses were as
41 follows: definitely no (1.0), probably no (2.0), neutral (3.0), probably yes (4.0), and definitely
42 yes (5.0). Formal statistical analyses were deemed unsuited to the qualitative nature of our study
43 design. Final conclusions are word descriptions of the intensity of desire of a reasonable patient
44 to have answers such as “probably yes” or “definitely yes.” Obvious trends in the data were
45 captured graphically.
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55 ***Statistics and Factor Analyses***

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3 The data subjected to analyses were collected in three surveys (student nurses, HPESS,
4 and the national survey). For each survey, descriptive statistics were obtained and analyses of
5 the results were performed using Stata (version 14.0; Stata Corp., College Station, TX). The
6 means of the responses of the various groups for each subject category (e.g., age, gender, etc.)
7 were tested for differences using methods that are appropriate for these categorical variables,
8 which are not normally distributed. The nonparametric Kruskal–Wallis one-way analysis of
9 variance by ranks was performed to test for differences between means and the Dunn test was
10 used to identify pairs that differed significantly. Statistical significance, adjusted for false
11 discovery, was established with $p < 0.025$.

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Factor analysis with principal component factoring was utilized in all surveys to
determine components that can explain the greatest portions of the total variance in responses
among the questions. The goal of a factor analysis is to reduce the number of variables to explain
and to interpret the results. Factor loadings was achieved by regression of scoring coefficients
obtained with varimax rotation. The loaded factors (principal components) generated were
analyzed as described above for other variables.

Patient, Public, and Provider Involvement

The research development of the present study was a direct result of patient advocates’
experiences with failed informed consent or lack of provider solicitation of patient preferences.
These led to formulation of many of the questions posed in our survey. The study leaders are
patient safety advocates. The outcome measures were a direct result of the reactions of putative
patients as “reasonable patients” to the survey questions. We intentionally involved providers by
surveying the HPESS community that consists of clinicians, nurses, and hospital administrators

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3 dedicated to educating the next generation of leaders in their respective disciplines. They were
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5 asked to assume the role of a patient as they completed our survey.
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9 Our results will be disseminated to the HPESS community once the study has been
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11 published, and we will ask that our findings be presented during the summer symposium in July,
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13 2019. The theme of that symposium is how to best educate millennials. Our national survey data
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15 provided a category specifically for responses by millennials. Results will be disseminated to
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17 student nurses at Galveston College through a presentation this spring. Our findings and
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19 suggested actions from our findings will be disseminated to patient advocates whose shared ideas
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21 and experiences powered this study. Those groups include the following: Patient Council of the
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23 Right Care Alliance, Patient Safety Action Network, and members of Patient Safety America.
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25 We expect to widely share our findings with the general public (represented by our national
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27 survey) through media outlets such as ProPublica, with physicians through KevinMD and
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29 Veritas Health Care, and with nurses through Quality and Safety Education for Nurses (QSEN).
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Results

We targeted two groups from which to obtain responses because of the access we had to them and the expectation that their demographics would be different. The response rate from the student nurses was 99% (76/77) because it was taken during a lecture in which support was available if anyone had difficulty. Only one did. The response rate of the HPESS Community to the email request was 63/146 = 43%. The low response is likely due to busy professionals not having time to read and respond to all emails sent to them. Combined, the response rate of the two targeted studies was 62%. Table 1 shows the diversity of demographics in the two groups that took initial surveys. The primary differences were in age, education level, race or ethnic origin, and hospital work experience (Supplemental file 4).

Table 1. Comparative demographics of targeted groups (2 sample test of proportions)

Demographic measure	Student Nurses (n = 76)	HPESS Community (n = 63)	P values
Under 35 years of age	77%	3%	<0.0001
Female	78%	70%	0.2755
High school graduate	34%	2%	<0.0001
College graduate	65%	5%	<0.0001
Advanced degree	1%	93%	<0.0001
White or Caucasian	51%	84%	<0.0001
Black or African American	16%	3%	0.0151
Hispanic or Latino	26%	2%	0.0001
Asian	4%	6%	0.5161
Have worked in a hospital	35%	86%	<0.0001

The national survey included 1211 persons who entered the survey and 1067 who completed it for a response rate of 88%. Nine participants did not answer location questions.

The combined results of our three surveys consistently showed that a “reasonable patient” would want to know an answer to each of the 10 questions presented in our survey (table 2).

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3 Table 2 allows the reader to view the results in two ways for each of the 10 questions.
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5 The first, shown in bracketed, red highlight, is the fraction of responders that indicated that they
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7 definitely wanted to know information (5.0 response) or have a certain right to access (e.g.
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9 medical record access). The second way to view results, in black lettering, indicates the
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11 numerical mean of all responses in each of the 3 surveys and the ranges of the means sorted by
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13 income groups and regions of the U.S. in the national survey. We used ranges as a measure of
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15 dispersion around the national means because it is likely lay readers will understand this more
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17 readily than the results of our formal statistical analysis. The three distinct surveys compare well
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19 regarding the wishes of patients. The highest intensity of desire to have an answer was to
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21 question 1 (know all treatment choices) in all three surveys (range 4.58-4.94). In all three
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23 surveys, the lowest intensity of desire to have an answer was to question 8 (medical record
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25 access) (range 3.98-4.07), and the second lowest intensity was to question 9 (advanced review of
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27 documents) (range 4.18-4.29). Even the lowest intensity desire for an answer was near 4.0,
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29 which implies that on weighted-average basis, the putative reasonable patient would *probably*
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31 want to have access to his medical record and be able to make entries.
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Table 2. Average response levels in three surveys. 4.0 indicates the person “probably” wants an answer, and 5.0 indicates the person “definitely” wants an answer. The percentage of the 5.0 responses are shown in bold red. In the national survey, 71 % of the reported income levels were from \$10,000 to \$99,000. Of the 9 geographic regions of the U.S., 54% of responses were from 3 of those – east north central, south Atlantic, and Pacific. Footnotes: ^an=75, ^bn=62

Number and description of survey question	Student Nurses (n = 76)	HPES Group (n = 63)	National Group (n = 1067)	National ranges over 10 income Groups	National ranges over 9 regions of the U.S.
The percentages of individuals that ‘definitely’ (5.0) wanted an answer to each question below is shown in bold red in the columns.	[% 5.0]	[% 5.0]	[%5.0]		
1. Would you like to know all your treatment choices, including alternatives and risks and benefits of each choice for a patient like you. Your choices may include invasive procedures (surgery, endoscopic procedures, insertion of a medical device), non-invasive treatments, and what happens if you do nothing?	4.92 [92%]	4.94 [95%]	4.58 [75%]	4.33-4.97	4.51-4.65
2. Drugs that have not been approved by the Food and Drug Administration for your condition are off-label for you. Drugs prescribed off-label are about twice as likely to cause serious side-effects as drugs prescribed on-label. Would you like to know if any drugs prescribed to you are off-label, and what their side effects may be?	4.89 ^a [89%]	4.51 [67%]	4.40 [67%]	4.07-4.71	4.26-4.57
3. Drugs assigned a “black box” warning by the FDA pose an especially serious risk of harm. If you are prescribed such a drug, would you want to know the reasons for the black box warning and if there are alternatives before you take it?	4.83 [83%]	4.67 [79%]	4.57 [78%]	4.27-4.92	4.43-4.69
4. Decision aids are created to assist patients with complex medical decisions and to help them understand the risks and benefits of treatment options. If there is a decision-aid available for your illness, would you like to review it?	4.66 [73%]	4.65 [70%]	4.41 [61%]	4.07-4.69	4.28-4.57
5. If you are considering an invasive procedure, would you like to know who will be performing it, their skill level, and how trainee doctors, if any, will be involved?	4.83 [84%]	4.78 [84%]	4.49 [68%]	4.34-4.82	4.41-4.63
6. Assuming you have decided on a procedure or treatment, would you like to know what your total, out-of-pocket costs will be?	4.71 [79%]	4.60 ^b [68%]	4.48 [69%]	4.21-4.76	4.41-4.52
7. You have a trusted family member that is willing to act as your advocate. Would you like for that person to be present during shared-decision-making about your medical care?	4.65 ^a [73%]	4.54 [62%]	4.31 [54%]	4.09-4.69	4.20-4.43
8. If you are well enough, would you like to be offered a chance to review and make entries in your medical records each day while you are hospitalized?	4.07 [47%]	4.06 [48%]	3.98 [38%]	3.41-4.23	3.89-4.11
9. Before signing any documents permitting invasive, non-emergency procedures would you like to review these at least one full day in advance of the procedure?	4.29 [49%]	4.19 [52%]	4.18 [47%]	3.91-4.41	3.87-4.34
10. If you are considering an invasive procedure, would you like to know your expected difficulties, recovery times, pain management, and restrictions after the procedure while hospitalized and after discharge from the hospital? This includes the risk of infection from the invasive procedure.	4.84 [86%]	4.89 [90%]	4.60 [76%]	4.32-4.85	4.49-4.70

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3 Below we provide brief descriptions of the statistical analyses and factor analyses for
4 each of the 3 surveys. The details of these analyses are in supplementary files. Question numbers
5 are found in table 2. Statistical analysis of the responses to survey questions obtained from
6 student nurses (Supplementary file 5) revealed no significant differences among age groups,
7 level of education, experience working in a hospital, or between genders, in their responses to
8 any of the 10 questions. Not considering 'another race' as a response suitable for comparisons,
9 the only differences in pairs were for question 1. 'White or Caucasian' was different from 'Black
10 or African American' ($p = 0.011$) and 'Black or African American' was different from 'Asian or
11 Asian American' ($p = 0.020$).
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24 Factor analysis with principal component factoring identified 3 factors each with
25 Eigenvalues greater than 1, which cumulatively accounted for 64% of total variance among
26 responses provided by the student nurses. Varimax factor loading of 3 factor variables labeled as
27 "knowledge", "participation", and "total cost" were generated and analyzed as above for
28 differences in responses among groups (Supplementary file 6). No significant differences were
29 found among age groups, levels of education, or between genders, in their responses to any of
30 the factor variables. The only significant differences, again disregarding comparisons to
31 'Another race,' existed among races and ethnicities in their responses associated with
32 "knowledge" ($p = 0.0091$) where 'White or Caucasian' differed from 'Black or African
33 American' ($p = 0.0211$).
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48 The responses of the HPESS survey did not differ significantly between genders, or
49 among various ethnicities for any of the ten questions (Supplementary file 7). Responses
50 differed significantly among age groups only for questions 1 ($p = 0.0171$) and 2 ($p = 0.0024$).
51 Responses differed significantly by education level for questions 1 ($p = 0.0015$), 2 ($p = 0.0139$),
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3 (p = 0.0170) and 10 (p = 0.0347). Among respondents to the HPESS survey, significant
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5 differences in responses to questions 1 (p = 0.003), 2 (p = 0.0024), and 5 (p = 0.0002) were
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7 provided by respondents who differed according to their employment as hospital workers.
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11 Factor analysis of the HPESS data with principal component factoring identified no
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13 statistically significant differences for either of two factor variables "knowledge" and
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15 "participation" when responses were compared by age, gender, or level of education
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17 (Supplementary file 8). A significant difference among ethnic groups was found for
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19 "knowledge" (p = 0.0394) but post hoc analysis with Dunn's test failed to identify any pairs of
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21 groups that differed significantly.
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26 In the national survey, responses differed significantly for all questions among age
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28 groups (p = 0.001 for questions 1 - 7 and 10; p = 0.0041 and 0.0052 for questions 8 and 9
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30 respectively), between genders (p = 0.001 for questions 1, 2, 4, 7, 8 and 10; p = 0.0043, 0.0002,
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32 0.0030 and 0.0014 for questions 3, 5, 6 and 9, respectively) (Supplementary file 9). Significant
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34 differences for questions 1 (p = 0.0001), 2 (p = 0.0384), 3 (p = 0.0047), 4 (p = 0.0037), and 6 (p =
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36 0.0190) were found among groups that differed by income level. Question 9 (p = 0.0473) was the
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38 only question for which responses differed significantly among regions of the U.S. Several
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40 salient generalizations from these comparisons are apparent. When comparing responses among
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42 various age groups, differences were found among all ages groups for most questions. When
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44 significant differences were found among response of groups of differing income levels the
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46 differences, most often, were between group 1 and the other groups. Differences between
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48 regions, in response to question 9, were most often between regions 1 and 2 and the other
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3 Factor analysis of the national data with principal component factoring demonstrated
4 significant differences among the age categories for both factor variables ("knowledge", and
5 "other", $p = 0.0001$ for both variables) (Supplementary file 10). All groups differed significantly
6 from each other, with the exception of group 4 vs group 5 for the factor variable "other". For
7 both factor variables the differences in responses of the genders are very highly significantly
8 different ($p < 0.0001$). When considering responses from groups of differing income levels,
9 significant differences were found for the variable "knowledge" ($p = 0.0005$). Most of the
10 differences among pairs are between group 1 and other groups and between group 3 and other
11 groups. There were no significant differences in responses to factor variables among regions.
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26 Discussion

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29 Despite the different demographics in the two targeted surveys (table 1), especially in
30 age, education level and hospital work experience, the responses were comparable in the two
31 groups (table 2). Only one of the 10 questions (number 2) had a response level that differed by
32 more than 0.20 units. This was the question of whether a reasonable patient would want to know
33 about any off-label drugs prescribed. The difference was 0.38 units. The higher education level
34 and more hospital experience of the HPESS Community may have made this group slightly less
35 concerned about the additional risk that may be associated with off-label prescriptions. Statistical
36 analysis of the nurse-student survey revealed two paired demographic differences. Two
37 race/ethnic pairs (white vs. black and black vs. Asian) were associated with differences in
38 intensity of response to question 1, which is about knowing all choices for treatment including
39 risks and benefits. Statistical analysis of the HPESS community survey disclosed differences
40 between pairs in the age, education-level and hospital-work-experience groups. While these
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3 statistical findings may be interesting, the reality is that the core message remains unchanged:
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5 patients of all types studied wish to know many details about their care choices when facing the
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7 possibility of an invasive procedure.
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11 The results of the national survey regarding demographics of gender (figure 1) and age
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13 (figure 2) demonstrated distinct trends for all 10 questions. Without exception, women wanted
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15 more information than men, and older adults wanted more information than younger adults.
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17 Similarly, statistical analysis supported associations between age and gender on the intensity of
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19 responses to most questions, and it revealed an effect of income for some of the survey
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21 questions. The gender associations may be due to women being higher users of hospital care and
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23 hospitals tending to offer many more services targeted to women than to men.¹⁴ Older adults may
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25 be more likely to be cautious compared to younger adults because of more lifetime hospital
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27 experiences.
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33 Our survey provides insight into some patient concerns that are not typically part of
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35 informed consent. In the wake of the opioid epidemic, the public is more aware of the potential
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37 dangers of prescription drugs. Thus, it should not be surprising that patients would want to know
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39 if the drugs prescribed to them are off-label or have a black-box warning. The U.S. Food and
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41 Drug Administration assigned “black box” warnings to immediate-release opioids in 2016.¹⁵
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43 There is also growing attention to surprise medical bills in the U.S., so a reasonable patient
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45 would likely to want an estimate of his out-of-pocket costs. Inordinate out-of-pocket costs,
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47 especially those that lead to bankruptcy, may have an adverse effect on clinical outcomes.¹⁶
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49 Hospital administration staff could assist with providing cost information. The opportunity to
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51 review and make entries in one’s medical record, while not part of the informed consent process,
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53 may relate. Many patients want to ensure that the data being recorded are accurate and complete;
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3 moreover, many desire access to their data as a means of gaining a better understanding of their
4 condition and engaging with their providers. Encouraging this access can convey strong support
5 for the view that the patient is an integral part of his care team.
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11 There is an important connection between informed consent and the overuse of medical
12 procedures. The overuse of PCI in the U.S. is a prime example. Patients that may need PCI were
13 less likely to choose this invasive option when they were better informed about their care options
14 during hospitalization.¹⁷ A study of patients in Northern England that may need PCI concluded
15 that there is “a mismatch between legal and ethical principles of informed consent and current
16 practice. The variation in patients’ experiences of the current place of informed consent in
17 service delivery represents a missed opportunity for cardiologists to work in decision-making
18 partnerships with patients. In light of recent changes in the law [to the reasonable patient
19 standard], a new approach to informed consent is required.”¹⁸
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34 The history of legally-defined informed consent for invasive procedures has evolved
35 from a totally physician-centered concept (before the Era of Enlightenment) in which deception
36 of the patient was deemed necessary, to the point where the process has now become patient-
37 centered, in principle. A brief summary of some of the court decisions pertinent to involvement
38 of the patient points to the next step in informed consent, which we feel we have defined with
39 our survey.¹⁹ As early as 1914, a New York court established that an “adult in sound mind has
40 the right to determine what shall be done with his own body.” This was reinforced in 1960 by the
41 decision of a court in Kansas that the patient, not the physician, must make the final decision
42 about any operation. Of course, the patient’s decision may be biased by receiving limited
43 information from the physician. Two court decisions in 1972, one in California and the other in
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3 Washington, D.C., determined that the patient must be informed of pertinent risks of surgery and
4 have the alternatives revealed to him or her. In 1983, a New Jersey court ruled that if a surgeon,
5 other than the one the patient selected, performs the surgery, then the surgeon that obtained
6 consent, but did not perform the surgery is liable for malpractice. The surgeon performing the
7 surgery is liable for battery. The importance of the side effects of a drug (prednisone) came to a
8 Massachusetts court's attention in 1986 when a patient suffered serious adverse effects of this
9 drug used after eye surgery. It seems there was controversy about whether the physician should
10 have known about the possible side effects, and then disclosed this potential complication of the
11 drug to the patient.
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24 While our survey questions originated primarily from adverse experiences of patients, it
25 is clear that court decisions have pointed the way to a new era of the patient's voice being heard
26 in the context of shared-decision making and informed consent. That voice says to clinicians
27 who would perform an invasive procedure, "We patients want to know more than you have been
28 telling us." We want to know all of our choices and their risks and benefits, we want to know the
29 risks and benefits of drugs prescribed to us and devices placed in us, we want to view decision
30 aids when available, we want to know the skill level of the physician(s) performing our
31 procedure, and we want to know our costs. Moreover, we want an advocate present during
32 shared-decision making, we want full access to our medical records, we want to review consent
33 documents at least 24 hours before signing them, and we want to know the expected outcomes of
34 the invasive procedure to include recovery times, pain management, and infection risks.
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50 **Limitations**

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53 In order to respect the time of responders to our survey, we limited it to 10 questions applicable
54 to an informed consent discussion in a hypothetical situation. In real clinical settings, it is likely
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3 that our “template” will need to be augmented with questions specific to the situation the patient
4 faces. These should be designed to elicit the patient’s preferences. We also recognize that some
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6 of the answers are out of the clinician’s hands; for example, clinicians in the U.S. are seldom
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8 going to know the patient’s out-of-pocket costs. We also recognize that clinicians may need the
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10 assistance of pharmacists in conveying the benefits, risks, and alternatives to off-label or black-
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12 box-warning drugs. Surveys like ours involving a hypothetical scenario may be limited because
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14 in a real and stressful situation a patient may simply want to trust doctors’ recommendations or
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16 may be afraid to ask too many questions. In a sense, our hypothetical “reasonable patient” has
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18 become a “frightened patient” when placed in a real situation, but that does not mean that he or
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20 she does not want to know answers to the all the questions in our survey.
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26 **Conclusions**

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29 Through two targeted surveys and a U.S. national survey, we have affirmed that a reasonable
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31 patient will want to know far more information than is generally conveyed during typical shared-
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33 decision making that leads to no more than a partly informed decision by the patient. Survey
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35 respondents wanted to know risks and benefits of all treatment options, the risks and benefits of
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37 off-label and box-warning drugs. They wished to view decision aids, know precisely who will
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39 perform the procedure, and their anticipated out-of-pocket costs. Their desire was for an
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41 advocate to be present during shared-decision making, have periodic opportunities to review
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43 their medical record, have a full day to review informed-consent documents, and to be made
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45 aware of expected outcomes and restrictions after the procedure. We expect our findings to have
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47 implications for what defines a reasonable patient standard for informed consent.
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Figure 1. National intensity scores above 4.0 vs. question number for gender differences in the national survey. Responses came from 497 males and 570 females.

Figure 2. National intensity scores above 4.0 vs. question number for age differences in the national survey. Responses came from 297, 230, 343, and 197 people in the four respective age groups.

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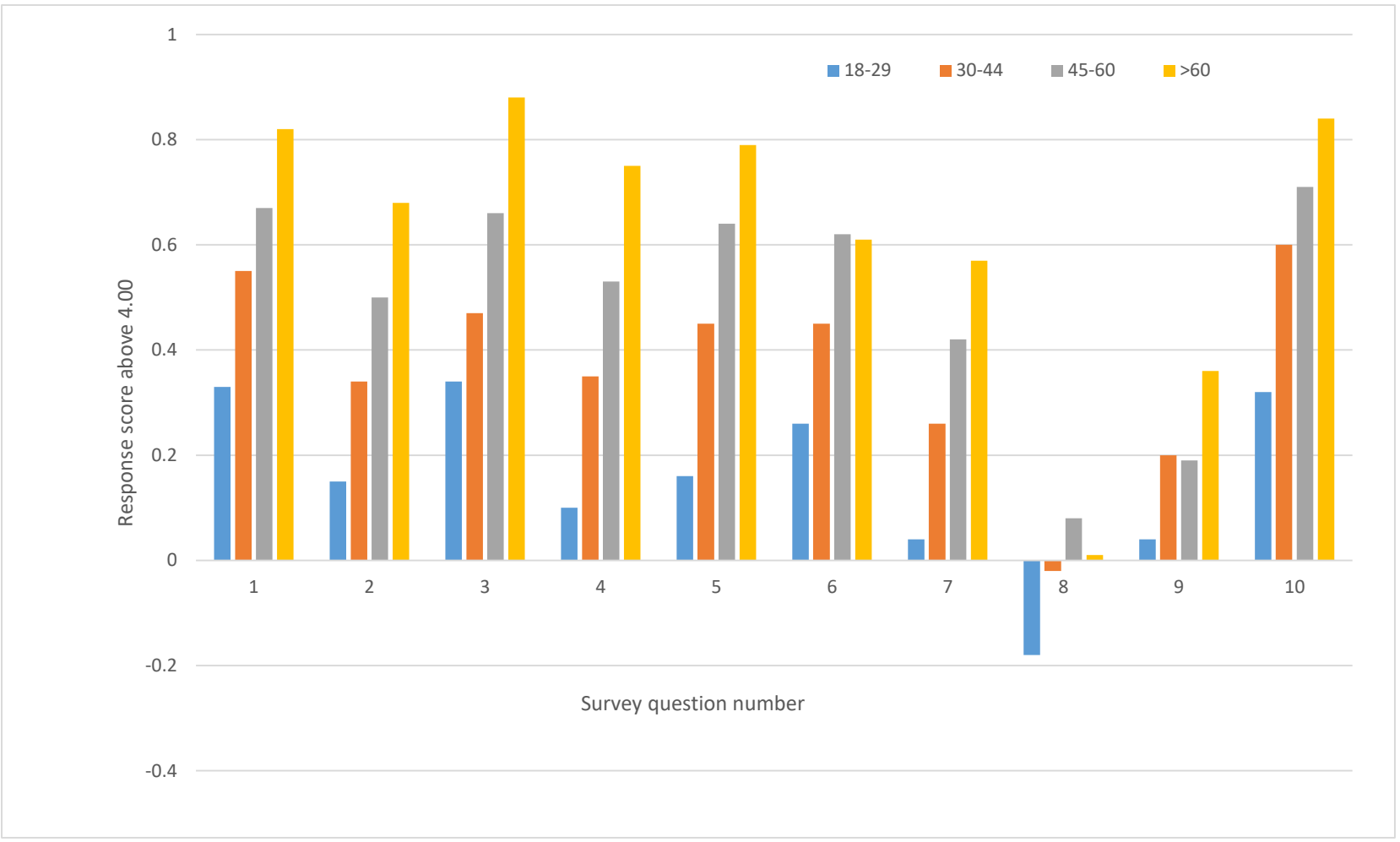
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Figure 1. Effect of gender on survey responses



review only

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A Baseline for the “Reasonable Patient Standard”

Investigators: John T. James, PhD, Patient Safety America, Houston, TX (retired NASA Chief Toxicologist) and Darwin J. Eakins, MS, (retired statistical expert, University of Kansas), Survey Consultant, Lawrence, KS

Background: Recent changes in the law on informed consent in the U.K. to favor a “reasonable patient standard” over a “reasonable clinicians’ standard” prompted experts on informed consent to survey the situation in the U.S. Laws defining informed consent vary from state to state. Laws in half the states favor the reasonable-patient-standard (RPS) and others favor the reasonable-clinicians-standard.ⁱ A debate ensued about the problems with the RPS because it is going to vary from patient to patient. As part of the debate, an opponent of the RPS stated that perhaps a baseline RPS could be formulated.ⁱⁱ It is our intent to begin to define a general baseline for the RPS. This is essential if patient-centered-care and shared-decision making are to become a reality. Texas is a RPS state.ⁱⁱⁱ Please note that for our purposes a “reasonable person” and a “reasonable patient” are identical.

Methods: We will use the Survey Monkey Platform to capture the demographics of each survey participant, and then they will answer 10 questions related to what they would like to know when facing the possibility of an invasive procedure while hospitalized. There are two identical versions of the survey, one intended to be taken simultaneously by an audience, and the other to be taken by individuals to whom the survey-link is sent via email. The survey platform prevents individuals from taking the survey more than once from their electronic device or computer. A link to the beta-version of the survey is given here: <https://www.surveymonkey.com/r/8Y5Q3MF>. Those taking the survey have 5 choices to express the degree to which they would like to know an answer to the question posed in the survey. Those responses range in 5 levels from “Definitely no” to “Definitely yes.”

Recruitment: Our plan is to survey up to 1,000 adults in a variety of categories. These have not been fully fixed at this point, but our target groups are as follows: students of nursing, mature and retired nurses, health professions educators, retired individuals, people with knowledge of patient safety issues, and a nationally representative group of adults. Subjects will be recruited via email or at presentations to groups, such as nursing students (see below). Our **primary hypothesis** is that across the survey groups and for most of the questions the participants will answer either “probably yes” or “definitely yes” to the questions. Our secondary goal is to discover groups that differ significantly from the overall average. We will use t-tests to determine statistical ($P < 0.05$) differences between groups for selected questions that seem worth exploring.

Results: At this point the survey has been administered to nursing students attending a lecture on informed consent at Galveston College (April 19, 2018). There were 77 respondents to the survey, which was taken early in the lecture. Later in the lecture, the results of the survey were presented to the group of students. The data were readily available in graphical and numerical form to the audience. This was done to prove-out our ability to capture data in near-real time.

Funding: The research is being funded by Patient Safety America, Houston, TX. This will be less than \$1,000 for the survey platform and additional costs if we choose to survey a nationally representative group to which we purchase access.

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4 ⁱ <https://jamanetwork.com/journals/jama/fullarticle/2516469>

5 ⁱⁱ <https://jamanetwork.com/journals/jama/article-abstract/2547748?redirect=true>

6 ⁱⁱⁱ CIVIL PRACTICE AND REMEDIES CODE

7 TITLE 4. LIABILITY IN TORT

8 CHAPTER 74. MEDICAL LIABILITY

9 SUBCHAPTER C. INFORMED CONSENT

10 Sec. 74.101. THEORY OF RECOVERY. In a suit against a physician or health care provider involving a health care
11 liability claim that is based on the failure of the physician or health care provider to disclose or adequately disclose
12 the risks and hazards involved in the medical care or surgical procedure rendered by the physician or health care
13 provider, the only theory on which recovery may be obtained is that of negligence in failing to disclose the risks or
14 hazards that could have influenced a reasonable person in making a decision to give or withhold consent.
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For peer review only

Reasonable Patient Care - Phone

You are hospitalized in a large, urban, teaching hospital after being brought into its emergency room last night. The condition that brought you to the ER has been stabilized, but additional procedures may be necessary. The following 10 questions determine what you would like to know as a reasonable patient. The survey should take no more than 5 minutes. There are only sixteen (16) items.

Reasonable Patient Care - Phone

Age

Page 1 of 16

1. Age

- | | |
|--------------------------------|-----------------------------|
| <input type="radio"/> Under 18 | <input type="radio"/> 45-54 |
| <input type="radio"/> 18-24 | <input type="radio"/> 55-64 |
| <input type="radio"/> 25-34 | <input type="radio"/> 65+ |
| <input type="radio"/> 35-44 | |

Reasonable Patient Care - Phone

Gender

Page 2 of 16

2. Gender

- Male
- Female

Reasonable Patient Care - Phone

Education

Page 3 of 16

3. Education

HS Grad

Advance Degree

College Grad

Reasonable Patient Care - Phone

Race/Ethnicity

Page 4 of 16

4. Race/Ethnicity

White or Caucasian

American Indian or Alaska Native

Black or African American

Native Hawaiian or other Pacific Islander

Hispanic or Latino

Another race

Asian or Asian American

Reasonable Patient Care - Phone

Worked in Hospital

Page 5 of 16

5. Have you worked in a hospital?

Yes

No

If Yes, your job was:

Reasonable Patient Care - Phone

Alternatives/Risks/Benefits

Page 6 of 16

1 6. Would you like to know all your treatment choices, including alternatives and risks and benefits of each
2 choice for a patient like you. Your choices may include invasive procedures (surgery, endoscopic
3 procedures, insertion of a medical device), non-invasive treatments, and what happens if you do nothing?
4

- 5 Definitely no Probably yes
6
7 Probably no Definitely yes
8
9 Neutral
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11 Reasonable Patient Care - Phone

12 Drugs

13 Page 7 of 16

14
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21 7. Drugs that have not been approved by the Food and Drug Administration for your condition are off-label
22 for you. Drugs prescribed off-label are about twice as likely to cause serious side-effects as drugs
23 prescribed on-label. Would you like to know if any drugs prescribed to you are off-label, and what their side
24 effects may be?
25

- 26
27 Definitely no Probably yes
28
29 Probably no Definitely yes
30
31 Neutral
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34 Reasonable Patient Care - Phone

35 Drugs Assigned "Black Box" Warning

36 Page 8 of 16

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42
43 8. Drugs assigned a "black box" warning by the FDA pose an especially serious risk of harm. If you are
44 prescribed such a drug, would you want to know the reasons for the black box warning and if there are
45 alternatives before you take it?
46

- 47
48 Definitely no Probably yes
49
50 Probably no Definitely yes
51
52 Neutral
53
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55 Reasonable Patient Care - Phone

56 Decisions Aids

Page 9 of 16

9. Decision aids are created to assist patients with complex medical decisions and to help them understand the risks and benefits of treatment options. If there is a decision-aid available for your illness, would you like to review it?

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Considering Invasive Procedure

Page 10 of 16

10. If you are considering an invasive procedure, would you like to know who will be performing it, their skill level, and how trainee doctors, if any, will be involved?

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Out-Of-Pocket Costs

Page 11 of 16

11. Assuming you have decided on a procedure or treatment, would you like to know what your total, out-of-pocket costs will be?

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Family Member as Advocate

Page 12 of 16

12. You have a trusted family member that is willing to act as your advocate. Would you like for that person to be present during shared-decision-making about your medical care?

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Make Entries In Medical Records

Page 13 of 16

13. If you are well enough, would you like to be offered a chance to review and make entries in your medical records each day while you are hospitalized?

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Documents Permitting Invasive Procedures

Page 14 of 16

14. Before signing any documents permitting invasive, non-emergency procedures would you like to review these at least one full day in advance of the procedure?

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Expected Difficulties /Recovery Times/Restrictions

Page 15 of 16

15. If you are considering an invasive procedure, would you like to know your expected difficulties, recovery times, pain management options, and restrictions after the procedure while hospitalized and after discharge from the hospital? This includes the risk of infection from the invasive procedure.

Definitely no

Probably yes

Probably no

Definitely yes

Neutral

Reasonable Patient Care - Phone

Other Comments

Page 16 of 16

16. What else would you like to know as a reasonable patient?

✓ only

Reasonable Patient 3

Reasonable Patient Care Survey

You are hospitalized in a large, urban, teaching hospital after being brought into its emergency room last night. The condition that brought you to the ER has been stabilized, but additional procedures may be necessary. The following 10 questions determine what you would like to know as a reasonable patient. The survey should take no more than 5 minutes.

- * 1. Would you like to know all your treatment choices, including alternatives and risks and benefits of each choice for a patient like you. Your choices may include invasive procedures (surgery, endoscopic procedures, insertion of a medical device), non-invasive treatments, and what happens if you do nothing?

1=definitely no

2=probably no

3=neutral

4=probably yes

5=definitely yes

- * 2. Drugs that have not been approved by the Food and Drug Administration for your condition are off-label for you. Drugs prescribed off-label are about twice as likely to cause serious side-effects as drugs prescribed on-label. Would you like to know if any drugs prescribed to you are off-label, and what their side effects may be?

1=definitely no

2=probably no

3=neutral

4=probably yes

5=definitely yes

- * 3. Drugs assigned a "black box" warning by the FDA pose an especially serious risk of harm. If you are prescribed such a drug, would you want to know the reasons for the black box warning and if there are alternatives before you take it?

1=definitely no

2=probably no

3=neutral

4=probably yes

5=definitely yes

- * 4. Decision aids are created to assist patients with complex medical decisions and to help them understand the risks and benefits of treatment options. If there is a decision-aid available for your illness, would you like to review it?

1=definitely no

2=probably no

3=neutral

4=probably yes

5=definitely yes

- * 5. If you are considering an invasive procedure, would you like to know who will be performing it, their skill level, and how trainee doctors, if any, will be involved?

1=definitely no

2=probably no

3=neutral

4=probably yes

5=definitely yes

1 * 6. Assuming you have decided on a procedure or treatment, would you like to know what your total, out-of-
2 pocket costs will be?

3
4 1-definitely no

2-probably no

3-neutral

4-probably yes

5-definitely yes

8 * 7. You have a trusted family member that is willing to act as your advocate. Would you like for that person
9 to be present during shared-decision-making about your medical care?

11 1-definitely no

2-probably no

3-neutral

4-probably yes

5-definitely yes

16 * 8. If you are well enough, would you like to be offered a chance to review and make entries in your medical
17 records each day while you are hospitalized?

19 1-definitely no

2-probably no

3-neutral

4-probably yes

5-definitely yes

23 * 9. Before signing any documents permitting invasive, non-emergency procedures would you like to review
24 these at least one full day in advance of the procedure?

26 1-definitely no

2-probably no

3-neutral

4-probably yes

5-definitely yes

31 * 10. If you are considering an invasive procedure, would you like to know your expected difficulties,
32 recovery times, pain management, and restrictions after the procedure while hospitalized and after
33 discharge from the hospital? This includes the risk of infection from the invasive procedure.

35 1-definitely no

2-probably no

3-neutral

4-probably yes

5-definitely yes

Table 1. Comparative demographics of targeted groups

Demographic measure	Student Nurses (n = 77)	HPESS Community (n = 63)	p-Value
Under 35 years of age	76.7%	3.2%	0.0000
Female	77.9%	69.8%	0.2755
High school graduate	33.8%	1.6%	0.0000
College graduate	64.9%	4.8%	0.0000
Advanced degree	1.3%	90.5%	0.0000
White or Caucasian	50.6%	84.1%	0.0000
Black or African American	15.6%	3.2%	0.0151
Hispanic or Latino	26.0%	1.6%	0.0001
Asian	3.9%	6.3%	0.5161
Have worked in a hospital	35.1%	85.7%	0.0000

Under 35 years of age

```
. prtesti 77 .767 63 .032
```

Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.767	.0481759			.6725769 .8614231
y	.032	.0221739			-.0114601 .0754601
diff	.735	.053034			.6310553 .8389447
under Ho:	.084248		8.72	0.000	

diff = prop(x) - prop(y)

z = 8.7242

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0

Ha: diff > 0

Pr(Z < z) = 1.0000

Pr(|Z| > |z|) = 0.0000

Pr(Z > z) = 0.0000

Female.

```
. prtesti 77 .779 63 .698
```

Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.779	.0472846			.6863239 .8716761
y	.698	.0578443			.5846272 .8113728
diff	.081	.0747114			-.0654317 .2274317
under Ho:	.0742776		1.09	0.275	

diff = prop(x) - prop(y)

z = 1.0905

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0

Ha: diff > 0

Pr(Z < z) = 0.8623

Pr(|Z| > |z|) = 0.2755

Pr(Z > z) = 0.1377

High school graduate

. prtesti 77 .338 63 .016

Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.338	.0539066			.232345 .443655
y	.016	.0158084			-.0149838 .0469838
diff	.322	.0561767	4.80	0.000	.2118956 .4321044
	under Ho:	.0670578			

diff = prop(x) - prop(y) z = 4.8018
 Ho: diff = 0

Ha: diff < 0 Pr(Z < z) = 1.0000
 Ha: diff != 0 Pr(|Z| > |z|) = 0.0000
 Ha: diff > 0 Pr(Z > z) = 0.0000

College graduate

. prtesti 77 .649 63 .048

Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.649	.0543914			.5423947 .7556053
y	.048	.026932			-.0047858 .1007858
diff	.601	.060694	7.29	0.000	.4820419 .7199581
	under Ho:	.0823973			

diff = prop(x) - prop(y) z = 7.2939
 Ho: diff = 0

Ha: diff < 0 Pr(Z < z) = 1.0000
 Ha: diff != 0 Pr(|Z| > |z|) = 0.0000
 Ha: diff > 0 Pr(Z > z) = 0.0000

Advanced degree

. prtesti 77 .013 63 .905

Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.013	.0129088			-.0123007 .0383007
y	.905	.0369416			.8325958 .9774042
diff	-.892	.0391321	-10.66	0.000	-.9686974 -.8153026
	under Ho:	.0836872			

diff = prop(x) - prop(y) z = -10.6587
 Ho: diff = 0

Ha: diff < 0 Pr(Z < z) = 0.0000
 Ha: diff != 0 Pr(|Z| > |z|) = 0.0000
 Ha: diff > 0 Pr(Z > z) = 1.0000

1
2
3 **. White or Caucasian**

4 . . prtesti 77 .506 63 .841

5 Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.506	.0569762			.3943287 .6176713
y	.841	.0460709			.7507028 .9312972
diff	-.335	.0732722			-.4786108 -.1913892
	under Ho:	.0806592	-4.15	0.000	

diff = prop(x) - prop(y)

z = -4.1533

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0

Ha: diff > 0

Pr(Z < z) = 0.0000

Pr(|Z| > |z|) = 0.0000

Pr(Z > z) = 1.0000

18
19
20 **. . Black or African American**

21 . prtesti 77 .156 63 .032

22 Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.156	.0413512			.0749531 .2370469
y	.032	.0221739			-.0114601 .0754601
diff	.124	.0469213			.032036 .215964
	under Ho:	.05101	2.43	0.015	

diff = prop(x) - prop(y)

z = 2.4309

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0

Ha: diff > 0

Pr(Z < z) = 0.9925

Pr(|Z| > |z|) = 0.0151

Pr(Z > z) = 0.0075

35
36
37 **. Hispanic or Latino**

38 . prtesti 77 .260 63 .016

39 Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.26	.049987			.1620273 .3579727
y	.016	.0158084			-.0149838 .0469838
diff	.244	.0524272			.1412447 .3467553
	under Ho:	.0606934	4.02	0.000	

diff = prop(x) - prop(y)

z = 4.0202

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0

Ha: diff > 0

Pr(Z < z) = 1.0000

Pr(|Z| > |z|) = 0.0001

Pr(Z > z) = 0.0000

Nurse-Student Statistics Report

Summary

- Question – For each of the questions, 1-10, is there a difference in the average response by age?
Answer – NO, there are no significant differences among age groups in their responses to any of the 10 questions.
- Question – For each of the questions, 1-10, is there a difference in the average response by gender?
Answer – NO, there are no significant differences between the genders in their responses to any of the 10 questions.
- Question – For each of the questions, 1-10, is there a difference in the average response by level of education?
Answer – NO, there are no significant differences among the education levels in their responses to any of the 10 questions.
- Question: For each of the questions, is there a difference in the average response based upon racer or ethnicity?
Answer – YES, for questions 1, 5, and 6,

```
. dunnstest iq1, by(ieth) ma(bh) wrap
K-Wallis probability = 0.0038
```

Dunn's Pairwise Comparison of iq1 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	3.061273			
	0.0110			
3	-0.085671	-1.871072		
	0.5176	0.0613		
4	-0.166771	-2.646096	0.000000	
	0.5422	0.0204	0.5000	
7	2.553091	-0.755791	1.387066	2.097047
	0.0178	0.3213	0.1379	0.0450

```
False Discovery Rate = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
. dunnstest iq5, by(ieth) ma(bh) wrap
K-Wallis probability = 0.0001
```

Dunn's Pairwise Comparison of iq5 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	1.713447			
	0.0866			
3	2.264929	0.858920		
	0.0294	0.2440		
4	-0.476526	-1.710491	-2.265841	
	0.3521	0.0726	0.0391	
7	4.334614	1.465931	0.247897	3.691637

```

| 0.0001 0.1019 0.4021 0.0006

```

```
False Discovery Rate = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
. dunntest iq6, by(ieth) ma(bh) wrap
```

```
Kwallis probability = 0.0245
```

```

Dunn's Pairwise Comparison of iq6 by ieth
(Benjamini-Hochberg)

```

Col Mean-	1	2	3	4
2	0.459251			
	0.3589			
3	-0.624727	-0.785168		
	0.3326	0.3088		
4	-1.215526	-1.110396	0.000000	
	0.2242	0.2224	0.5000	
7	2.934536	1.546239	2.055206	3.107180
	0.0084	0.1526	0.0664	0.0094

```
False Discovery Rate = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

- Question – For each of the questions, 1-10, is there a difference in the average response if respondent is or was a hospital worker?

Answer – NO, there are no significant differences among groups, based upon hospital work experience, in their responses to any of the 10 questions.

Statistics

- Question – For each of the questions, 1-10, is there a difference in the average response by age among those who identified their age group?

```
. dunntest iq1, by(iage) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

iage	Obs	Rank Sum
3	2	67.00
4	12	402.00
5	14	405.50
6	25	806.50
7	10	335.00

```
chi-squared = 0.550 with 4 d.f.
```

```
probability = 0.9685
```

```
chi-squared with ties = 4.037 with 4 d.f.
```

```
probability = 0.4010
```

```

Dunn's Pairwise Comparison of iq1 by iage
(Benjamini-Hochberg)

```

Col Mean-	3	4	5	6
4	0.000000			

```

1      |      0.6250
2      5 |      0.887093   1.704583
3      |      0.4688     0.4414
4      6 |      0.249476   0.522019  -1.459674
5      |      0.5736     0.6017     0.2406
6      7 |      0.000000   0.000000  -1.619603  -0.489962
7      |      0.5556     0.5000     0.2633     0.5201

```

8 False Discovery Rate = 0.05
9 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

11 . dunntest iq2, by(iage) ma(bh) wrap
12
13 Warning: by() values are unlabeled, option nolabel implicit

```

15 Kruskal-Wallis equality-of-populations rank test

```

17 +-----+
18 | iage | Obs | Rank Sum |
19 +-----+-----+
20 | 3 | 2 | 57.00 |
21 | 4 | 12 | 320.50 |
22 | 5 | 14 | 396.50 |
23 | 6 | 25 | 857.50 |
24 | 7 | 10 | 384.50 |
25 +-----+

```

24 chi-squared = 3.269 with 4 d.f.
25 probability = 0.5139
26 chi-squared with ties = 4.720 with 4 d.f.
27 probability = 0.3173

29 Dunn's Pairwise Comparison of iq2 by iage
30 (Benjamini-Hochberg)

```

31 Col Mean-|
32 Row Mean |          3          4          5          6
33 +-----+-----+-----+-----+
34 4 | 0.153782
35   | 0.4877
36 5 | 0.015486  -0.268804
37   | 0.4938     0.4926
38 6 | -0.517415  -1.417114  -1.174105
39   | 0.4320     0.2607     0.3004
40 7 | -0.842084  -1.797699  -1.603668  -0.727096
41   | 0.3997     0.3611     0.2720     0.3893

```

42 False Discovery Rate = 0.05
43 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

45 . dunntest iq3, by(iage) ma(bh) wrap
46
47 Warning: by() values are unlabeled, option nolabel implicit

```

49 Kruskal-Wallis equality-of-populations rank test

```

51 +-----+
52 | iage | Obs | Rank Sum |
53 +-----+-----+
54 | 3 | 2 | 20.00 |
55 | 4 | 12 | 428.00 |
56 | 5 | 14 | 405.50 |
57 | 6 | 25 | 806.00 |
58 | 7 | 10 | 356.50 |
59 +-----+

```

58 chi-squared = 4.146 with 4 d.f.
59 probability = 0.3866

1 chi-squared with ties = 8.316 with 4 d.f.
 2 probability = 0.0807

3
 4 Dunn's Pairwise Comparison of iq3 by iage
 5 (Benjamini-Hochberg)

Col Mean-	Row Mean	3	4	5	6
4		-2.596467			
		0.0471			
5		-1.938328	1.316342		
		0.0657	0.1881		
6		-2.338350	0.753882	-0.758192	
		0.0323	0.2818	0.3202	
7		-2.558488	0.003007	-1.247607	-0.704145
		0.0263	0.4988	0.1768	0.2674

16 False Discovery Rate = 0.05
 17 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

19 .
 20 . dunntest iq4, by(iage) ma(bh) wrap

21 Warning: by() values are unlabeled, option nolabel implicit

23 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	52.50
4	12	305.00
5	14	419.50
6	25	854.50
7	10	384.50

32 chi-squared = 3.509 with 4 d.f.
 33 probability = 0.4765

35 chi-squared with ties = 5.484 with 4 d.f.
 36 probability = 0.2411

38 Dunn's Pairwise Comparison of iq4 by iage
 39 (Benjamini-Hochberg)

Col Mean-	Row Mean	3	4	5	6
4		0.074414			
		0.4703			
5		-0.335113	-0.788405		
		0.4097	0.3587		
6		-0.735992	-1.701869	-0.861331	
		0.2886	0.2219	0.3891	
7		-1.074190	-2.076021	-1.397796	-0.778325
		0.3534	0.1895	0.2703	0.3117

50 False Discovery Rate = 0.05
 51 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

53 .
 54 . dunntest iq5, by(iage) ma(bh) wrap

55 Warning: by() values are unlabeled, option nolabel implicit

57 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	52.50
4	12	305.00
5	14	419.50
6	25	854.50
7	10	384.50

iage	Obs	Rank Sum
3	2	39.50
4	12	326.00
5	14	419.50
6	25	861.00
7	10	370.00

chi-squared = 3.087 with 4 d.f.
 probability = 0.5433

chi-squared with ties = 7.650 with 4 d.f.
 probability = 0.1053

Dunn's Pairwise Comparison of iq5 by iage
 (Benjamini-Hochberg)

Col Mean-	3	4	5	6
4	-0.833898 0.2527			
5	-1.160351 0.2049	-0.610687 0.3008		
6	-1.716672 0.1075	-1.778507 0.1255	-1.151401 0.1783	
7	-1.912387 0.1396	-1.972161 0.2430	-1.459248 0.1445	-0.587541 0.2784

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq6, by(iage) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	83.00
4	12	402.50
5	14	380.00
6	25	742.50
7	9	345.00

chi-squared = 3.125 with 4 d.f.
 probability = 0.5372

chi-squared with ties = 4.632 with 4 d.f.
 probability = 0.3272

Dunn's Pairwise Comparison of iq6 by iage
 (Benjamini-Hochberg)

Col Mean-	3	4	5	6
4	0.703165 0.3012			
5	1.281683 0.3333	1.097642 0.3405		
6	1.083624 0.2785	0.738198 0.3837	-0.516952 0.3362	
7	0.273361 0.3923	-0.733301 0.3310	-1.767517 0.3857	-1.498732 0.3349

False Discovery Rate = 0.05

Reject H_0 if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq7, by(iage) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	18.00
4	12	342.00
5	14	476.00
6	25	827.00
7	10	353.00

chi-squared = 4.164 with 4 d.f.

probability = 0.3843

chi-squared with ties = 5.665 with 4 d.f.

probability = 0.2256

Dunn's Pairwise Comparison of iq7 by iage
(Benjamini-Hochberg)

Col Mean-				
Row Mean	3	4	5	6
4	-1.624636			
	0.1303			
5	-2.104451	-0.889632		
	0.0883	0.3114		
6	-2.085160	-0.829861	0.175376	
	0.0618	0.2904	0.4304	
7	-2.160529	-1.010574	-0.199794	-0.377545
	0.1537	0.3122	0.4676	0.4411

False Discovery Rate = 0.05

Reject H_0 if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq8, by(iage) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	62.00
4	12	319.50
5	14	441.00
6	25	806.50
7	10	387.00

chi-squared = 2.389 with 4 d.f.

probability = 0.6646

chi-squared with ties = 2.751 with 4 d.f.

probability = 0.6003

Dunn's Pairwise Comparison of iq8 by iage
(Benjamini-Hochberg)

Col Mean-				
Row Mean	3	4	5	6
4	0.335334			
	0.5267			

```

1      5 | -0.038721 -0.725439
2      |      0.4846  0.4682
3      6 | -0.100377 -0.939317 -0.133283
4      |      0.5111  0.4345  0.5587
5      7 | -0.581934 -1.650916 -1.018004 -1.007582
6      |      0.4672  0.4938  0.7717  0.5228

```

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq9, by(iage) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 3 | 2 | 58.00 |
| 4 | 12 | 289.50 |
| 5 | 14 | 451.00 |
| 6 | 25 | 843.50 |
| 7 | 10 | 374.00 |
+-----+

```

chi-squared = 3.363 with 4 d.f.
 probability = 0.4989

chi-squared with ties = 4.008 with 4 d.f.
 probability = 0.4049

Dunn's Pairwise Comparison of iq9 by iage
 (Benjamini-Hochberg)

```

Col Mean-|
Row Mean |      3      4      5      6
+-----+-----+-----+-----+
4 | 0.380111
   | 0.4399
5 | -0.253220 -1.224538
   | 0.4000  0.3679
6 | -0.384128 -1.630434 -0.272188
   | 0.5006  0.2575  0.4364
7 | -0.645800 -1.846324 -0.745866 -0.582520
   | 0.5184  0.3242  0.5697  0.4668

```

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq10, by(iage) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 3 | 2 | 70.00 |
| 4 | 12 | 389.00 |
| 5 | 14 | 394.00 |
| 6 | 25 | 813.00 |
| 7 | 10 | 350.00 |
+-----+

```

chi-squared = 0.968 with 4 d.f.
 probability = 0.9147

chi-squared with ties = 3.737 with 4 d.f.
 probability = 0.4428

Dunn's Pairwise Comparison of iq10 by iage
 (Benjamini-Hochberg)

Col Mean-	3	4	5	6
Row Mean				
4	0.362629			
	0.5121			
5	0.972529	1.164725		
	0.4135	0.4069		
6	0.361822	-0.031546	-1.405830	
	0.4484	0.5416	0.3994	
7	0.000000	-0.646845	-1.775587	-0.710605
	0.5000	0.4314	0.3790	0.4773

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

- Question – For each of the questions, 1-10, is there a difference in the average response by gender?

```
. dunntest iq1, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	636.50
2	44	1379.50

chi-squared = 0.182 with 1 d.f.
 probability = 0.6695

chi-squared with ties = 1.338 with 1 d.f.
 probability = 0.2474

Dunn's Pairwise Comparison of iq1 by igender
 (No adjustment)

Col Mean-	1
Row Mean	
2	1.156689
	0.1237

alpha = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq2, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	565.00
2	44	1451.00

chi-squared = 0.415 with 1 d.f.
 probability = 0.5196

chi-squared with ties = 0.599 with 1 d.f.
 probability = 0.4390

Dunn's Pairwise Comparison of iq2 by igender
 (No adjustment)

Col Mean-	Row Mean	1
2	-0.773826	
	0.2195	

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq3, by(igender)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	629.00
2	44	1387.00

chi-squared = 0.099 with 1 d.f.

probability = 0.7531

chi-squared with ties = 0.198 with 1 d.f.

probability = 0.6560

Dunn's Pairwise Comparison of iq3 by igender
 (No adjustment)

Col Mean-	Row Mean	1
2	0.445408	
	0.3280	

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq4, by(igender)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	534.50
2	44	1481.50

chi-squared = 1.212 with 1 d.f.

probability = 0.2710

chi-squared with ties = 1.894 with 1 d.f.

probability = 0.1688

Dunn's Pairwise Comparison of iq4 by igender
 (No adjustment)

Col Mean-	Row Mean	1
2	-1.376105	
	0.0844	

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq5, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	614.50
2	44	1401.50

chi-squared = 0.009 with 1 d.f.

probability = 0.9225

chi-squared with ties = 0.023 with 1 d.f.

probability = 0.8782

Dunn's Pairwise Comparison of iq5 by igender
(No adjustment)

Col Mean	Row Mean
1	1
2	0.153230
	0.4391

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq6, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	587.50
2	43	1365.50

chi-squared = 0.028 with 1 d.f.

probability = 0.8666

chi-squared with ties = 0.042 with 1 d.f.

probability = 0.8380

Dunn's Pairwise Comparison of iq6 by igender
(No adjustment)

Col Mean	Row Mean
1	1
2	-0.204490
	0.4190

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq7, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	587.50
2	43	1365.50

```

1 | 1 | 19 | 551.00 |
1 | 2 | 44 | 1465.00 |
+-----+

```

```

3 chi-squared = 0.729 with 1 d.f.
4 probability = 0.3933

```

```

5 chi-squared with ties = 0.991 with 1 d.f.
6 probability = 0.3194

```

```

8           Dunn's Pairwise Comparison of iq7 by igender
9           (No adjustment)

```

```

10 Col Mean-|
11 Row Mean |           1
12 -----+-----
12      2 | -0.995685
13      | 0.1597

```

```

14 alpha = 0.05
15 Reject Ho if p = P(Z <= |z|) <= alpha/2

```

```

17 . dunntest iq8, by(igender)

```

```

19 Warning: by() values are unlabeled, option nolabel implicit

```

```

21 Kruskal-Wallis equality-of-populations rank test

```

```

23 +-----+
24 | igender | Obs | Rank Sum |
25 |-----+-----|
25 |      1 | 19 | 561.00 |
26 |      2 | 44 | 1455.00 |
27 +-----+

```

```

28 chi-squared = 0.495 with 1 d.f.
29 probability = 0.4815

```

```

30 chi-squared with ties = 0.570 with 1 d.f.
31 probability = 0.4501

```

```

33           Dunn's Pairwise Comparison of iq8 by igender
34           (No adjustment)

```

```

35 Col Mean-|
36 Row Mean |           1
37 -----+-----
37      2 | -0.755307
38      | 0.2250

```

```

39 alpha = 0.05
40 Reject Ho if p = P(Z <= |z|) <= alpha/2

```

```

42 . dunntest iq9, by(igender)

```

```

44 Warning: by() values are unlabeled, option nolabel implicit

```

```

46 Kruskal-Wallis equality-of-populations rank test

```

```

48 +-----+
49 | igender | Obs | Rank Sum |
50 |-----+-----|
50 |      1 | 19 | 491.00 |
51 |      2 | 44 | 1525.00 |
52 +-----+

```

```

53 chi-squared = 3.070 with 1 d.f.
54 probability = 0.0797

```

```

55 chi-squared with ties = 3.658 with 1 d.f.
56 probability = 0.0558

```

```

58           Dunn's Pairwise Comparison of iq9 by igender
59           (No adjustment)

```

```

60           For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

```



```

Col Mean-|
Row Mean |          1
-----+-----
      2 | -1.912701
      |      0.0279

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2

.
. dunnstest iq10, by(igender)

Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| igender | Obs | Rank Sum |
+-----+-----+
|      1 | 19 |   603.00 |
|      2 | 44 |  1413.00 |
+-----+-----+

chi-squared = 0.006 with 1 d.f.
probability = 0.9403

chi-squared with ties = 0.022 with 1 d.f.
probability = 0.8830

```

Dunn's Pairwise Comparison of iq10 by igender
(No adjustment)

```

Col Mean-|
Row Mean |          1
-----+-----
      2 | -0.147156
      |      0.4415

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2

```

-
- Question – For each of the questions, 1-10, is there a difference in the average response [by level of education](#)

```

. dunnstest iq1, by(ied) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

```

+-----+
| ied | Obs | Rank Sum |
+-----+-----+
|  1 |  1 |   32.50 |
|  2 |  3 |   97.50 |
|  3 | 57 |  1761.00 |
+-----+-----+

chi-squared = 0.031 with 2 d.f.
probability = 0.9848

chi-squared with ties = 0.218 with 2 d.f.
probability = 0.8969

```

Dunn's Pairwise Comparison of iq1 by ied
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          1          2
-----+-----+
      2 | 0.000000
      | 0.5000
      |
      3 | 0.239229 0.407392
      | 0.6082  1.0000

```

```

1 False Discovery Rate = 0.05
2 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
3 .
4 . dunntest iq2, by(ied) ma(bh) wrap
5 Warning: by() values are unlabeled, option nolabel implicit
6

```

```
7 Kruskal-Wallis equality-of-populations rank test
```

```

9 +-----+
10 | ied | Obs | Rank Sum |
11 |-----+-----+-----|
12 | 1 | 1 | 40.50 |
13 | 2 | 3 | 121.50 |
14 | 3 | 57 | 1729.00 |
15 +-----+

```

```
15 chi-squared = 1.226 with 2 d.f.
16 probability = 0.5418
```

```
17 chi-squared with ties = 1.853 with 2 d.f.
18 probability = 0.3959
```

```
20 Dunn's Pairwise Comparison of iq2 by ied
21 (Benjamini-Hochberg)
```

```

22 Col Mean-|
23 Row Mean | 1 2
24 -----+-----
25 2 | 0.000000
26 | 0.5000
27 3 | 0.698004 1.188657
28 | 0.3639 0.3519

```

```
29 False Discovery Rate = 0.05
30 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```

31 .
32 . dunntest iq3, by(ied) ma(bh) wrap
33 Warning: by() values are unlabeled, option nolabel implicit
34

```

```
35 Kruskal-Wallis equality-of-populations rank test
```

```

37 +-----+
38 | ied | Obs | Rank Sum |
39 |-----+-----+-----|
40 | 1 | 1 | 36.50 |
41 | 2 | 3 | 109.50 |
42 | 3 | 57 | 1745.00 |
43 +-----+

```

```
43 chi-squared = 0.411 with 2 d.f.
44 probability = 0.8143
```

```
45 chi-squared with ties = 0.917 with 2 d.f.
46 probability = 0.6323
```

```
48 Dunn's Pairwise Comparison of iq3 by ied
49 (Benjamini-Hochberg)
```

```

50 Col Mean-|
51 Row Mean | 1 2
52 -----+-----
53 2 | 0.000000
54 | 0.5000
55 3 | 0.490961 0.836076
56 | 0.4676 0.6047

```

```
57 False Discovery Rate = 0.05
58 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
59 .
60 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml
```

```
. dunntest iq4, by(ied) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| ied | Obs | Rank Sum |
+-----+
| 1 | 1 | 40.00 |
| 2 | 3 | 120.00 |
| 3 | 57 | 1731.00 |
+-----+
```

```
chi-squared = 1.100 with 2 d.f.
probability = 0.5769
```

```
chi-squared with ties = 1.741 with 2 d.f.
probability = 0.4187
```

```
Dunn's Pairwise Comparison of iq4 by ied
(Benjamini-Hochberg)
```

Col Mean-	1	2
Row Mean		

2	0.000000	
	0.5000	
3	0.676626	1.152253
	0.3740	0.3738

```
False Discovery Rate = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
. dunntest iq5, by(ied) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| ied | Obs | Rank Sum |
+-----+
| 1 | 1 | 35.50 |
| 2 | 3 | 73.50 |
| 3 | 57 | 1782.00 |
+-----+
```

```
chi-squared = 0.479 with 2 d.f.
probability = 0.7870
```

```
chi-squared with ties = 1.261 with 2 d.f.
probability = 0.5323
```

```
Dunn's Pairwise Comparison of iq5 by ied
(Benjamini-Hochberg)
```

Col Mean-	1	2
Row Mean		

2	0.870715	
	0.2879	
3	0.383900	-1.043578
	0.3505	0.4450

```
False Discovery Rate = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
. dunntest iq6, by(ied) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ied | Obs | Rank Sum |
+-----+
| 1 | 1 | 40.50 |
| 2 | 3 | 94.00 |
| 3 | 56 | 1695.50 |
+-----+
    
```

```

chi-squared = 0.344 with 2 d.f.
probability = 0.8420

chi-squared with ties = 0.500 with 2 d.f.
probability = 0.7788
    
```

Dunn's Pairwise Comparison of iq6 by ied
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          1          2
+-----+-----+
 2 | 0.548145
   | 0.4377
 3 | 0.699677 0.123104
   | 0.7262 0.4510
    
```

```

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
    
```

```

.
. dunntest iq7, by(ied) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit
    
```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ied | Obs | Rank Sum |
+-----+
| 1 | 1 | 42.50 |
| 2 | 3 | 99.50 |
| 3 | 57 | 1749.00 |
+-----+
    
```

```

chi-squared = 0.482 with 2 d.f.
probability = 0.7857

chi-squared with ties = 0.659 with 2 d.f.
probability = 0.7194
    
```

Dunn's Pairwise Comparison of iq7 by ied
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          1          2
+-----+-----+
 2 | 0.532085
   | 0.4460
 3 | 0.771080 0.275878
   | 0.6610 0.3913
    
```

```

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
    
```

```

.
. dunntest iq8, by(ied) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit
    
```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ied | Obs | Rank Sum |
+-----+
    
```

```

1      | 1 | 1 | 47.00 |
2      | 2 | 3 | 120.50 |
3      | 3 | 57 | 1723.50 |
4      +-----+
5      chi-squared = 1.717 with 2 d.f.
6      probability = 0.4237
7
8      chi-squared with ties = 1.981 with 2 d.f.
9      probability = 0.3713
10
11      Dunn's Pairwise Comparison of iq8 by ied
12      (Benjamini-Hochberg)
13      Col Mean-|
14      Row Mean | 1 2
15      +-----+
16      2 | 0.358033
17      | 0.3602
18      |
19      3 | 1.005400 1.014200
20      | 0.2360 0.4657
21
22      False Discovery Rate = 0.05
23      Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
24
25      .
26      . dunntest iq9, by(ied) ma(bh) wrap
27
28      Warning: by() values are unlabeled, option nolabel implicit
29
30      Kruskal-Wallis equality-of-populations rank test
31
32      +-----+
33      | ied | Obs | Rank Sum |
34      |-----+-----|
35      | 1 | 1 | 45.50 |
36      | 2 | 3 | 136.50 |
37      | 3 | 57 | 1709.00 |
38      +-----+
39
40      chi-squared = 2.856 with 2 d.f.
41      probability = 0.2398
42
43      chi-squared with ties = 3.409 with 2 d.f.
44      probability = 0.1819
45
46      Dunn's Pairwise Comparison of iq9 by ied
47      (Benjamini-Hochberg)
48      Col Mean-|
49      Row Mean | 1 2
50      +-----+
51      2 | 0.000000
52      | 0.5000
53      |
54      3 | 0.946695 1.612164
55      | 0.2578 0.1604
56
57      False Discovery Rate = 0.05
58      Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
59
60      .
61      . dunntest iq10, by(ied) ma(bh) wrap
62
63      Warning: by() values are unlabeled, option nolabel implicit
64
65      Kruskal-Wallis equality-of-populations rank test
66
67      +-----+
68      | ied | Obs | Rank Sum |
69      |-----+-----|
70      | 1 | 1 | 33.50 |
71      | 2 | 3 | 100.50 |
72      | 3 | 57 | 1757.00 |
73      +-----+

```

chi-squared = 0.085 with 2 d.f.
 probability = 0.9584

chi-squared with ties = 0.375 with 2 d.f.
 probability = 0.8288

Dunn's Pairwise Comparison of iq10 by ied
 (Benjamini-Hochberg)

Col Mean-	1	2
2	0.000000	
	0.5000	
3	0.314214	0.535088
	0.5650	0.8889

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

- Question: For each of the questions, is there a difference in the average response based upon racer or ethnicity

. dunntest iq1, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	53	1744.50
2	2	36.00
3	1	33.50
4	4	134.00
7	3	68.00

chi-squared = 2.110 with 4 d.f.
 probability = 0.7155

chi-squared with ties = 15.496 with 4 d.f.
 probability = 0.0038

Dunn's Pairwise Comparison of iq1 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	3.061273			
	0.0110			
3	-0.085671	-1.871072		
	0.5176	0.0613		
4	-0.166771	-2.646096	0.000000	
	0.5422	0.0204	0.5000	
7	2.553091	-0.755791	1.387066	2.097047
	0.0178	0.3213	0.1379	0.0450

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq2, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
------	-----	----------

	ieth	Obs	Rank Sum
1	1	53	1798.50
2	2	2	48.00
3	3	1	2.00
4	4	4	77.00
5	7	3	90.50

chi-squared = 5.615 with 4 d.f.
 probability = 0.2298
 chi-squared with ties = 8.107 with 4 d.f.
 probability = 0.0877

Dunn's Pairwise Comparison of iq2 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	0.904070 0.2614			
3	2.073966 0.1904	1.177565 0.2987		
4	1.856443 0.1585	0.359560 0.3596	-1.011444 0.3118	
7	0.416143 0.3763	-0.442842 0.4112	-1.599094 0.1830	-0.937000 0.2906

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq3, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

	ieth	Obs	Rank Sum
1	1	53	1761.50
2	2	2	14.50
3	3	1	38.50
4	4	4	120.00
5	7	3	81.50

chi-squared = 4.269 with 4 d.f.
 probability = 0.3708
 chi-squared with ties = 8.563 with 4 d.f.
 probability = 0.0730

Dunn's Pairwise Comparison of iq3 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	2.787277 0.0266			
3	-0.402941 0.3817	-1.971406 0.0811		
4	0.482159 0.3936	-2.029656 0.1060	0.587402 0.3978	
7	0.790144 0.4294	-1.685695 0.1148	0.758333 0.3735	0.286623 0.3872

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

```
. dunntest iq4, by(ieth) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+-----+
| 1 | 53 | 1803.00 |
| 2 | 2 | 22.00 |
| 3 | 1 | 41.50 |
| 4 | 4 | 95.00 |
| 7 | 3 | 54.50 |
+-----+
    
```

chi-squared = 6.055 with 4 d.f.
probability = 0.1951

chi-squared with ties = 9.464 with 4 d.f.
probability = 0.0505

Dunn's Pairwise Comparison of iq4 by ieth
(Benjamini-Hochberg)

Col Mean-				
Row Mean	1	2	3	4
2	2.179479			
	0.1465			
3	-0.505482	-1.698444		
	0.3407	0.1490		
4	1.350673	-1.004099	1.082780	
	0.1768	0.2252	0.2324	
7	1.821760	-0.535433	1.378175	0.498577
	0.1712	0.3702	0.2102	0.3090

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

```
. dunntest iq5, by(ieth) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+-----+
| 1 | 53 | 1808.50 |
| 2 | 2 | 39.50 |
| 3 | 1 | 7.50 |
| 4 | 4 | 148.00 |
| 7 | 3 | 12.50 |
+-----+
    
```

chi-squared = 10.605 with 4 d.f.
probability = 0.0314

chi-squared with ties = 26.277 with 4 d.f.
probability = 0.0001

Dunn's Pairwise Comparison of iq5 by ieth
(Benjamini-Hochberg)

Col Mean-				
Row Mean	1	2	3	4
2	1.713447			
	0.0866			


```

1      3 | 2.264929 0.858920
2      | 0.0294 0.2440
3      4 | -0.476526 -1.710491 -2.265841
4      | 0.3521 0.0726 0.0391
5      7 | 4.334614 1.465931 0.247897 3.691637
6      | 0.0001 0.1019 0.4021 0.0006
7
8 False Discovery Rate = 0.05
9 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
10
11 .
12 . dunntest iq6, by(ieth) ma(bh) wrap
13
14 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

16 +-----+
17 | ieth | Obs | Rank Sum |
18 +-----+
19 | 1 | 52 | 1672.00 |
20 | 2 | 2 | 54.50 |
21 | 3 | 1 | 41.50 |
22 | 4 | 4 | 166.00 |
23 | 7 | 3 | 19.00 |
24 +-----+

```

```

25 chi-squared = 7.553 with 4 d.f.
26 probability = 0.1094

```

```

27 chi-squared with ties = 11.196 with 4 d.f.
28 probability = 0.0245

```

Dunn's Pairwise Comparison of iq6 by ieth
(Benjamini-Hochberg)

```

29 Col Mean-|
30 Row Mean | 1 2 3 4
31 +-----+
32 2 | 0.459251
33 | 0.3589
34
35 3 | -0.624727 -0.785168
36 | 0.3326 0.3088
37
38 4 | -1.215526 -1.110396 0.000000
39 | 0.2242 0.2224 0.5000
40
41 7 | 2.934536 1.546239 2.055206 3.107180
42 | 0.0084 0.1526 0.0664 0.0094

```

```

43 False Discovery Rate = 0.05
44 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

45 .
46 . dunntest iq7, by(ieth) ma(bh) wrap
47
48 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

50 +-----+
51 | ieth | Obs | Rank Sum |
52 +-----+
53 | 1 | 53 | 1815.00 |
54 | 2 | 2 | 47.00 |
55 | 3 | 1 | 15.00 |
56 | 4 | 4 | 77.00 |
57 | 7 | 3 | 62.00 |
58 +-----+

```

```

59 chi-squared = 5.167 with 4 d.f.
60 probability = 0.2705

```

chi-squared with ties = 7.030 with 4 d.f.
 probability = 0.1343

Dunn's Pairwise Comparison of iq7 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	0.949225			
	0.4281			
3	1.213236	0.441625		
	0.3751	0.6588		
4	1.840200	0.312276	-0.241888	
	0.3287	0.5392	0.5055	
7	1.455928	0.197500	-0.312276	-0.118029
	0.3635	0.4686	0.6290	0.4530

False Discovery Rate = 0.05
 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

.
 . dunntest iq8, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	53	1804.00
2	2	27.00
3	1	48.50
4	4	92.50
7	3	44.00

chi-squared = 7.123 with 4 d.f.
 probability = 0.1295

chi-squared with ties = 8.202 with 4 d.f.
 probability = 0.0845

Dunn's Pairwise Comparison of iq8 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	1.669101			
	0.1189			
3	-0.838757	-1.672942		
	0.2869	0.1572		
4	1.232034	-0.650622	1.328647	
	0.1816	0.3221	0.1840	
7	1.910806	-0.074816	1.715276	0.648313
	0.2801	0.4702	0.2157	0.2871

False Discovery Rate = 0.05
 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

.
 . dunntest iq9, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
------	-----	----------

```

1 |-----+-----+-----|
2 | 1 | 53 | 1765.00 |
3 | 2 | 2 | 58.00 |
4 | 3 | 1 | 23.00 |
5 | 4 | 4 | 108.50 |
6 | 7 | 3 | 61.50 |
7 |-----+-----+-----|

```

chi-squared = 2.026 with 4 d.f.
probability = 0.7310

chi-squared with ties = 2.414 with 4 d.f.
probability = 0.6601

Dunn's Pairwise Comparison of iq9 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	0.355651			
	0.6018			
3	0.607788	0.291742		
	0.9055	0.5503		
4	0.709405	0.128933	-0.219717	
	1.0000	0.4986	0.5163	
7	1.284614	0.554503	0.128933	0.516561
	0.9946	0.7240	0.4487	0.6055

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq10, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+-----+-----+
| ieth | Obs | Rank Sum |
+-----+-----+-----+
| 1 | 53 | 1700.00 |
| 2 | 2 | 70.00 |
| 3 | 1 | 35.00 |
| 4 | 4 | 140.00 |
| 7 | 3 | 71.00 |
+-----+-----+-----+

```

chi-squared = 0.808 with 4 d.f.
probability = 0.9373

chi-squared with ties = 3.122 with 4 d.f.
probability = 0.5376

Dunn's Pairwise Comparison of iq10 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	-0.435279			
	0.5528			
3	-0.310626	0.000000		
	0.5401	0.5556		
4	-0.604682	0.000000	0.000000	
	0.5454	0.6250	0.5000	
7	1.519075	1.331032	1.052274	1.590888
	0.3219	0.3053	0.3658	0.5582

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

- 1 -----
- 2
- 3 • Question – For each of the questions, 1-10, is there a difference in the average response if respondent is or was a
- 4 hospital worker?
- 5

6 . dunntest iq1, by(ihwork) ma(bh) wrap

7

8 Warning: by() values are unlabeled, option nolabel implicit

9

10 Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	38	1211.00
1	16	503.50
2	9	301.50

17 chi-squared = 0.076 with 2 d.f.

18 probability = 0.9629

19

20 chi-squared with ties = 0.556 with 2 d.f.

21 probability = 0.7574

22

23 Dunn's Pairwise Comparison of iq1 by ihwork
(Benjamini-Hochberg)

Col Mean-		
Row Mean	0	1
1	0.198272	
	0.4214	
2	-0.650694	-0.720741
	0.3864	0.7066

31 False Discovery Rate = 0.05

32 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

33

34 . dunntest iq2, by(ihwork) ma(bh) wrap

35

36 Warning: by() values are unlabeled, option nolabel implicit

37

38 Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	38	1229.50
1	16	432.00
2	9	354.50

45 chi-squared = 2.667 with 2 d.f.

46 probability = 0.2635

47

48 chi-squared with ties = 3.851 with 2 d.f.

49 probability = 0.1458

50

51 Dunn's Pairwise Comparison of iq2 by ihwork
(Benjamini-Hochberg)

Col Mean-		
Row Mean	0	1
1	1.177995	
	0.1194	
2	-1.243802	-1.949178
	0.1602	0.0769

```

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
.
. dunntest iq3, by(ihwork) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	38	1187.00
1	16	482.50
2	9	346.50

```

chi-squared = 1.359 with 2 d.f.
probability = 0.5068

chi-squared with ties = 2.727 with 2 d.f.
probability = 0.2558

```

Dunn's Pairwise Comparison of iq3 by ihwork
(Benjamini-Hochberg)

Col Mean-	Row Mean	0	1
1	0.280149		
	0.3897		
2	-1.513775	-1.547192	
	0.0976	0.1827	

```

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
.
. dunntest iq4, by(ihwork) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	38	1109.50
1	16	533.00
2	9	373.50

```

chi-squared = 3.388 with 2 d.f.
probability = 0.1838

chi-squared with ties = 5.295 with 2 d.f.
probability = 0.0708

```

Dunn's Pairwise Comparison of iq4 by ihwork
(Benjamini-Hochberg)

Col Mean-	Row Mean	0	1
1	-0.941750		
	0.1732		
2	-2.263389	-1.340169	
	0.0354	0.1351	

```

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
.
. dunntest iq5, by(ihwork) ma(bh) wrap

```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  38 | 1219.00 |
|      1 |  16 |  464.00 |
|      2 |   9 |  333.00 |
+-----+

```

chi-squared = 1.099 with 2 d.f.
probability = 0.5773

chi-squared with ties = 2.723 with 2 d.f.
probability = 0.2563

Dunn's Pairwise Comparison of iq5 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |           0           1
+-----+
1 | 0.887196
  | 0.1875
2 | -1.139947 -1.648784
  | 0.1907 0.1488

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq6, by(ihwork) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  38 | 1081.00 |
|      1 |  16 |  540.00 |
|      2 |   8 |  332.00 |
+-----+

```

chi-squared = 3.794 with 2 d.f.
probability = 0.1500

chi-squared with ties = 5.625 with 2 d.f.
probability = 0.0601

Dunn's Pairwise Comparison of iq6 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |           0           1
+-----+
1 | -1.200715
  | 0.1149
2 | -2.264381 -1.207799
  | 0.0353 0.1703

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq7, by(ihwork) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

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```

1  +-----+
2  | ihwork | Obs | Rank Sum |
3  +-----+
4  |      0 | 38 | 1189.00 |
5  |      1 | 16 |  460.00 |
6  |      2 |  9 |  367.00 |
7  +-----+

```

```

8  chi-squared =      2.624 with 2 d.f.
9  probability =      0.2693

```

```

10 chi-squared with ties =      3.570 with 2 d.f.
11 probability =      0.1678

```

```

12          Dunn's Pairwise Comparison of iq7 by ihwork
13          (Benjamini-Hochberg)

```

```

14 Col Mean-|
15 Row Mean |          0          1
16 -----+-----
17 1 | 0.542224
18   | 0.2938
19 2 | -1.628668 -1.836862
20   | 0.0775  0.0993

```

```

21 False Discovery Rate = 0.05

```

```

22 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

23 . dunntest iq8, by(ihwork) ma(bh) wrap

```

```

24 Warning: by() values are unlabeled, option nolabel implicit

```

```

25 Kruskal-Wallis equality-of-populations rank test

```

```

26
27 +-----+
28 | ihwork | Obs | Rank Sum |
29 +-----+
30 |      0 | 38 | 1080.00 |
31 |      1 | 16 |  576.50 |
32 |      2 |  9 |  359.50 |
33 +-----+

```

```

34 chi-squared =      3.913 with 2 d.f.
35 probability =      0.1413

```

```

36 chi-squared with ties =      4.506 with 2 d.f.
37 probability =      0.1051

```

```

38
39          Dunn's Pairwise Comparison of iq8 by ihwork
40          (Benjamini-Hochberg)

```

```

41 Col Mean-|
42 Row Mean |          0          1
43 -----+-----
44 1 | -1.494891
45   | 0.1012
46 2 | -1.819713 -0.549796
47   | 0.1032  0.2912

```

```

48 False Discovery Rate = 0.05

```

```

49 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

50 .
51 . dunntest iq9, by(ihwork) ma(bh) wrap

```

```

52 Warning: by() values are unlabeled, option nolabel implicit

```

```

53 Kruskal-Wallis equality-of-populations rank test

```

```

54
55 +-----+
56 | ihwork | Obs | Rank Sum |
57 +-----+
58 |      0 | 38 | 1096.00 |

```

```

1 | 1 | 16 | 545.00 |
1 | 2 | 9 | 375.00 |
+-----+

```

```

3 chi-squared = 3.833 with 2 d.f.
4 probability = 0.1471

```

```

5 chi-squared with ties = 4.568 with 2 d.f.
6 probability = 0.1019

```

```

8           Dunn's Pairwise Comparison of iq9 by ihwork
9           (Benjamini-Hochberg)

```

```

10 Col Mean-|
11 Row Mean |           0           1
12 -----+-----
13 1 | -1.043163
13 | 0.1484
14 |
15 2 | -2.060159 -1.086818
15 | 0.0591 0.2078

```

```

16 False Discovery Rate = 0.05
17 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

19 .
20 . dunntest iq10, by(ihwork) ma(bh) wrap

```

```

21 Warning: by() values are unlabeled, option nolabel implicit

```

```

23 Kruskal-Wallis equality-of-populations rank test

```

```

25 +-----+
26 | ihwork | Obs | Rank Sum |
27 +-----+-----+
28 | 0 | 38 | 1206.00 |
28 | 1 | 16 | 495.00 |
29 | 2 | 9 | 315.00 |
29 +-----+

```

```

31 chi-squared = 0.303 with 2 d.f.
32 probability = 0.8596

```

```

33 chi-squared with ties = 1.169 with 2 d.f.
34 probability = 0.5574

```

```

36           Dunn's Pairwise Comparison of iq10 by ihwork
37           (Benjamini-Hochberg)

```

```

38 Col Mean-|
39 Row Mean |           0           1
40 -----+-----
41 1 | 0.287560
41 | 0.3868
42 |
43 2 | -0.943719 -1.045310
43 | 0.2590 0.4438

```

```

44 False Discovery Rate = 0.05
45 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```


Nurse Student Statistics on Factor Analysis Produced Variables

- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by age?

Answer – NO, there are no significant differences among the age categories for any of the three factor variables.

- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by gender?

Answer – NO, there are no significant differences between genders for any of the three factor variables.

- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by level of education?

Answer – NO, there are no significant differences among the levels of education for any of the three factor variables.

- Question: For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response based upon racer or ethnicity?

Answer – YES, for the factor variable knowledge there is a significant difference between groups 1 and 2 and between groups 1 and 7, and for the factor variable total cost there are significant differences between the pairs of groups 1 and 7, 3 and 7, and 4 and 7

- Question: For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response based experience working in a hospital?

Answer – YES, for the factor variable "participation" there is a significant difference between group 0 and group 2

STATISTICS

- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by age?

```
. dunnstest iknowledge, by(iage)
```

```
Kruskal-Wallis equality-of-populations rank test
```

```

+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 3 | 2 | 27.50 |
| 4 | 12 | 309.00 |
| 5 | 14 | 417.50 |
| 6 | 25 | 850.00 |
| 7 | 10 | 412.00 |
+-----+

```

```
chi-squared = 6.392 with 4 d.f.
probability = 0.1717
```

```
chi-squared with ties = 8.092 with 4 d.f.
probability = 0.0883
```

Dunn's Pairwise Comparison of iknowledge by iage

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(No adjustment)

Col Mean-	3	4	5	6
4	-0.964413			
	0.1674			
5	-1.305010	-0.635265		
	0.0959	0.2626		
6	-1.691486	-1.441963	-0.768369	
	0.0454	0.0747	0.2211	
7	-2.175239	-2.214869	-1.686889	-1.181160
	0.0148	0.0134	0.0458	0.1188

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iparticipate, by(iage)

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	37.00
4	12	281.00
5	14	458.00
6	25	834.00
7	10	406.00

chi-squared = 6.076 with 4 d.f.

probability = 0.1935

chi-squared with ties = 6.276 with 4 d.f.

probability = 0.1795

Dunn's Pairwise Comparison of iparticipate by iage

(No adjustment)

Col Mean-	3	4	5	6
4	-0.356920			
	0.3606			
5	-1.042565	-1.310385		
	0.1486	0.0950		
6	-1.121195	-1.569823	-0.107251	
	0.1311	0.0582	0.4573	
7	-1.581888	-2.225081	-1.055987	-1.072837
	0.0568	0.0130	0.1455	0.1417

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest itotcost, by(iage)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	83.00
4	12	402.50
5	14	380.00
6	25	742.50
7	9	345.00

```
chi-squared = 3.125 with 4 d.f.
probability = 0.5372
```

```
chi-squared with ties = 4.632 with 4 d.f.
probability = 0.3272
```

Dunn's Pairwise Comparison of itotcost by iage
(No adjustment)

Col Mean-	3	4	5	6
4	0.703165 0.2410			
5	1.281683 0.1000	1.097642 0.1362		
6	1.083624 0.1393	0.738198 0.2302	-0.516952 0.3026	
7	0.273361 0.3923	-0.733301 0.2317	-1.767517 0.0386	-1.498732 0.0670

```
alpha = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= alpha/2
```

Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by gender?

```
. dunnstest iknowledge, by(igender)
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

igender	Obs	Rank Sum
1	19	598.00
2	44	1418.00

```
chi-squared = 0.022 with 1 d.f.
probability = 0.8810
```

```
chi-squared with ties = 0.028 with 1 d.f.
probability = 0.8662
```

Dunn's Pairwise Comparison of iknowledge by igender
(No adjustment)

Col Mean-	1
2	-0.168503 0.4331

```
alpha = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= alpha/2
```

```
. dunnstest iparticipate, by(igender)
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

igender	Obs	Rank Sum
1	19	502.00
2	44	1514.00

```

1 chi-squared = 2.520 with 1 d.f.
2 probability = 0.1124
3 chi-squared with ties = 2.603 with 1 d.f.
4 probability = 0.1067

```

```

6      Dunn's Pairwise Comparison of iparticipate by igender
7      (No adjustment)

```

```

8 Col Mean-|
9 Row Mean |           1
10 -----+-----
11      2 | -1.613363
12      |      0.0533

```

```

12 alpha = 0.05
13 Reject Ho if p = P(Z <= |z|) <= alpha/2

```

```

15 . dunntest itotcost, by(igender)

```

```

16 Warning: by() values are unlabeled, option nolabel implicit

```

```

18 Kruskal-Wallis equality-of-populations rank test

```

```

20 +-----+
21 | igender | Obs | Rank Sum |
22 +-----+
23 |      1 | 19 |  587.50 |
24 |      2 | 43 | 1365.50 |
25 +-----+

```

```

26 chi-squared = 0.028 with 1 d.f.
27 probability = 0.8666

```

```

28 chi-squared with ties = 0.042 with 1 d.f.
29 probability = 0.8380

```

```

31      Dunn's Pairwise Comparison of itotcost by igender
32      (No adjustment)

```

```

33 Col Mean-|
34 Row Mean |           1
35 -----+-----
36      2 | -0.204490
37      |      0.4190

```

```

37 alpha = 0.05
38 Reject Ho if p = P(Z <= |z|) <= alpha/2

```

-
- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by level of education?

```

44 . dunntest iknowledge, by(ied)

```

```

45 Warning: by() values are unlabeled, option nolabel implicit

```

```

47 Kruskal-Wallis equality-of-populations rank test

```

```

49 +-----+
50 | ied | Obs | Rank Sum |
51 +-----+
52 |  1 |  1 |   43.00 |
53 |  2 |  3 |   96.50 |
54 |  3 | 57 | 1751.50 |
55 +-----+

```

```

55 chi-squared = 0.483 with 2 d.f.
56 probability = 0.7854

```

```

57 chi-squared with ties = 0.629 with 2 d.f.
58 probability = 0.7303

```

```

1          Dunn's Pairwise Comparison of iknowledge by ied
2          (No adjustment)
3 Col Mean-|
4 Row Mean |          1          2
5 -----+-----
6          2 |    0.602700
7          |    0.2734
8          |
9          3 |    0.781528    0.156016
10         |    0.2172    0.4380
11
12 alpha =    0.05
13 Reject Ho if p = P(Z <= |z|) <= alpha/2
14
15 .
16 . dunntest iparticipate, by(ied)
17
18 Warning: by() values are unlabeled, option nolabel implicit
19
20 Kruskal-Wallis equality-of-populations rank test
21
22 +-----+
23 | ied | Obs | Rank Sum |
24 +-----+-----+
25 |  1 |  1 |   53.00 |
26 |  2 |  3 |  137.00 |
27 |  3 | 57 | 1701.00 |
28 +-----+
29
30 chi-squared =    3.826 with 2 d.f.
31 probability =    0.1477
32
33 chi-squared with ties =    3.948 with 2 d.f.
34 probability =    0.1389
35
36
37          Dunn's Pairwise Comparison of iparticipate by ied
38          (No adjustment)
39 Col Mean-|
40 Row Mean |          1          2
41 -----+-----
42          2 |    0.363420
43          |    0.3581
44          |
45          3 |    1.313711    1.528732
46         |    0.0945    0.0632
47
48 alpha =    0.05
49 Reject Ho if p = P(Z <= |z|) <= alpha/2
50
51 .
52 . dunntest itotcost, by(ied)
53
54 Warning: by() values are unlabeled, option nolabel implicit
55
56 Kruskal-Wallis equality-of-populations rank test
57
58 +-----+
59 | ied | Obs | Rank Sum |
60 +-----+-----+
61 |  1 |  1 |   40.50 |
62 |  2 |  3 |   94.00 |
63 |  3 | 56 | 1695.50 |
64 +-----+
65
66 chi-squared =    0.344 with 2 d.f.
67 probability =    0.8420
68
69 chi-squared with ties =    0.500 with 2 d.f.
70 probability =    0.7788
71
72
73          Dunn's Pairwise Comparison of itotcost by ied
74          (No adjustment)
75 Col Mean-|
76 Row Mean |          1          2
77 -----+-----
78
79
80

```

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```

-----+-----
1      2 |    0.548145
2      |    0.2918
3      3 |    0.699677    0.123104
4      |    0.2421    0.4510
5
alpha =    0.05
6
Reject Ho if p = P(Z <= |z|) <= alpha/2
7

```

- Question: For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response based upon racer or ethnicity?

```

11 . dunnstest iknowledge, by(ieth)
12
13 Warning: by() values are unlabeled, option nolabel implicit
14

```

Kruskal-Wallis equality-of-populations rank test

```

17 +-----+
18 | ieth | Obs | Rank Sum |
19 |-----+-----|
20 | 1 | 53 | 1859.50 |
21 | 2 | 2 | 22.50 |
22 | 3 | 1 | 7.00 |
23 | 4 | 4 | 93.00 |
24 | 7 | 3 | 34.00 |
25 +-----+

```

```

26 chi-squared =    10.649 with 4 d.f.
27 probability =    0.0308

```

```

28 chi-squared with ties =    13.481 with 4 d.f.
29 probability =    0.0091

```

Dunn's Pairwise Comparison of iknowledge by ieth
(No adjustment)

```

31 Col Mean-|
32 Row Mean |          1          2          3          4
33 +-----+-----+-----+-----+
34 2 |    2.031072
35   |    0.0211
36 3 |    1.707868    0.213002
37   |    0.0438    0.4157
38 4 |    1.400992   -0.850533   -0.892152
39   |    0.0806    0.1975    0.1862
40 7 |    2.456616   -0.005603   -0.230353    0.957716
41   |    0.0070    0.4978    0.4089    0.1691

```

```

42 alpha =    0.05
43 Reject Ho if p = P(Z <= |z|) <= alpha/2
44

```

```

45 . dunnstest iparticipate, by(ieth)
46
47 Warning: by() values are unlabeled, option nolabel implicit
48

```

Kruskal-Wallis equality-of-populations rank test

```

51 +-----+
52 | ieth | Obs | Rank Sum |
53 |-----+-----|
54 | 1 | 53 | 1836.00 |
55 | 2 | 2 | 24.00 |
56 | 3 | 1 | 32.00 |
57 | 4 | 4 | 84.50 |
58 | 7 | 3 | 39.50 |
59 +-----+

```

```

60 chi-squared =    8.056 with 4 d.f.
61 probability =    0.0895

```

chi-squared with ties = 8.321 with 4 d.f.
 probability = 0.0805

Dunn's Pairwise Comparison of iparticipate by ieth
 (No adjustment)

Col Mean- Row Mean	1	2	3	4
2	1.742754 0.0407			
3	0.145095 0.4423	-0.905406 0.1826		
4	1.445287 0.0742	-0.584200 0.2795	0.539304 0.2948	
7	2.006289 0.0224	-0.070859 0.4718	0.904309 0.1829	0.577727 0.2817

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

. dunntest itotcost, by(ieth)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	52	1672.00
2	2	54.50
3	1	41.50
4	4	166.00
7	3	19.00

chi-squared = 7.553 with 4 d.f.
 probability = 0.1094

chi-squared with ties = 11.196 with 4 d.f.
 probability = 0.0245

Dunn's Pairwise Comparison of itotcost by ieth
 (No adjustment)

Col Mean- Row Mean	1	2	3	4
2	0.459251 0.3230			
3	-0.624727 0.2661	-0.785168 0.2162		
4	-1.215526 0.1121	-1.110396 0.1334	0.000000 0.5000	
7	2.934536 0.0017	1.546239 0.0610	2.055206 0.0199	3.107180 0.0009

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

- Question: For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response based experience working in a hospital?

. dunntest iknowledge, by(ihwork)

Warning: by() values are unlabeled, option nolabel implicit

1 Kruskal-Wallis equality-of-populations rank test

```
2
3 +-----+
4 | ihwork | Obs | Rank Sum |
5 |-----+-----|
6 |      0 |  38 | 1196.50 |
7 |      1 |  16 |  439.00 |
8 |      2 |   9 |  380.50 |
9 +-----+
```

9 chi-squared = 3.850 with 2 d.f.
10 probability = 0.1458

11 chi-squared with ties = 4.875 with 2 d.f.
12 probability = 0.0874

14 Dunn's Pairwise Comparison of iknowledge by ihwork
15 (No adjustment)

```
16 Col Mean-|
17 Row Mean |          0          1
18 +-----+-----+
19 |      1 | 0.834026
20 |      | 0.2021
21 |      2 | -1.786749 -2.186219
22 |      | 0.0370 0.0144
```

22 alpha = 0.05

23 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

25 .
26 . dunntest iparticipate, by(ihwork)

27 Warning: by() values are unlabeled, option nolabel implicit

29 Kruskal-Wallis equality-of-populations rank test

```
30
31 +-----+
32 | ihwork | Obs | Rank Sum |
33 |-----+-----|
34 |      0 |  38 | 1060.00 |
35 |      1 |  16 |  540.00 |
36 |      2 |   9 |  416.00 |
37 +-----+
```

37 chi-squared = 7.470 with 2 d.f.
38 probability = 0.0239

39 chi-squared with ties = 7.716 with 2 d.f.
40 probability = 0.0211

42 Dunn's Pairwise Comparison of iparticipate by ihwork
43 (No adjustment)

```
44 Col Mean-|
45 Row Mean |          0          1
46 +-----+-----+
47 |      1 | -1.089332
48 |      | 0.1380
49 |      2 | -2.741107 -1.659641
50 |      | 0.0031 0.0485
```

50 alpha = 0.05

51 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

53 .
54 . dunntest itotcost, by(ihwork)

55 Warning: by() values are unlabeled, option nolabel implicit

57 Kruskal-Wallis equality-of-populations rank test

```
58
59 +-----+
```


	ihwork	Obs	Rank Sum
1	0	38	1081.00
2	1	16	540.00
3	2	8	332.00

chi-squared = 3.794 with 2 d.f.
probability = 0.1500

chi-squared with ties = 5.625 with 2 d.f.
probability = 0.0601

Dunn's Pairwise Comparison of itotcost by ihwork
(No adjustment)

Col Mean-			
Row Mean		0	1
1	-1.200715		
	0.1149		
2	-2.264381	-1.207799	
	0.0118	0.1136	

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

HPESS Survey Statistics Report

- Question – For each of the questions, 1-10, is there a difference in the average response by age?

Answer – YES, but for only two questions:

Q1: age group 1 differed from all of the other groups.

Q2: age groups 1 and 5 differed from groups 2,3,4, but did not differ from each other.

- Question – For each of the questions, 1-10, is there a difference in the average response by gender?

Answer – NO – there are no significant differences in responses between genders for any of the 10 questions.

- Question – For each of the questions, 1-10, is there a difference in the average response by level of education

Answer – YES, for questions 1, 2, 3, and 10

Q1: 1 v. 3 2 v. 3

Q2: 1 v. 3 2 v. 3

Q3: 1 v.2 1 v. 3 2 v. 3

Q10: 1 v. 3 2 v. 3

- Question: For each of the questions, is there a difference in the average response based upon racer or ethnicity

Answer - NO – there are no significant difference in responses among races or ethnicities for any of the 10 questions.

- Question – For each of the questions, 1-10, is there a difference in the average response if respondent is or was a hospital worker?

Answer – YES – for questions 1, 2, and 5. For all three questions, group 1 is significantly different from both group 0, and group 2.

- Question – For each of the questions, 1-10, is there a difference in the average response by age among those who identified their age group?

```
. dunnstest iq1, by(iage) ma(bh) wrap
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 1 | 1 | 3.50 |
| 2 | 23 | 878.50 |
| 3 | 35 | 1376.50 |
| 4 | 11 | 456.50 |
| 5 | 5 | 169.50 |
+-----+-----+
| 6 | 1 | 41.50 |
+-----+-----+
```

```
chi-squared = 3.004 with 5 d.f.
```

```
probability = 0.6994
```

1 chi-squared with ties = 13.768 with 5 d.f.
 2 probability = 0.0171

3
 4 Dunn's Pairwise Comparison of iq1 by iage
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-3.292779				
	0.0025				
3	-3.424849	-0.409178			
	0.0023	0.4265			
4	-3.527106	-0.873848	-0.609012		
	0.0032	0.3583	0.3699		
5	-2.690371	0.843972	1.100788	1.366042	
	0.0134	0.3322	0.2903	0.2149	
6	-2.604940	-0.313598	-0.207567	0.000000	-0.672593
	0.0138	0.4349	0.4476	0.5000	0.3759

19 False Discovery Rate = 0.05

20 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

21
 22 . dunntest iq2, by(iage) ma(bh) wrap

23 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
1	1	4.50
2	22	849.00
3	35	1357.50
4	11	462.00
5	5	172.50
6	1	4.50

34 chi-squared = 5.286 with 5 d.f.
 35 probability = 0.3819

36 chi-squared with ties = 18.489 with 5 d.f.
 37 probability = 0.0024

39
 40 Dunn's Pairwise Comparison of iq2 by iage
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-2.861006				
	0.0063				
3	-2.900874	-0.061439			
	0.0070	0.5095			
4	-3.080845	-0.792177	-0.797937		
	0.0155	0.2920	0.3187		
5	-2.349976	0.708544	0.769210	1.193206	
	0.0201	0.2761	0.2761	0.1940	
6	0.000000	2.861006	2.900874	3.080845	2.349976
	0.5000	0.0053	0.0093	0.0077	0.0176

54 False Discovery Rate = 0.05

55 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

56
 57 . dunntest iq3, by(iage) ma(bh) wrap

58
 59 Kruskal-Wallis equality-of-populations rank test

```

1  +-----+
2  | iage | Obs | Rank Sum |
3  +-----+
4  | 1 | 1 | 7.00 |
5  | 2 | 23 | 921.00 |
6  | 3 | 35 | 1347.00 |
7  | 4 | 11 | 419.00 |
8  | 5 | 5 | 187.00 |
9  +-----+
10 | 6 | 1 | 45.00 |
11 +-----+

```

```

12 chi-squared = 2.250 with 5 d.f.
13 probability = 0.8136
14
15 chi-squared with ties = 5.288 with 5 d.f.
16 probability = 0.3817

```

```

17          Dunn's Pairwise Comparison of iq3 by iage
18          (Benjamini-Hochberg)
19 Col Mean-|
20 Row Mean |          1          2          3          4          5
21 +-----+
22 2 | -2.245722
23   | 0.1854
24 3 | -2.155302  0.402900
25   | 0.1168  0.5725
26 4 | -2.066574  0.369776  0.079295
27   | 0.0969  0.4851  0.4684
28 5 | -1.926615  0.371927  0.157658  0.088931
29   | 0.1013  0.5325  0.5046  0.4978
30 6 | -1.865437 -0.336858 -0.445925 -0.459239 -0.481654
31   | 0.0932  0.4601  0.6147  0.6922  0.7876

```

```

32 False Discovery Rate = 0.05
33 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

34 . dunnstest iq4, by(iage) ma(bh) wrap

```

```

35 Kruskal-Wallis equality-of-populations rank test

```

```

37 +-----+
38 | iage | Obs | Rank Sum |
39 +-----+
40 | 1 | 1 | 13.00 |
41 | 2 | 23 | 934.00 |
42 | 3 | 36 | 1433.50 |
43 | 4 | 11 | 362.00 |
44 | 5 | 5 | 211.00 |
45 +-----+

```

```

46 chi-squared = 2.656 with 5 d.f.
47 probability = 0.7529
48
49 chi-squared with ties = 4.393 with 5 d.f.
50 probability = 0.4944

```

```

51          Dunn's Pairwise Comparison of iq4 by iage
52          (Benjamini-Hochberg)
53 Col Mean-|
54 Row Mean |          1          2          3          4          5
55 +-----+
56 2 | -1.553696
57   | 0.9019
58 3 | -1.520764  0.169968
59   | 0.3208  0.4325

```

```

1      4 | -1.095769  1.207400  1.153083
2      |         0.2927   0.3409   0.3111
3      5 | -1.532336 -0.185389 -0.286737 -0.990242
4      |         0.4704   0.4569   0.4467   0.3019
5      6 | -1.483678 -0.500363 -0.548924 -0.913141 -0.383084
6      |         0.2586   0.4206   0.4373   0.3010   0.4385

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq5, by(iage) ma(bh) wrap
```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+
|  1  |  1  |    7.00  |
|  2  | 23  |   836.00 |
|  3  | 35  |  1476.50 |
|  4  | 11  |   377.00 |
|  5  |  5  |   185.00 |
+-----+
|  6  |  1  |    44.50 |
+-----+

```

chi-squared = 3.728 with 5 d.f.

probability = 0.5892

chi-squared with ties = 9.323 with 5 d.f.

probability = 0.0968

Dunn's Pairwise Comparison of iq5 by iage
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          1          2          3          4          5
+-----+-----+-----+-----+-----+
2 | -2.057391
  |  0.1487
3 | -2.484459 -1.557480
  |  0.0973  0.1279
4 | -1.869894  0.405361  1.639361
  |  0.0922  0.4283  0.1264
5 | -1.961161 -0.094649  0.776748 -0.362103
  |  0.1247  0.4623  0.4100  0.4138
6 | -1.898886 -0.571498 -0.163411 -0.701210 -0.490290
  |  0.1080  0.4257  0.4662  0.4026  0.4254

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq6, by(iage) ma(bh) wrap
```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+
|  1  |  1  |   11.00  |
|  2  | 23  |   841.50 |
|  3  | 35  |  1397.00 |
|  4  | 11  |   468.50 |
|  5  |  5  |   161.50 |
+-----+
|  6  |  1  |    46.50 |
+-----+

```

chi-squared = 2.770 with 5 d.f.

probability = 0.7354

chi-squared with ties = 5.486 with 5 d.f.
 probability = 0.3595

Dunn's Pairwise Comparison of iq6 by iage
 (Benjamini-Hochberg)

Col Mean- Row Mean	1	2	3	4	5
2	-1.596368 0.2070				
3	-1.816984 0.2596	-0.790016 0.3221			
4	-1.927631 0.4043	-1.043792 0.3178	-0.493509 0.3586		
5	-1.239210 0.3229	0.553701 0.3624	1.015019 0.2907	1.215993 0.2800	
6	-1.599813 0.2741	-0.618474 0.3656	-0.413849 0.3637	-0.238527 0.4057	-0.826140 0.3406

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq7, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
1	1	13.50
2	22	819.00
3	35	1270.50
4	11	493.50
5	5	205.50
6	1	48.00

chi-squared = 2.907 with 5 d.f.
 probability = 0.7143

chi-squared with ties = 4.855 with 5 d.f.
 probability = 0.4338

Dunn's Pairwise Comparison of iq7 by iage
 (Benjamini-Hochberg)

Col Mean- Row Mean	1	2	3	4	5
2	-1.376058 0.2532				
3	-1.333089 0.2281	0.202096 0.4499			
4	-1.780629 0.5623	-1.226249 0.2358	-1.469099 0.3545		
5	-1.494032 0.5069	-0.463525 0.4384	-0.595349 0.4137	0.413781 0.4244	
6	-1.446590 0.2775	-0.624762 0.4434	-0.684085 0.4631	-0.178063 0.4293	-0.373508 0.4089

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq8, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+
| 1 | 1 | 16.00 |
| 2 | 23 | 896.00 |
| 3 | 35 | 1360.00 |
| 4 | 11 | 356.00 |
| 5 | 5 | 239.50 |
+-----+
| 6 | 1 | 58.50 |
+-----+
    
```

chi-squared = 3.633 with 5 d.f.
 probability = 0.6034

chi-squared with ties = 4.157 with 5 d.f.
 probability = 0.5270

Dunn's Pairwise Comparison of iq8 by iage
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-1.088658				
	0.3454				
3	-1.091772	0.017935			
	0.4124	0.4928			
4	-0.758949	0.871211	0.910035		
	0.2584	0.2398	0.2721		
5	-1.410676	-0.878018	-0.916267	-1.395398	
	0.5938	0.2590	0.2996	0.4072	
6	-1.455798	-0.926803	-0.938242	-1.212211	-0.468751
	1.0000	0.3319	0.3730	0.4227	0.3425

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunnstest iq9, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+
| 1 | 1 | 26.50 |
| 2 | 23 | 844.00 |
| 3 | 35 | 1377.00 |
| 4 | 11 | 443.50 |
| 5 | 5 | 208.50 |
+-----+
| 6 | 1 | 26.50 |
+-----+
    
```

chi-squared = 0.975 with 5 d.f.
 probability = 0.9646

chi-squared with ties = 1.158 with 5 d.f.
 probability = 0.9488

Dunn's Pairwise Comparison of iq9 by iage
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-0.492653				
	0.5834				
3	-0.625047	-0.486788			
	0.7979	0.4271			
4	-0.653017	-0.487754	-0.139274		

```

1 |      0.9633      0.4693      0.5130
2 |      5 | -0.684890 -0.500594 -0.243357 -0.126456
3 |      1.0000      0.6607      0.5048      0.4818
4 |      6 |  0.000000  0.492653  0.625047  0.653017  0.684890
5 |      0.5000      0.5185      0.6649      1.0000      1.0000

```

6 False Discovery Rate = 0.05
 7 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

9 . dunnstest iq10, by(iage) ma(bh) wrap

10 Kruskal-Wallis equality-of-populations rank test

```

12 +-----+
13 | iage | Obs | Rank Sum |
14 +-----+
15 | 1 | 1 | 6.50 |
16 | 2 | 23 | 856.50 |
17 | 3 | 35 | 1427.50 |
18 | 4 | 11 | 409.00 |
19 | 5 | 5 | 182.50 |
20 +-----+

```

21 chi-squared = 2.692 with 5 d.f.
 22 probability = 0.7473
 23 chi-squared with ties = 7.233 with 5 d.f.
 24 probability = 0.2039

26 Dunn's Pairwise Comparison of iq10 by iage
 27 (Benjamini-Hochberg)

```

28 Col Mean-|
29 Row Mean |      1      2      3      4      5
30 -----+-----
31 2 | -2.233632
32 | 0.0957
33 3 | -2.509329 -0.980744
34 | 0.0907 0.4084
35 4 | -2.180462 0.011605 0.773901
36 | 0.0731 0.4954 0.4703
37 5 | -2.032789 0.111187 0.665386 0.093832
38 | 0.0789 0.5258 0.4742 0.4957
39 6 | -1.968240 -0.491273 -0.235250 -0.484547 -0.508197
40 | 0.0736 0.4674 0.5088 0.4282 0.5094

```

41 False Discovery Rate = 0.05
 42 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

- 45 • Question – For each of the questions, 1-10, is there a difference in the average response by gender?

48 . ranksum iq1, by(igender)

49 Two-sample Wilcoxon rank-sum (Mann-Whitney) test

```

51 igender |      obs      rank sum      expected
52 -----+-----
53 1 |      17      629.5      654.5
54 2 |      59     2296.5     2271.5
55 -----+-----
56 combined |      76     2926     2926

```

56 unadjusted variance 6435.92
 57 adjustment for ties -5031.72
 58 -----
 59 adjusted variance 1404.20


```

1  Ho: iq1(igender==1) = iq1(igender==2)
2      z = -0.667
3      Prob > |z| = 0.5047
4
5  .
6  . ranksum iq2, by(igender)
7
8  Two-sample Wilcoxon rank-sum (Mann-Whitney) test
9
10     igender |      obs   rank sum   expected
11 -----+-----
12     1 |      17       564       646
13     2 |      58      2286      2204
14 -----+-----
15     combined |      75      2850      2850
16
17 unadjusted variance      6244.67
18 adjustment for ties     -4459.21
19 -----
20 adjusted variance      1785.46
21
22 Ho: iq2(igender==1) = iq2(igender==2)
23     z = -1.941
24     Prob > |z| = 0.0523
25
26 .
27 . ranksum iq3, by(igender)
28
29 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
30
31     igender |      obs   rank sum   expected
32 -----+-----
33     1 |      17       613       654.5
34     2 |      59      2313      2271.5
35 -----+-----
36     combined |      76      2926      2926
37
38 unadjusted variance      6435.92
39 adjustment for ties     -3697.73
40 -----
41 adjusted variance      2738.19
42
43 Ho: iq3(igender==1) = iq3(igender==2)
44     z = -0.793
45     Prob > |z| = 0.4277
46
47 .
48 . ranksum iq4, by(igender)
49
50 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
51
52     igender |      obs   rank sum   expected
53 -----+-----
54     1 |      17       659       663
55     2 |      60      2344      2340
56 -----+-----
57     combined |      77      3003      3003
58
59 unadjusted variance      6630.00
60 adjustment for ties     -2621.46
61 -----
62 adjusted variance      4008.54
63
64 Ho: iq4(igender==1) = iq4(igender==2)
65     z = -0.063
66     Prob > |z| = 0.9496
67
68 .
69 . ranksum iq5, by(igender)
70
71 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
72
73     igender |      obs   rank sum   expected
74 -----+-----
75     1 |      17       600.5      654.5
76     2 |      59      2325.5      2271.5
77 -----+-----
78     combined |      76      2926      2926

```

```

1  unadjusted variance      6435.92
2  adjustment for ties     -3862.43
3  -----
4  adjusted variance       2573.49

```

```

5  Ho: iq5(igender==1) = iq5(igender==2)
6      z = -1.064
7      Prob > |z| = 0.2871

```

```

8  . ranksum iq6, by(igender)
9

```

```

10 Two-sample Wilcoxon rank-sum (Mann-Whitney) test

```

igender	obs	rank sum	expected
1	17	684	654.5
2	59	2242	2271.5
combined	76	2926	2926

```

16 unadjusted variance      6435.92
17 adjustment for ties     -3186.72
18 -----
19 adjusted variance       3249.19

```

```

20 Ho: iq6(igender==1) = iq6(igender==2)
21      z = 0.518
22      Prob > |z| = 0.6048

```

```

23 .
24 . ranksum iq7, by(igender)
25

```

```

26 Two-sample Wilcoxon rank-sum (Mann-Whitney) test

```

igender	obs	rank sum	expected
1	17	599	646
2	58	2251	2204
combined	75	2850	2850

```

32 unadjusted variance      6244.67
33 adjustment for ties     -2505.86
34 -----
35 adjusted variance       3738.81

```

```

36 Ho: iq7(igender==1) = iq7(igender==2)
37      z = -0.769
38      Prob > |z| = 0.4421

```

```

39 .
40 . ranksum iq8, by(igender)
41

```

```

42 Two-sample Wilcoxon rank-sum (Mann-Whitney) test

```

igender	obs	rank sum	expected
1	17	610.5	654.5
2	59	2315.5	2271.5
combined	76	2926	2926

```

48 unadjusted variance      6435.92
49 adjustment for ties     -812.08
50 -----
51 adjusted variance       5623.84

```

```

52 Ho: iq8(igender==1) = iq8(igender==2)
53      z = -0.587
54      Prob > |z| = 0.5574

```

```

55 .
56 . ranksum iq9, by(igender)
57

```

```

58 Two-sample Wilcoxon rank-sum (Mann-Whitney) test

```

igender	obs	rank sum	expected
---------	-----	----------	----------

```

-----+-----
1      1 |      17      597      654.5
2      2 |      59     2329     2271.5
-----+-----
3      combined |      76     2926     2926

```

```

4      unadjusted variance      6435.92
5      adjustment for ties      -1019.01
6      -----
7      adjusted variance        5416.90

```

```

8      Ho: iq9(igender==1) = iq9(igender==2)
9            z = -0.781

```

```

10     Prob > |z| = 0.4347

```

```

11     .
12     . ranksum iq10, by(igender)

```

```

13     Two-sample Wilcoxon rank-sum (Mann-Whitney) test

```

```

14     igender |      obs      rank sum      expected
15     -----+-----
16     1 |      17      635.5      654.5
17     2 |      59     2290.5     2271.5
18     -----+-----
19     combined |      76     2926     2926

```

```

20     unadjusted variance      6435.92
21     adjustment for ties      -4040.59
22     -----
23     adjusted variance        2395.32

```

```

24     Ho: iq10(igender==1) = iq10(igender==2)
25           z = -0.388

```

```

26     Prob > |z| = 0.6979

```

```

27     -----+-----

```

- Question – For each of the questions, 1-10, is there a difference in the average response by level of education

```

30     . dunnstest iq1, by(ied) ma(bh) wrap

```

```

31     Warning: by() values are unlabeled, option nolabel implicit

```

```

32     Kruskal-Wallis equality-of-populations rank test
33
34
35

```

```

36     +-----+
37     | ied | Obs | Rank Sum |
38     |-----+-----|
39     | 1 | 26 | 965.00 |
40     | 2 | 49 | 1957.50 |
41     | 3 | 1 | 3.50 |
42     |-----+-----|

```

```

43     chi-squared = 2.825 with 2 d.f.
44     probability = 0.2435

```

```

45     chi-squared with ties = 12.949 with 2 d.f.
46     probability = 0.0015

```

```

47     Dunn's Pairwise Comparison of iq1 by ied
48     (Benjamini-Hochberg)

```

```

49     Col Mean-|
50     Row Mean |      1      2
51     -----+-----
52     2 | -1.132195
53     | 0.1288
54     |
55     3 | 3.197953  3.498063
56     | 0.0010  0.0007

```

```

57     False Discovery Rate = 0.05
58     Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

59     .
60     . dunnstest iq2, by(ied) ma(bh) wrap

```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| ied | Obs | Rank Sum |
+-----+
| 1 | 26 | 979.50 |
| 2 | 48 | 1866.00 |
| 3 | 1 | 4.50 |
+-----+
```

chi-squared = 2.446 with 2 d.f.
probability = 0.2944

chi-squared with ties = 8.554 with 2 d.f.
probability = 0.0139

Dunn's Pairwise Comparison of iq2 by ied
(Benjamini-Hochberg)

```
Col Mean-|
Row Mean |          1          2
+-----+
2 | -0.423546
   | 0.3359
3 | 2.793337  2.919430
   | 0.0039    0.0053
```

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq3, by(ied) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| ied | Obs | Rank Sum |
+-----+
| 1 | 26 | 904.00 |
| 2 | 49 | 2015.00 |
| 3 | 1 | 7.00 |
+-----+
```

chi-squared = 3.468 with 2 d.f.
probability = 0.1766

chi-squared with ties = 8.151 with 2 d.f.
probability = 0.0170

Dunn's Pairwise Comparison of iq3 by ied
(Benjamini-Hochberg)

```
Col Mean-|
Row Mean |          1          2
+-----+
2 | -1.817857
   | 0.0345
3 | 1.891823  2.345120
   | 0.0439    0.0285
```

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq4, by(ied) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

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```

1  +-----+
2  | ied | Obs | Rank Sum |
3  |-----+-----|
4  | 1 | 26 | 1021.50 |
5  | 2 | 50 | 1968.50 |
6  | 3 | 1 | 13.00 |
7  +-----+

```

```

7  chi-squared = 1.369 with 2 d.f.
8  probability = 0.5044

```

```

9  chi-squared with ties = 2.264 with 2 d.f.
10 probability = 0.3224

```

```

11
12          Dunn's Pairwise Comparison of iq4 by ied
13          (Benjamini-Hochberg)

```

```

14 Col Mean-|
15 Row Mean |          1          2
16 -----+-----
17 2 | -0.019386
18   | 0.4923
19   |
20 3 | 1.482968  1.500969
21   | 0.1036    0.2000

```

```

22 False Discovery Rate = 0.05

```

```

23 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

24 . dunntest iq5, by(ied) ma(bh) wrap

```

```

25 Warning: by() values are unlabeled, option nolabel implicit

```

```

26
27 Kruskal-Wallis equality-of-populations rank test

```

```

28
29 +-----+
30 | ied | Obs | Rank Sum |
31 |-----+-----|
32 | 1 | 26 | 1044.50 |
33 | 2 | 49 | 1874.50 |
34 | 3 | 1 | 7.00 |
35 +-----+

```

```

36 chi-squared = 2.190 with 2 d.f.
37 probability = 0.3345

```

```

38 chi-squared with ties = 5.477 with 2 d.f.
39 probability = 0.0647

```

```

40          Dunn's Pairwise Comparison of iq5 by ied
41          (Benjamini-Hochberg)

```

```

42 Col Mean-|
43 Row Mean |          1          2
44 -----+-----
45 2 | 0.566082
46   | 0.2857
47   |
48 3 | 2.331166  2.215729
49   | 0.0296    0.0200

```

```

50 False Discovery Rate = 0.05

```

```

51 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

52 . dunntest iq6, by(ied) ma(bh) wrap

```

```

53 Warning: by() values are unlabeled, option nolabel implicit

```

```

54
55 Kruskal-Wallis equality-of-populations rank test

```

```

56
57 +-----+
58 | ied | Obs | Rank Sum |
59 |-----+-----|
60 | 1 | 26 | 1024.00 |

```

```

1 | 2 | 49 | 1891.00 |
1 | 3 | 1 | 11.00 |
+-----+

```

```

3 chi-squared = 1.593 with 2 d.f.
4 probability = 0.4508

```

```

5 chi-squared with ties = 3.156 with 2 d.f.
6 probability = 0.2064

```

```

8           Dunn's Pairwise Comparison of iq6 by ied
9           (Benjamini-Hochberg)

```

```

10 Col Mean-|
11 Row Mean |           1           2
12 -----+-----
12      2 | 0.208239
13      | 0.4175
14      |
15      3 | 1.775186  1.740803
16      | 0.1138   0.0613

```

```

17 False Discovery Rate = 0.05
18 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

19 .
20 . dunntest iq7, by(ied) ma(bh) wrap
21 Warning: by() values are unlabeled, option nolabel implicit

```

```

23 Kruskal-Wallis equality-of-populations rank test

```

```

25 +-----+
26 | ied | Obs | Rank Sum |
27 +-----+
27 | 1 | 26 | 1065.50 |
28 | 2 | 48 | 1771.00 |
29 | 3 | 1 | 13.50 |
30 +-----+

```

```

31 chi-squared = 1.873 with 2 d.f.
32 probability = 0.3920

```

```

33 chi-squared with ties = 3.129 with 2 d.f.
34 probability = 0.2092

```

```

36           Dunn's Pairwise Comparison of iq7 by ied
37           (Benjamini-Hochberg)

```

```

38 Col Mean-|
39 Row Mean |           1           2
40 -----+-----
40      2 | 0.994759
41      | 0.1599
42      |
43      3 | 1.599098  1.373101
44      | 0.1647   0.1273

```

```

45 False Discovery Rate = 0.05
46 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

47 .
48 . dunntest iq8, by(ied) ma(bh) wrap
49 Warning: by() values are unlabeled, option nolabel implicit

```

```

51 Kruskal-Wallis equality-of-populations rank test

```

```

53 +-----+
54 | ied | Obs | Rank Sum |
55 +-----+
55 | 1 | 26 | 1025.50 |
56 | 2 | 49 | 1868.50 |
57 | 3 | 1 | 32.00 |
58 +-----+

```

```

59 chi-squared = 0.148 with 2 d.f.

```

probability = 0.9289

1 chi-squared with ties = 0.169 with 2 d.f.
 2 probability = 0.9190
 3

4 Dunn's Pairwise Comparison of iq8 by ied
 5 (Benjamini-Hochberg)

Col Mean-		
Row Mean	1	2
2	0.261480	
	0.3969	
3	0.353785	0.294096
	1.0000	0.5765

13 False Discovery Rate = 0.05

14 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

16 . dunntest iq9, by(ied) ma(bh) wrap

17 Warning: by() values are unlabeled, option nolabel implicit

19 Kruskal-Wallis equality-of-populations rank test

ied	Obs	Rank Sum
1	26	1086.50
2	49	1813.00
3	1	26.50

27 chi-squared = 1.098 with 2 d.f.

28 probability = 0.5776

29 chi-squared with ties = 1.304 with 2 d.f.

30 probability = 0.5209
 31

32 Dunn's Pairwise Comparison of iq9 by ied
 33 (Benjamini-Hochberg)

Col Mean-		
Row Mean	1	2
2	0.974133	
	0.4950	
3	0.740520	0.513063
	0.3442	0.3040

41 False Discovery Rate = 0.05

42 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

44 . dunntest iq10, by(ied) ma(bh) wrap

45 Warning: by() values are unlabeled, option nolabel implicit

47 Kruskal-Wallis equality-of-populations rank test

ied	Obs	Rank Sum
1	26	956.50
2	49	1963.00
3	1	6.50

55 chi-squared = 2.501 with 2 d.f.

56 probability = 0.2864

57 chi-squared with ties = 6.720 with 2 d.f.

58 probability = 0.0347
 59

```

1          Dunn's Pairwise Comparison of iq10 by ied
2          (Benjamini-Hochberg)
3 Col Mean-|
4 Row Mean |          1          2
5 -----+-----
6      2 | -1.001222
7      |      0.1584
8      |
9      3 |  2.206194  2.466110
10     |  0.0205   0.0205
11
12 False Discovery Rate = 0.05
13 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

- Question: For each of the questions, is there a difference in the average response based upon racer or ethnicity

```

14
15 . dunntest iq1, by(ieth) ma(bh) wrap
16
17 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

21 +-----+
22 | ieth | Obs | Rank Sum |
23 +-----+
24 | 1 | 39 | 1542.50 |
25 | 2 | 12 | 460.00 |
26 | 3 | 20 | 716.00 |
27 | 4 | 3 | 124.50 |
28 | 7 | 2 | 83.00 |
29 +-----+

```

```

30 chi-squared = 0.480 with 4 d.f.
31 probability = 0.9754
32
33 chi-squared with ties = 2.201 with 4 d.f.
34 probability = 0.6988

```

```

35          Dunn's Pairwise Comparison of iq1 by ieth
36          (Benjamini-Hochberg)
37 Col Mean-|
38 Row Mean |          1          2          3          4
39 -----+-----
40      2 |  0.357681
41      |      0.5147
42      |
43      3 |  1.322301  0.672593
44      |  0.9303   0.6265
45      |
46      4 | -0.315316 -0.475595 -0.892515
47      |  0.4703   0.6344   0.9303
48      |
49      7 | -0.260575 -0.401951 -0.745114  0.000000
50      |  0.4413   0.5731   0.7603   0.5000
51
52 False Discovery Rate = 0.05
53 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

54 .
55 . dunntest iq2, by(ieth) ma(bh) wrap
56
57 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

55 +-----+
56 | ieth | Obs | Rank Sum |
57 +-----+
58 | 1 | 38 | 1483.50 |
59 | 2 | 12 | 429.00 |
60 | 3 | 20 | 727.50 |

```



```

1 | 4 | 3 | 126.00 |
1 | 7 | 2 | 84.00 |
2 +-----+

```

```

3 chi-squared = 0.494 with 4 d.f.
4 probability = 0.9741

```

```

5 chi-squared with ties = 1.728 with 4 d.f.
6 probability = 0.7857
7

```

Dunn's Pairwise Comparison of iq2 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	0.852426			
	1.0000			
3	0.827632	-0.146874		
	0.6798	0.4907		
4	-0.423606	-0.830842	-0.779591	
	0.4799	1.0000	0.5445	
7	-0.350170	-0.702190	-0.650840	0.000000
	0.4539	0.4826	0.4293	0.5000

```

21 False Discovery Rate = 0.05

```

```

22 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

24 . dunntest iq3, by(ieth) ma(bh) wrap

```

```

26 Warning: by() values are unlabeled, option nolabel implicit

```

```

28 Kruskal-Wallis equality-of-populations rank test

```

```

30 +-----+
31 | ieth | Obs | Rank Sum |
32 |-----+-----+
33 | 1 | 39 | 1641.00 |
34 | 2 | 12 | 350.00 |
35 | 3 | 20 | 710.00 |
36 | 4 | 3 | 135.00 |
37 | 7 | 2 | 90.00 |
38 +-----+

```

```

37 chi-squared = 3.969 with 4 d.f.
38 probability = 0.4102

```

```

39 chi-squared with ties = 9.329 with 4 d.f.
40 probability = 0.0534
41

```

Dunn's Pairwise Comparison of iq3 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	2.715092			
	0.0331			
3	1.660183	-1.204134		
	0.1615	0.2285		
4	-0.338704	-1.702903	-1.065239	
	0.4593	0.2215	0.2390	
7	-0.279903	-1.439216	-0.889312	0.000000
	0.4331	0.1876	0.2670	0.5000

```

55 False Discovery Rate = 0.05

```

```

56 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

58 . dunntest iq4, by(ieth) ma(bh) wrap

```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+
| 1 | 39 | 1584.50 |
| 2 | 12 | 474.00 |
| 3 | 20 | 733.00 |
| 4 | 3 | 37.50 |
| 7 | 2 | 97.00 |
+-----+
    
```

chi-squared = 5.096 with 4 d.f.
 probability = 0.2776

chi-squared with ties = 8.628 with 4 d.f.
 probability = 0.0711

Dunn's Pairwise Comparison of iq4 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	0.201372			
	0.4202			
3	0.852280	0.459885		
	0.3284	0.3587		
4	2.766202	2.464580	2.298277	
	0.0284	0.0343	0.0269	
7	-0.639739	-0.694317	-0.941479	-2.323629
	0.3265	0.3482	0.3465	0.0336

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq5, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+
| 1 | 39 | 1585.50 |
| 2 | 12 | 384.00 |
| 3 | 20 | 771.50 |
| 4 | 3 | 96.00 |
| 7 | 2 | 89.00 |
+-----+
    
```

chi-squared = 1.818 with 4 d.f.
 probability = 0.7691

chi-squared with ties = 4.548 with 4 d.f.
 probability = 0.3369

Dunn's Pairwise Comparison of iq5 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	1.877283			
	0.3024			
3	0.541285	-1.289464		
	0.3677	0.4931		
4	1.034332	0.000000	0.760484	

```

      |      0.3762      0.5000      0.3725
1      |
2      7 | -0.379896 -1.172018 -0.572123 -0.980581
3      |      0.3911      0.4020      0.4052      0.3268
4 False Discovery Rate = 0.05
5 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
6
7 . dunntest iq6, by(ieth) ma(bh) wrap
8 Warning: by() values are unlabeled, option nolabel implicit
9
10 Kruskal-Wallis equality-of-populations rank test
11
12 +-----+
13 | ieth | Obs | Rank Sum |
14 |-----+-----|
15 | 1 | 39 | 1547.50 |
16 | 2 | 12 | 479.50 |
17 | 3 | 20 | 666.50 |
18 | 4 | 3 | 139.50 |
19 | 7 | 2 | 93.00 |
20 +-----+
21
22 chi-squared = 1.918 with 4 d.f.
23 probability = 0.7508
24
25 chi-squared with ties = 3.799 with 4 d.f.
26 probability = 0.4338
27
28 Dunn's Pairwise Comparison of iq6 by ieth
29 (Benjamini-Hochberg)
30
31 Col Mean-|
32 Row Mean | 1 2 3 4
33 +-----+
34 2 | -0.053834
35 | 0.5317
36 |
37 3 | 1.472508 1.157760
38 | 0.7044 0.4116
39 |
40 4 | -0.725506 -0.645877 -1.356183
41 | 0.4681 0.4320 0.4376
42 |
43 7 | -0.599554 -0.545866 -1.132205 0.000000
44 | 0.3920 0.3657 0.3219 0.5000
45
46 False Discovery Rate = 0.05
47 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
48
49 . dunntest iq7, by(ieth) ma(bh) wrap
50 Warning: by() values are unlabeled, option nolabel implicit
51
52 Kruskal-Wallis equality-of-populations rank test
53
54 +-----+
55 | ieth | Obs | Rank Sum |
56 |-----+-----|
57 | 1 | 38 | 1459.00 |
58 | 2 | 12 | 507.00 |
59 | 3 | 20 | 644.00 |
60 | 4 | 3 | 144.00 |
61 | 7 | 2 | 96.00 |
62 +-----+
63
64 chi-squared = 2.938 with 4 d.f.
65 probability = 0.5683
66
67 chi-squared with ties = 4.907 with 4 d.f.
68 probability = 0.2970
69
70 Dunn's Pairwise Comparison of iq7 by ieth
71 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

```

(Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	-0.690387			
	0.3500			
3	1.329710	1.632067		
	0.3060	0.5133		
4	-0.949754	-0.528220	-1.513248	
	0.3422	0.3733	0.3255	
7	-0.785104	-0.446427	-1.263331	0.000000
	0.3603	0.3640	0.2581	0.5000

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq8, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	39	1519.00
2	12	510.00
3	20	673.50
4	3	106.50
7	2	117.00

chi-squared = 3.060 with 4 d.f.
 probability = 0.5478

chi-squared with ties = 3.502 with 4 d.f.
 probability = 0.4775

Dunn's Pairwise Comparison of iq8 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	-0.521135			
	0.3764			
3	0.928892	1.170773		
	0.2941	0.3021		
4	0.278839	0.525328	-0.142791	
	0.4335	0.4281	0.4432	
7	-1.306345	-1.014820	-1.621568	-1.220522
	0.4786	0.3102	0.5245	0.3704

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq9, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	39	1358.00
2	12	488.50
3	20	821.00
4	3	142.50

```

| 7 | 2 | 116.00 |
+-----+

```

```

1
2 chi-squared = 3.527 with 4 d.f.
3 probability = 0.4738

```

```

4 chi-squared with ties = 4.191 with 4 d.f.
5 probability = 0.3808
6

```

Dunn's Pairwise Comparison of iq9 by ieth
(Benjamini-Hochberg)

```

9 Col Mean-|
10 Row Mean | 1 2 3 4
-----+-----+-----+-----+
11 2 | -0.880360
12 | 0.3156
13 |
14 3 | -1.118000 -0.046185
15 | 0.4393 0.4816
16 |
17 4 | -1.044571 -0.519338 -0.514209
18 | 0.2962 0.3772 0.3373
19 |
20 7 | -1.578074 -1.117498 -1.128123 -0.567738
21 | 0.5727 0.3297 0.6482 0.4073

```

```

22 False Discovery Rate = 0.05

```

```

23 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

24 . dunntest iq10, by(ieth) ma(bh) wrap

```

```

25 Warning: by() values are unlabeled, option nolabel implicit

```

```

26 Kruskal-Wallis equality-of-populations rank test

```

```

27
28
29 +-----+
30 | ieth | Obs | Rank Sum |
31 |-----+-----+-----+
32 | 1 | 39 | 1603.50 |
33 | 2 | 12 | 415.50 |
34 | 3 | 20 | 687.00 |
35 | 4 | 3 | 132.00 |
36 | 7 | 2 | 88.00 |
37 +-----+

```

```

38 chi-squared = 1.933 with 4 d.f.
39 probability = 0.7481

```

```

40 chi-squared with ties = 5.194 with 4 d.f.
41 probability = 0.2680

```

Dunn's Pairwise Comparison of iq10 by ieth
(Benjamini-Hochberg)

```

42 Col Mean-|
43 Row Mean | 1 2 3 4
-----+-----+-----+-----+
44 2 | 1.459385
45 | 0.3611
46 |
47 3 | 1.825894 0.055902
48 | 0.3393 0.5308
49 |
50 4 | -0.357370 -1.078049 -1.156913
51 | 0.5149 0.3513 0.4122
52 |
53 7 | -0.295328 -0.911118 -0.965845 0.000000
54 | 0.4798 0.3019 0.3341 0.5000

```

```

55 False Discovery Rate = 0.05

```

```

56 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

57 -----+
58 . dunntest iq1, by(ihwork) ma(bh) wrap
59

```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+-----+
|      0 |  16 |   664.00 |
|      1 |  10 |   263.00 |
|      2 |  50 |  1999.00 |
+-----+-----+

```

chi-squared = 3.572 with 2 d.f.
probability = 0.1676

chi-squared with ties = 16.371 with 2 d.f.
probability = 0.0003

Dunn's Pairwise Comparison of iq1 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |           0           1
-----+-----+-----+
|      1 |  3.655494
|      |  0.0002
|      2 |  0.513034 -3.828465
|      |  0.3040  0.0002

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq2, by(ihwork) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+-----+
|      0 |  16 |   634.50 |
|      1 |   9 |   228.00 |
|      2 |  50 |  1987.50 |
+-----+-----+

```

chi-squared = 3.455 with 2 d.f.
probability = 0.1777

chi-squared with ties = 12.083 with 2 d.f.
probability = 0.0024

Dunn's Pairwise Comparison of iq2 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |           0           1
-----+-----+-----+
|      1 |  2.949684
|      |  0.0024
|      2 | -0.028008 -3.416473
|      |  0.4888  0.0010

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq3, by(ihwork) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  16 |   644.00 |
|      1 |  10 |   298.00 |
|      2 |  50 |  1984.00 |
+-----+

```

```

6 chi-squared =      1.795 with 2 d.f.
7 probability =      0.4075

```

```

8 chi-squared with ties =      4.220 with 2 d.f.
9 probability =      0.1213

```

```

11          Dunn's Pairwise Comparison of iq3 by ihwork
12                (Benjamini-Hochberg)

```

```

13 Col Mean-|
14 Row Mean |          0          1
+-----+
15      1 |   1.799706
16      |   0.0539
17      |
18      2 |   0.137772  -1.980059
19      |   0.4452    0.0715

```

```

20 False Discovery Rate =      0.05
21 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

22 .
23 . dunntest iq4, by(ihwork) ma(bh) wrap

```

```

24 Warning: by() values are unlabeled, option nolabel implicit

```

```

26 Kruskal-Wallis equality-of-populations rank test

```

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  17 |   685.50 |
|      1 |  10 |   300.50 |
|      2 |  50 |  2017.00 |
+-----+

```

```

34 chi-squared =      1.839 with 2 d.f.
35 probability =      0.3987

```

```

36 chi-squared with ties =      3.042 with 2 d.f.
37 probability =      0.2185

```

```

39          Dunn's Pairwise Comparison of iq4 by ihwork
40                (Benjamini-Hochberg)

```

```

41 Col Mean-|
42 Row Mean |          0          1
+-----+
43      1 |   1.481917
44      |   0.1038
45      |
46      2 |  -0.003372  -1.707601
47      |   0.4987    0.1316

```

```

48 False Discovery Rate =      0.05
49 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

50 .
51 . dunntest iq5, by(ihwork) ma(bh) wrap

```

```

52 Warning: by() values are unlabeled, option nolabel implicit

```

```

54 Kruskal-Wallis equality-of-populations rank test

```

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  16 |   712.00 |
|      1 |  10 |   220.00 |

```

```

|      2 | 50 | 1994.00 |
+-----+

```

```

1
2 chi-squared =      6.959 with 2 d.f.
3 probability =      0.0308

```

```

4 chi-squared with ties =      17.404 with 2 d.f.
5 probability =      0.0002
6

```

Dunn's Pairwise Comparison of iq5 by ihwork
(Benjamini-Hochberg)

```

9 Col Mean-|
10 Row Mean |          0          1
11 -----+-----
12 1 | 3.997040
13   | 0.0001
14 2 | 1.151855 -3.696235
15   | 0.1247 0.0002

```

```

16 False Discovery Rate = 0.05
17 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

18 .
19 . dunntest iq6, by(ihwork) ma(bh) wrap

```

```

20 Warning: by() values are unlabeled, option nolabel implicit

```

```

21
22 Kruskal-Wallis equality-of-populations rank test

```

```

23
24 +-----+
25 | ihwork | Obs | Rank Sum |
26 +-----+-----+
27 |      0 | 16 | 559.00 |
28 |      1 | 10 | 308.00 |
29 |      2 | 50 | 2059.00 |
30 +-----+

```

```

31 chi-squared =      2.369 with 2 d.f.
32 probability =      0.3060

```

```

33 chi-squared with ties =      4.692 with 2 d.f.
34 probability =      0.0958

```

Dunn's Pairwise Comparison of iq6 by ihwork
(Benjamini-Hochberg)

```

37 Col Mean-|
38 Row Mean |          0          1
39 -----+-----
40 1 | 0.654135
41   | 0.2565
42 2 | -1.385120 -1.909689
43   | 0.1245 0.0843

```

```

44 False Discovery Rate = 0.05
45 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

46 .
47 . dunntest iq7, by(ihwork) ma(bh) wrap

```

```

48 Warning: by() values are unlabeled, option nolabel implicit

```

```

49
50 Kruskal-Wallis equality-of-populations rank test

```

```

51
52 +-----+
53 | ihwork | Obs | Rank Sum |
54 +-----+-----+
55 |      0 | 16 | 644.50 |
56 |      1 | 9 | 353.00 |
57 |      2 | 50 | 1852.50 |
58 +-----+

```

```

59 chi-squared =      0.299 with 2 d.f.
60 probability =      0.8613

```



```

1  chi-squared with ties =      0.499 with 2 d.f.
2  probability =      0.7793
3
4          Dunn's Pairwise Comparison of iq7 by ihwork
5          (Benjamini-Hochberg)
6  Col Mean-|
7  Row Mean |          0          1
8  -----+-----
9  1 | 0.150716
10 | 0.4401
11 |
12 | 2 | 0.667091  0.355734
13 | 0.7571  0.5415
14
15 False Discovery Rate = 0.05
16 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
17
18 .
19 . dunntest iq8, by(ihwork) ma(bh) wrap
20
21 Warning: by() values are unlabeled, option nolabel implicit
22
23 Kruskal-Wallis equality-of-populations rank test
24
25 +-----+
26 | ihwork | Obs | Rank Sum |
27 |-----+-----|
28 | 0 | 16 | 521.00 |
29 | 1 | 10 | 393.00 |
30 | 2 | 50 | 2012.00 |
31 +-----+
32
33 chi-squared = 1.480 with 2 d.f.
34 probability = 0.4771
35
36 chi-squared with ties = 1.694 with 2 d.f.
37 probability = 0.4287
38
39          Dunn's Pairwise Comparison of iq8 by ihwork
40          (Benjamini-Hochberg)
41 Col Mean-|
42 Row Mean |          0          1
43 -----+-----
44 1 | -0.809654
45 | 0.3136
46 |
47 2 | -1.294852 -0.131451
48 | 0.2931  0.4477
49
50 False Discovery Rate = 0.05
51 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
52
53 .
54 . dunntest iq9, by(ihwork) ma(bh) wrap
55
56 Warning: by() values are unlabeled, option nolabel implicit
57
58 Kruskal-Wallis equality-of-populations rank test
59
60 +-----+
61 | ihwork | Obs | Rank Sum |
62 |-----+-----|
63 | 0 | 16 | 639.00 |
64 | 1 | 10 | 379.00 |
65 | 2 | 50 | 1908.00 |
66 +-----+
67
68 chi-squared = 0.087 with 2 d.f.
69 probability = 0.9574
70
71 chi-squared with ties = 0.103 with 2 d.f.
72 probability = 0.9496

```

Dunn's Pairwise Comparison of iq9 by ihwork
(Benjamini-Hochberg)

Col Mean-				
Row Mean			0	1
1		0.249482		
		0.6022		
2		0.305457	-0.037047	
		1.0000	0.4852	

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq10, by(ihwork) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	16	666.50
1	10	322.00
2	50	1937.50

chi-squared = 1.147 with 2 d.f.

probability = 0.5635

chi-squared with ties = 3.082 with 2 d.f.

probability = 0.2141

Dunn's Pairwise Comparison of iq10 by ihwork
(Benjamini-Hochberg)

Col Mean-				
Row Mean			0	1
1		1.741221		
		0.1225		
2		0.751048	-1.403500	
		0.2263	0.1204	

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

HPSS Survey Statistics on Factor Analysis Produced Variables

- Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by age?

Answer – NO, not for either variable

- Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by gender?

Answer – NO, not for either variable

- Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by level of education

Answer – NO, not for either variable

- Question: For each of the factor variables (knowledge, participation), is there a difference in the average response based upon racer or ethnicity

Answer – K-Wallis (nonparametric ANOVA reports a significant p value for "knowledge" but the Dunn test finds no significant difference among the pairs tested. No significant difference was found for "participate"

- Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by age?

```
. dunntest iknowledge, by(iage) ma(bh) wrap
```

```
Kruskal-Wallis equality-of-populations rank test
```

iage	Obs	Rank Sum
1	1	3.50
2	22	876.00
3	35	1415.50
4	11	324.50
5	5	209.50
6	1	21.00

```
chi-squared = 5.540 with 5 d.f.
probability = 0.3535
```

```
chi-squared with ties = 7.568 with 5 d.f.
probability = 0.1817
```

Dunn's Pairwise Comparison of iknowledge by iage
(Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-1.904824				
	0.2130				
3	-1.953424	-0.123125			
	0.3808	0.4510			
4	-1.334942	1.498433	1.697718		

		0.2274	0.2010	0.1679		
1						
2	5	-1.879853	-0.225341	-0.163446	-1.232896	
3		0.1503	0.4741	0.4662	0.2332	
4	6	-0.663600	0.986980	1.028078	0.436423	1.023149
5		0.3456	0.2427	0.2849	0.4141	0.2552

False Discovery Rate = 0.05
 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

. dunnstest iparticipate, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
1	1	10.00
2	22	810.00
3	35	1355.00
4	11	407.50
5	5	221.50
6	1	46.00

chi-squared = 2.326 with 5 d.f.
 probability = 0.8024

chi-squared with ties = 2.448 with 5 d.f.
 probability = 0.7843

Dunn's Pairwise Comparison of iparticipate by iage
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
2	-1.234590				
	0.5425				
3	-1.332682	-0.328032			
	0.6849	0.4643			
4	-1.218838	-0.028970	0.227253		
	0.4179	0.4884	0.4732		
5	-1.473837	-0.710833	-0.549938	-0.633107	
	1.0000	0.5965	0.5460	0.5643	
6	-1.198211	-0.422690	-0.338143	-0.403548	-0.073047
	0.3463	0.5604	0.5013	0.5149	0.5045

False Discovery Rate = 0.05
 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by gender?

. ranksum iknowledge, by(igender)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

igender	obs	rank sum	expected
1	17	579	646
2	58	2271	2204
combined	75	2850	2850

unadjusted variance 6244.67
 adjustment for ties -1673.27
 adjusted variance 4571.40

```

1  Ho: iknowl~e(igender==1) = iknowl~e(igender==2)
2      z = -0.991
3      Prob > |z| = 0.3217
4
5  .
6  . ranksum iparticipate, by(igender)
7
8  Two-sample Wilcoxon rank-sum (Mann-Whitney) test
9
10     igender |      obs   rank sum   expected
11 -----+-----
12     1 |      17     599.5     646
13     2 |      58    2250.5    2204
14 -----+-----
15     combined |      75    2850     2850
16
17 unadjusted variance      6244.67
18 adjustment for ties      -310.99
19 -----+-----
20 adjusted variance      5933.68
21
22 Ho: iparti~e(igender==1) = iparti~e(igender==2)
23     z = -0.604
24     Prob > |z| = 0.5461

```

- **Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by level of education**

```

25 . dunntest iknowledge, by(ied) ma(bh) wrap
26
27 Kruskal-Wallis equality-of-populations rank test
28
29 +-----+
30 | ied | Obs | Rank Sum |
31 +-----+
32 | 1 | 26 | 952.00 |
33 | 2 | 48 | 1894.50 |
34 | 3 | 1 | 3.50 |
35 +-----+
36
37 chi-squared = 2.829 with 2 d.f.
38 probability = 0.2431
39
40 chi-squared with ties = 3.864 with 2 d.f.
41 probability = 0.1449
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

```

Dunn's Pairwise Comparison of iknowledge by ied
(Benjamini-Hochberg)

Col Mean-	1	2
Row Mean		
2	-0.628394	
	0.2649	
3	1.742681	1.909111
	0.0610	0.0844

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

50 .
51 . dunntest iparticipate, by(ied) ma(bh) wrap
52
53 Kruskal-Wallis equality-of-populations rank test
54
55 +-----+
56 | ied | Obs | Rank Sum |
57 +-----+
58 | 1 | 26 | 1051.50 |
59 | 2 | 48 | 1784.00 |
60 | 3 | 1 | 14.50 |
61 +-----+

```

chi-squared = 1.559 with 2 d.f.
 probability = 0.4586

chi-squared with ties = 1.641 with 2 d.f.
 probability = 0.4402

Dunn's Pairwise Comparison of iparticipate by ied
 (Benjamini-Hochberg)

Col Mean-	1	2
2	0.633189	
	0.2633	
3	1.198283	1.055981
	0.3462	0.2182

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

- Question: For each of the factor variables (knowledge, participation), is there a difference in the average response based upon racer or ethnicity

```
. dunntest iknowledge, by(ieth) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit
Kruskal-Wallis equality-of-populations rank test
```

ieth	Obs	Rank Sum
1	38	1601.50
2	12	333.00
3	20	759.00
4	3	53.50
7	2	103.00

chi-squared = 7.365 with 4 d.f.
 probability = 0.1178
 chi-squared with ties = 10.060 with 4 d.f.
 probability = 0.0394

Dunn's Pairwise Comparison of iknowledge by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	2.331226			
	0.0987			
3	0.814293	-1.498008		
	0.2308	0.1118		
4	2.173971	0.823862	1.742413	
	0.0743	0.2563	0.1018	
7	-0.691538	-1.667587	-0.979809	-1.977762
	0.2446	0.0954	0.2337	0.0799

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

```
. dunntest iparticipate, by(ieth) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit
Kruskal-Wallis equality-of-populations rank test
```

ieth	Obs	Rank	Sum
1	38		1430.50
2	12		507.00
3	20		659.50
4	3		128.00
7	2		125.00

chi-squared = 4.195 with 4 d.f.
probability = 0.3803

chi-squared with ties = 4.414 with 4 d.f.
probability = 0.3528

Dunn's Pairwise Comparison of iparticipate by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	-0.654633 0.3204			
3	0.795667 0.3552	1.195612 0.2898		
4	-0.394164 0.3853	-0.030384 0.4879	-0.736811 0.3295	
7	-1.612653 0.2670	-1.247994 0.3534	-1.873935 0.3047	-1.022662 0.3065

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

National Survey Statistics Report

Summary

- Question – For each of the questions, 1-10, are there differences in the average response by age?
Answer – YES, for ALL questions there are significant differences among the responses of the various age groups
- Question – For each of the questions, 1-10, are there differences in the average response by gender?
Answer – YES, for ALL questions there are significant differences between the responses of the genders.
- Question – For each of the questions, 1-10, are there differences in the average response by income level?
Answer – YES, for questions 1, 2, 3, 4, and 6 there are differences in responses among income levels.
- Question: For each of the questions, are there differences in the average responses among regions?
Answer – YES, but only for question 9.
- Question – For each of the questions, 1-10, are there differences in the average responses among the devices used?
Answer – Yes, for all questions, except 2, 8 and 9, there are differences in the average responses among the devices used.

Statistics

- Question – For each of the questions, 1-10, are there differences in the average response by age among those who identified their age group?

```
. dunnstest iq1, by(iage) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```

+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 2 | 297 | 136808.00 |
| 3 | 230 | 120095.00 |
| 4 | 343 | 193579.00 |
| 5 | 197 | 119296.00 |
+-----+

```

```
chi-squared = 31.130 with 3 d.f.
probability = 0.0001
```

```
chi-squared with ties = 53.379 with 3 d.f.
probability = 0.0001
```

```
Dunn's Pairwise Comparison of iq1 by iage
(Benjamini-Hochberg)
```

```
Col Mean-|
Row Mean |
```

² For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>


```

-----+-----
1      3 | -2.976209
2      | 0.0022
3      4 | -5.561425 -2.104981
4      | 0.0000 0.0212
5      5 | -6.702295 -3.651101 -1.958054
6      | 0.0000 0.0003 0.0251
7
8 False Discovery Rate = 0.05
9 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
10
11 .
12 . dunntest iq2, by(iage) ma(bh) wrap
13
14 Warning: by() values are unlabeled, option nolabel implicit

```

```

15 Kruskal-Wallis equality-of-populations rank test

```

```

16 +-----+
17 | iage | Obs | Rank Sum |
18 |-----+-----|
19 | 2 | 297 | 137489.50 |
20 | 3 | 230 | 117935.00 |
21 | 4 | 343 | 193709.50 |
22 | 5 | 197 | 120644.00 |
23 +-----+

```

```

24 chi-squared = 33.059 with 3 d.f.
25 probability = 0.0001
26
27 chi-squared with ties = 47.662 with 3 d.f.
28 probability = 0.0001

```

```

29 Dunn's Pairwise Comparison of iq2 by iage
30 (Benjamini-Hochberg)

```

```

31 Col Mean-|
32 Row Mean | 2 3 4
33 +-----+
34 3 | -2.210640
35 | 0.0162
36 4 | -5.005456 -2.376918
37 | 0.0000 0.0131
38 5 | -6.338529 -3.999461 -2.077098
39 | 0.0000 0.0001 0.0189

```

```

40 False Discovery Rate = 0.05
41 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
42
43 .
44 . dunntest iq3, by(iage) ma(bh) wrap
45
46 Warning: by() values are unlabeled, option nolabel implicit

```

```

47 Kruskal-Wallis equality-of-populations rank test

```

```

48 +-----+
49 | iage | Obs | Rank Sum |
50 |-----+-----|
51 | 2 | 297 | 139770.50 |
52 | 3 | 230 | 117843.00 |
53 | 4 | 343 | 191441.00 |
54 | 5 | 197 | 120723.50 |
55 +-----+

```

```

56 chi-squared = 28.691 with 3 d.f.
57 probability = 0.0001
58
59 chi-squared with ties = 53.833 with 3 d.f.
60 probability = 0.0001

```

```

61 Dunn's Pairwise Comparison of iq3 by iage

```

(Benjamini-Hochberg)

Col Mean-	2	3	4
3	-2.113003		
	0.0173		
4	-4.908660	-2.387522	
	0.0000	0.0102	
5	-6.879036	-4.599409	-2.718488
	0.0000	0.0000	0.0049

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq4, by(iage) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	131759.50
3	230	116810.50
4	343	196304.50
5	197	124903.50

chi-squared = 53.252 with 3 d.f.
 probability = 0.0001

chi-squared with ties = 70.467 with 3 d.f.
 probability = 0.0001

Dunn's Pairwise Comparison of iq4 by iage
 (Benjamini-Hochberg)

Col Mean-	2	3	4
3	-2.730052		
	0.0038		
4	-6.060387	-2.822725	
	0.0000	0.0036	
5	-7.734777	-4.851098	-2.576905
	0.0000	0.0000	0.0050

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq5, by(iage) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	130735.50
3	230	118988.50
4	343	197372.50
5	197	122681.50

chi-squared = 50.736 with 3 d.f.
 probability = 0.0001

chi-squared with ties = 74.894 with 3 d.f.
 probability = 0.0001

```

1
2           Dunn's Pairwise Comparison of iq5 by iage
3           (Benjamini-Hochberg)
4 Col Mean-|
5 Row Mean |           2           3           4
6 -----+-----+-----+-----+
7 3 | -3.463252
8   | 0.0004
9   |
10 4 | -6.727241 -2.687273
11  | 0.0000 0.0043
12  |
13 5 | -7.833291 -4.280955 -2.086904
14  | 0.0000 0.0000 0.0184

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
.
. dunntest iq6, by(iage) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 2 | 297 | 139523.00 |
| 3 | 230 | 121315.50 |
| 4 | 343 | 196979.50 |
| 5 | 197 | 111960.00 |
+-----+

```

chi-squared = 21.310 with 3 d.f.

probability = 0.0001

chi-squared with ties = 31.684 with 3 d.f.

probability = 0.0001

```

32           Dunn's Pairwise Comparison of iq6 by iage
33           (Benjamini-Hochberg)
34 Col Mean-|
35 Row Mean |           2           3           4
36 -----+-----+-----+
37 3 | -2.598612
38   | 0.0094
39   |
40 4 | -5.217225 -2.174021
41  | 0.0000 0.0223
42  |
43 5 | -4.243787 -1.665690 0.263774
44  | 0.0000 0.0575 0.3960

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
.
. dunntest iq7, by(iage) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 2 | 297 | 134994.00 |
| 3 | 230 | 118404.00 |
| 4 | 343 | 195415.00 |
| 5 | 197 | 120965.00 |
+-----+

```

chi-squared = 38.545 with 3 d.f.

probability = 0.0001

1 chi-squared with ties = 47.396 with 3 d.f.
 2 probability = 0.0001

3
 4 Dunn's Pairwise Comparison of iq7 by iage
 5 (Benjamini-Hochberg)

Col Mean-			
Row Mean	2	3	4
3	-2.469339		
	0.0102		
4	-5.229834	-2.318978	
	0.0000	0.0122	
5	-6.246620	-3.678399	-1.783685
	0.0000	0.0002	0.0372

14 False Discovery Rate = 0.05
 15 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

17 . dunntest iq8, by(iage) ma(bh) wrap
 18
 19 Warning: by() values are unlabeled, option nolabel implicit

20
 21 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	144264.00
3	230	123659.00
4	343	195323.50
5	197	106531.50

29 chi-squared = 11.953 with 3 d.f.
 30 probability = 0.0075

31 chi-squared with ties = 13.243 with 3 d.f.
 32 probability = 0.0041

34
 35 Dunn's Pairwise Comparison of iq8 by iage
 36 (Benjamini-Hochberg)

Col Mean-			
Row Mean	2	3	4
3	-2.018706		
	0.0435		
4	-3.607781	-1.274845	
	0.0009	0.1518	
5	-2.045700	-0.109821	1.096108
	0.0612	0.4563	0.1638

45 False Discovery Rate = 0.05
 46 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

48 . dunntest iq9, by(iage) ma(bh) wrap
 49
 50 Warning: by() values are unlabeled, option nolabel implicit

51
 52 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	145982.00
3	230	123673.00
4	343	185055.00
5	197	115068.00

```

1  chi-squared = 10.994 with 3 d.f.
2  probability = 0.0118
3  chi-squared with ties = 12.738 with 3 d.f.
4  probability = 0.0052
5
6          Dunn's Pairwise Comparison of iq9 by iage
7          (Benjamini-Hochberg)
8  Col Mean-|
9  Row Mean |          2          3          4
10 -----+-----
11  3 | -1.836776
12   | 0.0662
13  4 | -2.115200 -0.074195
14   | 0.0516 0.4704
15  5 | -3.519369 -1.669304 -1.742007
16   | 0.0013 0.0570 0.0611
17
18 False Discovery Rate = 0.05
19 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

19 .
20 . dunntest iq10, by(iage) ma(bh) wrap
21
22 Warning: by() values are unlabeled, option nolabel implicit

```

```

23 Kruskal-Wallis equality-of-populations rank test

```

```

24 +-----+
25 | iage | Obs | Rank Sum |
26 +-----+
27 | 2 | 297 | 134627.00 |
28 | 3 | 230 | 122540.00 |
29 | 4 | 343 | 194647.50 |
30 | 5 | 197 | 117963.50 |
31 +-----+

```

```

32 chi-squared = 33.137 with 3 d.f.
33 probability = 0.0001
34 chi-squared with ties = 60.194 with 3 d.f.
35 probability = 0.0001

```

```

36
37          Dunn's Pairwise Comparison of iq10 by iage
38          (Benjamini-Hochberg)
39  Col Mean-|
40  Row Mean |          2          3          4
41 -----+-----
42  3 | -3.958265
43   | 0.0001
44  4 | -6.301218 -1.780890
45   | 0.0000 0.0450
46  5 | -6.925950 -2.974246 -1.532010
47   | 0.0000 0.0022 0.0628
48
49 False Discovery Rate = 0.05
50 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

-
- Question – For each of the questions, 1-10, are there differences in the average response by gender?

```

53 . dunntest iq1, by(igender)
54
55 Warning: by() values are unlabeled, option nolabel implicit
56
57 Kruskal-Wallis equality-of-populations rank test

```

```

58 +-----+

```

```

| igender | Obs | Rank Sum |
+-----+-----+-----+
|         |     |           |
|         |     |           |
|         |     |           |
+-----+-----+-----+

```

```

chi-squared = 11.781 with 1 d.f.
probability = 0.0006

```

```

chi-squared with ties = 20.202 with 1 d.f.
probability = 0.0001

```

Dunn's Pairwise Comparison of iq1 by igender
(No adjustment)

```

Col Mean-|
Row Mean |           1
+-----+-----+
|         |           |
|         |           |
|         |           |
+-----+-----+

```

```

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2

```

```

.
. dunntest iq2, by(igender)

```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+-----+-----+
| igender | Obs | Rank Sum |
+-----+-----+-----+
|         |     |           |
|         |     |           |
|         |     |           |
+-----+-----+-----+

```

```

chi-squared = 15.032 with 1 d.f.
probability = 0.0001

```

```

chi-squared with ties = 21.672 with 1 d.f.
probability = 0.0001

```

Dunn's Pairwise Comparison of iq2 by igender
(No adjustment)

```

Col Mean-|
Row Mean |           1
+-----+-----+
|         |           |
|         |           |
|         |           |
+-----+-----+

```

```

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2

```

```

.
. dunntest iq3, by(igender)

```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+-----+-----+
| igender | Obs | Rank Sum |
+-----+-----+-----+
|         |     |           |
|         |     |           |
|         |     |           |
+-----+-----+-----+

```

```

chi-squared = 4.340 with 1 d.f.
probability = 0.0372

```

```

chi-squared with ties = 8.144 with 1 d.f.
probability = 0.0043

```

Dunn's Pairwise Comparison of iq3 by igender
(No adjustment)

```

1 Col Mean-|
2 Row Mean |           1
3 -----+-----
4         2 | -2.853738
5         |           0.0022

```

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
.
. dunntest iq4, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

14 +-----+
15 | igender | Obs | Rank Sum |
16 |-----+-----|
17 |         1 | 497 | 245219.00 |
18 |         2 | 570 | 324559.00 |
19 +-----+

```

chi-squared = 16.150 with 1 d.f.
probability = 0.0001

chi-squared with ties = 21.371 with 1 d.f.
probability = 0.0001

Dunn's Pairwise Comparison of iq4 by igender
(No adjustment)

```

26 Col Mean-|
27 Row Mean |           1
28 -----+-----
29         2 | -4.622902
30         |           0.0000

```

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
.
. dunntest iq5, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

39 +-----+
40 | igender | Obs | Rank Sum |
41 |-----+-----|
42 |         1 | 497 | 250255.00 |
43 |         2 | 570 | 319523.00 |
44 +-----+

```

chi-squared = 9.095 with 1 d.f.
probability = 0.0026

chi-squared with ties = 13.426 with 1 d.f.
probability = 0.0002

Dunn's Pairwise Comparison of iq5 by igender
(No adjustment)

```

51 Col Mean-|
52 Row Mean |           1
53 -----+-----
54         2 | -3.664079
55         |           0.0001

```

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
.
. dunntest iq6, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	497	253170.50
2	570	316607.50

chi-squared = 5.930 with 1 d.f.
probability = 0.0149

chi-squared with ties = 8.817 with 1 d.f.
probability = 0.0030

Dunn's Pairwise Comparison of iq6 by igender
(No adjustment)

Col Mean-	Row Mean	
		1
2	-2.969281	
	0.0015	

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq7, by(igender)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	497	242886.00
2	570	326892.00

chi-squared = 20.100 with 1 d.f.
probability = 0.0001

chi-squared with ties = 24.716 with 1 d.f.
probability = 0.0001

Dunn's Pairwise Comparison of iq7 by igender
(No adjustment)

Col Mean-	Row Mean	
		1
2	-4.971520	
	0.0000	

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq8, by(igender)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	497	243180.50
2	570	326597.50


```
chi-squared = 19.578 with 1 d.f.
probability = 0.0001
```

```
chi-squared with ties = 21.691 with 1 d.f.
probability = 0.0001
```

```
Dunn's Pairwise Comparison of iq8 by igender
(No adjustment)
```

```
Col Mean-|
Row Mean |          1
-----+-----
      2 | -4.657396
      | 0.0000
```

```
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
```

```
. dunntest iq9, by(igender)
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| igender | Obs | Rank Sum |
+-----+-----+
|          |     |           |
|          1 | 497 | 250477.00 |
|          2 | 570 | 319301.00 |
+-----+-----+
```

```
chi-squared = 8.830 with 1 d.f.
probability = 0.0030
```

```
chi-squared with ties = 10.231 with 1 d.f.
probability = 0.0014
```

```
Dunn's Pairwise Comparison of iq9 by igender
(No adjustment)
```

```
Col Mean-|
Row Mean |          1
-----+-----
      2 | -3.198645
      | 0.0007
```

```
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
```

```
. dunntest iq10, by(igender)
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| igender | Obs | Rank Sum |
+-----+-----+
|          |     |           |
|          1 | 497 | 246943.50 |
|          2 | 570 | 322834.50 |
+-----+-----+
```

```
chi-squared = 13.508 with 1 d.f.
probability = 0.0002
```

```
chi-squared with ties = 24.537 with 1 d.f.
probability = 0.0001
```

```
Dunn's Pairwise Comparison of iq10 by igender
(No adjustment)
```

```
Col Mean-|
Row Mean |          1
-----+-----
      2 | -4.953449
```

| 0.0000

alpha = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

- Question – For each of the questions, 1-10, are there differences in the average response by income level?

```
. dunnstest iq1, by(iincome)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	39647.00
2	124	60999.00
3	220	109906.00
4	194	109253.00
5	138	73959.00
6	81	47674.00
7	45	26205.00
8	29	18958.00
9	13	7766.00
10	22	13681.00
11	116	61730.00

chi-squared = 21.252 with 10 d.f.
 probability = 0.0194

chi-squared with ties = 36.441 with 10 d.f.
 probability = 0.0001

Dunn's Pairwise Comparison of iq1 by iincome
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.769253 0.2209					
3	-1.102569 0.1351	-0.289304 0.3862				
4	-3.159808 0.0008	-2.632641 0.0042	-2.743449 0.0030			
5	-2.141875 0.0161	-1.511267 0.0654	-1.422898 0.0774	1.038856 0.1494		
6	-3.342301 0.0004	-2.874429 0.0020	-2.909733 0.0018	-0.816141 0.2072	-1.597847 0.0550	
7	-2.671383 0.0038	-2.207428 0.0136	-2.149485 0.0158	-0.492410 0.3112	-1.148526 0.1254	0.142490 0.4433
8	-3.700701 0.0001	-3.333112 0.0004	-3.315692 0.0005	-1.932950 0.0266	-2.450205 0.0071	-1.279432 0.1004
9	-1.868475 0.0308	-1.537144 0.0621	-1.456172 0.0727	-0.507627 0.3059	-0.900035 0.1841	-0.125393 0.4501
10	-2.761056 0.0029	-2.386668 0.0085	-2.323942 0.0101	-1.108837 0.1338	-1.590545 0.0559	-0.588491 0.2781
11	-1.955930 0.0252	-1.323354 0.0929	-1.206620 0.1138	1.122513 0.1308	0.127501 0.4493	1.655509 0.0489
Col Mean- Row Mean	7	8	9	10		

```

-----+-----
1      8 | -1.273936
2      |      0.1013
3      9 | -0.203120  0.717258
4      |      0.4195  0.2366
5     10 | -0.645693  0.478844 -0.297344
6      |      0.2592  0.3160  0.3831
7     11 |  1.214096  2.488185  0.947688  1.639269
8      |      0.1124  0.0064  0.1716  0.0506
9

```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
.
. dunntest iq2, by(iincome)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iincome | Obs | Rank Sum |
+-----+
| 1 | 85 | 39413.00 |
| 2 | 124 | 62680.50 |
| 3 | 220 | 113218.00 |
| 4 | 194 | 104957.50 |
| 5 | 138 | 77734.00 |
+-----+
| 6 | 81 | 46268.50 |
| 7 | 45 | 27142.00 |
| 8 | 29 | 14295.00 |
| 9 | 13 | 8091.00 |
| 10 | 22 | 12619.00 |
+-----+
| 11 | 116 | 63359.50 |
+-----+

```

chi-squared = 13.281 with 10 d.f.

probability = 0.2084

chi-squared with ties = 19.148 with 10 d.f.

probability = 0.0384

Dunn's Pairwise Comparison of iq2 by iincome
(No adjustment)

```

Col Mean-|
Row Mean |      1      2      3      4      5      6
-----+-----
2 | -1.156759
   |      0.1237
3 | -1.554296 -0.317118
   |      0.0601  0.3756
4 | -2.316595 -1.204085 -1.044061
   |      0.0103  0.1143  0.1482
5 | -2.814820 -1.820137 -1.746089 -0.779272
   |      0.0024  0.0344  0.0404  0.2179
6 | -2.698388 -1.792626 -1.696535 -0.889441 -0.220641
   |      0.0035  0.0365  0.0449  0.1869  0.4127
7 | -2.947791 -2.186686 -2.108330 -1.463268 -0.904860 -0.669351
   |      0.0016  0.0144  0.0175  0.0717  0.1828  0.2516
8 | -0.529937  0.237196  0.427915  0.941103  1.342026  1.409567
   |      0.2981  0.4063  0.3344  0.1733  0.0898  0.0793
9 | -2.076410 -1.562379 -1.471004 -1.106612 -0.793658 -0.667291
   |      0.0189  0.0591  0.0706  0.1342  0.2137  0.2523
10 | -1.790286 -1.147028 -1.027451 -0.564161 -0.174837 -0.038489

```

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		0.0367	0.1257	0.1521	0.2863	0.4306	0.4846
11		-2.251971	-1.228138	-1.072211	-0.172116	0.528550	0.673092
		0.0122	0.1097	0.1418	0.4317	0.2986	0.2504
Col Mean-							
Row Mean		7	8	9	10		
8		1.803556					
		0.0357					
9		-0.237949	-1.511200				
		0.4060	0.0654				
10		0.442807	-1.111590	0.543469			
		0.3290	0.1332	0.2934			
11		1.263574	-0.999773	1.014893	0.458911		
		0.1032	0.1587	0.1551	0.3231		

```
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunntest iq3, by(iincome)
Warning: by() values are unlabeled, option nolabel implicit
```

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	38988.50
2	124	65318.50
3	220	111481.50
4	194	108216.50
5	138	75233.00
6	81	46445.50
7	45	26126.00
8	29	16689.00
9	13	8034.00
10	22	13280.50
11	116	59965.00

```
chi-squared = 13.531 with 10 d.f.
probability = 0.1955
chi-squared with ties = 25.388 with 10 d.f.
probability = 0.0047
```

Dunn's Pairwise Comparison of iq3 by iincome
(No adjustment)

		1	2	3	4	5	6
2		-2.148829					
		0.0158					
3		-1.672250	0.792784				
		0.0472	0.2140				
4		-3.387523	-1.200612	-2.305484			
		0.0004	0.1150	0.0106			
5		-2.787910	-0.661150	-1.573197	0.504950		
		0.0027	0.2543	0.0578	0.3068		
6		-3.283862	-1.451113	-2.280115	-0.523645	-0.896635	
		0.0005	0.0734	0.0113	0.3003	0.1850	
7		-2.938900	-1.374539	-2.006238	-0.611462	-0.916926	-0.171575
		0.0016	0.0846	0.0224	0.2704	0.1796	0.4319
8		-2.414087	-1.049909	-1.546854	-0.394415	-0.659672	-0.042756

		0.0079	0.1469	0.0609	0.3466	0.2547	0.4829
1							
2	9	-2.377882	-1.391143	-1.732772	-0.933760	-1.115905	-0.663510
3		0.0087	0.0821	0.0416	0.1752	0.1322	0.2535
4	10	-2.693915	-1.477507	-1.926749	-0.905783	-1.132569	-0.559433
5		0.0035	0.0698	0.0270	0.1825	0.1287	0.2879
6	11	-1.813516	0.338009	-0.395350	1.548125	0.996072	1.733268
7		0.0349	0.3677	0.3463	0.0608	0.1596	0.0415
8	Col Mean-						
9	Row Mean	7	8	9	10		

10	8	0.095106					
11		0.4621					
12	9	-0.528284	-0.566220				
13		0.2987	0.2856				
14	10	-0.394380	-0.442980	0.182222			
15		0.3467	0.3289	0.4277			
16	11	1.610698	1.253413	1.535893	1.657645		
17		0.0536	0.1050	0.0623	0.0487		

```

19 alpha = 0.05
20 Reject Ho if p = P(Z <= |z|) <= alpha/2
21 .
22 . dunntest iq4, by(iincome)
23 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

	iincome	Obs	Rank Sum
1	1	85	37107.00
2	2	124	65210.00
3	3	220	110440.00
4	4	194	111545.50
5	5	138	75994.50
6	6	81	42547.50
7	7	45	27401.50
8	8	29	15829.50
9	9	13	7802.00
10	10	22	13522.00
11	11	116	62378.50

```

41 chi-squared = 19.683 with 10 d.f.
42 probability = 0.0324
43 chi-squared with ties = 26.046 with 10 d.f.
44 probability = 0.0037

```

Dunn's Pairwise Comparison of iq4 by iincome
(No adjustment)

48	Col Mean-					
49	Row Mean	1	2	3	4	5
50	2	-2.368171				
51		0.0089				
52	3	-1.912976	0.794063			
53		0.0279	0.2136			
54	4	-3.972534	-1.593812	-2.765956		
55		0.0000	0.0555	0.0028		
56	5	-3.089953	-0.748099	-1.673598	0.814298	
57		0.0010	0.2272	0.0471	0.2077	
58	6	-2.133003	0.015921	-0.668591	1.402405	0.677582

		0.0165	0.4936	0.2519	0.0804	0.2490
7		-3.490216	-1.781082	-2.439558	-0.765840	-1.266400
		0.0002	0.0374	0.0074	0.2219	0.1027
8		-1.897109	-0.361180	-0.828471	0.546218	0.088444
		0.0289	0.3590	0.2037	0.2925	0.4648
9		-2.050700	-0.950966	-1.283692	-0.328050	-0.636509
		0.0201	0.1708	0.0996	0.3714	0.2622
10		-2.779079	-1.432053	-1.880365	-0.658084	-1.039898
		0.0027	0.0761	0.0300	0.2552	0.1492
11		-2.645686	-0.342701	-1.162901	1.184141	0.383446
		0.0041	0.3659	0.1224	0.1182	0.3507

Col Mean-				
Row Mean		7	8	9
	8	0.988807		
		0.1614		
	9	0.103952	-0.607388	
		0.4586	0.2718	
	10	-0.081994	-0.908257	-0.154540
		0.4673	0.1819	0.4386
	11	1.512891	0.145623	0.796518
		0.0652	0.4421	0.2129
				1.234306
				0.1085

alpha = 0.05

Reject Ho if p = P(Z <= |z|) <= alpha/2

. dunnstest iq5, by(iincome)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	43091.50
2	124	66453.50
3	220	109374.50
4	194	106261.50
5	138	75463.00
6	81	44934.00
7	45	24609.50
8	29	17201.00
9	13	8082.00
10	22	13958.00
11	116	60349.50

chi-squared = 9.564 with 10 d.f.

probability = 0.4796

chi-squared with ties = 14.118 with 10 d.f.

probability = 0.1677

Dunn's Pairwise Comparison of iq5 by iincome
(No adjustment)

Col Mean-					
Row Mean		1	2	3	4
	2	-0.810736			
		0.2088			
	3	0.302602	1.360806		
		0.3811	0.0868		
	4	-1.236093	-0.405473	-2.024892	

```

1      |      0.1082      0.3426      0.0214
2      |      -1.140193  -0.347880  -1.803628  0.032089
3      |      0.1271      0.3640      0.0356      0.4872
4      |      -1.213243  -0.519526  -1.746860  -0.208654  -0.222731
5      |      0.1125      0.3017      0.0403      0.4174      0.4119
6      |      -0.853708  -0.248352  -1.198176  0.020538  -0.001021  0.166739
7      |      0.1966      0.4019      0.1154      0.4918      0.4996      0.4338
8      |      -1.579954  -1.093750  -1.915503  -0.899027  -0.893698  -0.699570
9      |      0.0571      0.1370      0.0277      0.1843      0.1857      0.2421
10     |      -1.518954  -1.160057  -1.720222  -1.017718  -1.017309  -0.883481
11     |      0.0644      0.1230      0.0427      0.1544      0.1545      0.1885
12     |      -2.101410  -1.679350  -2.420832  -1.519726  -1.504827  -1.307239
13     |      0.0178      0.0465      0.0077      0.0643      0.0662      0.0956
14     |      -0.367139  0.478014  -0.793637  0.923288  0.831911  0.939016
15     |      0.3568      0.3163      0.2137      0.1779      0.2027      0.1739
16     |
17     | Col Mean-|
18     | Row Mean |          7          8          9          10
19     |-----|
20     |      8 | -0.765919
21     |      |      0.2219
22     |      9 | -0.936777  -0.337291
23     |      |      0.1744      0.3679
24     |     10 | -1.327258  -0.576151  -0.143834
25     |      |      0.0922      0.2823      0.4428
26     |     11 |  0.597686  1.384077  1.367391  1.936218
27     |      |      0.2750      0.0832      0.0858      0.0264

```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq6, by(iincome)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iincome | Obs | Rank Sum |
+-----+
|      1 |  85 | 39943.00 |
|      2 | 124 | 65934.00 |
|      3 | 220 | 112644.00 |
|      4 | 194 | 111196.50 |
|      5 | 138 |  76173.50 |
+-----+
|      6 |  81 |  42432.00 |
|      7 |  45 |  27899.50 |
|      8 |  29 |  16523.00 |
|      9 |  13 |   7017.00 |
|     10 |  22 |  12425.00 |
+-----+
|     11 | 116 |  57590.50 |
+-----+

```

chi-squared = 14.334 with 10 d.f.

probability = 0.1583

chi-squared with ties = 21.312 with 10 d.f.

probability = 0.0190

Dunn's Pairwise Comparison of iq6 by iincome
(No adjustment)

```

Col Mean-|
Row Mean |      1      2      3      4      5      6
-----|
2 | -1.736761

```

1			0.0412								
2	3	-1.304384	0.694423								
3		0.0961	0.2437								
4	4	-3.141146	-1.426563	-2.457107							
5		0.0008	0.0769	0.0070							
6	5	-2.355036	-0.647742	-1.456204	0.753132						
7		0.0093	0.2586	0.0727	0.2257						
8	6	-1.374388	0.218080	-0.360277	1.475366	0.795202					
9		0.0847	0.4137	0.3593	0.0701	0.2132					
10	7	-3.220984	-2.006780	-2.611245	-1.119447	-1.567548	-2.045979				
11		0.0006	0.0224	0.0045	0.1315	0.0585	0.0204				
12	8	-1.837011	-0.729574	-1.156479	0.067955	-0.344334	-0.839400				
13		0.0331	0.2328	0.1237	0.4729	0.3653	0.2006				
14	9	-0.928093	-0.109172	-0.384708	0.461416	0.166563	-0.210799				
15		0.1767	0.4565	0.3502	0.3223	0.4339	0.4165				
16	10	-1.569049	-0.565228	-0.933516	0.147834	-0.220464	-0.673484				
17		0.0583	0.2860	0.1753	0.4412	0.4128	0.2503				
18	11	-0.735847	1.079976	0.536170	2.586049	1.743757	0.748257				
19		0.2309	0.1401	0.2959	0.0049	0.0406	0.2272				
20	Col Mean-										
21	Row Mean	7	8	9	10						
22											
23	8	0.834645									
24		0.2020									
25	9	1.008073	0.355517								
26		0.1567	0.3611								
27	10	0.839834	0.069777	-0.282811							
28		0.2005	0.4722	0.3887							
29	11	2.782937	1.396782	0.585780	1.162216						
30		0.0027	0.0812	0.2790	0.1226						

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq7, by(iincome)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	40655.00
2	124	63730.00
3	220	112270.00
4	194	105789.00
5	138	76798.00
6	81	41235.00
7	45	24842.00
8	29	18999.00
9	13	8325.00
10	22	13773.00
11	116	63362.00

chi-squared = 14.459 with 10 d.f.
probability = 0.1531

chi-squared with ties = 17.779 with 10 d.f.
probability = 0.0588

Dunn's Pairwise Comparison of iq7 by iincome
(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.911185 0.1811					
3	-0.902310 0.1834	0.116431 0.4537				
4	-1.853772 0.0319	-0.981248 0.1632	-1.278245 0.1006			
5	-2.041196 0.0206	-1.237557 0.1079	-1.530584 0.0629	-0.362009 0.3587		
6	-0.713304 0.2378	0.122853 0.4511	0.034446 0.4863	0.985495 0.1622	1.219413 0.1113	
7	-1.439516 0.0750	-0.787636 0.2155	-0.917725 0.1794	-0.146588 0.4417	0.093548 0.4627	-0.831651 0.2028
8	-2.959064 0.0015	-2.463005 0.0069	-2.637831 0.0042	-1.985144 0.0236	-1.737404 0.0412	-2.428826 0.0076
9	-1.958548 0.0251	-1.560599 0.0593	-1.639754 0.0505	-1.194228 0.1162	-1.040342 0.1491	-1.581461 0.0569
10	-2.222639 0.0131	-1.743556 0.0406	-1.862341 0.0313	-1.291486 0.0983	-1.089991 0.1379	-1.750747 0.0400
11	-1.712027 0.0434	-0.899033 0.1843	-1.126019 0.1301	-0.028207 0.4887	0.293755 0.3845	-0.923223 0.1779
Col Mean- Row Mean	7	8	9	10		
8	-1.557863 0.0596					
9	-1.009557 0.1564	0.159054 0.4368				
10	-1.023591 0.1530	0.370267 0.3556	0.147496 0.4414			
11	0.119255 0.4525	1.887710 0.0295	1.158465 0.1233	1.235174 0.1084		

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq8, by(iincome)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	44398.00
2	124	67446.50
3	220	114674.50
4	194	109552.50
5	138	77545.00
6	81	39286.00
7	45	27072.00
8	29	11459.50
9	13	7777.00
10	22	11179.00
11	116	59388.00

chi-squared = 15.098 with 10 d.f.

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probability = 0.1285

chi-squared with ties = 16.728 with 10 d.f.

probability = 0.0806

Dunn's Pairwise Comparison of iq8 by iincome
(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.523795 0.3002					
3	0.028930 0.4885	0.689738 0.2452				
4	-1.112733 0.1329	-0.617347 0.2685	-1.507100 0.0659			
5	-0.980783 0.1633	-0.496797 0.3097	-1.279359 0.1004	0.085372 0.4660		
6	0.820893 0.2059	1.408492 0.0795	0.952324 0.1705	2.057639 0.0198	1.876777 0.0303	
7	-1.468715 0.0710	-1.132022 0.1288	-1.677545 0.0467	-0.761682 0.2231	-0.789533 0.2149	-2.141891 0.0161
8	2.019931 0.0217	2.463517 0.0069	2.180125 0.0146	2.908858 0.0018	2.788476 0.0026	1.418337 0.0780
9	-0.870561 0.1920	-0.636301 0.2623	-0.921258 0.1785	-0.399729 0.3447	-0.427500 0.3345	-1.294341 0.0978
10	0.202668 0.4197	0.528388 0.2986	0.200283 0.4206	0.858878 0.1952	0.800248 0.2118	-0.328534 0.3713
11	0.247939 0.4021	0.845071 0.1990	0.276314 0.3912	1.534811 0.0624	1.354597 0.0878	-0.635813 0.2624
Col Mean- Row Mean	7	8	9	10		
8	2.961248 0.0015					
9	0.036549 0.4854	-2.078189 0.0188				
10	1.227169 0.1099	-1.364937 0.0861	0.879687 0.1895			
11	1.743327 0.0406	-1.921793 0.0273	1.007449 0.1569	-0.056245 0.4776		

alpha = 0.05

Reject Ho if p = P(Z <= |z|) <= alpha/2

. dunntest iq9, by(iincome)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	42614.00
2	124	71402.00
3	220	115021.00
4	194	107204.00
5	138	73164.00
6	81	36234.00
7	45	25791.00
8	29	18002.00
9	13	6129.00

```

|      10 | 22 | 12144.00 |
|-----+-----+-----|
|      11 | 116 | 62073.00 |
+-----+-----+-----+

```

chi-squared = 14.299 with 10 d.f.
probability = 0.1598

chi-squared with ties = 16.568 with 10 d.f.
probability = 0.0845

Dunn's Pairwise Comparison of iq9 by iincome
(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-1.847551 0.0323					
3	-0.587541 0.2784	1.648615 0.0496				
4	-1.376451 0.0843	0.705584 0.2402	-1.056011 0.1455			
5	-0.730439 0.2326	1.288633 0.0988	-0.236466 0.4065	0.703374 0.2409		
6	1.214944 0.1122	3.141555 0.0008	2.028888 0.0212	2.779463 0.0027	2.067305 0.0194	
7	-1.360262 0.0869	0.053977 0.4785	-1.074127 0.1414	-0.433524 0.3323	-0.874138 0.1910	-2.363446 0.0091
8	-1.939659 0.0262	-0.760958 0.2233	-1.731626 0.0417	-1.195867 0.1159	-1.548947 0.0607	-2.799362 0.0026
9	0.350465 0.3630	1.250438 0.1056	0.628553 0.2648	0.989247 0.1613	0.706893 0.2398	-0.282083 0.3889
10	-0.739751 0.2297	0.359696 0.3595	-0.455786 0.3243	0.009284 0.4963	-0.332100 0.3699	-1.520705 0.0642
11	-0.826199 0.2043	1.100886 0.1355	-0.374111 0.3542	0.520401 0.3014	-0.136936 0.4455	-2.117528 0.0171
Col Mean- Row Mean	7	8	9	10		
8	-0.698600 0.2424					
9	1.127888 0.1297	1.562424 0.0591				
10	0.283759 0.3883	0.849481 0.1978	-0.804181 0.2106			
11	0.756224 0.2248	1.440971 0.0748	-0.760168 0.2236	0.253676 0.3999		

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq10, by(iincome)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iincome | Obs | Rank Sum |
+-----+
|      1 | 85 | 40198.50 |
|      2 | 124 | 64675.00 |
|      3 | 220 | 115226.00 |
|      4 | 194 | 105304.00 |

```

5	138	75828.00
6	81	43222.00
7	45	27158.00
8	29	17443.00
9	13	7630.50
10	22	12461.00
11	116	60632.00

chi-squared = 8.754 with 10 d.f.
 probability = 0.5556

chi-squared with ties = 15.902 with 10 d.f.
 probability = 0.1025

Dunn's Pairwise Comparison of iq10 by iincome
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-1.510986 0.0654					
3	-1.740758 0.0409	-0.084983 0.4661				
4	-2.349653 0.0094	-0.807641 0.2096	-0.845934 0.1988			
5	-2.428329 0.0076	-0.986350 0.1620	-1.036053 0.1501	-0.262123 0.3966		
6	-1.709198 0.0437	-0.368355 0.3563	-0.331484 0.3701	0.304134 0.3805	0.495983 0.3100	
7	-3.098024 0.0010	-2.059211 0.0197	-2.132063 0.0165	-1.604670 0.0543	-1.376629 0.0843	-1.644439 0.0500
8	-2.614557 0.0045	-1.694358 0.0451	-1.720791 0.0426	-1.289040 0.0987	-1.113423 0.1328	-1.371867 0.0851
9	-1.674775 0.0470	-0.980992 0.1633	-0.968521 0.1664	-0.674109 0.2501	-0.565066 0.2860	-0.781047 0.2174
10	-1.709276 0.0437	-0.847650 0.1983	-0.834294 0.2021	-0.458910 0.3231	-0.322558 0.3735	-0.596764 0.2753
11	-1.524450 0.0637	-0.037823 0.4849	0.040590 0.4838	0.749543 0.2268	0.930124 0.1762	0.329695 0.3708
Col Mean- Row Mean	7	8	9	10		
8	0.037254 0.4851					
9	0.229874 0.4091	0.190278 0.4245				
10	0.623759 0.2664	0.542557 0.2937	0.256952 0.3986			
11	2.012741 0.0221	1.659858 0.0485	0.961094 0.1683	0.822269 0.2055		

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

- Question: For each of the questions, are there differences in the average response among regions?

```
. dunnstest iq1, by(iiregion)
```

Warning: by() values are unlabeled, option nolabel implicit

1 Kruskal-Wallis equality-of-populations rank test

```

2
3 +-----+
4 | iregion | Obs | Rank Sum |
5 +-----+-----+
6 |         | 1 | 47 | 25801.50 |
7 |         | 2 | 123 | 67314.50 |
8 |         | 3 | 190 | 102363.00 |
9 |         | 4 | 60 | 30521.00 |
10 |         | 5 | 196 | 99988.50 |
11 +-----+-----+
12 |         | 6 | 74 | 39154.50 |
13 |         | 7 | 102 | 53159.00 |
14 |         | 8 | 77 | 40078.50 |
15 |         | 9 | 189 | 101830.50 |
16 +-----+-----+

```

14 chi-squared = 2.163 with 8 d.f.
15 probability = 0.9756

16 chi-squared with ties = 3.726 with 8 d.f.
17 probability = 0.8809

18
19
20 Dunn's Pairwise Comparison of iq1 by iregion
(No adjustment)

```

21 Col Mean-|
22 Row Mean |         1         2         3         4         5         6
23 -----+-----+-----+-----+-----+-----+
24 2 | 0.042474
25   | 0.4831
26 3 | 0.269342 0.316211
27   | 0.3938 0.3759
28 4 | 0.888316 1.052593 0.872168
29   | 0.1872 0.1463 0.1916
30 5 | 1.026723 1.386337 1.206927 -0.042564
31   | 0.1523 0.0828 0.1137 0.4830
32 6 | 0.457191 0.530134 0.302107 -0.505166 -0.597188
33   | 0.3238 0.2980 0.3813 0.3067 0.2752
34 7 | 0.677356 0.837319 0.615384 -0.329566 -0.387744 0.223575
35   | 0.2491 0.2012 0.2692 0.3709 0.3491 0.4115
36 8 | 0.660596 0.791341 0.580345 -0.294747 -0.330689 0.227308
37   | 0.2544 0.2144 0.2808 0.3841 0.3704 0.4101
38 9 | 0.268329 0.314656 -0.001383 -0.872573 -1.206703 -0.302920
39   | 0.3942 0.3765 0.4994 0.1914 0.1138 0.3810
40 Col Mean-|
41 Row Mean |         7         8
42 -----+-----+-----+
43 8 | 0.018968
44   | 0.4924
45 9 | -0.615972 -0.580954
46   | 0.2690 0.2806

```

47 alpha = 0.05

48 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

49
50
51 . dunntest iq2, by(iregion)

52 Warning: by() values are unlabeled, option nolabel implicit

53
54 Kruskal-Wallis equality-of-populations rank test

```

55 +-----+
56 | iregion | Obs | Rank Sum |
57 +-----+-----+
58 |         | 1 | 47 | 23519.00 |
59 |         | 2 | 123 | 69050.00 |

```

3	190	100366.50
4	60	31012.00
5	196	100609.50
6	74	36875.00
7	102	54881.50
8	77	44283.00
9	189	99614.50

chi-squared = 4.999 with 8 d.f.
 probability = 0.7577

chi-squared with ties = 7.247 with 8 d.f.
 probability = 0.5102

Dunn's Pairwise Comparison of iq2 by iregion
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-1.401196 0.0806					
3	-0.673408 0.2503	1.128301 0.1296				
4	-0.333024 0.3696	1.113944 0.1327	0.302762 0.3810			
5	-0.313209 0.3771	1.646623 0.0498	0.577895 0.2817	0.094889 0.4622		
6	0.044227 0.4824	1.689339 0.0456	0.860804 0.1947	0.420891 0.3369	0.433300 0.3324	
7	-0.841525 0.2000	0.686424 0.2462	-0.314897 0.3764	-0.513148 0.3039	-0.798495 0.2123	-1.025584 0.1525
8	-1.590200 0.0559	-0.372086 0.3549	-1.366818 0.0858	-1.332635 0.0913	-1.810343 0.0351	-1.858851 0.0315
9	-0.644434 0.2596	1.167399 0.1215	0.045410 0.4819	-0.271087 0.3932	-0.531360 0.2976	-0.826147 0.2044
8	-0.967067 0.1668					
9	0.352577 0.3622	1.400283 0.0807				

alpha = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq3, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	24663.50
2	123	68571.50
3	190	103626.00
4	60	29282.00
5	196	101056.00
6	74	36988.00
7	102	51807.00
8	77	42563.50
9	189	101653.50

1 chi-squared = 4.863 with 8 d.f.
 2 probability = 0.7721
 3 chi-squared with ties = 9.241 with 8 d.f.
 4 probability = 0.3224

Dunn's Pairwise Comparison of iq3 by iregion
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.861221 0.1946					
3	-0.571695 0.2838	0.471363 0.3187				
4	0.850479 0.1975	1.989908 0.0233	1.747619 0.0403			
5	0.254530 0.3995	1.643252 0.0502	1.320843 0.0933	-0.842644 0.1997		
6	0.602672 0.2734	1.767949 0.0385	1.500029 0.0668	-0.306543 0.3796	0.520904 0.3012	
7	0.431017 0.3332	1.670219 0.0474	1.377797 0.0841	-0.551195 0.2908	0.283785 0.3883	-0.238533 0.4057
8	-0.682835 0.2474	0.146504 0.4418	-0.246206 0.4028	-1.696032 0.0449	-1.247144 0.1062	-1.466964 0.0712
9	-0.362407 0.3585	0.764912 0.2222	0.331578 0.3701	-1.516629 0.0647	-0.984934 0.1623	-1.250510 0.1056
7		8				
8	-1.340578 0.0900					
9	-1.099269 0.1358	0.497979 0.3092				

34 alpha = 0.05
 35 Reject Ho if p = P(Z <= |z|) <= alpha/2

37 . dunntest iq4, by(iregion)

38 Warning: by() values are unlabeled, option nolabel implicit

41 Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	23898.00
2	123	70371.00
3	190	99803.00
4	60	29574.00
5	196	99327.50
6	74	39668.00
7	102	56000.00
8	77	43087.50
9	189	98482.00

53 chi-squared = 5.937 with 8 d.f.
 54 probability = 0.6543
 55
 56 chi-squared with ties = 7.884 with 8 d.f.
 57 probability = 0.4449

Dunn's Pairwise Comparison of iq4 by iregion

(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-1.399868 0.0808					
3	-0.389159 0.3486	1.526466 0.0634				
4	0.301407 0.3816	1.897289 0.0289	0.824575 0.2048			
5	0.039361 0.4843	2.142444 0.0161	0.685502 0.2465	-0.354599 0.3614		
6	-0.557758 0.2885	0.924573 0.1776	-0.296550 0.3834	-0.936798 0.1744	-0.809347 0.2092	
7	-0.867458 0.1928	0.650583 0.2577	-0.729396 0.2329	-1.300823 0.0967	-1.304961 0.0960	-0.320211 0.3744
8	-1.041294 0.1489	0.325541 0.3724	-0.957487 0.1692	-1.460253 0.0721	-1.480649 0.0694	-0.544963 0.2929
9	-0.291544 0.3853	1.661935 0.0483	0.154551 0.4386	-0.716903 0.2367	-0.528838 0.2985	0.412115 0.3401
8	-0.263754 0.3960					
9	0.857955 0.1955	1.074198 0.1414				

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq5, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	25000.00
2	123	70157.00
3	190	97806.00
4	60	31315.00
5	196	99921.50
6	74	41475.00
7	102	54597.00
8	77	40836.00
9	189	99103.50

chi-squared = 4.348 with 8 d.f.

probability = 0.8244

chi-squared with ties = 6.456 with 8 d.f.

probability = 0.5962

Dunn's Pairwise Comparison of iq5 by iregion

(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.894537 0.1855					
3	0.419717 0.3373	1.916327 0.0277				

1	4	0.204685	1.227342	-0.192492			
2		0.4189	0.1098	0.4237			
3	5	0.542899	2.100075	0.194468	0.327393		
4		0.2936	0.0179	0.4229	0.3717		
5	6	-0.610565	0.268597	-1.330089	-0.885045	-1.480943	
6		0.2707	0.3941	0.0917	0.1881	0.0693	
7	7	-0.075772	1.045718	-0.665873	-0.327165	-0.831627	0.658314
8		0.4698	0.1478	0.2527	0.3718	0.2028	0.2552
9	8	0.033979	1.098894	-0.459584	-0.195009	-0.608833	0.738209
10		0.4864	0.1359	0.3229	0.4227	0.2713	0.2302
11	9	0.184904	1.584274	-0.372203	-0.065677	-0.569284	1.050261
12		0.4267	0.0566	0.3549	0.4738	0.2846	0.1468
13	Col Mean-						
14	Row Mean	7	8				
15							
16	8	0.130148					
17		0.4482					
18	9	0.354032	0.176403				
19		0.3617	0.4300				

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq6, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	24290.50
2	123	67846.50
3	190	101167.00
4	60	31261.00
5	196	103413.00
6	74	36430.00
7	102	52408.00
8	77	40753.50
9	189	102641.50

chi-squared = 2.535 with 8 d.f.

probability = 0.9601

chi-squared with ties = 3.778 with 8 d.f.

probability = 0.8766

Dunn's Pairwise Comparison of iq6 by iregion
(No adjustment)

Col Mean-	1	2	3	4	5	6
2	-0.810245					
	0.2089					
3	-0.383515	0.660725				
	0.3507	0.2544				
4	-0.086090	0.775858	0.308663			
	0.4657	0.2189	0.3788			
5	-0.265616	0.832852	0.189948	-0.178732		
	0.3953	0.2025	0.4247	0.4291		
6	0.525236	1.610354	1.170901	0.660455	1.034219	
	0.2997	0.0537	0.1208	0.2545	0.1505	

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1	7	0.068329	1.127482	0.607136	0.177112	0.452013	-0.562680
2		0.4728	0.1298	0.2719	0.4297	0.3256	0.2868
3	8	-0.268646	0.613941	0.094387	-0.191391	-0.048979	-0.907275
4		0.3941	0.2696	0.4624	0.4241	0.4805	0.1821
5	9	-0.643588	0.293845	-0.412947	-0.594761	-0.605829	-1.479401
6		0.2599	0.3844	0.3398	0.2760	0.2723	0.0695
7	Col Mean-						
8	Row Mean	7	8				
9	8	-0.409188					
10		0.3412					
11	9	-0.951871	-0.408107				
12		0.1706	0.3416				

alpha = 0.05

Reject Ho if p = P(Z <= |z|) <= alpha/2

.
. dunntest iq7, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	25775.50
2	123	69441.50
3	190	96261.50
4	60	29885.00
5	196	104560.50
6	74	36689.50
7	102	55909.00
8	77	41935.00
9	189	99753.50

chi-squared = 5.004 with 8 d.f.
probability = 0.7572

chi-squared with ties = 6.168 with 8 d.f.
probability = 0.6284

Dunn's Pairwise Comparison of iq7 by iregion
(No adjustment)

Col Mean-						
Row Mean	1	2	3	4	5	6
2	-0.342213					
	0.3661					
3	0.931783	1.818737				
	0.1757	0.0345				
4	0.938892	1.534078	0.209944			
	0.1739	0.0625	0.4169			
5	0.334313	0.982182	-0.957666	-0.871545		
	0.3691	0.1630	0.1691	0.1917		
6	1.024920	1.698322	0.287329	0.047674	1.003173	
	0.1527	0.0447	0.3869	0.4810	0.1579	
7	0.005924	0.446007	-1.228147	-1.117670	-0.436178	-1.245082
	0.4976	0.3278	0.1097	0.1319	0.3314	0.1066
8	0.074683	0.498964	-1.021316	-0.981768	-0.300926	-1.089410
	0.4702	0.3089	0.1536	0.1631	0.3817	0.1380
9	0.459648	1.153261	-0.748309	-0.728610	0.202295	-0.847727
	0.3229	0.1244	0.2271	0.2331	0.4198	0.1983

```

Col Mean-|
Row Mean |          7          8
-----+-----+-----
      8 | 0.084653
      | 0.4663
      |
      9 | 0.601297  0.451909
      | 0.2738    0.3257

```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq8, by(iregion)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iregion | Obs | Rank Sum |
+-----+-----+-----+
| 1 | 47 | 24173.50 |
| 2 | 123 | 63543.50 |
| 3 | 190 | 99851.00 |
| 4 | 60 | 30860.50 |
| 5 | 196 | 106283.50 |
+-----+-----+-----+
| 6 | 74 | 37277.50 |
| 7 | 102 | 58555.00 |
| 8 | 77 | 38886.50 |
| 9 | 189 | 100780.00 |
+-----+-----+-----+

```

chi-squared = 4.074 with 8 d.f.
probability = 0.8504

chi-squared with ties = 4.516 with 8 d.f.
probability = 0.8078

Dunn's Pairwise Comparison of iq8 by iregion
(No adjustment)

```

Col Mean-|
Row Mean |          1          2          3          4          5          6
-----+-----+-----+-----+-----+-----+
      2 | -0.045892
      | 0.4817
      |
      3 | -0.236920  -0.265506
      | 0.4064    0.3953
      |
      4 | -0.000210  0.049717  0.260358
      | 0.4999    0.4802    0.3973
      |
      5 | -0.592588  -0.768275  -0.566239  -0.652046
      | 0.2767    0.2212    0.2856    0.2572
      |
      6 | 0.195439   0.301278   0.547699   0.210071   0.972587
      | 0.4225    0.3816    0.2919    0.4168    0.1654
      |
      7 | -1.167548  -1.478256  -1.362451  -1.264884  -0.897613  -1.586690
      | 0.1215    0.0697    0.0865    0.1030    0.1847    0.0563
      |
      8 | 0.173304   0.274910   0.523165   0.186526   0.954118  -0.026870
      | 0.4312    0.3917    0.3004    0.4260    0.1700    0.4893
      |
      9 | -0.399480  -0.494122  -0.258114  -0.439142  0.305373  -0.740665
      | 0.3448    0.3106    0.3982    0.3303    0.3800    0.2294
Col Mean-|
Row Mean |          7          8
-----+-----+-----
      8 | 1.575938
      | 0.0575
      |
      9 | 1.145365  -0.718903
      | 0.1260    0.2361

```

```
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunnstest iq9, by(iregion)
Warning: by() values are unlabeled, option nolabel implicit
```

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	20677.00
2	123	72186.50
3	190	102587.00
4	60	28965.00
5	196	99733.50
6	74	42108.50
7	102	55248.00
8	77	42429.00
9	189	96276.50

```
chi-squared = 13.497 with 8 d.f.
probability = 0.0958
chi-squared with ties = 15.670 with 8 d.f.
probability = 0.0473
```

Dunn's Pairwise Comparison of iq9 by iregion
(No adjustment)

Col Mean-	1	2	3	4	5	6
Row Mean						
2	-3.021716 0.0013					
3	-2.164465 0.0152	1.430595 0.0763				
4	-0.775061 0.2192	2.331881 0.0099	1.361625 0.0867			
5	-1.496111 0.0673	2.392263 0.0084	1.076742 0.1408	-0.623663 0.2664		
6	-2.440672 0.0073	0.427811 0.3344	-0.748920 0.2270	-1.751408 0.0399	-1.555611 0.0599	
7	-2.034428 0.0210	1.191120 0.1168	-0.049282 0.4803	-1.276529 0.1009	-0.947432 0.1717	0.632439 0.2635
8	-2.116297 0.0172	0.870093 0.1921	-0.289594 0.3861	-1.398130 0.0810	-1.105946 0.1344	0.390079 0.3482
9	-1.502790 0.0664	2.358466 0.0092	1.048006 0.1473	-0.634183 0.2630	-0.019200 0.4923	1.533501 0.0626
Col Mean- <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
Row Mean	7	8				
8	-0.219074 0.4133					
9	0.925552 0.1773	1.085736 0.1388				

```
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunnstest iq10, by(iregion)
Warning: by() values are unlabeled, option nolabel implicit
```

Kruskal-Wallis equality-of-populations rank test

```

1
2  +-----+
3  | iregion | Obs | Rank Sum |
4  +-----+
5  |         |     |          |
6  |         |     |          |
7  |         |     |          |
8  |         |     |          |
9  |         |     |          |
10 |         |     |          |
11 |         |     |          |
12 +-----+

```

chi-squared = 4.123 with 8 d.f.
probability = 0.8458

chi-squared with ties = 7.555 with 8 d.f.
probability = 0.4781

Dunn's Pairwise Comparison of iq10 by iregion
(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.935595 0.1747					
3	-0.705458 0.2403	0.393271 0.3471				
4	0.553976 0.2898	1.704126 0.0442	1.504759 0.0662			
5	0.073394 0.4707	1.498376 0.0670	1.245921 0.1064	-0.650586 0.2577		
6	0.675122 0.2498	1.946495 0.0258	1.757676 0.0394	0.103700 0.4587	0.835569 0.2017	
7	-0.351199 0.3627	0.735705 0.2310	0.431870 0.3329	-1.043803 0.1483	-0.604764 0.2727	-1.230118 0.1093
8	-0.321760 0.3738	0.694206 0.2438	0.409844 0.3410	-0.972509 0.1654	-0.531464 0.2975	-1.139406 0.1273
9	-0.646183 0.2591	0.475741 0.3171	0.093459 0.4628	-1.439010 0.0751	-1.150070 0.1251	-1.686357 0.0459
Col Mean- Row Mean	7	8				
8	0.015606 0.4938					
9	-0.353323 0.3619	-0.338514 0.3675				

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

- Question – For each of the questions, 1-10, are there differences in the average response among the devices used?

```
. dunntest iq1, by(idevice) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

Kruskal-Wallis equality-of-populations rank test

```
+-----+
```

```

+-----+-----+-----+
| idevice | Obs | Rank Sum |
+-----+-----+-----+
| 1 | 455 | 235385.00 |
| 2 | 464 | 243130.00 |
| 4 | 117 | 72496.00 |
| 5 | 22 | 13796.00 |
| 6 | 9 | 4971.00 |
+-----+-----+-----+
    
```

```

chi-squared = 12.894 with 4 d.f.
probability = 0.0118

chi-squared with ties = 22.109 with 4 d.f.
probability = 0.0002
    
```

Dunn's Pairwise Comparison of iq1 by idevice
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |      1      2      4      5
+-----+-----+-----+-----+
2 | -0.428773
   | 0.4176
4 | -4.193416 -3.928305
   | 0.0001 0.0002
5 | -2.136598 -2.007905 -0.136539
   | 0.0544 0.0558 0.4457
6 | -0.441873 -0.357900 0.826607 0.802829
   | 0.4704 0.4002 0.4085 0.3517
    
```

```

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
    
```

```

.
. dunntest iq2, by(idevice) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit
    
```

Kruskal-Wallis equality-of-populations rank test

```

+-----+-----+-----+
| idevice | Obs | Rank Sum |
+-----+-----+-----+
| 1 | 455 | 238731.50 |
| 2 | 464 | 243803.00 |
| 4 | 117 | 69497.50 |
| 5 | 22 | 13042.00 |
| 6 | 9 | 4704.00 |
+-----+-----+-----+
    
```

```

chi-squared = 6.023 with 4 d.f.
probability = 0.1975

chi-squared with ties = 8.683 with 4 d.f.
probability = 0.0695
    
```

Dunn's Pairwise Comparison of iq2 by idevice
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |      1      2      4      5
+-----+-----+-----+-----+
2 | -0.044463
   | 0.6890
4 | -2.605346 -2.582173
   | 0.0459 0.0245
5 | -1.216133 -1.203232 0.019744
   | 0.3732 0.2861 0.4921
6 | 0.023358 0.032079 0.803447 0.690797
   | 0.5452 0.6090 0.4217 0.4081
    
```

```

False Discovery Rate = 0.05
    
```

Reject H_0 if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq3, by(idevice) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| idevice | Obs | Rank Sum |
+-----+-----+
|      1 | 455 | 231099.50 |
|      2 | 464 | 249881.00 |
|      4 | 117 | 70070.00  |
|      5 |  22 | 13920.00  |
|      6 |   9 |  4807.50  |
+-----+-----+
```

chi-squared = 10.808 with 4 d.f.

probability = 0.0288

chi-squared with ties = 20.278 with 4 d.f.

probability = 0.0004

Dunn's Pairwise Comparison of iq3 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
Row Mean				
2	-2.063320			
	0.0489			
4	-3.901314	-2.593174		
	0.0005	0.0238		
5	-2.541578	-1.918820	-0.647263	
	0.0184	0.0550	0.3234	
6	-0.346709	0.057717	0.831681	1.107209
	0.4049	0.4770	0.2897	0.2235

False Discovery Rate = 0.05

Reject H_0 if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq4, by(idevice) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| idevice | Obs | Rank Sum |
+-----+-----+
|      1 | 455 | 233917.50 |
|      2 | 464 | 245190.00 |
|      4 | 117 | 71356.50  |
|      5 |  22 | 13558.00  |
|      6 |   9 |  5756.00  |
+-----+-----+
```

chi-squared = 11.767 with 4 d.f.

probability = 0.0192

chi-squared with ties = 15.571 with 4 d.f.

probability = 0.0037

Dunn's Pairwise Comparison of iq4 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
Row Mean				
2	-0.810343			
	0.2984			

```

1      4 | -3.449252 -2.939310
2      | 0.0028    0.0082
3      5 | -1.747119 -1.502874 -0.102617
4      | 0.1344    0.1661    0.4591
5      6 | -1.391205 -1.232608 -0.320191 -0.219652
6      | 0.1642    0.1814    0.4680    0.4590

```

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq5, by(idevice) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
1	455	233689.00
2	464	246682.00
4	117	72399.00
5	22	13029.00
6	9	3979.00

chi-squared = 12.465 with 4 d.f.
 probability = 0.0142

chi-squared with ties = 18.400 with 4 d.f.
 probability = 0.0010

Dunn's Pairwise Comparison of iq5 by idevice
 (Benjamini-Hochberg)

Col Mean-	1	2	4	5
Row Mean				
2	-1.078030			
	0.2007			
4	-4.001036	-3.321473		
	0.0003	0.0022		
5	-1.420055	-1.094722	0.450750	
	0.1556	0.2280	0.3261	
6	0.837348	1.048842	2.013779	1.495773
	0.2236	0.1839	0.0734	0.1684

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq6, by(idevice) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
1	455	232150.00
2	464	249498.50
4	117	70802.00
5	22	12735.50
6	9	4592.00

chi-squared = 9.534 with 4 d.f.
 probability = 0.0491

chi-squared with ties = 14.174 with 4 d.f.
probability = 0.0068

Dunn's Pairwise Comparison of iq6 by idevice
(Benjamini-Hochberg)

Col Mean- Row Mean	1	2	4	5
2	-1.648801 0.1653			
4	-3.623520 0.0015	-2.579191 0.0248		
5	-1.244659 0.2666	-0.746660 0.3794	0.447117 0.4092	
6	-0.000029 0.5000	0.323201 0.4147	1.085795 0.2776	0.686639 0.3516

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq7, by(idevice) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
1	455	241171.00
2	464	241784.00
4	117	70870.00
5	22	12133.00
6	9	3820.00

chi-squared = 8.437 with 4 d.f.
probability = 0.0768

chi-squared with ties = 10.374 with 4 d.f.
probability = 0.0346

Dunn's Pairwise Comparison of iq7 by idevice
(Benjamini-Hochberg)

Col Mean- Row Mean	1	2	4	5
2	0.488676 0.3473			
4	-2.627194 0.0215	-2.944079 0.0162		
5	-0.353648 0.3618	-0.501570 0.3850	0.839686 0.2865	
6	1.128879 0.2589	1.033292 0.2512	1.885785 0.0989	1.155457 0.3099

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq8, by(idevice) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
---------	-----	----------

```

1 |-----+-----+-----|
2 |      1 | 455 | 236191.50 |
3 |      2 | 464 | 255170.50 |
4 |      4 | 117 | 60562.50 |
5 |      5 |  22 | 13139.50 |
6 |      6 |   9 |  4714.00 |
7 |-----+-----+-----|
    
```

```

6 chi-squared =      3.571 with 4 d.f.
7 probability =      0.4671

8 chi-squared with ties =      3.957 with 4 d.f.
9 probability =      0.4119
    
```

Dunn's Pairwise Comparison of iq8 by idevice (Benjamini-Hochberg)

```

13 Col Mean-|
14 Row Mean |      1      2      4      5
15 -----+-----+-----+-----+-----
16 2 | -1.596325
17   |      0.5521
18 4 |  0.048571  1.066739
19   |      0.5340      0.3576
20 5 | -1.222802 -0.740661 -1.170335
21   |      0.5535      0.4589      0.4031
22 6 | -0.047444  0.265489 -0.060723  0.634244
23   |      0.4811      0.5647      0.5947      0.4383
    
```

```

24 False Discovery Rate =      0.05
25 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
    
```

```

27 . dunntest iq9, by(idevice) ma(bh) wrap
    
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

33 +-----+-----+-----+
34 | idevice | Obs | Rank Sum |
35 |-----+-----+-----+
36 |      1 | 455 | 233402.00 |
37 |      2 | 464 | 251754.00 |
38 |      4 | 117 | 69053.00 |
39 |      5 |  22 | 11048.00 |
40 |      6 |   9 |  4521.00 |
41 +-----+-----+-----+
    
```

```

40 chi-squared =      6.698 with 4 d.f.
41 probability =      0.1527

42 chi-squared with ties =      7.761 with 4 d.f.
43 probability =      0.1007
    
```

Dunn's Pairwise Comparison of iq9 by idevice (Benjamini-Hochberg)

```

47 Col Mean-|
48 Row Mean |      1      2      4      5
49 -----+-----+-----+-----+-----
50 2 | -1.567210
51   |      0.1951
52 4 | -2.602321 -1.607996
53   |      0.0463      0.2696
54 5 |  0.172649  0.646611  1.322982
55   |      0.5393      0.4316      0.2323
56 6 |  0.110391  0.417646  0.887233 -0.001338
57   |      0.5067      0.4830      0.3750      0.4995
    
```

```

58 False Discovery Rate =      0.05
59 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
    
```

```

1 .
2 . dunntest iq10, by(idevice) ma(bh) wrap
3 Warning: by() values are unlabeled, option nolabel implicit
4

```

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
1	455	230212.00
2	464	251454.50
4	117	70292.50
5	22	13460.00
6	9	4359.00

```

14 chi-squared = 11.207 with 4 d.f.
15 probability = 0.0243

```

```

16 chi-squared with ties = 20.357 with 4 d.f.
17 probability = 0.0004
18

```

Dunn's Pairwise Comparison of iq10 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
Row Mean				
2	-2.384264			
	0.0285			
4	-4.001160	-2.488534		
	0.0003	0.0321		
5	-2.120896	-1.400904	-0.207547	
	0.0424	0.1152	0.4178	
6	0.280999	0.748461	1.472429	1.409124
	0.4326	0.2839	0.1409	0.1323

```

32 False Discovery Rate = 0.05

```

```

33 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
34
35
36
37
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57
58
59
60

```

National Survey Statistics on Factor Analysis Produced Variables

- Question – For each of the factor variables (knowledge and other), are there differences in the average response by age?

Answer – YES, there are significant differences among the age categories for both factor variables, and with the exception of group 4 vs group 5 for the factor variable "other" all groups differed significantly from each other.

Difference

```
. dunnstest iknowledge, by(iage)
Kruskal-Wallis probability = 0.0001

Dunn's Pairwise Comparison of iknowledge by iage
(No adjustment)

Col Mean-|
Row Mean |      2      3      4
-----|-----
3 | -3.047089
   | 0.0012
   |
4 | -6.647864 -3.042354
   | 0.0000 0.0012
   |
5 | -8.540506 -5.326895 -2.884203
   | 0.0000 0.0000 0.0020

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
```

```
. dunnstest iother, by(iage)
Kruskal-Wallis probability = 0.0001

Dunn's Pairwise Comparison of iother by iage
(No adjustment)

Col Mean-|
Row Mean |      2      3      4
-----|-----
3 | -3.687658
   | 0.0001
   |
4 | -6.409482 -2.160471
   | 0.0000 0.0154
   |
5 | -5.995882 -2.338749 -0.480036
   | 0.0000 0.0097 0.3156
```

- Question – For each of the factor variables (knowledge and other), are there differences in the average response by gender?

Answer – YES, for both factor variables (knowledge and other) the differences in responses of the genders are very highly significantly different ($p < 0.0001$)

- Question – For each of the factor variables (knowledge and other), are there differences in the average response by income?

Answer – YES, but only for the factor variable knowledge. Most of the differences among pairs are between group 1 and other groups and between group 3 and other groups.

```
. dunnstest iknowledge, by(iincome)
Kruskal-Wallis probability = 0.0005
```

Dunn's Pairwise Comparison of iknowledge by iincome
(No adjustment)

Col Mean-	1	2	3	4	5	6
Row Mean						
2	-2.497470					
	0.0063					
3	-1.980782	0.879087				
	0.0238	0.1897				
4	-3.815271	-1.257535	-2.470334			
	0.0001	0.1043	0.0067			
5	-3.893000	-1.495793	-2.613509	-0.363691		
	0.0000	0.0674	0.0045	0.3580		
6	-3.353408	-1.183058	-2.060025	-0.184688	0.114798	
	0.0004	0.1184	0.0197	0.4267	0.4543	
7	-3.552889	-1.742852	-2.457248	-0.959300	-0.688698	-0.722300
	0.0002	0.0407	0.0070	0.1687	0.2455	0.2351
8	-1.760408	-0.130388	-0.635829	0.591132	0.774389	0.656758
	0.0392	0.4481	0.2624	0.2772	0.2194	0.2557
9	-2.347848	-1.192059	-1.563387	-0.708333	-0.559877	-0.597431
	0.0094	0.1166	0.0590	0.2394	0.2878	0.2751
10	-3.169354	-1.756891	-2.259138	-1.163994	-0.964239	-0.987559
	0.0008	0.0395	0.0119	0.1222	0.1675	0.1617
11	-3.282179	-0.905285	-1.879430	0.235565	0.541013	0.359674
	0.0005	0.1827	0.0301	0.4069	0.2942	0.3595
Col Mean-						
Row Mean	7	8	9	10		
8	1.160782					
	0.1229					
9	-0.140395	-0.960591				
	0.4442	0.1684				
10	-0.396438	-1.342428	-0.168444			
	0.3459	0.0897	0.4331			
11	1.061221	-0.433697	0.788364	1.244967		
	0.1443	0.3323	0.2152	0.1066		

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

- Question: For each of the factor variables (knowledge and other), are there differences in the average response among regions?

Answer – NO, for both factor variables, there are no significant differences in responses among regions.

- Question: For each of the factor variables (knowledge and other), are there differences in the average response based upon type of device used?

Answer – YES, for both factor variables there are significant differences in response provided on various devices.

```
. dunntest iknowledge, by(idevice)
```

Kruskal-Wallis probability = 0.0002

Dunn's Pairwise Comparison of iknowledge by idevice
(No adjustment)

Col Mean-	1	2	4	5
Row Mean				
2	-0.842399			

```

1      |      0.1998
2      |
3      |
4      | 4 | -4.104772 -3.575691
5      |      | 0.0000      0.0002
6      |
7      | 5 | -2.253612 -1.999900 -0.286000
8      |      | 0.0121      0.0228      0.3874
9      |
10     | 6 | -1.116132 -0.951199 0.143918 0.293782
11     |      | 0.1322      0.1708      0.4428      0.3845

```

alpha = 0.05

Reject Ho if p = P(Z <= |z|) <= alpha/2

. dunnstest iother, by(idevice)

Kruskal-Wallis probability = 0.0423

Dunn's Pairwise Comparison of iother by idevice
(No adjustment)

Col Mean-	1	2	4	5
Row Mean				
2	-1.392887			
	0.0818			
4	-3.084003	-2.201813		
	0.0010	0.0138		
5	-0.728643	-0.307796	0.691191	
	0.2331	0.3791	0.2447	
6	0.005101	0.278162	0.929115	0.406324
	0.4980	0.3904	0.1764	0.3423

alpha = 0.05

Reject Ho if p = P(Z <= |z|) <= alpha/2

STATISTICS

- Question – For each of the factor variables (knowledge and other), are there differences in the average response by age?

. dunnstest iknowledge, by(iage)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	126497.00
3	230	115847.50
4	343	198606.00
5	197	128827.50

chi-squared = 75.931 with 3 d.f.
probability = 0.0001

chi-squared with ties = 85.400 with 3 d.f.
probability = 0.0001

Dunn's Pairwise Comparison of iknowledge by iage
(No adjustment)

Col Mean-	2	3	4
Row Mean			
3	-3.047089		
	0.0012		
4	-6.647864	-3.042354	
	0.0000	0.0012	

```

1      5 | -8.540506 -5.326895 -2.884203
2      | 0.0000    0.0000    0.0020
3 alpha = 0.05
4 Reject Ho if p = P(Z <= |z|) <= alpha/2
5
6 . dunntest iother, by(iage)
7
8 Warning: by() values are unlabeled, option nolabel implicit
9
10 Kruskal-Wallis equality-of-populations rank test
11
12 +-----+
13 | iage | Obs | Rank Sum |
14 +-----+
15 | 2 | 297 | 128210.00 |
16 | 3 | 230 | 122050.50 |
17 | 4 | 343 | 201312.00 |
18 | 5 | 197 | 118205.50 |
19 +-----+
20 chi-squared = 51.926 with 3 d.f.
21 probability = 0.0001
22
23 chi-squared with ties = 52.814 with 3 d.f.
24 probability = 0.0001
25
26 Dunn's Pairwise Comparison of iother by iage
27 (No adjustment)
28
29 Col Mean-|
30 Row Mean | 2 3 4
31 +-----+
32 3 | -3.687658
33 | 0.0001
34
35 4 | -6.409482 -2.160471
36 | 0.0000 0.0154
37
38 5 | -5.995882 -2.338749 -0.480036
39 | 0.0000 0.0097 0.3156
40
41 alpha = 0.05
42 Reject Ho if p = P(Z <= |z|) <= alpha/2
43
44
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```

- **Question – For each of the factor variables (knowledge and other), are there differences in the average response by gender?**

```

41 . dunntest iknowledge, by(igender)
42
43 Warning: by() values are unlabeled, option nolabel implicit
44
45 Kruskal-Wallis equality-of-populations rank test
46
47 +-----+
48 | igender | Obs | Rank Sum |
49 +-----+
50 | 1 | 497 | 240985.50 |
51 | 2 | 570 | 328792.50 |
52 +-----+
53 chi-squared = 23.638 with 1 d.f.
54 probability = 0.0001
55
56 chi-squared with ties = 26.585 with 1 d.f.
57 probability = 0.0001
58
59 Dunn's Pairwise Comparison of iknowledge by igender
60 (No adjustment)
61
62 Col Mean-|
63 Row Mean |
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80

```

```

Row Mean |                1
-----+-----
 2 | -5.156095
   | 0.0000
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunntest iother, by(igender)
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| igender | Obs | Rank Sum |
+-----+-----+
|         |     |           |
|         |     |           |
|         |     |           |
+-----+-----+
chi-squared = 28.299 with 1 d.f.
probability = 0.0001
chi-squared with ties = 28.783 with 1 d.f.
probability = 0.0001

```

Dunn's Pairwise Comparison of iother by igender
(No adjustment)

```

Col Mean-|
Row Mean |                1
-----+-----
 2 | -5.365020
   | 0.0000
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2

```

-
- **Question – For each of the factor variables (knowledge and other), are there differences in the average response by [income](#)?**

```

. dunntest iknowledge, by(iincome)
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iincome | Obs | Rank Sum |
+-----+-----+
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
+-----+-----+
chi-squared = 28.138 with 10 d.f.
probability = 0.0017
chi-squared with ties = 31.647 with 10 d.f.
probability = 0.0005

```


Dunn's Pairwise Comparison of iknowledge by iincome
(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-2.497470 0.0063					
3	-1.980782 0.0238	0.879087 0.1897				
4	-3.815271 0.0001	-1.257535 0.1043	-2.470334 0.0067			
5	-3.893000 0.0000	-1.495793 0.0674	-2.613509 0.0045	-0.363691 0.3580		
6	-3.353408 0.0004	-1.183058 0.1184	-2.060025 0.0197	-0.184688 0.4267	0.114798 0.4543	
7	-3.552889 0.0002	-1.742852 0.0407	-2.457248 0.0070	-0.959300 0.1687	-0.688698 0.2455	-0.722300 0.2351
8	-1.760408 0.0392	-0.130388 0.4481	-0.635829 0.2624	0.591132 0.2772	0.774389 0.2194	0.656758 0.2557
9	-2.347848 0.0094	-1.192059 0.1166	-1.563387 0.0590	-0.708333 0.2394	-0.559877 0.2878	-0.597431 0.2751
10	-3.169354 0.0008	-1.756891 0.0395	-2.259138 0.0119	-1.163994 0.1222	-0.964239 0.1675	-0.987559 0.1617
11	-3.282179 0.0005	-0.905285 0.1827	-1.879430 0.0301	0.235565 0.4069	0.541013 0.2942	0.359674 0.3595
Col Mean- Row Mean	7	8	9	10		
8	1.160782 0.1229					
9	-0.140395 0.4442	-0.960591 0.1684				
10	-0.396438 0.3459	-1.342428 0.0897	-0.168444 0.4331			
11	1.061221 0.1443	-0.433697 0.3323	0.788364 0.2152	1.244967 0.1066		

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iother, by(iincome)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	40557.50
2	124	68881.50
3	220	111152.50
4	194	109253.00
5	138	76566.00
6	81	38956.50
7	45	26963.00
8	29	15964.00
9	13	7397.50
10	22	12425.50
11	116	61661.00

chi-squared = 12.672 with 10 d.f.

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probability = 0.2426

chi-squared with ties = 12.889 with 10 d.f.
 probability = 0.2299

Dunn's Pairwise Comparison of iother by iincome
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-1.820902 0.0343					
3	-0.719869 0.2358	1.464701 0.0715				
4	-2.164101 0.0152	-0.218148 0.4137	-1.924668 0.0271			
5	-1.843770 0.0326	0.017718 0.4929	-1.494472 0.0675	0.244915 0.4033		
6	-0.080037 0.4681	1.707810 0.0438	0.611758 0.2703	2.033932 0.0210	1.727440 0.0420	
7	-2.166306 0.0151	-0.821450 0.2057	-1.879091 0.0301	-0.712417 0.2381	-0.845545 0.1989	-2.081181 0.0187
8	-1.116035 0.1322	0.079540 0.4683	-0.749513 0.2268	0.208387 0.4175	0.069584 0.4723	-1.051661 0.1465
9	-1.009833 0.1563	-0.152029 0.4396	-0.731528 0.2322	-0.067154 0.4732	-0.160323 0.4363	-0.964946 0.1673
10	-1.199166 0.1152	-0.131556 0.4477	-0.871672 0.1917	-0.023795 0.4905	-0.142123 0.4435	-1.141432 0.1268
11	-1.247245 0.1062	0.606437 0.2721	-0.750743 0.2264	0.881120 0.1891	0.604470 0.2728	-1.144015 0.1263
Col Mean- Row Mean	7	8	9	10		
8	0.669238 0.2517					
9	0.313259 0.3770	-0.181941 0.4278				
10	0.432536 0.3327	-0.165674 0.4342	0.039694 0.4842			
11	1.260049 0.1038	0.298282 0.3827	0.419363 0.3375	0.467740 0.3200		

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

- Question: For each of the factor variables (knowledge and other), are there differences in the average response among regions?

```
. dunnstest iknowledge, by(iregion)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| iregion | Obs | Rank Sum |
+-----+-----+
| 1 | 47 | 24583.50 |
| 2 | 123 | 70842.50 |
| 3 | 190 | 100915.00 |
| 4 | 60 | 30070.50 |
| 5 | 196 | 98718.00 |
```

```

+-----+-----+-----+
|      6 | 74 | 38057.50 |
|      7 | 102 | 54316.00 |
|      8 | 77 | 42647.50 |
|      9 | 189 | 100060.50 |
+-----+-----+-----+

```

chi-squared = 5.469 with 8 d.f.
probability = 0.7065

chi-squared with ties = 6.162 with 8 d.f.
probability = 0.6291

Dunn's Pairwise Comparison of iknowledge by iregion
(No adjustment)

Col Mean-	1	2	3	4	5	6
Row Mean						
2	-1.071609					
	0.1419					
3	-0.172251	1.345399				
	0.4316	0.0892				
4	0.390149	1.649590	0.702685			
	0.3482	0.0495	0.2411			
5	0.414702	2.183041	0.937194	-0.058582		
	0.3392	0.0145	0.1743	0.4766		
6	0.163190	1.455991	0.426919	-0.262248	-0.270564	
	0.4352	0.0727	0.3347	0.3966	0.3934	
7	-0.186328	1.126918	-0.039002	-0.669008	-0.820729	-0.414454
	0.4261	0.1299	0.4844	0.2517	0.2059	0.3393
8	-0.578186	0.528077	-0.584510	-1.062830	-1.296538	-0.844421
	0.2816	0.2987	0.2794	0.1439	0.0974	0.1992
9	-0.135699	1.395304	0.057851	-0.662132	-0.877640	-0.383263
	0.4460	0.0815	0.4769	0.2539	0.1901	0.3508
Col Mean-						
Row Mean	7	8				
8	-0.491339					
	0.3116					
9	0.087340	0.628024				
	0.4652	0.2650				

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

.
. dunntest iother, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+-----+-----+
| iregion | Obs | Rank Sum |
+-----+-----+-----+
|      1 | 47 | 22561.50 |
|      2 | 123 | 69595.50 |
|      3 | 190 | 98283.50 |
|      4 | 60 | 29825.50 |
|      5 | 196 | 103603.00 |
+-----+-----+-----+
|      6 | 74 | 38500.50 |
|      7 | 102 | 56208.00 |
|      8 | 77 | 40265.50 |
|      9 | 189 | 101368.00 |
+-----+-----+-----+

```

chi-squared = 4.655 with 8 d.f.
probability = 0.7937

1 chi-squared with ties = 4.736 with 8 d.f.
 2 probability = 0.7854

3

4 Dunn's Pairwise Comparison of iother by iregion
 (No adjustment)

5 Col Mean-|
 6 Row Mean | 1 2 3 4 5 6

7

8 2 | -1.651264
 9 | 0.0493

10 3 | -0.754747 1.384344
 11 | 0.2252 0.0831

12 4 | -0.289090 1.440613 0.450033
 13 | 0.3863 0.0748 0.3263

14 5 | -0.986810 1.068340 -0.366535 -0.704618
 15 | 0.1619 0.1427 0.3570 0.2405

16 6 | -0.712218 1.021777 -0.072157 -0.440535 0.201037
 17 | 0.2382 0.1534 0.4712 0.3298 0.4203

18

19 7 | -1.329861 0.363767 -0.908316 -1.094902 -0.607562 -0.665397
 20 | 0.0918 0.3580 0.1819 0.1368 0.2717 0.2529

21 8 | -0.764952 0.974207 -0.137978 -0.495255 0.138866 -0.053765
 22 | 0.2221 0.1650 0.4451 0.3102 0.4448 0.4786

23 9 | -1.140280 0.839921 -0.612310 -0.874259 -0.250994 -0.386621
 24 | 0.1271 0.2005 0.2702 0.1910 0.4009 0.3495

25 Col Mean-|
 26 Row Mean | 7 8

27 8 | 0.615064
 28 | 0.2693

29 9 | 0.395481 -0.327411
 30 | 0.3462 0.3717

31 alpha = 0.05
 32 Reject Ho if p = P(Z <= |z|) <= alpha/2

- 33
- 34
- 35
-
- 36
- 37 • Question: For each of the factor variables (knowledge and other), are there differences in the average response based upon type of device used?

38

39

40 . dunnstest iknowledge, by(idevice)

41

42 Warning: by() values are unlabeled, option nolabel implicit

43

44 Kruskal-Wallis equality-of-populations rank test

45

idevice	Obs	Rank Sum
1	455	231846.00
2	464	243925.50
4	117	74083.00
5	22	14355.00
6	9	5568.50

46

47

48

49

50

51

52

53 chi-squared = 19.255 with 4 d.f.
 54 probability = 0.0007

55 chi-squared with ties = 21.656 with 4 d.f.
 56 probability = 0.0002

57

58

59 Dunn's Pairwise Comparison of iknowledge by idevice

(No adjustment)

Col Mean-	1	2	4	5
2	-0.842399			
	0.1998			
4	-4.104772	-3.575691		
	0.0000	0.0002		
5	-2.253612	-1.999900	-0.286000	
	0.0121	0.0228	0.3874	
6	-1.116132	-0.951199	0.143918	0.293782
	0.1322	0.1708	0.4428	0.3845

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iother, by(idevice)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
1	455	232086.50
2	464	249706.50
4	117	71108.00
5	22	12291.00
6	9	4586.00

chi-squared = 9.727 with 4 d.f.

probability = 0.0453

chi-squared with ties = 9.893 with 4 d.f.

probability = 0.0423

Dunn's Pairwise Comparison of iother by idevice
(No adjustment)

Col Mean-	1	2	4	5
2	-1.392887			
	0.0818			
4	-3.084003	-2.201813		
	0.0010	0.0138		
5	-0.728643	-0.307796	0.691191	
	0.2331	0.3791	0.2447	
6	0.005101	0.278162	0.929115	0.406324
	0.4980	0.3904	0.1764	0.3423

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*,
ADAPTED FOR A SURVEY STUDY: Informed consent, shared-decision making and a reasonable patient's wished based on a national survey in the United States using a hypothetical scenario.
 An (X) indicates that the checklist item is included in the manuscript if applicable for a survey study.

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract X (b) Provide in the abstract an informative and balanced summary of what was done and what was found X
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported X
Objectives	3	State specific objectives, including any prespecified hypotheses X
Methods		
Study design	4	Present key elements of study design early in the paper X
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection X
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants X
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable X
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group X
Bias	9	Describe any efforts to address potential sources of bias X
Study size	10	Explain how the study size was arrived at X
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why X
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding X (b) Describe any methods used to examine subgroups and interactions X (c) Explain how missing data were addressed NOT APPLICABLE (d) If applicable, describe analytical methods taking account of sampling strategy X (e) Describe any sensitivity analyses NOT APPLICABLE
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed NOT APPLICABLE (b) Give reasons for non-participation at each stage NOT APPLICABLE (c) Consider use of a flow diagram NOT USEFUL
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders X (b) Indicate number of participants with missing data for each variable of interest X
Outcome data	15*	Report numbers of outcome events or summary measures X
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were

		adjusted for and why they were included NOT APPLICABLE
		(b) Report category boundaries when continuous variables were categorized NOT APPLICABLE
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period NOT RELEVANT
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses X
Discussion		
Key results	18	Summarise key results with reference to study objectives X
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias X
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence X
Generalisability	21	Discuss the generalisability (external validity) of the study results X
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based X

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Informed Consent, Shared-Decision Making and a Reasonable Patient's Wishes Based on a Cross-sectional, National Survey in the United States Using a Hypothetical Scenario

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Secondary Subject Heading:	Medical management
Keywords:	informed consent, shared-decision making, reasonable patient, overuse of procedures, coproduction, patient autonomy

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Manuscripts

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3 Informed Consent, Shared-Decision Making and a Reasonable Patient's Wishes
4 Based on a Cross-sectional, National Survey in the United States Using a
5 Hypothetical Scenario
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8 John T. James¹, Darwin J. Eakins², and Robert R. Scully³
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10 ¹CEO, Patient Safety America, Houston, TX, and retired NASA Chief Toxicologist, Houston,
11 TX
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13 ²Private consultant on survey methods, retired statistical expert from the University of Kansas,
14 Lawrence, KS
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16 ³Private consultant on statistical methods and interpretation
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20 Corresponding Author:
21

22 John T. James
23

24 Patient Safety America
25

26 14503 Windy Ridge Lane, Suite 200
27

28 Houston, TX 77062
29

30 Phone: 713-416-2878
31

32 john.t.james@earthlink.net
33

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Abstract

Objective: In approximately half the states in the U.S., and more recently in the U.K., informed consent is legally defined as what a reasonable patient would wish to know. Our objective was to discern the information needs of a hospitalized, “reasonable patient” during the informed-consent process.

Design: We performed a cross-sectional study to develop a survey instrument and better define “reasonable person” in relation to informed consent in a hypothetical scenario where an invasive procedure may be an option.

Setting: A 10-question survey was administered from April 19 through October 22, 2018 to three groups: student nurses (n=76), health professions educators (n=63), and a U.S. national population (n=1067).

Primary and secondary outcome measures: The primary outcome measure was the average intensity, on a 5-point scale, by which survey groups wished to have each of 10 questions answered. The secondary outcome was to discern relationships between survey demographics and the intensity by which participants wanted an answer.

Results: Despite substantial demographic differences in the nursing-student group and health-professions-educator group, the average intensity scores were within 0.2 units on 9 of 10 questions. The national survey revealed a strong desire to have an answer to each question (range 3.98 to 4.60 units). It showed that women desired answers more than men and older adults desired answers more than younger adults.

Conclusions: Based on responses to 10 survey questions regarding wishes of people in a situation where an invasive procedure may be necessary, the vast majority want an answer to

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3 each question. They wanted to know about all treatment options, risky drugs, decision aids, who
4 will perform the procedure, and the cost. They wanted their advocate present, periodic review of
5 their medical record, a full day to review documents, and expected outcomes and restrictions
6 after the procedure.
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13 **Key Words:** Informed consent, shared-decision making, reasonable patient, overuse of
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For peer review only

Strengths and limitations of this study:

- Based on two targeted surveys and a national survey, findings are consistent across demographic groups and across the United States, making our conclusions robust.
- The findings form a template that could be used by clinicians when engaged in shared-decision making to elicit truly informed consent from the patient.
- The survey questions had to be limited to be practical, so in any specific, real-life situation additional questions may be asked by a reasonable patient.
- Findings about the out-of-pocket costs of a procedure probably apply only to patients in the United States where out-of-pocket costs may be enormous.
- Our survey was limited by requirements to read English and have electronic access.

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Competing interests: Dr. James founded Patient Safety America as a no-budget organization dedicated to educating people about problems in the U.S. healthcare industry. He serves as its unpaid CEO and leader. He has no conflicts of interest, advocating only for improved care.

Author’s contribution: JTJ conceived the study and developed the questions. DJE formed the survey instrument to suit each of the situations where questions were to be presented to a survey audience. JTJ and RRS analyzed the data. JTJ wrote most of the paper in close consultation with coauthors. All authors agreed to be accountable for accuracy of the work.

Data sharing statement: National survey data at: <http://patientsafetyamerica.com/survey-data/>.

Health-Professions-Educator survey at: <https://www.surveymonkey.com/results/SM-DQJDBBQ7L/>

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3 Nursing-student survey available at: <https://www.surveymonkey.com/results/SM-5F2SX9W3V/>
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5 Available 'Supplementary files' include the research proposal, 2 forms of the survey, and 6
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7 statistical analysis files.
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10 **Introduction**

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13 The human right to self-determination in healthcare is a hallmark of instruments promulgated by
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15 the United Nations. Rights are specifically described for children, persons with disabilities and
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17 older persons. These call for the highest standards attainable for children's health,¹ for treatment
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19 of illness or rehabilitation of the disabled,² and for maintenance of optimum health as people
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21 age.³ The patient's right to know certainly extends to knowing the risks and benefits of
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23 prescription medications. For example, based on a recent court decision in the U.K. involving off
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25 label and unlicensed medication prescribing, consent laws now call for patients to receive all
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27 information that a patient deems important, and not just what the physician thinks is important.⁴
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29 However, unless the patient is harmed by denial of sufficient information to exercise their rights
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31 to make an informed decision about off-label prescriptions, there is no legal standing for
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33 compensation. In our opinion, the human rights of patients to self-determination in healthcare
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35 can only be attained through a balanced process of shared-decision making between patient and
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37 clinician.
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44 While the idea of shared-decision making between patient and clinician has been around
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46 many decades, based on peer-reviewed citations, the concept has gained momentum since 2012.⁵
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48 The culmination of shared-decision making is that the patient consents to the mutually-agreed
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50 procedures to be performed or not performed. The old standard calling for information that
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52 "reasonable clinicians" feel their patients need to know is giving way to the new standard
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54 defined by what a reasonable patient wishes to know. However, a study of recorded
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3 conversations between clinicians and a patients that may need percutaneous coronary
4 intervention (PCI) found that only 3% of the patients received all 8 elements necessary for
5 informed decision making.⁶ A recent court ruling in the U.K has upheld the patient-centered,
6 informed consent standard and about half of the United States use “reasonable patient” as the
7 basis for administering informed consent.⁷ In the past, the “reasonable patient” standard has been
8 ill-defined and abstract; our intent is to better-define the information wishes of a reasonable
9 person when facing the possibility of an invasive procedure.⁸ There is a natural conflict between
10 respect for patient autonomy in making an informed decision and the practical aspects of how a
11 clinician delivers information to a “reasonable patient” to fulfill the ethical principle of
12 autonomy.
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27 The question then becomes, “What does a reasonable patient wish to know?” Typically,
28 that is answered after the fact in specific cases where a patient may allege that he was not given
29 sufficient information to make an informed decision.⁹ One example involved a case where a
30 man’s family was not given enough information about his defibrillator replacement to make an
31 informed decision.¹⁰ Patient preferences were not elicited by the clinician. A court in the U.K.
32 decided that a woman was not given sufficient information on the 1% risk of shoulder dystocia
33 from a vaginal vs. a Caesarian delivery to make an informed decision.¹¹ To our knowledge, no
34 investigators have attempted to define the information needs of a reasonable patient in a general
35 way that applies to care during hospitalization. To some extent the survey was driven by stories
36 of patient advocates who have experienced harm and, in retrospect, wish they had known more
37 about the risks of their treatment, device, or medication. We hypothesized that such wishes could
38 be generalized into information a “reasonable patient” would want to know.
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55 **Goal**

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3 Our primary goal was to establish the descriptive intensity (scale of 1 to 5, with 1 being
4 “definitely no” and 5 being “definitely yes”) by which answers to general questions are desired
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6 by a reasonable patient before giving consent for an invasive procedure, prescription drugs, or
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8 medical devices that could pose a risk of avoidable harm. Our secondary goal was to characterize
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10 heterogeneity, such as gender and age, in the survey groups that may be associated with intensity
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12 variations in what a reasonable patient wishes to know.
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16 17 **Methods**

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20 Our survey-study proposal (Supplementary file 1) was approved by the Galveston College
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22 Institutional Review Board. Our search of peer-reviewed literature using “reasonable patient
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24 survey” (15 November 2018) discovered only 2 partially relevant articles. One involved wishes
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26 of patients about anesthesia risks in a Singapore hospital.¹² Another surveyed patients’ opinions
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28 about pre-surgical informed-consent in a Jamaica teaching hospital.¹³ In the latter study, 67% of
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30 the surveyed patients described their consent process as ‘unsatisfactory.’ We created a statement
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32 of a generic situation in which a hospitalized patient must make choices about their care after
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34 being stabilized upon entry via the emergency department: *You are hospitalized in a large,*
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36 *urban, teaching hospital after being brought into its emergency room last night. The condition*
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38 *that brought you to the ER has been stabilized, but additional procedures may be necessary. The*
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40 *following 10 questions determine what you would like to know as a reasonable patient. We*
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42 *developed a 10-question survey based on adverse experiences reported by members of the*
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44 *Patient Safety Action Network (formerly members of the Safe Patient Project of Consumers*
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46 *Union) and our knowledge of shortcomings with current informed consent practices as reflected*
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48 *in medical literature.*
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3 The survey was developed in two forms. The first employed demographics to include
4 age, gender, education level, race or ethnicity, and whether the survey taker has worked in a
5 hospital (Supplementary file 2). This survey was administered via cell phone, without any means
6 of coercion, to student nurses (and a few faculty) on April 19, 2018 at Galveston College,
7 Galveston Texas during a presentation by Dr. James. All present in the lecture hall were verbally
8 recruited to take the survey at the start of the presentation, and then the survey results were
9 shared at the conclusion of the talk. It was also administered to participants in the Health
10 Professions Educators Summer Symposium (HPESS) Community via email request on June 8,
11 2018. The master-list of past participants in summer symposia was used as the recruitment tool.
12 The latter included primarily mature academics involved in educating physicians, nurses, and
13 health-care administrators.
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29 The second form of the survey, which was used for the U.S. national survey, employed
30 an identical scenario and questions, but the demographics were adapted to those offered by
31 SurveyMonkey® (SM) for a national survey (Supplementary file 3). These included age, gender,
32 household income level, and region of the United States. The national platform included survey
33 takers across the U.S. that had been previously recruited by SM as part of their nationally
34 representative database. The vast majority of the national survey takers used cell phones to
35 answer the questions. The third survey was administered to the national audience on October 22,
36 2018.
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48 Each of the 10 questions could be answered at one of 5 intensity levels indicating the
49 degree to which an answer is desired by the person taking the survey. The responses were as
50 follows: definitely no (1.0), probably no (2.0), neutral (3.0), probably yes (4.0), and definitely
51 yes (5.0). Formal statistical analyses were deemed unsuited to the qualitative nature of our study
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3 design. Final conclusions are word descriptions of the intensity of desire of a reasonable patient
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5 to have answers such as “probably yes” or “definitely yes.” Obvious trends in the data were
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7 captured graphically.
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10 ***Statistics and Factor Analyses***

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13 The data subjected to analyses were collected in three surveys (student nurses, HPES, and the
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15 national survey). For each survey, descriptive statistics were obtained and analyses of the results
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17 were performed using Stata (version 14.0; Stata Corp., College Station, TX). The means of the
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19 responses of the various groups for each subject category (e.g., age, gender, etc.) were tested for
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21 differences using methods that are appropriate for these categorical variables, which are not
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23 normally distributed. The nonparametric Kruskal–Wallis one-way analysis of variance by ranks
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25 was performed to test for differences between means and the Dunn test was used to identify pairs
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27 that differed significantly. Statistical significance, adjusted for false discovery, was established
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29 with $p < 0.025$.
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36 Factor analysis with principal component factoring was utilized in all surveys to
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38 determine components that can explain the greatest portions of the total variance in responses
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40 among the questions. The goal of a factor analysis is to reduce the number of variables to explain
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42 and to interpret the results. Factor loadings was achieved by regression of scoring coefficients
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44 obtained with varimax rotation. The loaded factors (principal components) generated were
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46 analyzed as described above for other variables.
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49 ***Patient and Public Involvement***

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52 The development of our research plan was a direct result of patient advocates’ experiences with
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54 failed informed consent. These experiences led to formulation of many of the questions posed in
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3 our survey. Our results will be disseminated to the HPESS community once the study has been
4 published. Results will be disseminated to student nurses at Galveston College through a
5 presentation this spring. Our findings and suggested actions from our findings will be
6 disseminated to patient advocates whose shared ideas and experiences powered this study. Those
7 groups include the following: Patient Council of the Right Care Alliance, Patient Safety Action
8 Network, and members of Patient Safety America. We expect to widely share our findings with
9 the general public (represented by our national survey) through media outlets such as ProPublica,
10 with physicians through KevinMD and Veritas Health Care, and with nurses through Quality and
11 Safety Education for Nurses (QSEN).
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Results

We targeted two groups from which to obtain responses because of the access we had to them and the expectation that their demographics would be different. The response rate from the student nurses was 99% (76/77) because it was taken during a lecture in which support was available if anyone had difficulty. Only one did. The response rate of the HPESS Community to the email request was 63/146 = 43%. The low response is likely due to busy professionals not having time to read and respond to all emails sent to them. Combined, the response rate of the two targeted studies was 62%. Table 1 shows the diversity of demographics in the two groups that took initial surveys. The primary differences were in age, education level, race or ethnic origin, and hospital work experience (Supplemental file 4).

Table 1. Comparative demographics of targeted groups (2 sample test of proportions)

Demographic measure	Student Nurses (n = 76)	HPESS Community (n = 63)	P values
Under 35 years of age	77%	3%	<0.0001
Female	78%	70%	0.2755
High school graduate	34%	2%	<0.0001
College graduate	65%	5%	<0.0001
Advanced degree	1%	93%	<0.0001
White or Caucasian	51%	84%	<0.0001
Black or African American	16%	3%	0.0151
Hispanic or Latino	26%	2%	0.0001
Asian	4%	6%	0.5161
Have worked in a hospital	35%	86%	<0.0001

The national survey included 1211 persons who entered the survey and 1067 who completed it for a response rate of 88%. Nine participants did not answer location questions.

The combined results of our three surveys consistently showed that a “reasonable patient” would want to know an answer to each of the 10 questions presented in our survey (table 2).

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3 Table 2 allows the reader to view the results in two ways for each of the 10 questions.
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5 The first, shown in bracketed, red highlight, is the fraction of responders that indicated that they
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7 definitely wanted to know information (5.0 response) or have a certain right to access (e.g.
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9 medical record access). The second way to view results, in black lettering, indicates the
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11 numerical mean of all responses in each of the 3 surveys and the ranges of the means sorted by
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13 income groups and regions of the U.S. in the national survey. We used ranges as a measure of
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15 dispersion around the national means because it is likely lay readers will understand this more
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17 readily than the results of our formal statistical analysis. The three distinct surveys compare well
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19 regarding the wishes of patients. The highest intensity of desire to have an answer was to
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21 question 1 (know all treatment choices) in all three surveys (range 4.58-4.94). In all three
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23 surveys, the lowest intensity of desire to have an answer was to question 8 (medical record
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25 access) (range 3.98-4.07), and the second lowest intensity was to question 9 (advanced review of
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27 documents) (range 4.18-4.29). Even the lowest intensity desire for an answer was near 4.0,
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29 which implies that on weighted-average basis, the putative reasonable patient would *probably*
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31 want to have access to his medical record and be able to make entries.
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Table 2. Average response levels in three surveys. 4.0 indicates the person “probably” wants an answer, and 5.0 indicates the person “definitely” wants an answer. The percentage of the 5.0 responses are shown in bold red. In the national survey, 71 % of the reported income levels were from \$10,000 to \$99,000. Of the 9 geographic regions of the U.S., 54% of responses were from 3 of those – east north central, south Atlantic, and Pacific. Footnotes: ^an=75, ^bn=62

Number and description of survey question	Student Nurses (n = 76)	HPES Group (n = 63)	National Group (n = 1067)	National ranges over 10 income Groups	National ranges over 9 regions of the U.S.
The percentages of individuals that ‘definitely’ (5.0) wanted an answer to each question below is shown in bold red in the columns.	[% 5.0]	[% 5.0]	[%5.0]		
1. Would you like to know all your treatment choices, including alternatives and risks and benefits of each choice for a patient like you. Your choices may include invasive procedures (surgery, endoscopic procedures, insertion of a medical device), non-invasive treatments, and what happens if you do nothing?	4.92 [92%]	4.94 [95%]	4.58 [75%]	4.33-4.97	4.51-4.65
2. Drugs that have not been approved by the Food and Drug Administration for your condition are off-label for you. Drugs prescribed off-label are about twice as likely to cause serious side-effects as drugs prescribed on-label. Would you like to know if any drugs prescribed to you are off-label, and what their side effects may be?	4.89 ^a [89%]	4.51 [67%]	4.40 [67%]	4.07-4.71	4.26-4.57
3. Drugs assigned a “black box” warning by the FDA pose an especially serious risk of harm. If you are prescribed such a drug, would you want to know the reasons for the black box warning and if there are alternatives before you take it?	4.83 [83%]	4.67 [79%]	4.57 [78%]	4.27-4.92	4.43-4.69
4. Decision aids are created to assist patients with complex medical decisions and to help them understand the risks and benefits of treatment options. If there is a decision-aid available for your illness, would you like to review it?	4.66 [73%]	4.65 [70%]	4.41 [61%]	4.07-4.69	4.28-4.57
5. If you are considering an invasive procedure, would you like to know who will be performing it, their skill level, and how trainee doctors, if any, will be involved?	4.83 [84%]	4.78 [84%]	4.49 [68%]	4.34-4.82	4.41-4.63
6. Assuming you have decided on a procedure or treatment, would you like to know what your total, out-of-pocket costs will be?	4.71 [79%]	4.60 ^b [68%]	4.48 [69%]	4.21-4.76	4.41-4.52
7. You have a trusted family member that is willing to act as your advocate. Would you like for that person to be present during shared-decision-making about your medical care?	4.65 ^a [73%]	4.54 [62%]	4.31 [54%]	4.09-4.69	4.20-4.43
8. If you are well enough, would you like to be offered a chance to review and make entries in your medical records each day while you are hospitalized?	4.07 [47%]	4.06 [48%]	3.98 [38%]	3.41-4.23	3.89-4.11
9. Before signing any documents permitting invasive, non-emergency procedures would you like to review these at least one full day in advance of the procedure?	4.29 [49%]	4.19 [52%]	4.18 [47%]	3.91-4.41	3.87-4.34
10. If you are considering an invasive procedure, would you like to know your expected difficulties, recovery times, pain management, and restrictions after the procedure while hospitalized and after discharge from the hospital? This includes the risk of infection from the invasive procedure.	4.84 [86%]	4.89 [90%]	4.60 [76%]	4.32-4.85	4.49-4.70

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3 Below we provide brief descriptions of the statistical analyses and factor analyses for
4 each of the 3 surveys. The details of these analyses are in supplementary files. Question numbers
5 are found in table 2. Statistical analysis of the responses to survey questions obtained from
6 student nurses (Supplementary file 5) revealed no significant differences among age groups,
7 level of education, experience working in a hospital, or between genders, in their responses to
8 any of the 10 questions. Not considering 'another race' as a response suitable for comparisons,
9 the only differences in pairs were for question 1. 'White or Caucasian' was different from 'Black
10 or African American' ($p = 0.011$) and 'Black or African American' was different from 'Asian or
11 Asian American' ($p = 0.020$).
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24 Factor analysis with principal component factoring identified 3 factors each with
25 Eigenvalues greater than 1, which cumulatively accounted for 64% of total variance among
26 responses provided by the student nurses. Varimax factor loading of 3 factor variables labeled as
27 "knowledge", "participation", and "total cost" were generated and analyzed as above for
28 differences in responses among groups (Supplementary file 6). No significant differences were
29 found among age groups, levels of education, or between genders, in their responses to any of
30 the factor variables. The only significant differences, again disregarding comparisons to
31 'Another race,' existed among races and ethnicities in their responses associated with
32 "knowledge" ($p = 0.0091$) where 'White or Caucasian' differed from 'Black or African
33 American' ($p = 0.0211$).
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48 The responses of the HPESS survey did not differ significantly between genders, or
49 among various ethnicities for any of the ten questions (Supplementary file 7). Responses
50 differed significantly among age groups only for questions 1 ($p = 0.0171$) and 2 ($p = 0.0024$).
51 Responses differed significantly by education level for questions 1 ($p = 0.0015$), 2 ($p = 0.0139$),
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3 (p = 0.0170) and 10 (p = 0.0347). Among respondents to the HPESS survey, significant
4 differences in responses to questions 1 (p = 0.003), 2 (p = 0.0024), and 5 (p = 0.0002) were
5 provided by respondents who differed according to their employment as hospital workers.
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11 Factor analysis of the HPESS data with principal component factoring identified no
12 statistically significant differences for either of two factor variables "knowledge" and
13 "participation" when responses were compared by age, gender, or level of education
14 (Supplementary file 8). A significant difference among ethnic groups was found for
15 "knowledge" (p = 0.0394) but post hoc analysis with Dunn's test failed to identify any pairs of
16 groups that differed significantly.
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25 In the national survey, responses differed significantly for all questions among age
26 groups (p = 0.001 for questions 1 - 7 and 10; p = 0.0041 and 0.0052 for questions 8 and 9
27 respectively), between genders (p = 0.001 for questions 1, 2, 4, 7, 8 and 10; p = 0.0043, 0.0002,
28 0.0030 and 0.0014 for questions 3, 5, 6 and 9, respectively) (Supplementary file 9). Significant
29 differences for questions 1 (p = 0.0001), 2 (p = 0.0384), 3 (p = 0.0047), 4 (p = 0.0037), and 6 (p =
30 0.0190) were found among groups that differed by income level. Question 9 (p = 0.0473) was the
31 only question for which responses differed significantly among regions of the U.S. Several
32 salient generalizations from these comparisons are apparent. When comparing responses among
33 various age groups, differences were found among all ages groups for most questions. When
34 significant differences were found among response of groups of differing income levels the
35 differences, most often, were between group 1 and the other groups. Differences between
36 regions, in response to question 9, were most often between regions 1 and 2 and the other
37 regions.
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Factor analysis of the national data with principal component factoring demonstrated significant differences among the age categories for both factor variables ("knowledge", and "other", $p = 0.0001$ for both variables) (Supplementary file 10). All groups differed significantly from each other, with the exception of group 4 vs group 5 for the factor variable "other". For both factor variables the differences in responses of the genders are very highly significantly different ($p < 0.0001$). When considering responses from groups of differing income levels, significant differences were found for the variable "knowledge" ($p = 0.0005$). Most of the differences among pairs are between group 1 and other groups and between group 3 and other groups. There were no significant differences in responses to factor variables among regions.

Discussion

Despite the different demographics in the two targeted surveys (table 1), especially in age, education level and hospital work experience, the responses were comparable in the two groups (table 2). Only one of the 10 questions (number 2) had a response level that differed by more than 0.20 units. This was the question of whether a reasonable patient would want to know about any off-label drugs prescribed. The difference was 0.38 units. The higher education level and more hospital experience of the HPESS Community may have made this group slightly less concerned about the additional risk that may be associated with off-label prescriptions. Statistical analysis of the nurse-student survey revealed two paired demographic differences. Two race/ethnic pairs (white vs. black and black vs. Asian) were associated with differences in intensity of response to question 1, which is about knowing all choices for treatment including risks and benefits. Statistical analysis of the HPESS community survey disclosed differences between pairs in the age, education-level and hospital-work-experience groups. While these

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3 statistical findings may be interesting, the reality is that the core message remains unchanged:
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5 patients of all types studied wish to know many details about their care choices when facing the
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7 possibility of an invasive procedure.
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11 The results of the national survey regarding demographics of gender (figure 1) and age
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13 (figure 2) demonstrated distinct trends for all 10 questions. Without exception, women wanted
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15 more information than men, and older adults wanted more information than younger adults.
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17 Similarly, statistical analysis supported associations between age and gender on the intensity of
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19 responses to most questions, and it revealed an effect of income for some of the survey
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21 questions. The gender associations may be due to women being higher users of hospital care and
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23 hospitals tending to offer many more services targeted to women than to men.¹⁴ Older adults may
24
25 be more likely to be cautious compared to younger adults because of more lifetime hospital
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27 experiences.
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33 Our survey provides insight into some patient concerns that are not typically part of
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35 informed consent. In the wake of the opioid epidemic, the public is more aware of the potential
36
37 dangers of prescription drugs. Thus, it should not be surprising that patients would want to know
38
39 if the drugs prescribed to them are off-label or have a black-box warning. The U.S. Food and
40
41 Drug Administration assigned “black box” warnings to immediate-release opioids in 2016.¹⁵
42
43 There is also growing attention to surprise medical bills in the U.S., so a reasonable patient
44
45 would likely to want an estimate of his out-of-pocket costs. Inordinate out-of-pocket costs,
46
47 especially those that lead to bankruptcy, may have an adverse effect on clinical outcomes.¹⁶
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49 Hospital administration staff could assist with providing cost information. The opportunity to
50
51 review and make entries in one’s medical record, while not part of the informed consent process,
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53 may relate. Many patients want to ensure that the data being recorded are accurate and complete;
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3 moreover, many desire access to their data as a means of gaining a better understanding of their
4 condition and engaging with their providers. Encouraging this access can convey strong support
5 for the view that the patient is an integral part of his care team.
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11 There is an important connection between informed consent and the overuse of medical
12 procedures. The overuse of PCI in the U.S. is a prime example. Patients that may need PCI were
13 less likely to choose this invasive option when they were better informed about their care options
14 during hospitalization.¹⁷ A study of patients in Northern England that may need PCI concluded
15 that there is “a mismatch between legal and ethical principles of informed consent and current
16 practice. The variation in patients’ experiences of the current place of informed consent in
17 service delivery represents a missed opportunity for cardiologists to work in decision-making
18 partnerships with patients. In light of recent changes in the law [to the reasonable patient
19 standard], a new approach to informed consent is required.”¹⁸
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34 The history of legally-defined informed consent for invasive procedures has evolved
35 from a totally physician-centered concept (before the Era of Enlightenment) in which deception
36 of the patient was deemed necessary, to the point where the process has now become patient-
37 centered, in principle. A brief summary of some of the court decisions pertinent to involvement
38 of the patient points to the next step in informed consent, which we feel we have defined with
39 our survey.¹⁹ As early as 1914, a New York court established that an “adult in sound mind has
40 the right to determine what shall be done with his own body.” This was reinforced in 1960 by the
41 decision of a court in Kansas that the patient, not the physician, must make the final decision
42 about any operation. Of course, the patient’s decision may be biased by receiving limited
43 information from the physician. Two court decisions in 1972, one in California and the other in
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3 Washington, D.C., determined that the patient must be informed of pertinent risks of surgery and
4 have the alternatives revealed to him or her. In 1983, a New Jersey court ruled that if a surgeon,
5 other than the one the patient selected, performs the surgery, then the surgeon that obtained
6 consent, but did not perform the surgery is liable for malpractice. The surgeon performing the
7 surgery is liable for battery. The importance of the side effects of a drug (prednisone) came to a
8 Massachusetts court's attention in 1986 when a patient suffered serious adverse effects of this
9 drug used after eye surgery. It seems there was controversy about whether the physician should
10 have known about the possible side effects, and then disclosed this potential complication of the
11 drug to the patient.
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24 While our survey questions originated primarily from adverse experiences of patients, it
25 is clear that court decisions have pointed the way to a new era of the patient's voice being heard
26 in the context of shared-decision making and informed consent. That voice says to clinicians
27 who would perform an invasive procedure, "We patients want to know more than you have been
28 telling us." We want to know all of our choices and their risks and benefits, we want to know the
29 risks and benefits of drugs prescribed to us and devices placed in us, we want to view decision
30 aids when available, we want to know the skill level of the physician(s) performing our
31 procedure, and we want to know our costs. Moreover, we want an advocate present during
32 shared-decision making, we want full access to our medical records, we want to review consent
33 documents at least 24 hours before signing them, and we want to know the expected outcomes of
34 the invasive procedure to include recovery times, pain management, and infection risks.
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50 **Limitations**

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53 In order to respect the time of responders to our survey, we limited it to 10 questions applicable
54 to an informed consent discussion in a hypothetical situation. In real clinical settings, it is likely
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3 that our “template” will need to be augmented with questions specific to the situation the patient
4 faces. These should be designed to elicit the patient’s preferences. We also recognize that some
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6 of the answers are out of the clinician’s hands; for example, clinicians in the U.S. are seldom
7
8 going to know the patient’s out-of-pocket costs. We also recognize that clinicians may need the
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10 assistance of pharmacists in conveying the benefits, risks, and alternatives to off-label or black-
11
12 box-warning drugs. Surveys like ours involving a hypothetical scenario may be limited because
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14 in a real and stressful situation a patient may simply want to trust doctors’ recommendations or
15
16 may be afraid to ask too many questions. In a sense, our hypothetical “reasonable patient” has
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18 become a “frightened patient” when placed in a real situation, but that does not mean that he or
19
20 she does not want to know answers to the all the questions in our survey.
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27 Selection bias is always a possibility in surveys such as ours. Survey takers were
28
29 recruited from the 3 different groups to which we had access. One clear bias is that the survey
30
31 platform was electronic and written in English, eliminating any potential responses from people
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33 that do not have electronic access or do not read English well enough to participate in the survey.
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35 The number of adult Americans who cannot read has been estimated at about 32 million.²⁰ Our
36
37 results do not apply to populations outside the U.S. where there may be higher or lower trust of
38
39 the healthcare delivery system, or where people are desperate to get any medical care. Despite
40
41 large demographic differences in the smaller survey populations (table 1) and the different
42
43 methods of recruitment in all 3 surveys, the consistency of the results across the 3 surveys
44
45 suggests that the data in table 2 are representative of the majority of people living in the U.S.
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50 **Conclusions**

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53 Through two targeted surveys and a U.S. national survey, we have affirmed that a reasonable
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55 patient will want to know far more information than is generally conveyed during typical shared-
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3 decision making that leads to no more than a partly informed decision by the patient. Survey
4
5 respondents wanted to know risks and benefits of all treatment options, the risks and benefits of
6
7 off-label and box-warning drugs. They wished to view decision aids, know precisely who will
8
9 perform the procedure, and their anticipated out-of-pocket costs. Their desire was for an
10
11 advocate to be present during shared-decision making, have periodic opportunities to review
12
13 their medical record, have a full day to review informed-consent documents, and to be made
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15 aware of expected outcomes and restrictions after the procedure. We expect our findings to have
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17 implications for what defines a reasonable patient standard for informed consent.
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3 Figure 1. National intensity scores above 4.0 vs. question number for gender differences in the
4 national survey. Responses came from 497 males and 570 females.
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6 Figure 2. National intensity scores above 4.0 vs. question number for age differences in the
7 national survey. Responses came from 297, 230, 343, and 197 people in the four respective age
8 groups.
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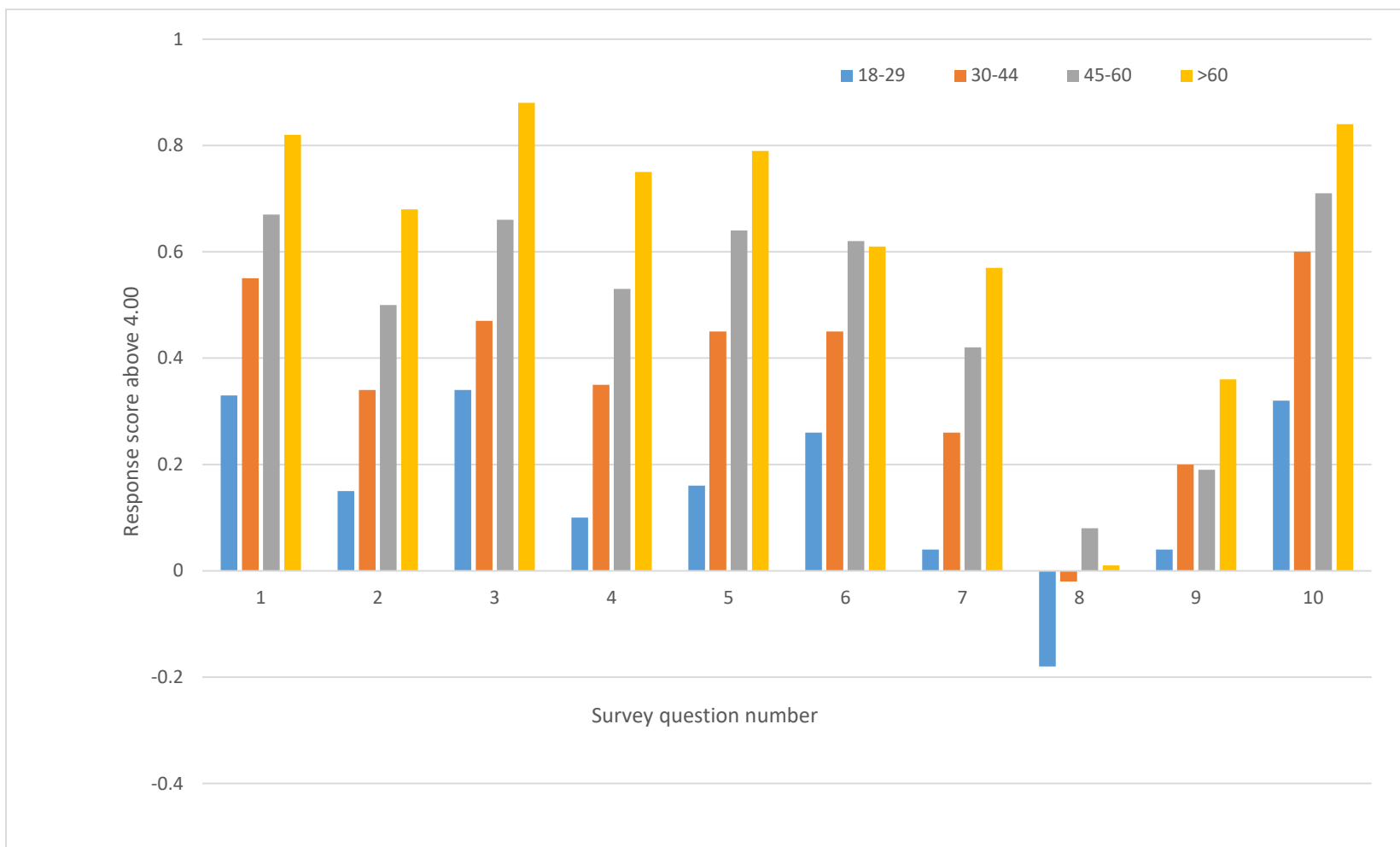
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Figure 1. Effect of gender on survey responses



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A Baseline for the “Reasonable Patient Standard”

Investigators: John T. James, PhD, Patient Safety America, Houston, TX (retired NASA Chief Toxicologist) and Darwin J. Eakins, MS, (retired statistical expert, University of Kansas), Survey Consultant, Lawrence, KS

Background: Recent changes in the law on informed consent in the U.K. to favor a “reasonable patient standard” over a “reasonable clinicians’ standard” prompted experts on informed consent to survey the situation in the U.S. Laws defining informed consent vary from state to state. Laws in half the states favor the reasonable-patient-standard (RPS) and others favor the reasonable-clinicians-standard.ⁱ A debate ensued about the problems with the RPS because it is going to vary from patient to patient. As part of the debate, an opponent of the RPS stated that perhaps a baseline RPS could be formulated.ⁱⁱ It is our intent to begin to define a general baseline for the RPS. This is essential if patient-centered-care and shared-decision making are to become a reality. Texas is a RPS state.ⁱⁱⁱ Please note that for our purposes a “reasonable person” and a “reasonable patient” are identical.

Methods: We will use the Survey Monkey Platform to capture the demographics of each survey participant, and then they will answer 10 questions related to what they would like to know when facing the possibility of an invasive procedure while hospitalized. There are two identical versions of the survey, one intended to be taken simultaneously by an audience, and the other to be taken by individuals to whom the survey-link is sent via email. The survey platform prevents individuals from taking the survey more than once from their electronic device or computer. A link to the beta-version of the survey is given here: <https://www.surveymonkey.com/r/8Y5Q3MF>. Those taking the survey have 5 choices to express the degree to which they would like to know an answer to the question posed in the survey. Those responses range in 5 levels from “Definitely no” to “Definitely yes.”

Recruitment: Our plan is to survey up to 1,000 adults in a variety of categories. These have not been fully fixed at this point, but our target groups are as follows: students of nursing, mature and retired nurses, health professions educators, retired individuals, people with knowledge of patient safety issues, and a nationally representative group of adults. Subjects will be recruited via email or at presentations to groups, such as nursing students (see below). Our **primary hypothesis** is that across the survey groups and for most of the questions the participants will answer either “probably yes” or “definitely yes” to the questions. Our secondary goal is to discover groups that differ significantly from the overall average. We will use t-tests to determine statistical ($P < 0.05$) differences between groups for selected questions that seem worth exploring.

Results: At this point the survey has been administered to nursing students attending a lecture on informed consent at Galveston College (April 19, 2018). There were 77 respondents to the survey, which was taken early in the lecture. Later in the lecture, the results of the survey were presented to the group of students. The data were readily available in graphical and numerical form to the audience. This was done to prove-out our ability to capture data in near-real time.

Funding: The research is being funded by Patient Safety America, Houston, TX. This will be less than \$1,000 for the survey platform and additional costs if we choose to survey a nationally representative group to which we purchase access.

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4 ⁱ <https://jamanetwork.com/journals/jama/fullarticle/2516469>

5 ⁱⁱ <https://jamanetwork.com/journals/jama/article-abstract/2547748?redirect=true>

6 ⁱⁱⁱ CIVIL PRACTICE AND REMEDIES CODE

7 TITLE 4. LIABILITY IN TORT

8 CHAPTER 74. MEDICAL LIABILITY

9 SUBCHAPTER C. INFORMED CONSENT

10 Sec. 74.101. THEORY OF RECOVERY. In a suit against a physician or health care provider involving a health care
11 liability claim that is based on the failure of the physician or health care provider to disclose or adequately disclose
12 the risks and hazards involved in the medical care or surgical procedure rendered by the physician or health care
13 provider, the only theory on which recovery may be obtained is that of negligence in failing to disclose the risks or
14 hazards that could have influenced a reasonable person in making a decision to give or withhold consent.
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For peer review only

Reasonable Patient Care - Phone

You are hospitalized in a large, urban, teaching hospital after being brought into its emergency room last night. The condition that brought you to the ER has been stabilized, but additional procedures may be necessary. The following 10 questions determine what you would like to know as a reasonable patient. The survey should take no more than 5 minutes. There are only sixteen (16) items.

Reasonable Patient Care - Phone

Age

Page 1 of 16

1. Age

- | | |
|--------------------------------|-----------------------------|
| <input type="radio"/> Under 18 | <input type="radio"/> 45-54 |
| <input type="radio"/> 18-24 | <input type="radio"/> 55-64 |
| <input type="radio"/> 25-34 | <input type="radio"/> 65+ |
| <input type="radio"/> 35-44 | |

Reasonable Patient Care - Phone

Gender

Page 2 of 16

2. Gender

- Male
- Female

Reasonable Patient Care - Phone

Education

Page 3 of 16

3. Education

- HS Grad
 College Grad

Advance Degree

Reasonable Patient Care - Phone

Race/Ethnicity

Page 4 of 16

4. Race/Ethnicity

- White or Caucasian
 Black or African American
 Hispanic or Latino
 Asian or Asian American
- American Indian or Alaska Native
 Native Hawaiian or other Pacific Islander
 Another race

Reasonable Patient Care - Phone

Worked in Hospital

Page 5 of 16

5. Have you worked in a hospital?

- Yes
 No
- If Yes, your job was:

Reasonable Patient Care - Phone

Alternatives/Risks/Benefits

Page 6 of 16

1 6. Would you like to know all your treatment choices, including alternatives and risks and benefits of each
2 choice for a patient like you. Your choices may include invasive procedures (surgery, endoscopic
3 procedures, insertion of a medical device), non-invasive treatments, and what happens if you do nothing?
4

- 5 Definitely no Probably yes
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7 Probably no Definitely yes
8
9 Neutral
10

Reasonable Patient Care - Phone

Drugs

Page 7 of 16

21 7. Drugs that have not been approved by the Food and Drug Administration for your condition are off-label
22 for you. Drugs prescribed off-label are about twice as likely to cause serious side-effects as drugs
23 prescribed on-label. Would you like to know if any drugs prescribed to you are off-label, and what their side
24 effects may be?
25

- 26
27 Definitely no Probably yes
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29 Probably no Definitely yes
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31 Neutral
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Reasonable Patient Care - Phone

Drugs Assigned "Black Box" Warning

Page 8 of 16

43 8. Drugs assigned a "black box" warning by the FDA pose an especially serious risk of harm. If you are
44 prescribed such a drug, would you want to know the reasons for the black box warning and if there are
45 alternatives before you take it?
46

- 47
48 Definitely no Probably yes
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50 Probably no Definitely yes
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52 Neutral
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Reasonable Patient Care - Phone

Decisions Aids

Page 9 of 16

9. Decision aids are created to assist patients with complex medical decisions and to help them understand the risks and benefits of treatment options. If there is a decision-aid available for your illness, would you like to review it?

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Considering Invasive Procedure

Page 10 of 16

10. If you are considering an invasive procedure, would you like to know who will be performing it, their skill level, and how trainee doctors, if any, will be involved?

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Out-Of-Pocket Costs

Page 11 of 16

11. Assuming you have decided on a procedure or treatment, would you like to know what your total, out-of-pocket costs will be?

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Family Member as Advocate

Page 12 of 16

12. You have a trusted family member that is willing to act as your advocate. Would you like for that person to be present during shared-decision-making about your medical care?

- Definitely no Probably yes
 Probably no Definitely yes
 Neutral

Reasonable Patient Care - Phone

Make Entries In Medical Records

Page 13 of 16

13. If you are well enough, would you like to be offered a chance to review and make entries in your medical records each day while you are hospitalized?

- Definitely no Probably yes
 Probably no Definitely yes
 Neutral

Reasonable Patient Care - Phone

Documents Permitting Invasive Procedures

Page 14 of 16

14. Before signing any documents permitting invasive, non-emergency procedures would you like to review these at least one full day in advance of the procedure?

- Definitely no Probably yes
 Probably no Definitely yes
 Neutral

Reasonable Patient Care - Phone

Expected Difficulties /Recovery Times/Restrictions

Page 15 of 16

15. If you are considering an invasive procedure, would you like to know your expected difficulties, recovery times, pain management options, and restrictions after the procedure while hospitalized and after discharge from the hospital? This includes the risk of infection from the invasive procedure.

- Definitely no Probably yes
- Probably no Definitely yes
- Neutral

Reasonable Patient Care - Phone

Other Comments

Page 16 of 16

16. What else would you like to know as a reasonable patient?

For peer review only

Reasonable Patient 3

Reasonable Patient Care Survey

You are hospitalized in a large, urban, teaching hospital after being brought into its emergency room last night. The condition that brought you to the ER has been stabilized, but additional procedures may be necessary. The following 10 questions determine what you would like to know as a reasonable patient. The survey should take no more than 5 minutes.

- * 1. Would you like to know all your treatment choices, including alternatives and risks and benefits of each choice for a patient like you. Your choices may include invasive procedures (surgery, endoscopic procedures, insertion of a medical device), non-invasive treatments, and what happens if you do nothing?

1=definitely no 2=probably no 3=neutral 4=probably yes 5=definitely yes

- * 2. Drugs that have not been approved by the Food and Drug Administration for your condition are off-label for you. Drugs prescribed off-label are about twice as likely to cause serious side-effects as drugs prescribed on-label. Would you like to know if any drugs prescribed to you are off-label, and what their side effects may be?

1=definitely no 2=probably no 3=neutral 4=probably yes 5=definitely yes

- * 3. Drugs assigned a "black box" warning by the FDA pose an especially serious risk of harm. If you are prescribed such a drug, would you want to know the reasons for the black box warning and if there are alternatives before you take it?

1=definitely no 2=probably no 3=neutral 4=probably yes 5=definitely yes

- * 4. Decision aids are created to assist patients with complex medical decisions and to help them understand the risks and benefits of treatment options. If there is a decision-aid available for your illness, would you like to review it?

1=definitely no 2=probably no 3=neutral 4=probably yes 5=definitely yes

- * 5. If you are considering an invasive procedure, would you like to know who will be performing it, their skill level, and how trainee doctors, if any, will be involved?

1=definitely no 2=probably no 3=neutral 4=probably yes 5=definitely yes

1 * 6. Assuming you have decided on a procedure or treatment, would you like to know what your total, out-of-
2 pocket costs will be?

3 1-definitely no 2-probably no 3-neutral 4-probably yes 5-definitely yes

7
8 * 7. You have a trusted family member that is willing to act as your advocate. Would you like for that person
9 to be present during shared-decision-making about your medical care?

10 1-definitely no 2-probably no 3-neutral 4-probably yes 5-definitely yes

14
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16 * 8. If you are well enough, would you like to be offered a chance to review and make entries in your medical
17 records each day while you are hospitalized?

18 1-definitely no 2-probably no 3-neutral 4-probably yes 5-definitely yes

22
23 * 9. Before signing any documents permitting invasive, non-emergency procedures would you like to review
24 these at least one full day in advance of the procedure?

25 1-definitely no 2-probably no 3-neutral 4-probably yes 5-definitely yes

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31 * 10. If you are considering an invasive procedure, would you like to know your expected difficulties,
32 recovery times, pain management, and restrictions after the procedure while hospitalized and after
33 discharge from the hospital? This includes the risk of infection from the invasive procedure.

34 1-definitely no 2-probably no 3-neutral 4-probably yes 5-definitely yes

Table 1. Comparative demographics of targeted groups

Demographic measure	Student Nurses (n = 77)	HPESS Community (n = 63)	p-Value
Under 35 years of age	76.7%	3.2%	0.0000
Female	77.9%	69.8%	0.2755
High school graduate	33.8%	1.6%	0.0000
College graduate	64.9%	4.8%	0.0000
Advanced degree	1.3%	90.5%	0.0000
White or Caucasian	50.6%	84.1%	0.0000
Black or African American	15.6%	3.2%	0.0151
Hispanic or Latino	26.0%	1.6%	0.0001
Asian	3.9%	6.3%	0.5161
Have worked in a hospital	35.1%	85.7%	0.0000

Under 35 years of age

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. prtesti 77 .767 63 .032
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Two-sample test of proportions          x: Number of obs = 77
                                         y: Number of obs = 63
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Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.767	.0481759			.6725769 .8614231
y	.032	.0221739			-.0114601 .0754601
diff	.735	.053034			.6310553 .8389447
under Ho:		.084248	8.72	0.000	

```
diff = prop(x) - prop(y)              z = 8.7242
Ho: diff = 0
```

```
Ha: diff < 0          Ha: diff != 0          Ha: diff > 0
Pr(Z < z) = 1.0000    Pr(|Z| > |z|) = 0.0000    Pr(Z > z) = 0.0000
```

Female.

```
. prtesti 77 .779 63 .698
```

```
Two-sample test of proportions          x: Number of obs = 77
                                         y: Number of obs = 63
```

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.779	.0472846			.6863239 .8716761
y	.698	.0578443			.5846272 .8113728
diff	.081	.0747114			-.0654317 .2274317
under Ho:		.0742776	1.09	0.275	

```
diff = prop(x) - prop(y)              z = 1.0905
Ho: diff = 0
```

```
Ha: diff < 0          Ha: diff != 0          Ha: diff > 0
Pr(Z < z) = 0.8623    Pr(|Z| > |z|) = 0.2755    Pr(Z > z) = 0.1377
```

High school graduate

. prtesti 77 .338 63 .016

Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.338	.0539066			.232345 .443655
y	.016	.0158084			-.0149838 .0469838
diff	.322	.0561767	4.80	0.000	.2118956 .4321044
	under Ho:	.0670578			

diff = prop(x) - prop(y) z = 4.8018
 Ho: diff = 0

Ha: diff < 0 Pr(Z < z) = 1.0000
 Ha: diff != 0 Pr(|Z| > |z|) = 0.0000
 Ha: diff > 0 Pr(Z > z) = 0.0000

College graduate

. prtesti 77 .649 63 .048

Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.649	.0543914			.5423947 .7556053
y	.048	.026932			-.0047858 .1007858
diff	.601	.060694	7.29	0.000	.4820419 .7199581
	under Ho:	.0823973			

diff = prop(x) - prop(y) z = 7.2939
 Ho: diff = 0

Ha: diff < 0 Pr(Z < z) = 1.0000
 Ha: diff != 0 Pr(|Z| > |z|) = 0.0000
 Ha: diff > 0 Pr(Z > z) = 0.0000

Advanced degree

. prtesti 77 .013 63 .905

Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.013	.0129088			-.0123007 .0383007
y	.905	.0369416			.8325958 .9774042
diff	-.892	.0391321	-10.66	0.000	-.9686974 -.8153026
	under Ho:	.0836872			

diff = prop(x) - prop(y) z = -10.6587
 Ho: diff = 0

Ha: diff < 0 Pr(Z < z) = 0.0000
 Ha: diff != 0 Pr(|Z| > |z|) = 0.0000
 Ha: diff > 0 Pr(Z > z) = 1.0000

1
2
3 **. White or Caucasian**

4 . . prtesti 77 .506 63 .841

5 Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.506	.0569762			.3943287 .6176713
y	.841	.0460709			.7507028 .9312972
diff	-.335	.0732722			-.4786108 -.1913892
	under Ho:	.0806592	-4.15	0.000	

diff = prop(x) - prop(y)

z = -4.1533

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0

Ha: diff > 0

Pr(Z < z) = 0.0000

Pr(|Z| > |z|) = 0.0000

Pr(Z > z) = 1.0000

18
19
20 **. . Black or African American**

21 . prtesti 77 .156 63 .032

22 Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.156	.0413512			.0749531 .2370469
y	.032	.0221739			-.0114601 .0754601
diff	.124	.0469213			.032036 .215964
	under Ho:	.05101	2.43	0.015	

diff = prop(x) - prop(y)

z = 2.4309

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0

Ha: diff > 0

Pr(Z < z) = 0.9925

Pr(|Z| > |z|) = 0.0151

Pr(Z > z) = 0.0075

35
36
37 **. Hispanic or Latino**

38 . prtesti 77 .260 63 .016

39 Two-sample test of proportions

x: Number of obs = 77

y: Number of obs = 63

Variable	Mean	Std. Err.	z	P> z	[95% Conf. Interval]
x	.26	.049987			.1620273 .3579727
y	.016	.0158084			-.0149838 .0469838
diff	.244	.0524272			.1412447 .3467553
	under Ho:	.0606934	4.02	0.000	

diff = prop(x) - prop(y)

z = 4.0202

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0

Ha: diff > 0

Pr(Z < z) = 1.0000

Pr(|Z| > |z|) = 0.0001

Pr(Z > z) = 0.0000

Nurse-Student Statistics Report

Summary

- Question – For each of the questions, 1-10, is there a difference in the average response by age?
Answer – NO, there are no significant differences among age groups in their responses to any of the 10 questions.
- Question – For each of the questions, 1-10, is there a difference in the average response by gender?
Answer – NO, there are no significant differences between the genders in their responses to any of the 10 questions.
- Question – For each of the questions, 1-10, is there a difference in the average response by level of education?
Answer – NO, there are no significant differences among the education levels in their responses to any of the 10 questions.
- Question: For each of the questions, is there a difference in the average response based upon racer or ethnicity?
Answer – YES, for questions 1, 5, and 6,

```
. dunntest iq1, by(ieth) ma(bh) wrap
K-Wallis probability = 0.0038
```

Dunn's Pairwise Comparison of iq1 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	3.061273 0.0110			
3	-0.085671 0.5176	-1.871072 0.0613		
4	-0.166771 0.5422	-2.646096 0.0204	0.000000 0.5000	
7	2.553091 0.0178	-0.755791 0.3213	1.387066 0.1379	2.097047 0.0450

```
False Discovery Rate = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
. dunntest iq5, by(ieth) ma(bh) wrap
K-Wallis probability = 0.0001
```

Dunn's Pairwise Comparison of iq5 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	1.713447 0.0866			
3	2.264929 0.0294	0.858920 0.2440		
4	-0.476526 0.3521	-1.710491 0.0726	-2.265841 0.0391	
7	4.334614	1.465931	0.247897	3.691637

| 0.0001 0.1019 0.4021 0.0006

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq6, by(ieth) ma(bh) wrap
 Kwallis probability = 0.0245

Dunn's Pairwise Comparison of iq6 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	0.459251			
	0.3589			
3	-0.624727	-0.785168		
	0.3326	0.3088		
4	-1.215526	-1.110396	0.000000	
	0.2242	0.2224	0.5000	
7	2.934536	1.546239	2.055206	3.107180
	0.0084	0.1526	0.0664	0.0094

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

- Question – For each of the questions, 1-10, is there a difference in the average response if respondent is or was a hospital worker?

Answer – NO, there are no significant differences among groups, based upon hospital work experience, in their responses to any of the 10 questions.

Statistics

- Question – For each of the questions, 1-10, is there a difference in the average response by age among those who identified their age group?

. dunntest iq1, by(iage) ma(bh) wrap
 Warning: by() values are unlabeled, option nolabel implicit
 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	67.00
4	12	402.00
5	14	405.50
6	25	806.50
7	10	335.00

chi-squared = 0.550 with 4 d.f.
 probability = 0.9685
 chi-squared with ties = 4.037 with 4 d.f.
 probability = 0.4010

Dunn's Pairwise Comparison of iq1 by iage
 (Benjamini-Hochberg)

Col Mean-	3	4	5	6
Row Mean				
4	0.000000			

```

1         |      0.6250
2         |
3         |
4         |      0.887093   1.704583
5         |      0.4688     0.4414
6         |
7         |      0.249476   0.522019   -1.459674
8         |      0.5736     0.6017     0.2406
9         |
10        |
11        |      0.000000   0.000000   -1.619603   -0.489962
12        |      0.5556     0.5000     0.2633     0.5201
13
14 False Discovery Rate = 0.05
15 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
16
17 .
18 . dunntest iq2, by(iage) ma(bh) wrap
19
20 Warning: by() values are unlabeled, option nolabel implicit
21
22 Kruskal-Wallis equality-of-populations rank test
23
24 +-----+
25 | iage | Obs | Rank Sum |
26 +-----+
27 | 3 | 2 | 57.00 |
28 | 4 | 12 | 320.50 |
29 | 5 | 14 | 396.50 |
30 | 6 | 25 | 857.50 |
31 | 7 | 10 | 384.50 |
32 +-----+
33
34 chi-squared = 3.269 with 4 d.f.
35 probability = 0.5139
36
37 chi-squared with ties = 4.720 with 4 d.f.
38 probability = 0.3173
39
40
41
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```

Dunn's Pairwise Comparison of iq2 by iage
(Benjamini-Hochberg)

Col Mean-				
Row Mean		3	4	5
4	0.153782			
	0.4877			
5	0.015486	-0.268804		
	0.4938	0.4926		
6	-0.517415	-1.417114	-1.174105	
	0.4320	0.2607	0.3004	
7	-0.842084	-1.797699	-1.603668	-0.727096
	0.3997	0.3611	0.2720	0.3893

```

42 False Discovery Rate = 0.05
43 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
44
45 .
46 . dunntest iq3, by(iage) ma(bh) wrap
47
48 Warning: by() values are unlabeled, option nolabel implicit
49
50 Kruskal-Wallis equality-of-populations rank test
51
52 +-----+
53 | iage | Obs | Rank Sum |
54 +-----+
55 | 3 | 2 | 20.00 |
56 | 4 | 12 | 428.00 |
57 | 5 | 14 | 405.50 |
58 | 6 | 25 | 806.00 |
59 | 7 | 10 | 356.50 |
60 +-----+
61
62 chi-squared = 4.146 with 4 d.f.
63 probability = 0.3866

```

1 chi-squared with ties = 8.316 with 4 d.f.
 2 probability = 0.0807

3
 4 Dunn's Pairwise Comparison of iq3 by iage
 5 (Benjamini-Hochberg)

Col Mean-	Row Mean	3	4	5	6
4		-2.596467			
		0.0471			
5		-1.938328	1.316342		
		0.0657	0.1881		
6		-2.338350	0.753882	-0.758192	
		0.0323	0.2818	0.3202	
7		-2.558488	0.003007	-1.247607	-0.704145
		0.0263	0.4988	0.1768	0.2674

16 False Discovery Rate = 0.05
 17 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

19 .
 20 . dunntest iq4, by(iage) ma(bh) wrap

21 Warning: by() values are unlabeled, option nolabel implicit

23 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	52.50
4	12	305.00
5	14	419.50
6	25	854.50
7	10	384.50

32 chi-squared = 3.509 with 4 d.f.
 33 probability = 0.4765

35 chi-squared with ties = 5.484 with 4 d.f.
 36 probability = 0.2411

38 Dunn's Pairwise Comparison of iq4 by iage
 39 (Benjamini-Hochberg)

Col Mean-	Row Mean	3	4	5	6
4		0.074414			
		0.4703			
5		-0.335113	-0.788405		
		0.4097	0.3587		
6		-0.735992	-1.701869	-0.861331	
		0.2886	0.2219	0.3891	
7		-1.074190	-2.076021	-1.397796	-0.778325
		0.3534	0.1895	0.2703	0.3117

50 False Discovery Rate = 0.05
 51 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

53 .
 54 . dunntest iq5, by(iage) ma(bh) wrap

55 Warning: by() values are unlabeled, option nolabel implicit

57 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
3	2	52.50
4	12	305.00
5	14	419.50
6	25	854.50
7	10	384.50

	iage	Obs	Rank Sum
1	3	2	39.50
2	4	12	326.00
3	5	14	419.50
4	6	25	861.00
5	7	10	370.00

chi-squared = 3.087 with 4 d.f.
probability = 0.5433

chi-squared with ties = 7.650 with 4 d.f.
probability = 0.1053

Dunn's Pairwise Comparison of iq5 by iage
(Benjamini-Hochberg)

Col Mean-	3	4	5	6
Row Mean				
4	-0.833898			
	0.2527			
5	-1.160351	-0.610687		
	0.2049	0.3008		
6	-1.716672	-1.778507	-1.151401	
	0.1075	0.1255	0.1783	
7	-1.912387	-1.972161	-1.459248	-0.587541
	0.1396	0.2430	0.1445	0.2784

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunnstest iq6, by(iage) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

	iage	Obs	Rank Sum
35	3	2	83.00
36	4	12	402.50
37	5	14	380.00
38	6	25	742.50
39	7	9	345.00

chi-squared = 3.125 with 4 d.f.
probability = 0.5372

chi-squared with ties = 4.632 with 4 d.f.
probability = 0.3272

Dunn's Pairwise Comparison of iq6 by iage
(Benjamini-Hochberg)

Col Mean-	3	4	5	6
Row Mean				
4	0.703165			
	0.3012			
5	1.281683	1.097642		
	0.3333	0.3405		
6	1.083624	0.738198	-0.516952	
	0.2785	0.3837	0.3362	
7	0.273361	-0.733301	-1.767517	-1.498732
	0.3923	0.3310	0.3857	0.3349

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

```
. dunntest iq7, by(iage) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 3 | 2 | 18.00 |
| 4 | 12 | 342.00 |
| 5 | 14 | 476.00 |
| 6 | 25 | 827.00 |
| 7 | 10 | 353.00 |
+-----+
```

chi-squared = 4.164 with 4 d.f.
 probability = 0.3843

chi-squared with ties = 5.665 with 4 d.f.
 probability = 0.2256

Dunn's Pairwise Comparison of iq7 by iage
 (Benjamini-Hochberg)

Col Mean-					
Row Mean		3	4	5	6
4	-1.624636				
	0.1303				
5	-2.104451	-0.889632			
	0.0883	0.3114			
6	-2.085160	-0.829861	0.175376		
	0.0618	0.2904	0.4304		
7	-2.160529	-1.010574	-0.199794	-0.377545	
	0.1537	0.3122	0.4676	0.4411	

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

```
. dunntest iq8, by(iage) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 3 | 2 | 62.00 |
| 4 | 12 | 319.50 |
| 5 | 14 | 441.00 |
| 6 | 25 | 806.50 |
| 7 | 10 | 387.00 |
+-----+
```

chi-squared = 2.389 with 4 d.f.
 probability = 0.6646

chi-squared with ties = 2.751 with 4 d.f.
 probability = 0.6003

Dunn's Pairwise Comparison of iq8 by iage
 (Benjamini-Hochberg)

Col Mean-					
Row Mean		3	4	5	6
4	0.335334				
	0.5267				

```

1      5 | -0.038721 -0.725439
2      |      0.4846  0.4682
3      6 | -0.100377 -0.939317 -0.133283
4      |      0.5111  0.4345  0.5587
5      7 | -0.581934 -1.650916 -1.018004 -1.007582
6      |      0.4672  0.4938  0.7717  0.5228
7
8 False Discovery Rate = 0.05
9 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
10
11 .
12 . dunntest iq9, by(iage) ma(bh) wrap
13
14 Warning: by() values are unlabeled, option nolabel implicit
15
16 Kruskal-Wallis equality-of-populations rank test
17
18 +-----+
19 | iage | Obs | Rank Sum |
20 |-----+-----|
21 | 3 | 2 | 58.00 |
22 | 4 | 12 | 289.50 |
23 | 5 | 14 | 451.00 |
24 | 6 | 25 | 843.50 |
25 | 7 | 10 | 374.00 |
26 +-----+
27
28 chi-squared = 3.363 with 4 d.f.
29 probability = 0.4989
30
31 chi-squared with ties = 4.008 with 4 d.f.
32 probability = 0.4049
33
34
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```

Dunn's Pairwise Comparison of iq9 by iage
(Benjamini-Hochberg)

Col Mean-	3	4	5	6
Row Mean				
4	0.380111			
	0.4399			
5	-0.253220	-1.224538		
	0.4000	0.3679		
6	-0.384128	-1.630434	-0.272188	
	0.5006	0.2575	0.4364	
7	-0.645800	-1.846324	-0.745866	-0.582520
	0.5184	0.3242	0.5697	0.4668

```

41 False Discovery Rate = 0.05
42 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
43
44 .
45 . dunntest iq10, by(iage) ma(bh) wrap
46
47 Warning: by() values are unlabeled, option nolabel implicit
48
49 Kruskal-Wallis equality-of-populations rank test
50
51 +-----+
52 | iage | Obs | Rank Sum |
53 |-----+-----|
54 | 3 | 2 | 70.00 |
55 | 4 | 12 | 389.00 |
56 | 5 | 14 | 394.00 |
57 | 6 | 25 | 813.00 |
58 | 7 | 10 | 350.00 |
59 +-----+
60
61 chi-squared = 0.968 with 4 d.f.
62 probability = 0.9147

```

chi-squared with ties = 3.737 with 4 d.f.
 probability = 0.4428

Dunn's Pairwise Comparison of iq10 by iage
 (Benjamini-Hochberg)

Col Mean-	3	4	5	6
Row Mean				
4	0.362629			
	0.5121			
5	0.972529	1.164725		
	0.4135	0.4069		
6	0.361822	-0.031546	-1.405830	
	0.4484	0.5416	0.3994	
7	0.000000	-0.646845	-1.775587	-0.710605
	0.5000	0.4314	0.3790	0.4773

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

- Question – For each of the questions, 1-10, is there a difference in the average response by gender?

```
. dunntest iq1, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	636.50
2	44	1379.50

chi-squared = 0.182 with 1 d.f.
 probability = 0.6695

chi-squared with ties = 1.338 with 1 d.f.
 probability = 0.2474

Dunn's Pairwise Comparison of iq1 by igender
 (No adjustment)

Col Mean-	1
Row Mean	
2	1.156689
	0.1237

alpha = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq2, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	565.00
2	44	1451.00

chi-squared = 0.415 with 1 d.f.
 probability = 0.5196

chi-squared with ties = 0.599 with 1 d.f.
 probability = 0.4390

Dunn's Pairwise Comparison of iq2 by igender
 (No adjustment)

Col Mean-	Row Mean	1
2	-0.773826	
	0.2195	

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq3, by(igender)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	629.00
2	44	1387.00

chi-squared = 0.099 with 1 d.f.

probability = 0.7531

chi-squared with ties = 0.198 with 1 d.f.

probability = 0.6560

Dunn's Pairwise Comparison of iq3 by igender
 (No adjustment)

Col Mean-	Row Mean	1
2	0.445408	
	0.3280	

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq4, by(igender)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	534.50
2	44	1481.50

chi-squared = 1.212 with 1 d.f.

probability = 0.2710

chi-squared with ties = 1.894 with 1 d.f.

probability = 0.1688

Dunn's Pairwise Comparison of iq4 by igender
 (No adjustment)

Col Mean-	Row Mean	1
2	-1.376105	
	0.0844	

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq5, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| igender | Obs | Rank Sum |
+-----+-----+
|         1 | 19 |    614.50 |
|         2 | 44 |   1401.50 |
+-----+-----+
```

chi-squared = 0.009 with 1 d.f.
probability = 0.9225

chi-squared with ties = 0.023 with 1 d.f.
probability = 0.8782

Dunn's Pairwise Comparison of iq5 by igender
(No adjustment)

```
Col Mean-|
Row Mean |          1
-----+-----
      2 |    0.153230
      |    0.4391
```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq6, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| igender | Obs | Rank Sum |
+-----+-----+
|         1 | 19 |    587.50 |
|         2 | 43 |   1365.50 |
+-----+-----+
```

chi-squared = 0.028 with 1 d.f.
probability = 0.8666

chi-squared with ties = 0.042 with 1 d.f.
probability = 0.8380

Dunn's Pairwise Comparison of iq6 by igender
(No adjustment)

```
Col Mean-|
Row Mean |          1
-----+-----
      2 |   -0.204490
      |    0.4190
```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq7, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| igender | Obs | Rank Sum |
+-----+-----+
```

```

1      |      1 | 19 | 551.00 |
2      |      2 | 44 | 1465.00 |
3      +-----+
4      chi-squared =      0.729 with 1 d.f.
5      probability =      0.3933
6
7      chi-squared with ties =      0.991 with 1 d.f.
8      probability =      0.3194
9
10     Dunn's Pairwise Comparison of iq7 by igender
11     (No adjustment)
12
13     Col Mean-|
14     Row Mean |      1
15     +-----+
16     |      2 | -0.995685
17     |      | 0.1597
18
19     alpha =      0.05
20     Reject Ho if p = P(Z <= |z|) <= alpha/2
21
22     . dunntest iq8, by(igender)
23
24     Warning: by() values are unlabeled, option nolabel implicit
25
26     Kruskal-Wallis equality-of-populations rank test
27
28     +-----+
29     | igender | Obs | Rank Sum |
30     +-----+
31     |      1 | 19 | 561.00 |
32     |      2 | 44 | 1455.00 |
33     +-----+
34
35     chi-squared =      0.495 with 1 d.f.
36     probability =      0.4815
37
38     chi-squared with ties =      0.570 with 1 d.f.
39     probability =      0.4501
40
41     Dunn's Pairwise Comparison of iq8 by igender
42     (No adjustment)
43
44     Col Mean-|
45     Row Mean |      1
46     +-----+
47     |      2 | -0.755307
48     |      | 0.2250
49
50     alpha =      0.05
51     Reject Ho if p = P(Z <= |z|) <= alpha/2
52
53     . dunntest iq9, by(igender)
54
55     Warning: by() values are unlabeled, option nolabel implicit
56
57     Kruskal-Wallis equality-of-populations rank test
58
59     +-----+
60     | igender | Obs | Rank Sum |
61     +-----+
62     |      1 | 19 | 491.00 |
63     |      2 | 44 | 1525.00 |
64     +-----+
65
66     chi-squared =      3.070 with 1 d.f.
67     probability =      0.0797
68
69     chi-squared with ties =      3.658 with 1 d.f.
70     probability =      0.0558
71
72     Dunn's Pairwise Comparison of iq9 by igender
73     (No adjustment)
74
75     For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

```

```

Col Mean-|
Row Mean |          1
-----+-----
      2 | -1.912701
      |      0.0279

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunntest iq10, by(igender)
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| igender | Obs | Rank Sum |
+-----+-----+
|      1 | 19 |   603.00 |
|      2 | 44 |  1413.00 |
+-----+-----+

chi-squared = 0.006 with 1 d.f.
probability = 0.9403

chi-squared with ties = 0.022 with 1 d.f.
probability = 0.8830

```

Dunn's Pairwise Comparison of iq10 by igender
(No adjustment)

```

Col Mean-|
Row Mean |          1
-----+-----
      2 | -0.147156
      |      0.4415

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2

```

-
- Question – For each of the questions, 1-10, is there a difference in the average response [by level of education](#)

```

. dunntest iq1, by(ied) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

```

+-----+
| ied | Obs | Rank Sum |
+-----+-----+
|  1 |  1 |   32.50 |
|  2 |  3 |   97.50 |
|  3 | 57 |  1761.00 |
+-----+-----+

chi-squared = 0.031 with 2 d.f.
probability = 0.9848

chi-squared with ties = 0.218 with 2 d.f.
probability = 0.8969

```

Dunn's Pairwise Comparison of iq1 by ied
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          1          2
-----+-----+
      2 | 0.000000
      | 0.5000
      |
      3 | 0.239229  0.407392
      | 0.6082   1.0000

```

```

1  False Discovery Rate = 0.05
2  Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
3  .
4  . dunntest iq2, by(ied) ma(bh) wrap
5  Warning: by() values are unlabeled, option nolabel implicit
6
7  Kruskal-Wallis equality-of-populations rank test
8
9  +-----+
10 | ied | Obs | Rank Sum |
11 |-----+-----+-----|
12 | 1 | 1 | 40.50 |
13 | 2 | 3 | 121.50 |
14 | 3 | 57 | 1729.00 |
15 |-----+-----+-----|
16
17 chi-squared = 1.226 with 2 d.f.
18 probability = 0.5418
19
20 chi-squared with ties = 1.853 with 2 d.f.
21 probability = 0.3959
22
23 Dunn's Pairwise Comparison of iq2 by ied
24 (Benjamini-Hochberg)
25
26 Col Mean-|
27 Row Mean | 1 2
28 -----+-----
29 2 | 0.000000
30 | 0.5000
31 |
32 3 | 0.698004 1.188657
33 | 0.3639 0.3519
34
35 False Discovery Rate = 0.05
36 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
37 .
38 . dunntest iq3, by(ied) ma(bh) wrap
39 Warning: by() values are unlabeled, option nolabel implicit
40
41 Kruskal-Wallis equality-of-populations rank test
42
43 +-----+
44 | ied | Obs | Rank Sum |
45 |-----+-----+-----|
46 | 1 | 1 | 36.50 |
47 | 2 | 3 | 109.50 |
48 | 3 | 57 | 1745.00 |
49 |-----+-----+-----|
50
51 chi-squared = 0.411 with 2 d.f.
52 probability = 0.8143
53
54 chi-squared with ties = 0.917 with 2 d.f.
55 probability = 0.6323
56
57 Dunn's Pairwise Comparison of iq3 by ied
58 (Benjamini-Hochberg)
59
60 Col Mean-|
61 Row Mean | 1 2
62 -----+-----
63 2 | 0.000000
64 | 0.5000
65 |
66 3 | 0.490961 0.836076
67 | 0.4676 0.6047
68
69 False Discovery Rate = 0.05
70 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
71 .

```

```
. dunnstest iq4, by(ied) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| ied | Obs | Rank Sum |
+-----+
| 1 | 1 | 40.00 |
| 2 | 3 | 120.00 |
| 3 | 57 | 1731.00 |
+-----+
```

```
chi-squared = 1.100 with 2 d.f.
probability = 0.5769
```

```
chi-squared with ties = 1.741 with 2 d.f.
probability = 0.4187
```

```
Dunn's Pairwise Comparison of iq4 by ied
(Benjamini-Hochberg)
```

Col Mean-	1	2
Row Mean		

2	0.000000	
	0.5000	
3	0.676626	1.152253
	0.3740	0.3738

```
False Discovery Rate = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
. dunnstest iq5, by(ied) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| ied | Obs | Rank Sum |
+-----+
| 1 | 1 | 35.50 |
| 2 | 3 | 73.50 |
| 3 | 57 | 1782.00 |
+-----+
```

```
chi-squared = 0.479 with 2 d.f.
probability = 0.7870
```

```
chi-squared with ties = 1.261 with 2 d.f.
probability = 0.5323
```

```
Dunn's Pairwise Comparison of iq5 by ied
(Benjamini-Hochberg)
```

Col Mean-	1	2
Row Mean		

2	0.870715	
	0.2879	
3	0.383900	-1.043578
	0.3505	0.4450

```
False Discovery Rate = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
. dunnstest iq6, by(ied) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

Kruskal-Wallis equality-of-populations rank test

```

1
2 +-----+
3 | ied | Obs | Rank Sum |
4 | 1 | 1 | 40.50 |
5 | 2 | 3 | 94.00 |
6 | 3 | 56 | 1695.50 |
7 +-----+
8 chi-squared = 0.344 with 2 d.f.
9 probability = 0.8420
10 chi-squared with ties = 0.500 with 2 d.f.
11 probability = 0.7788

```

Dunn's Pairwise Comparison of iq6 by ied
(Benjamini-Hochberg)

Col Mean-	Row Mean	1	2
2	0.548145		
	0.4377		
3	0.699677	0.123104	
	0.7262	0.4510	

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq7, by(ied) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

29 +-----+
30 | ied | Obs | Rank Sum |
31 | 1 | 1 | 42.50 |
32 | 2 | 3 | 99.50 |
33 | 3 | 57 | 1749.00 |
34 +-----+
35 chi-squared = 0.482 with 2 d.f.
36 probability = 0.7857
37 chi-squared with ties = 0.659 with 2 d.f.
38 probability = 0.7194

```

Dunn's Pairwise Comparison of iq7 by ied
(Benjamini-Hochberg)

Col Mean-	Row Mean	1	2
2	0.532085		
	0.4460		
3	0.771080	0.275878	
	0.6610	0.3913	

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq8, by(ied) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

57 +-----+
58 | ied | Obs | Rank Sum |
59 |-----+-----+-----+

```

```

1 | 1 | 1 | 47.00 |
1 | 2 | 3 | 120.50 |
2 | 3 | 57 | 1723.50 |
+-----+

```

```

4 chi-squared = 1.717 with 2 d.f.
5 probability = 0.4237

```

```

6 chi-squared with ties = 1.981 with 2 d.f.
7 probability = 0.3713

```

Dunn's Pairwise Comparison of iq8 by ied
(Benjamini-Hochberg)

```

11 Col Mean-|
12 Row Mean |          1          2
13 -----+-----
14 2 | 0.358033
15 | 0.3602
16 3 | 1.005400 1.014200
17 | 0.2360 0.4657

```

```

17 False Discovery Rate = 0.05

```

```

18 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

20 . dunntest iq9, by(ied) ma(bh) wrap

```

```

22 Warning: by() values are unlabeled, option nolabel implicit

```

```

24 Kruskal-Wallis equality-of-populations rank test

```

```

26 +-----+
27 | ied | Obs | Rank Sum |
28 |----+----+----|
29 | 1 | 1 | 45.50 |
30 | 2 | 3 | 136.50 |
31 | 3 | 57 | 1709.00 |
32 +-----+

```

```

32 chi-squared = 2.856 with 2 d.f.
33 probability = 0.2398

```

```

34 chi-squared with ties = 3.409 with 2 d.f.
35 probability = 0.1819

```

Dunn's Pairwise Comparison of iq9 by ied
(Benjamini-Hochberg)

```

39 Col Mean-|
40 Row Mean |          1          2
41 -----+-----
42 2 | 0.000000
43 | 0.5000
44 3 | 0.946695 1.612164
45 | 0.2578 0.1604

```

```

45 False Discovery Rate = 0.05

```

```

46 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

48 . dunntest iq10, by(ied) ma(bh) wrap

```

```

50 Warning: by() values are unlabeled, option nolabel implicit

```

```

52 Kruskal-Wallis equality-of-populations rank test

```

```

54 +-----+
55 | ied | Obs | Rank Sum |
56 |----+----+----|
57 | 1 | 1 | 33.50 |
58 | 2 | 3 | 100.50 |
59 | 3 | 57 | 1757.00 |
60 +-----+

```



```
chi-squared = 0.085 with 2 d.f.
probability = 0.9584
```

```
chi-squared with ties = 0.375 with 2 d.f.
probability = 0.8288
```

Dunn's Pairwise Comparison of iq10 by ied
(Benjamini-Hochberg)

Col Mean-			
Row Mean		1	2
2	0.000000		
	0.5000		
3	0.314214	0.535088	
	0.5650	0.8889	

```
False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

- Question: For each of the questions, is there a difference in the average response based upon racer or ethnicity

```
. dunntest iq1, by(ieth) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

ieth	Obs	Rank Sum
1	53	1744.50
2	2	36.00
3	1	33.50
4	4	134.00
7	3	68.00

```
chi-squared = 2.110 with 4 d.f.
probability = 0.7155
```

```
chi-squared with ties = 15.496 with 4 d.f.
probability = 0.0038
```

Dunn's Pairwise Comparison of iq1 by ieth
(Benjamini-Hochberg)

Col Mean-				
Row Mean		1	2	3
2	3.061273			
	0.0110			
3	-0.085671	-1.871072		
	0.5176	0.0613		
4	-0.166771	-2.646096	0.000000	
	0.5422	0.0204	0.5000	
7	2.553091	-0.755791	1.387066	2.097047
	0.0178	0.3213	0.1379	0.0450

```
False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
. dunntest iq2, by(ieth) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
```

ieth	Obs	Rank Sum
1	53	1798.50
2	2	48.00
3	1	2.00
4	4	77.00
7	3	90.50

chi-squared = 5.615 with 4 d.f.
 probability = 0.2298

chi-squared with ties = 8.107 with 4 d.f.
 probability = 0.0877

Dunn's Pairwise Comparison of iq2 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	0.904070			
	0.2614			
3	2.073966	1.177565		
	0.1904	0.2987		
4	1.856443	0.359560	-1.011444	
	0.1585	0.3596	0.3118	
7	0.416143	-0.442842	-1.599094	-0.937000
	0.3763	0.4112	0.1830	0.2906

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunnstest iq3, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	53	1761.50
2	2	14.50
3	1	38.50
4	4	120.00
7	3	81.50

chi-squared = 4.269 with 4 d.f.
 probability = 0.3708

chi-squared with ties = 8.563 with 4 d.f.
 probability = 0.0730

Dunn's Pairwise Comparison of iq3 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	2.787277			
	0.0266			
3	-0.402941	-1.971406		
	0.3817	0.0811		
4	0.482159	-2.029656	0.587402	
	0.3936	0.1060	0.3978	
7	0.790144	-1.685695	0.758333	0.286623
	0.4294	0.1148	0.3735	0.3872

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq4, by(ieth) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	53	1803.00
2	2	22.00
3	1	41.50
4	4	95.00
7	3	54.50

chi-squared = 6.055 with 4 d.f.

probability = 0.1951

chi-squared with ties = 9.464 with 4 d.f.

probability = 0.0505

Dunn's Pairwise Comparison of iq4 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	2.179479			
	0.1465			
3	-0.505482	-1.698444		
	0.3407	0.1490		
4	1.350673	-1.004099	1.082780	
	0.1768	0.2252	0.2324	
7	1.821760	-0.535433	1.378175	0.498577
	0.1712	0.3702	0.2102	0.3090

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq5, by(ieth) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	53	1808.50
2	2	39.50
3	1	7.50
4	4	148.00
7	3	12.50

chi-squared = 10.605 with 4 d.f.

probability = 0.0314

chi-squared with ties = 26.277 with 4 d.f.

probability = 0.0001

Dunn's Pairwise Comparison of iq5 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	1.713447			
	0.0866			

```

1      3 | 2.264929 0.858920
2      | 0.0294 0.2440
3      4 | -0.476526 -1.710491 -2.265841
4      | 0.3521 0.0726 0.0391
5      7 | 4.334614 1.465931 0.247897 3.691637
6      | 0.0001 0.1019 0.4021 0.0006

```

```

7 False Discovery Rate = 0.05
8 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
9

```

```

10 .
11 . dunntest iq6, by(ieth) ma(bh) wrap
12 Warning: by() values are unlabeled, option nolabel implicit
13

```

```

14 Kruskal-Wallis equality-of-populations rank test
15

```

```

16 +-----+
17 | ieth | Obs | Rank Sum |
18 +-----+
19 | 1 | 52 | 1672.00 |
20 | 2 | 2 | 54.50 |
21 | 3 | 1 | 41.50 |
22 | 4 | 4 | 166.00 |
23 | 7 | 3 | 19.00 |
24 +-----+

```

```

25 chi-squared = 7.553 with 4 d.f.
26 probability = 0.1094
27
28 chi-squared with ties = 11.196 with 4 d.f.
29 probability = 0.0245

```

```

30
31
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40
41
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43
44
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52
53
54
55
56
57
58
59
60

```

Dunn's Pairwise Comparison of iq6 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	0.459251			
	0.3589			
3	-0.624727	-0.785168		
	0.3326	0.3088		
4	-1.215526	-1.110396	0.000000	
	0.2242	0.2224	0.5000	
7	2.934536	1.546239	2.055206	3.107180
	0.0084	0.1526	0.0664	0.0094

```

41 False Discovery Rate = 0.05
42 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
43

```

```

44 .
45 . dunntest iq7, by(ieth) ma(bh) wrap
46 Warning: by() values are unlabeled, option nolabel implicit
47

```

```

48 Kruskal-Wallis equality-of-populations rank test
49

```

```

50 +-----+
51 | ieth | Obs | Rank Sum |
52 +-----+
53 | 1 | 53 | 1815.00 |
54 | 2 | 2 | 47.00 |
55 | 3 | 1 | 15.00 |
56 | 4 | 4 | 77.00 |
57 | 7 | 3 | 62.00 |
58 +-----+

```

```

59 chi-squared = 5.167 with 4 d.f.
60 probability = 0.2705

```

chi-squared with ties = 7.030 with 4 d.f.
 probability = 0.1343

Dunn's Pairwise Comparison of iq7 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	0.949225			
	0.4281			
3	1.213236	0.441625		
	0.3751	0.6588		
4	1.840200	0.312276	-0.241888	
	0.3287	0.5392	0.5055	
7	1.455928	0.197500	-0.312276	-0.118029
	0.3635	0.4686	0.6290	0.4530

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

.
 . dunntest iq8, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	53	1804.00
2	2	27.00
3	1	48.50
4	4	92.50
7	3	44.00

chi-squared = 7.123 with 4 d.f.
 probability = 0.1295

chi-squared with ties = 8.202 with 4 d.f.
 probability = 0.0845

Dunn's Pairwise Comparison of iq8 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	1.669101			
	0.1189			
3	-0.838757	-1.672942		
	0.2869	0.1572		
4	1.232034	-0.650622	1.328647	
	0.1816	0.3221	0.1840	
7	1.910806	-0.074816	1.715276	0.648313
	0.2801	0.4702	0.2157	0.2871

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

.
 . dunntest iq9, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
------	-----	----------

```

+-----+-----+-----+
| 1 | 53 | 1765.00 |
| 2 | 2 | 58.00 |
| 3 | 1 | 23.00 |
| 4 | 4 | 108.50 |
| 7 | 3 | 61.50 |
+-----+-----+-----+
    
```

chi-squared = 2.026 with 4 d.f.
 probability = 0.7310

chi-squared with ties = 2.414 with 4 d.f.
 probability = 0.6601

Dunn's Pairwise Comparison of iq9 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	0.355651			
	0.6018			
3	0.607788	0.291742		
	0.9055	0.5503		
4	0.709405	0.128933	-0.219717	
	1.0000	0.4986	0.5163	
7	1.284614	0.554503	0.128933	0.516561
	0.9946	0.7240	0.4487	0.6055

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq10, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+-----+-----+
| ieth | Obs | Rank Sum |
+-----+-----+-----+
| 1 | 53 | 1700.00 |
| 2 | 2 | 70.00 |
| 3 | 1 | 35.00 |
| 4 | 4 | 140.00 |
| 7 | 3 | 71.00 |
+-----+-----+-----+
    
```

chi-squared = 0.808 with 4 d.f.
 probability = 0.9373

chi-squared with ties = 3.122 with 4 d.f.
 probability = 0.5376

Dunn's Pairwise Comparison of iq10 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	-0.435279			
	0.5528			
3	-0.310626	0.000000		
	0.5401	0.5556		
4	-0.604682	0.000000	0.000000	
	0.5454	0.6250	0.5000	
7	1.519075	1.331032	1.052274	1.590888
	0.3219	0.3053	0.3658	0.5582

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

- 1 -----
- 2
- 3 • Question – For each of the questions, 1-10, is there a difference in the average response if respondent is or was a
- 4 hospital worker?
- 5

6 . dunntest iq1, by(ihwork) ma(bh) wrap

7 Warning: by() values are unlabeled, option nolabel implicit

8

9

10 Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	38	1211.00
1	16	503.50
2	9	301.50

11

12

13

14

15

16

17 chi-squared = 0.076 with 2 d.f.

18 probability = 0.9629

19

20 chi-squared with ties = 0.556 with 2 d.f.

21 probability = 0.7574

22

23 Dunn's Pairwise Comparison of iq1 by ihwork

24 (Benjamini-Hochberg)

Col Mean-	0	1
Row Mean		
1	0.198272	
	0.4214	
2	-0.650694	-0.720741
	0.3864	0.7066

25

26

27

28

29

30

31 False Discovery Rate = 0.05

32 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

33

34 . dunntest iq2, by(ihwork) ma(bh) wrap

35 Warning: by() values are unlabeled, option nolabel implicit

36

37

38 Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	38	1229.50
1	16	432.00
2	9	354.50

39

40

41

42

43

44

45 chi-squared = 2.667 with 2 d.f.

46 probability = 0.2635

47

48 chi-squared with ties = 3.851 with 2 d.f.

49 probability = 0.1458

50

51 Dunn's Pairwise Comparison of iq2 by ihwork

52 (Benjamini-Hochberg)

Col Mean-	0	1
Row Mean		
1	1.177995	
	0.1194	
2	-1.243802	-1.949178
	0.1602	0.0769

```

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
.
. dunntest iq3, by(ihwork) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+-----+
|      0 |  38 | 1187.00 |
|      1 |  16 |  482.50 |
|      2 |   9 |  346.50 |
+-----+

```

```

chi-squared = 1.359 with 2 d.f.
probability = 0.5068

chi-squared with ties = 2.727 with 2 d.f.
probability = 0.2558

```

Dunn's Pairwise Comparison of iq3 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          0          1
+-----+-----+
1 | 0.280149
  | 0.3897
  |
2 | -1.513775 -1.547192
  | 0.0976 0.1827

```

```

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
.
. dunntest iq4, by(ihwork) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+-----+
|      0 |  38 | 1109.50 |
|      1 |  16 |  533.00 |
|      2 |   9 |  373.50 |
+-----+

```

```

chi-squared = 3.388 with 2 d.f.
probability = 0.1838

chi-squared with ties = 5.295 with 2 d.f.
probability = 0.0708

```

Dunn's Pairwise Comparison of iq4 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          0          1
+-----+-----+
1 | -0.941750
  | 0.1732
  |
2 | -2.263389 -1.340169
  | 0.0354 0.1351

```

```

False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
.
. dunntest iq5, by(ihwork) ma(bh) wrap

```


Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  38 | 1219.00 |
|      1 |  16 |  464.00 |
|      2 |   9 |  333.00 |
+-----+

```

chi-squared = 1.099 with 2 d.f.
probability = 0.5773

chi-squared with ties = 2.723 with 2 d.f.
probability = 0.2563

Dunn's Pairwise Comparison of iq5 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |           0           1
+-----+
  1 |  0.887196
    |  0.1875
  2 | -1.139947 -1.648784
    |  0.1907   0.1488

```

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq6, by(ihwork) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  38 | 1081.00 |
|      1 |  16 |  540.00 |
|      2 |   8 |  332.00 |
+-----+

```

chi-squared = 3.794 with 2 d.f.
probability = 0.1500

chi-squared with ties = 5.625 with 2 d.f.
probability = 0.0601

Dunn's Pairwise Comparison of iq6 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |           0           1
+-----+
  1 | -1.200715
    |  0.1149
  2 | -2.264381 -1.207799
    |  0.0353   0.1703

```

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq7, by(ihwork) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

1  +-----+
2  | ihwork | Obs | Rank Sum |
3  +-----+
4  |      0 | 38 | 1189.00 |
5  |      1 | 16 |  460.00 |
6  |      2 |  9 |  367.00 |
7  +-----+
    
```

```

7  chi-squared =      2.624 with 2 d.f.
8  probability =      0.2693
9
9  chi-squared with ties =      3.570 with 2 d.f.
10 probability =      0.1678
    
```

Dunn's Pairwise Comparison of iq7 by ihwork
(Benjamini-Hochberg)

```

14 Col Mean-|
15 Row Mean |                0                1
16 -----+-----
16      1 |  0.542224
17      |  0.2938
18      |
18      2 | -1.628668 -1.836862
19      |  0.0775  0.0993
    
```

```

20 False Discovery Rate = 0.05
21 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
    
```

```

23 . dunntest iq8, by(ihwork) ma(bh) wrap
24
25 Warning: by() values are unlabeled, option nolabel implicit
    
```

Kruskal-Wallis equality-of-populations rank test

```

29 +-----+
30 | ihwork | Obs | Rank Sum |
31 +-----+
31 |      0 | 38 | 1080.00 |
32 |      1 | 16 |  576.50 |
33 |      2 |  9 |  359.50 |
34 +-----+
    
```

```

35 chi-squared =      3.913 with 2 d.f.
36 probability =      0.1413
37
37 chi-squared with ties =      4.506 with 2 d.f.
38 probability =      0.1051
    
```

Dunn's Pairwise Comparison of iq8 by ihwork
(Benjamini-Hochberg)

```

42 Col Mean-|
43 Row Mean |                0                1
44 -----+-----
44      1 | -1.494891
45      |  0.1012
46      |
46      2 | -1.819713 -0.549796
47      |  0.1032  0.2912
    
```

```

48 False Discovery Rate = 0.05
49 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
    
```

```

51 . dunntest iq9, by(ihwork) ma(bh) wrap
52
53 Warning: by() values are unlabeled, option nolabel implicit
    
```

Kruskal-Wallis equality-of-populations rank test

```

57 +-----+
58 | ihwork | Obs | Rank Sum |
59 +-----+
59 |      0 | 38 | 1096.00 |
    
```

```

1      |      1 | 16 | 545.00 |
2      |      2 |  9 | 375.00 |
3      +-----+
4      chi-squared =      3.833 with 2 d.f.
5      probability =      0.1471
6
7      chi-squared with ties =      4.568 with 2 d.f.
8      probability =      0.1019
9
10     Dunn's Pairwise Comparison of iq9 by ihwork
11     (Benjamini-Hochberg)
12     Col Mean-|
13     Row Mean |          0          1
14     +-----+
15     1 | -1.043163
16     |      0.1484
17     |
18     2 | -2.060159 -1.086818
19     |      0.0591      0.2078
20
21     False Discovery Rate =      0.05
22     Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
23
24     .
25     . dunntest iq10, by(ihwork) ma(bh) wrap
26
27     Warning: by() values are unlabeled, option nolabel implicit
28
29     Kruskal-Wallis equality-of-populations rank test
30
31     +-----+
32     | ihwork | Obs | Rank Sum |
33     +-----+
34     |      0 | 38 | 1206.00 |
35     |      1 | 16 | 495.00 |
36     |      2 |  9 | 315.00 |
37     +-----+
38
39     chi-squared =      0.303 with 2 d.f.
40     probability =      0.8596
41
42     chi-squared with ties =      1.169 with 2 d.f.
43     probability =      0.5574
44
45     Dunn's Pairwise Comparison of iq10 by ihwork
46     (Benjamini-Hochberg)
47     Col Mean-|
48     Row Mean |          0          1
49     +-----+
50     1 |      0.287560
51     |      0.3868
52     |
53     2 | -0.943719 -1.045310
54     |      0.2590      0.4438
55
56     False Discovery Rate =      0.05
57     Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
58
59
60

```

Nurse Student Statistics on Factor Analysis Produced Variables

- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by age?

Answer – NO, there are no significant differences among the age categories for any of the three factor variables.

- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by gender?

Answer – NO, there are no significant differences between genders for any of the three factor variables.

- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by level of education?

Answer – NO, there are no significant differences among the levels of education for any of the three factor variables.

- Question: For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response based upon racer or ethnicity?

Answer – YES, for the factor variable knowledge there is a significant difference between groups 1 and 2 and between groups 1 and 7, and for the factor variable total cost there are significant differences between the pairs of groups 1 and 7, 3 and 7, and 4 and 7

- Question: For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response based experience working in a hospital?

Answer – YES, for the factor variable "participation" there is a significant difference between group 0 and group 2

STATISTICS

- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by age?

```
. dunnstest iknowledge, by(iage)
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 3 | 2 | 27.50 |
| 4 | 12 | 309.00 |
| 5 | 14 | 417.50 |
| 6 | 25 | 850.00 |
| 7 | 10 | 412.00 |
+-----+
```

```
chi-squared = 6.392 with 4 d.f.
probability = 0.1717
```

```
chi-squared with ties = 8.092 with 4 d.f.
probability = 0.0883
```

Dunn's Pairwise Comparison of iknowledge by iage

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

```

(No adjustment)
1 Col Mean-|
2 Row Mean |          3          4          5          6
-----+-----
3 4 | -0.964413
4   | 0.1674
5   |
6 5 | -1.305010 -0.635265
7   | 0.0959 0.2626
8   |
9 6 | -1.691486 -1.441963 -0.768369
10  | 0.0454 0.0747 0.2211
11  |
12 7 | -2.175239 -2.214869 -1.686889 -1.181160
13  | 0.0148 0.0134 0.0458 0.1188

```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
.
. dunntest iparticipate, by(iage)
```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 3 | 2 | 37.00 |
| 4 | 12 | 281.00 |
| 5 | 14 | 458.00 |
| 6 | 25 | 834.00 |
| 7 | 10 | 406.00 |
+-----+

```

chi-squared = 6.076 with 4 d.f.

probability = 0.1935

chi-squared with ties = 6.276 with 4 d.f.

probability = 0.1795

```
Dunn's Pairwise Comparison of iparticipate by iage
```

```
(No adjustment)
```

```

Col Mean-|
Row Mean |          3          4          5          6
-----+-----
35 4 | -0.356920
36   | 0.3606
37   |
38 5 | -1.042565 -1.310385
39   | 0.1486 0.0950
40   |
41 6 | -1.121195 -1.569823 -0.107251
42  | 0.1311 0.0582 0.4573
43   |
44 7 | -1.581888 -2.225081 -1.055987 -1.072837
45  | 0.0568 0.0130 0.1455 0.1417

```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
.
. dunntest itotcost, by(iage)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 3 | 2 | 83.00 |
| 4 | 12 | 402.50 |
| 5 | 14 | 380.00 |
| 6 | 25 | 742.50 |
| 7 | 9 | 345.00 |
+-----+

```

```

chi-squared = 3.125 with 4 d.f.
probability = 0.5372

chi-squared with ties = 4.632 with 4 d.f.
probability = 0.3272
    
```

Dunn's Pairwise Comparison of itotcost by iage
(No adjustment)

Col Mean-	3	4	5	6
4	0.703165 0.2410			
5	1.281683 0.1000	1.097642 0.1362		
6	1.083624 0.1393	0.738198 0.2302	-0.516952 0.3026	
7	0.273361 0.3923	-0.733301 0.2317	-1.767517 0.0386	-1.498732 0.0670

```

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
    
```

Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by gender?

```

. dunnstest iknowledge, by(igender)
Warning: by() values are unlabeled, option nolabel implicit
    
```

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	598.00
2	44	1418.00

```

chi-squared = 0.022 with 1 d.f.
probability = 0.8810

chi-squared with ties = 0.028 with 1 d.f.
probability = 0.8662
    
```

Dunn's Pairwise Comparison of iknowledge by igender
(No adjustment)

Col Mean-	1
2	-0.168503 0.4331

```

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
    
```

```

. dunnstest iparticipate, by(igender)
Warning: by() values are unlabeled, option nolabel implicit
    
```

Kruskal-Wallis equality-of-populations rank test

igender	Obs	Rank Sum
1	19	502.00
2	44	1514.00

```
1  chi-squared =      2.520 with 1 d.f.
2  probability =      0.1124
```

```
3  chi-squared with ties =      2.603 with 1 d.f.
4  probability =      0.1067
```

```
6          Dunn's Pairwise Comparison of iparticipate by igender
7          (No adjustment)
```

```
8  Col Mean-|
9  Row Mean |          1
10 -----+-----
11      2 | -1.613363
12      |      0.0533
```

```
12 alpha =      0.05
```

```
13 Reject Ho if p = P(Z <= |z|) <= alpha/2
```

```
15 . dunntest itotcost, by(igender)
```

```
17 Warning: by() values are unlabeled, option nolabel implicit
```

```
19 Kruskal-Wallis equality-of-populations rank test
```

```
21 +-----+
22 | igender | Obs | Rank Sum |
23 +-----+
24 |      1 | 19 |  587.50 |
25 |      2 | 43 | 1365.50 |
26 +-----+
```

```
26 chi-squared =      0.028 with 1 d.f.
27 probability =      0.8666
```

```
28 chi-squared with ties =      0.042 with 1 d.f.
29 probability =      0.8380
```

```
31          Dunn's Pairwise Comparison of itotcost by igender
32          (No adjustment)
```

```
33 Col Mean-|
34 Row Mean |          1
35 -----+-----
36      2 | -0.204490
37      |      0.4190
```

```
37 alpha =      0.05
```

```
38 Reject Ho if p = P(Z <= |z|) <= alpha/2
```

-
- Question – For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response by level of education?

```
44 . dunntest iknowledge, by(ied)
```

```
45 Warning: by() values are unlabeled, option nolabel implicit
```

```
47 Kruskal-Wallis equality-of-populations rank test
```

```
49 +-----+
50 | ied | Obs | Rank Sum |
51 +-----+
52 |  1 |  1 |   43.00 |
53 |  2 |  3 |   96.50 |
54 |  3 | 57 | 1751.50 |
55 +-----+
```

```
55 chi-squared =      0.483 with 2 d.f.
56 probability =      0.7854
```

```
57 chi-squared with ties =      0.629 with 2 d.f.
58 probability =      0.7303
```

```

1          Dunn's Pairwise Comparison of iknowledge by ied
2          (No adjustment)
3 Col Mean-|
4 Row Mean |          1          2
5 -----+-----
6          2 |    0.602700
7          |    0.2734
8          |
9          3 |    0.781528    0.156016
10         |    0.2172    0.4380

```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iparticipate, by(ied)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ied | Obs | Rank Sum |
+-----+-----+
| 1 | 1 | 53.00 |
| 2 | 3 | 137.00 |
| 3 | 57 | 1701.00 |
+-----+

```

chi-squared = 3.826 with 2 d.f.

probability = 0.1477

chi-squared with ties = 3.948 with 2 d.f.

probability = 0.1389

```

29          Dunn's Pairwise Comparison of iparticipate by ied
30          (No adjustment)

```

```

31 Col Mean-|
32 Row Mean |          1          2
33 -----+-----
34          2 |    0.363420
35          |    0.3581
36          |
37          3 |    1.313711    1.528732
38         |    0.0945    0.0632

```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest itotcost, by(ied)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ied | Obs | Rank Sum |
+-----+-----+
| 1 | 1 | 40.50 |
| 2 | 3 | 94.00 |
| 3 | 56 | 1695.50 |
+-----+

```

chi-squared = 0.344 with 2 d.f.

probability = 0.8420

chi-squared with ties = 0.500 with 2 d.f.

probability = 0.7788

```

56          Dunn's Pairwise Comparison of itotcost by ied
57          (No adjustment)

```

```

58 Col Mean-|
59 Row Mean |          1          2

```



```

-----+-----
1      2 | 0.548145
2      | 0.2918
3      3 | 0.699677 0.123104
4      | 0.2421 0.4510
5
6 alpha = 0.05
7 Reject Ho if p = P(Z <= |z|) <= alpha/2

```

- Question: For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response based upon racer or ethnicity?

```

11 . dunnstest iknowledge, by(ieth)
12
13 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+
| 1 | 53 | 1859.50 |
| 2 | 2 | 22.50 |
| 3 | 1 | 7.00 |
| 4 | 4 | 93.00 |
| 7 | 3 | 34.00 |
+-----+

```

```

24 chi-squared = 10.649 with 4 d.f.
25 probability = 0.0308

```

```

26 chi-squared with ties = 13.481 with 4 d.f.
27 probability = 0.0091

```

Dunn's Pairwise Comparison of iknowledge by ieth
(No adjustment)

```

31 Col Mean-|
32 Row Mean | 1 2 3 4
-----+-----
33 2 | 2.031072
34 | 0.0211
35 |
36 3 | 1.707868 0.213002
37 | 0.0438 0.4157
38 |
39 4 | 1.400992 -0.850533 -0.892152
40 | 0.0806 0.1975 0.1862
41 |
42 7 | 2.456616 -0.005603 -0.230353 0.957716
43 | 0.0070 0.4978 0.4089 0.1691

```

```

42 alpha = 0.05
43 Reject Ho if p = P(Z <= |z|) <= alpha/2

```

```

45 . dunnstest iparticipate, by(ieth)
46
47 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+
| 1 | 53 | 1836.00 |
| 2 | 2 | 24.00 |
| 3 | 1 | 32.00 |
| 4 | 4 | 84.50 |
| 7 | 3 | 39.50 |
+-----+

```

```

58 chi-squared = 8.056 with 4 d.f.
59 probability = 0.0895

```

1 chi-squared with ties = 8.321 with 4 d.f.
 2 probability = 0.0805

4 Dunn's Pairwise Comparison of iparticipate by ieth
 (No adjustment)

Col Mean-	1	2	3	4
2 1.742754 0.0407				
3 0.145095 -0.905406 0.4423 0.1826				
4 1.445287 -0.584200 0.539304 0.0742 0.2795 0.2948				
7 2.006289 -0.070859 0.904309 0.577727 0.0224 0.4718 0.1829 0.2817				

16 alpha = 0.05
 17 Reject Ho if p = P(Z <= |z|) <= alpha/2

19 .
 20 . dunntest itotcost, by(ieth)

21 Warning: by() values are unlabeled, option nolabel implicit

23 Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	52	1672.00
2	2	54.50
3	1	41.50
4	4	166.00
7	3	19.00

32 chi-squared = 7.553 with 4 d.f.
 33 probability = 0.1094

35 chi-squared with ties = 11.196 with 4 d.f.
 36 probability = 0.0245

38 Dunn's Pairwise Comparison of itotcost by ieth
 (No adjustment)

Col Mean-	1	2	3	4
2 0.459251 0.3230				
3 -0.624727 -0.785168 0.2661 0.2162				
4 -1.215526 -1.110396 0.000000 0.1121 0.1334 0.5000				
7 2.934536 1.546239 2.055206 3.107180 0.0017 0.0610 0.0199 0.0009				

50 alpha = 0.05
 51 Reject Ho if p = P(Z <= |z|) <= alpha/2

- Question: For each of the factor variables (knowledge, participation, and total cost), are there differences in the average response based experience working in a hospital?

57 . dunntest iknowledge, by(ihwork)

59 Warning: by() values are unlabeled, option nolabel implicit

1 Kruskal-Wallis equality-of-populations rank test

```
2
3 +-----+
4 | ihwork | Obs | Rank Sum |
5 |-----+-----|
6 |      0 |  38 | 1196.50 |
7 |      1 |  16 |  439.00 |
8 |      2 |   9 |  380.50 |
9 +-----+
```

9 chi-squared = 3.850 with 2 d.f.
10 probability = 0.1458

11 chi-squared with ties = 4.875 with 2 d.f.
12 probability = 0.0874

14 Dunn's Pairwise Comparison of iknowledge by ihwork
15 (No adjustment)

```
16 Col Mean-|
17 Row Mean |          0          1
18 +-----+-----+
19 |      1 | 0.834026
20 |      | 0.2021
21 |      2 | -1.786749 -2.186219
22 |      | 0.0370 0.0144
```

22 alpha = 0.05

23 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

25 .
26 . dunntest iparticipate, by(ihwork)

27 Warning: by() values are unlabeled, option nolabel implicit

29 Kruskal-Wallis equality-of-populations rank test

```
30
31 +-----+
32 | ihwork | Obs | Rank Sum |
33 |-----+-----|
34 |      0 |  38 | 1060.00 |
35 |      1 |  16 |  540.00 |
36 |      2 |   9 |  416.00 |
37 +-----+
```

37 chi-squared = 7.470 with 2 d.f.
38 probability = 0.0239

39 chi-squared with ties = 7.716 with 2 d.f.
40 probability = 0.0211

42 Dunn's Pairwise Comparison of iparticipate by ihwork
43 (No adjustment)

```
44 Col Mean-|
45 Row Mean |          0          1
46 +-----+-----+
47 |      1 | -1.089332
48 |      | 0.1380
49 |      2 | -2.741107 -1.659641
50 |      | 0.0031 0.0485
```

50 alpha = 0.05

51 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

53 .
54 . dunntest itotcost, by(ihwork)

55 Warning: by() values are unlabeled, option nolabel implicit

57 Kruskal-Wallis equality-of-populations rank test

```
58
59 +-----+
```

ihwork	Obs	Rank Sum
0	38	1081.00
1	16	540.00
2	8	332.00

chi-squared = 3.794 with 2 d.f.
 probability = 0.1500

chi-squared with ties = 5.625 with 2 d.f.
 probability = 0.0601

Dunn's Pairwise Comparison of itotcost by ihwork
 (No adjustment)

Col Mean-	0		1	
Row Mean				
1	-1.200715			
	0.1149			
2	-2.264381	-1.207799		
	0.0118	0.1136		

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

HPESS Survey Statistics Report

- Question – For each of the questions, 1-10, is there a difference in the average response by age?

Answer – YES, but for only two questions:

Q1: age group 1 differed from all of the other groups.

Q2: age groups 1 and 5 differed from groups 2,3,4, but did not differ from each other.

- Question – For each of the questions, 1-10, is there a difference in the average response by gender?

Answer – NO – there are no significant differences in responses between genders for any of the 10 questions.

- Question – For each of the questions, 1-10, is there a difference in the average response by level of education

Answer – YES, for questions 1, 2, 3, and 10

Q1: 1 v. 3 2 v. 3

Q2: 1 v. 3 2 v. 3

Q3: 1 v.2 1 v. 3 2 v. 3

Q10: 1 v. 3 2 v. 3

- Question: For each of the questions, is there a difference in the average response based upon racer or ethnicity

Answer - NO – there are no significant difference in responses among races or ethnicities for any of the 10 questions.

- Question – For each of the questions, 1-10, is there a difference in the average response if respondent is or was a hospital worker?

Answer – YES – for questions 1, 2, and 5. For all three questions, group 1 is significantly different from both group 0, and group 2.

- Question – For each of the questions, 1-10, is there a difference in the average response by age among those who identified their age group?

```
. dunnstest iq1, by(iage) ma(bh) wrap
```

```
Kruskal-Wallis equality-of-populations rank test
```

iage	Obs	Rank Sum
1	1	3.50
2	23	878.50
3	35	1376.50
4	11	456.50
5	5	169.50
6	1	41.50

```
chi-squared = 3.004 with 5 d.f.
```

```
probability = 0.6994
```

1 chi-squared with ties = 13.768 with 5 d.f.
 2 probability = 0.0171

3
 4 Dunn's Pairwise Comparison of iq1 by iage
 5 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-3.292779				
	0.0025				
3	-3.424849	-0.409178			
	0.0023	0.4265			
4	-3.527106	-0.873848	-0.609012		
	0.0032	0.3583	0.3699		
5	-2.690371	0.843972	1.100788	1.366042	
	0.0134	0.3322	0.2903	0.2149	
6	-2.604940	-0.313598	-0.207567	0.000000	-0.672593
	0.0138	0.4349	0.4476	0.5000	0.3759

19 False Discovery Rate = 0.05
 20 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

21
 22 . dunntest iq2, by(iage) ma(bh) wrap

23 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
1	1	4.50
2	22	849.00
3	35	1357.50
4	11	462.00
5	5	172.50
6	1	4.50

34 chi-squared = 5.286 with 5 d.f.
 35 probability = 0.3819

36 chi-squared with ties = 18.489 with 5 d.f.
 37 probability = 0.0024

39
 40 Dunn's Pairwise Comparison of iq2 by iage
 41 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-2.861006				
	0.0063				
3	-2.900874	-0.061439			
	0.0070	0.5095			
4	-3.080845	-0.792177	-0.797937		
	0.0155	0.2920	0.3187		
5	-2.349976	0.708544	0.769210	1.193206	
	0.0201	0.2761	0.2761	0.1940	
6	0.000000	2.861006	2.900874	3.080845	2.349976
	0.5000	0.0053	0.0093	0.0077	0.0176

54 False Discovery Rate = 0.05
 55 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

56
 57 . dunntest iq3, by(iage) ma(bh) wrap

58
 59 Kruskal-Wallis equality-of-populations rank test

```

1  +-----+
2  | iage | Obs | Rank Sum |
3  +-----+
4  | 1 | 1 | 7.00 |
5  | 2 | 23 | 921.00 |
6  | 3 | 35 | 1347.00 |
7  | 4 | 11 | 419.00 |
8  | 5 | 5 | 187.00 |
9  +-----+
10 | 6 | 1 | 45.00 |
11 +-----+

```

chi-squared = 2.250 with 5 d.f.
probability = 0.8136

chi-squared with ties = 5.288 with 5 d.f.
probability = 0.3817

Dunn's Pairwise Comparison of iq3 by iage
(Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-2.245722				
	0.1854				
3	-2.155302	0.402900			
	0.1168	0.5725			
4	-2.066574	0.369776	0.079295		
	0.0969	0.4851	0.4684		
5	-1.926615	0.371927	0.157658	0.088931	
	0.1013	0.5325	0.5046	0.4978	
6	-1.865437	-0.336858	-0.445925	-0.459239	-0.481654
	0.0932	0.4601	0.6147	0.6922	0.7876

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunnstest iq4, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

```

37 +-----+
38 | iage | Obs | Rank Sum |
39 +-----+
40 | 1 | 1 | 13.00 |
41 | 2 | 23 | 934.00 |
42 | 3 | 36 | 1433.50 |
43 | 4 | 11 | 362.00 |
44 | 5 | 5 | 211.00 |
45 +-----+
46 | 6 | 1 | 49.50 |
47 +-----+

```

chi-squared = 2.656 with 5 d.f.
probability = 0.7529

chi-squared with ties = 4.393 with 5 d.f.
probability = 0.4944

Dunn's Pairwise Comparison of iq4 by iage
(Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-1.553696				
	0.9019				
3	-1.520764	0.169968			
	0.3208	0.4325			

4	-1.095769	1.207400	1.153083		
	0.2927	0.3409	0.3111		
5	-1.532336	-0.185389	-0.286737	-0.990242	
	0.4704	0.4569	0.4467	0.3019	
6	-1.483678	-0.500363	-0.548924	-0.913141	-0.383084
	0.2586	0.4206	0.4373	0.3010	0.4385

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq5, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
1	1	7.00
2	23	836.00
3	35	1476.50
4	11	377.00
5	5	185.00
6	1	44.50

chi-squared = 3.728 with 5 d.f.
 probability = 0.5892
 chi-squared with ties = 9.323 with 5 d.f.
 probability = 0.0968

Dunn's Pairwise Comparison of iq5 by iage
 (Benjamini-Hochberg)

Col Mean	1	2	3	4	5
2	-2.057391				
	0.1487				
3	-2.484459	-1.557480			
	0.0973	0.1279			
4	-1.869894	0.405361	1.639361		
	0.0922	0.4283	0.1264		
5	-1.961161	-0.094649	0.776748	-0.362103	
	0.1247	0.4623	0.4100	0.4138	
6	-1.898886	-0.571498	-0.163411	-0.701210	-0.490290
	0.1080	0.4257	0.4662	0.4026	0.4254

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq6, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
1	1	11.00
2	23	841.50
3	35	1397.00
4	11	468.50
5	5	161.50
6	1	46.50

chi-squared = 2.770 with 5 d.f.
 probability = 0.7354

chi-squared with ties = 5.486 with 5 d.f.
 probability = 0.3595

Dunn's Pairwise Comparison of iq6 by iage
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
2	-1.596368				
	0.2070				
3	-1.816984	-0.790016			
	0.2596	0.3221			
4	-1.927631	-1.043792	-0.493509		
	0.4043	0.3178	0.3586		
5	-1.239210	0.553701	1.015019	1.215993	
	0.3229	0.3624	0.2907	0.2800	
6	-1.599813	-0.618474	-0.413849	-0.238527	-0.826140
	0.2741	0.3656	0.3637	0.4057	0.3406

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq7, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
1	1	13.50
2	22	819.00
3	35	1270.50
4	11	493.50
5	5	205.50
6	1	48.00

chi-squared = 2.907 with 5 d.f.
 probability = 0.7143

chi-squared with ties = 4.855 with 5 d.f.
 probability = 0.4338

Dunn's Pairwise Comparison of iq7 by iage
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
2	-1.376058				
	0.2532				
3	-1.333089	0.202096			
	0.2281	0.4499			
4	-1.780629	-1.226249	-1.469099		
	0.5623	0.2358	0.3545		
5	-1.494032	-0.463525	-0.595349	0.413781	
	0.5069	0.4384	0.4137	0.4244	
6	-1.446590	-0.624762	-0.684085	-0.178063	-0.373508
	0.2775	0.4434	0.4631	0.4293	0.4089

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq8, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+
| 1 | 1 | 16.00 |
| 2 | 23 | 896.00 |
| 3 | 35 | 1360.00 |
| 4 | 11 | 356.00 |
| 5 | 5 | 239.50 |
+-----+
| 6 | 1 | 58.50 |
+-----+
    
```

chi-squared = 3.633 with 5 d.f.
 probability = 0.6034

chi-squared with ties = 4.157 with 5 d.f.
 probability = 0.5270

Dunn's Pairwise Comparison of iq8 by iage
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-1.088658				
	0.3454				
3	-1.091772	0.017935			
	0.4124	0.4928			
4	-0.758949	0.871211	0.910035		
	0.2584	0.2398	0.2721		
5	-1.410676	-0.878018	-0.916267	-1.395398	
	0.5938	0.2590	0.2996	0.4072	
6	-1.455798	-0.926803	-0.938242	-1.212211	-0.468751
	1.0000	0.3319	0.3730	0.4227	0.3425

False Discovery Rate = 0.05
 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

. dunnstest iq9, by(iage) ma(bh) wrap

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+
| 1 | 1 | 26.50 |
| 2 | 23 | 844.00 |
| 3 | 35 | 1377.00 |
| 4 | 11 | 443.50 |
| 5 | 5 | 208.50 |
+-----+
| 6 | 1 | 26.50 |
+-----+
    
```

chi-squared = 0.975 with 5 d.f.
 probability = 0.9646

chi-squared with ties = 1.158 with 5 d.f.
 probability = 0.9488

Dunn's Pairwise Comparison of iq9 by iage
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-0.492653				
	0.5834				
3	-0.625047	-0.486788			
	0.7979	0.4271			
4	-0.653017	-0.487754	-0.139274		

```

1      |      0.9633      0.4693      0.5130
2      |      |
3      |      |
4      |      |
5      |      |
6      |      |
7      |      |
8      |      |
9      |      |
10     |      |
11     |      |
12     |      |
13     |      |
14     |      |
15     |      |
16     |      |
17     |      |
18     |      |
19     |      |
20     |      |

```

```

6 False Discovery Rate = 0.05
7 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```
9 . dunnstest iq10, by(iage) ma(bh) wrap
```

```
10 Kruskal-Wallis equality-of-populations rank test
```

```

12 +-----+
13 | iage | Obs | Rank Sum |
14 +-----+
15 | 1 | 1 | 6.50 |
16 | 2 | 23 | 856.50 |
17 | 3 | 35 | 1427.50 |
18 | 4 | 11 | 409.00 |
19 | 5 | 5 | 182.50 |
20 +-----+

```

```

21 chi-squared = 2.692 with 5 d.f.
22 probability = 0.7473

```

```

23 chi-squared with ties = 7.233 with 5 d.f.
24 probability = 0.2039

```

```

26 Dunn's Pairwise Comparison of iq10 by iage
27 (Benjamini-Hochberg)

```

```

28 Col Mean-|
29 Row Mean |      1      2      3      4      5
30 -----+-----
31 2 | -2.233632
32   | 0.0957
33 3 | -2.509329 -0.980744
34   | 0.0907 0.4084
35 4 | -2.180462 0.011605 0.773901
36   | 0.0731 0.4954 0.4703
37 5 | -2.032789 0.111187 0.665386 0.093832
38   | 0.0789 0.5258 0.4742 0.4957
39 6 | -1.968240 -0.491273 -0.235250 -0.484547 -0.508197
40   | 0.0736 0.4674 0.5088 0.4282 0.5094

```

```

41 False Discovery Rate = 0.05
42 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

- Question – For each of the questions, 1-10, is there a difference in the average response by gender?

```
48 . ranksum iq1, by(igender)
```

```
49 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
```

```

51 igender |      obs      rank sum      expected
52 -----+-----
53 1 |      17      629.5      654.5
54 2 |      59     2296.5     2271.5
55 -----+-----
56 combined |      76     2926     2926

```

```

56 unadjusted variance 6435.92
57 adjustment for ties -5031.72
58 -----
59 adjusted variance 1404.20

```

```

1 Ho: iq1(igender==1) = iq1(igender==2)
2       z = -0.667
3       Prob > |z| = 0.5047
4
5 .
6 . ranksum iq2, by(igender)
7
8 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
9
10      igender |      obs   rank sum   expected
11 -----+-----
12      1 |      17       564       646
13      2 |      58      2286      2204
14 -----+-----
15      combined |      75      2850      2850
16
17 unadjusted variance      6244.67
18 adjustment for ties     -4459.21
19 -----
20 adjusted variance      1785.46
21
22 Ho: iq2(igender==1) = iq2(igender==2)
23       z = -1.941
24       Prob > |z| = 0.0523
25
26 .
27 . ranksum iq3, by(igender)
28
29 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
30
31      igender |      obs   rank sum   expected
32 -----+-----
33      1 |      17       613       654.5
34      2 |      59      2313      2271.5
35 -----+-----
36      combined |      76      2926      2926
37
38 unadjusted variance      6435.92
39 adjustment for ties     -3697.73
40 -----
41 adjusted variance      2738.19
42
43 Ho: iq3(igender==1) = iq3(igender==2)
44       z = -0.793
45       Prob > |z| = 0.4277
46
47 .
48 . ranksum iq4, by(igender)
49
50 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
51
52      igender |      obs   rank sum   expected
53 -----+-----
54      1 |      17       659       663
55      2 |      60      2344      2340
56 -----+-----
57      combined |      77      3003      3003
58
59 unadjusted variance      6630.00
60 adjustment for ties     -2621.46
61 -----
62 adjusted variance      4008.54
63
64 Ho: iq4(igender==1) = iq4(igender==2)
65       z = -0.063
66       Prob > |z| = 0.9496
67
68 .
69 . ranksum iq5, by(igender)
70
71 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
72
73      igender |      obs   rank sum   expected
74 -----+-----
75      1 |      17       600.5      654.5
76      2 |      59      2325.5      2271.5
77 -----+-----
78      combined |      76      2926      2926

```

```

1  unadjusted variance      6435.92
2  adjustment for ties     -3862.43
3  -----
4  adjusted variance       2573.49
5
6  Ho: iq5(igender==1) = iq5(igender==2)
7      z = -1.064
8  Prob > |z| = 0.2871
9
10 .
11 . ranksum iq6, by(igender)
12
13 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
14
15      igender |      obs      rank sum      expected
16 -----+-----
17      1 |      17          684          654.5
18      2 |      59         2242         2271.5
19 -----+-----
20      combined |      76         2926          2926
21
22 unadjusted variance      6435.92
23 adjustment for ties     -3186.72
24 -----
25 adjusted variance       3249.19
26
27 Ho: iq6(igender==1) = iq6(igender==2)
28      z = 0.518
29 Prob > |z| = 0.6048
30
31 .
32 . ranksum iq7, by(igender)
33
34 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
35
36      igender |      obs      rank sum      expected
37 -----+-----
38      1 |      17          599          646
39      2 |      58         2251         2204
40 -----+-----
41      combined |      75         2850          2850
42
43 unadjusted variance      6244.67
44 adjustment for ties     -2505.86
45 -----
46 adjusted variance       3738.81
47
48 Ho: iq7(igender==1) = iq7(igender==2)
49      z = -0.769
50 Prob > |z| = 0.4421
51
52 .
53 . ranksum iq8, by(igender)
54
55 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
56
57      igender |      obs      rank sum      expected
58 -----+-----
59      1 |      17          610.5          654.5
60      2 |      59         2315.5         2271.5
61 -----+-----
62      combined |      76         2926          2926
63
64 unadjusted variance      6435.92
65 adjustment for ties     -812.08
66 -----
67 adjusted variance       5623.84
68
69 Ho: iq8(igender==1) = iq8(igender==2)
70      z = -0.587
71 Prob > |z| = 0.5574
72
73 .
74 . ranksum iq9, by(igender)
75
76 Two-sample Wilcoxon rank-sum (Mann-Whitney) test
77
78      igender |      obs      rank sum      expected
79 -----+-----
80

```

```

-----+-----
1      1 |      17      597      654.5
2      2 |      59     2329     2271.5
-----+-----
3      combined |      76     2926     2926

```

```

4      unadjusted variance      6435.92
5      adjustment for ties      -1019.01
6      -----
7      adjusted variance        5416.90

```

Ho: iq9(igender==1) = iq9(igender==2)

z = -0.781

Prob > |z| = 0.4347

```

.      . ranksum iq10, by(igender)

```

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

```

15      igender |      obs      rank sum      expected
16      -----+-----
17      1 |      17      635.5      654.5
18      2 |      59     2290.5     2271.5
19      -----+-----
19      combined |      76     2926     2926

```

```

20      unadjusted variance      6435.92
21      adjustment for ties      -4040.59
22      -----
23      adjusted variance        2395.32

```

Ho: iq10(igender==1) = iq10(igender==2)

z = -0.388

Prob > |z| = 0.6979

- Question – For each of the questions, 1-10, is there a difference in the average response by level of education

```

.      . dunnstest iq1, by(ied) ma(bh) wrap

```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

36      +-----+
37      | ied | Obs | Rank Sum |
38      |-----+-----|
39      | 1 | 26 | 965.00 |
40      | 2 | 49 | 1957.50 |
41      | 3 | 1 | 3.50 |
42      |-----+-----|

```

```

42      chi-squared =      2.825 with 2 d.f.
43      probability =      0.2435

```

```

44      chi-squared with ties =      12.949 with 2 d.f.
45      probability =      0.0015

```

Dunn's Pairwise Comparison of iq1 by ied
(Benjamini-Hochberg)

```

49      Col Mean-|
50      Row Mean |      1      2
51      -----+-----
52      2 |      -1.132195
53      |      0.1288
54      |
55      3 |      3.197953      3.498063
56      |      0.0010      0.0007

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```

.      . dunnstest iq2, by(ied) ma(bh) wrap

```

1 Warning: by() values are unlabeled, option nolabel implicit

2

3 Kruskal-Wallis equality-of-populations rank test

```
4
5 +-----+
6 | ied | Obs | Rank Sum |
7 |-----+-----|
8 | 1 | 26 | 979.50 |
9 | 2 | 48 | 1866.00 |
10 | 3 | 1 | 4.50 |
11 +-----+
```

11 chi-squared = 2.446 with 2 d.f.
12 probability = 0.2944

13 chi-squared with ties = 8.554 with 2 d.f.
14 probability = 0.0139

15
16 Dunn's Pairwise Comparison of iq2 by ied
17 (Benjamini-Hochberg)

```
18 Col Mean-|
19 Row Mean |-----+-----|
20 2 | -0.423546
21 | 0.3359
22 3 | 2.793337 2.919430
23 | 0.0039 0.0053
```

24 False Discovery Rate = 0.05
25 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

26
27 . dunntest iq3, by(ied) ma(bh) wrap

28 Warning: by() values are unlabeled, option nolabel implicit

29
30
31 Kruskal-Wallis equality-of-populations rank test

```
32
33 +-----+
34 | ied | Obs | Rank Sum |
35 |-----+-----|
36 | 1 | 26 | 904.00 |
37 | 2 | 49 | 2015.00 |
38 | 3 | 1 | 7.00 |
39 +-----+
```

38 chi-squared = 3.468 with 2 d.f.
39 probability = 0.1766

40
41 chi-squared with ties = 8.151 with 2 d.f.
42 probability = 0.0170

43
44 Dunn's Pairwise Comparison of iq3 by ied
45 (Benjamini-Hochberg)

```
46 Col Mean-|
47 Row Mean |-----+-----|
48 2 | -1.817857
49 | 0.0345
50 3 | 1.891823 2.345120
51 | 0.0439 0.0285
```

52 False Discovery Rate = 0.05
53 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

54
55 . dunntest iq4, by(ied) ma(bh) wrap

56 Warning: by() values are unlabeled, option nolabel implicit

57
58
59 Kruskal-Wallis equality-of-populations rank test

60 For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

```

1  +-----+
2  | ied | Obs | Rank Sum |
3  +-----+
4  | 1 | 26 | 1021.50 |
5  | 2 | 50 | 1968.50 |
6  | 3 | 1 | 13.00 |
7  +-----+

```

```

7  chi-squared = 1.369 with 2 d.f.
8  probability = 0.5044
9  chi-squared with ties = 2.264 with 2 d.f.
10 probability = 0.3224

```

Dunn's Pairwise Comparison of iq4 by ied
(Benjamini-Hochberg)

```

14 Col Mean-|
15 Row Mean |          1          2
16 -----+-----
17 2 | -0.019386
18   | 0.4923
19 3 | 1.482968  1.500969
20   | 0.1036  0.2000

```

```

20 False Discovery Rate = 0.05
21 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
22
23 .
24 . dunntest iq5, by(ied) ma(bh) wrap
25 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

29 +-----+
30 | ied | Obs | Rank Sum |
31 +-----+
32 | 1 | 26 | 1044.50 |
33 | 2 | 49 | 1874.50 |
34 | 3 | 1 | 7.00 |
35 +-----+

```

```

35 chi-squared = 2.190 with 2 d.f.
36 probability = 0.3345
37 chi-squared with ties = 5.477 with 2 d.f.
38 probability = 0.0647

```

Dunn's Pairwise Comparison of iq5 by ied
(Benjamini-Hochberg)

```

42 Col Mean-|
43 Row Mean |          1          2
44 -----+-----
45 2 | 0.566082
46   | 0.2857
47 3 | 2.331166  2.215729
48   | 0.0296  0.0200

```

```

48 False Discovery Rate = 0.05
49 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
50
51 .
52 . dunntest iq6, by(ied) ma(bh) wrap
53 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

57 +-----+
58 | ied | Obs | Rank Sum |
59 +-----+
60 | 1 | 26 | 1024.00 |

```



```

1 | 2 | 49 | 1891.00 |
1 | 3 | 1 | 11.00 |
2 +-----+

```

```

3 chi-squared = 1.593 with 2 d.f.
4 probability = 0.4508

```

```

5 chi-squared with ties = 3.156 with 2 d.f.
6 probability = 0.2064
7

```

Dunn's Pairwise Comparison of iq6 by ied
(Benjamini-Hochberg)

```

10 Col Mean-|
11 Row Mean |          1          2
12 -----+-----
13 2 | 0.208239
14   | 0.4175
15 3 | 1.775186  1.740803
16   | 0.1138    0.0613

```

```

17 False Discovery Rate = 0.05
18 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

19 .
20 . dunntest iq7, by(ied) ma(bh) wrap

```

```

21 Warning: by() values are unlabeled, option nolabel implicit
22

```

Kruskal-Wallis equality-of-populations rank test

```

25 +-----+
26 | ied | Obs | Rank Sum |
27 +-----+-----+
28 | 1 | 26 | 1065.50 |
29 | 2 | 48 | 1771.00 |
30 | 3 | 1 | 13.50 |
31 +-----+

```

```

31 chi-squared = 1.873 with 2 d.f.
32 probability = 0.3920

```

```

33 chi-squared with ties = 3.129 with 2 d.f.
34 probability = 0.2092
35

```

Dunn's Pairwise Comparison of iq7 by ied
(Benjamini-Hochberg)

```

38 Col Mean-|
39 Row Mean |          1          2
40 -----+-----
41 2 | 0.994759
42   | 0.1599
43 3 | 1.599098  1.373101
44   | 0.1647    0.1273

```

```

45 False Discovery Rate = 0.05
46 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

47 .
48 . dunntest iq8, by(ied) ma(bh) wrap

```

```

49 Warning: by() values are unlabeled, option nolabel implicit
50

```

Kruskal-Wallis equality-of-populations rank test

```

53 +-----+
54 | ied | Obs | Rank Sum |
55 +-----+-----+
56 | 1 | 26 | 1025.50 |
57 | 2 | 49 | 1868.50 |
58 | 3 | 1 | 32.00 |
59 +-----+

```

```

59 chi-squared = 0.148 with 2 d.f.

```

probability = 0.9289

1 chi-squared with ties = 0.169 with 2 d.f.
 2 probability = 0.9190
 3

4 Dunn's Pairwise Comparison of iq8 by ied
 5 (Benjamini-Hochberg)

Col Mean-	1		2	
Row Mean	-----			
2	0.261480			
	0.3969			
3	0.353785	0.294096		
	1.0000	0.5765		

13 False Discovery Rate = 0.05

14 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

16 . dunnstest iq9, by(ied) ma(bh) wrap

17 Warning: by() values are unlabeled, option nolabel implicit

19 Kruskal-Wallis equality-of-populations rank test

ied	Obs	Rank Sum
1	26	1086.50
2	49	1813.00
3	1	26.50

27 chi-squared = 1.098 with 2 d.f.

28 probability = 0.5776

29 chi-squared with ties = 1.304 with 2 d.f.

30 probability = 0.5209
 31

32 Dunn's Pairwise Comparison of iq9 by ied
 33 (Benjamini-Hochberg)

Col Mean-	1		2	
Row Mean	-----			
2	0.974133			
	0.4950			
3	0.740520	0.513063		
	0.3442	0.3040		

41 False Discovery Rate = 0.05

42 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

44 . dunnstest iq10, by(ied) ma(bh) wrap

45 Warning: by() values are unlabeled, option nolabel implicit

47 Kruskal-Wallis equality-of-populations rank test

ied	Obs	Rank Sum
1	26	956.50
2	49	1963.00
3	1	6.50

55 chi-squared = 2.501 with 2 d.f.

56 probability = 0.2864

57 chi-squared with ties = 6.720 with 2 d.f.

58 probability = 0.0347
 59

```

1          Dunn's Pairwise Comparison of iq10 by ied
2          (Benjamini-Hochberg)
3 Col Mean-|
4 Row Mean |          1          2
5 -----+-----
6          2 | -1.001222
7          |          0.1584
8          |
9          3 |  2.206194  2.466110
10         |  0.0205   0.0205
11
12 False Discovery Rate = 0.05
13 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

- Question: For each of the questions, is there a difference in the average response based upon racer or ethnicity

```

14
15 . dunntest iq1, by(ieth) ma(bh) wrap
16
17 Warning: by() values are unlabeled, option nolabel implicit
18
19 Kruskal-Wallis equality-of-populations rank test
20
21 +-----+
22 | ieth | Obs | Rank Sum |
23 +-----+
24 | 1 | 39 | 1542.50 |
25 | 2 | 12 | 460.00 |
26 | 3 | 20 | 716.00 |
27 | 4 | 3 | 124.50 |
28 | 7 | 2 | 83.00 |
29 +-----+
30
31 chi-squared = 0.480 with 4 d.f.
32 probability = 0.9754
33
34 chi-squared with ties = 2.201 with 4 d.f.
35 probability = 0.6988

```

```

36          Dunn's Pairwise Comparison of iq1 by ieth
37          (Benjamini-Hochberg)
38 Col Mean-|
39 Row Mean |          1          2          3          4
40 -----+-----
41          2 |  0.357681
42          |  0.5147
43          |
44          3 |  1.322301  0.672593
45          |  0.9303  0.6265
46          |
47          4 | -0.315316 -0.475595 -0.892515
48          |  0.4703  0.6344  0.9303
49          |
50          7 | -0.260575 -0.401951 -0.745114  0.000000
51          |  0.4413  0.5731  0.7603  0.5000
52
53 False Discovery Rate = 0.05
54 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

55 .
56 . dunntest iq2, by(ieth) ma(bh) wrap
57
58 Warning: by() values are unlabeled, option nolabel implicit
59
60 Kruskal-Wallis equality-of-populations rank test
61
62 +-----+
63 | ieth | Obs | Rank Sum |
64 +-----+
65 | 1 | 38 | 1483.50 |
66 | 2 | 12 | 429.00 |
67 | 3 | 20 | 727.50 |

```

```

1 | 4 | 3 | 126.00 |
1 | 7 | 2 | 84.00 |
+-----+

```

```

3 chi-squared = 0.494 with 4 d.f.
4 probability = 0.9741
5 chi-squared with ties = 1.728 with 4 d.f.
6 probability = 0.7857
7

```

Dunn's Pairwise Comparison of iq2 by ieth
(Benjamini-Hochberg)

```

10 Col Mean-|
11 Row Mean |          1          2          3          4
+-----+
12 2 | 0.852426
13   | 1.0000
14 3 | 0.827632 -0.146874
15   | 0.6798 0.4907
16 4 | -0.423606 -0.830842 -0.779591
17   | 0.4799 1.0000 0.5445
18 7 | -0.350170 -0.702190 -0.650840 0.000000
19   | 0.4539 0.4826 0.4293 0.5000
20

```

```

21 False Discovery Rate = 0.05
22 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
23

```

```

24 . dunntest iq3, by(ieth) ma(bh) wrap
25
26 Warning: by() values are unlabeled, option nolabel implicit
27

```

Kruskal-Wallis equality-of-populations rank test

```

29 +-----+
30 | ieth | Obs | Rank Sum |
31 +-----+
32 | 1 | 39 | 1641.00 |
33 | 2 | 12 | 350.00 |
34 | 3 | 20 | 710.00 |
35 | 4 | 3 | 135.00 |
36 | 7 | 2 | 90.00 |
37 +-----+

```

```

37 chi-squared = 3.969 with 4 d.f.
38 probability = 0.4102
39 chi-squared with ties = 9.329 with 4 d.f.
40 probability = 0.0534
41

```

Dunn's Pairwise Comparison of iq3 by ieth
(Benjamini-Hochberg)

```

44 Col Mean-|
45 Row Mean |          1          2          3          4
+-----+
46 2 | 2.715092
47   | 0.0331
48 3 | 1.660183 -1.204134
49   | 0.1615 0.2285
50 4 | -0.338704 -1.702903 -1.065239
51   | 0.4593 0.2215 0.2390
52 7 | -0.279903 -1.439216 -0.889312 0.000000
53   | 0.4331 0.1876 0.2670 0.5000
54

```

```

55 False Discovery Rate = 0.05
56 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
57

```

```

58 . dunntest iq4, by(ieth) ma(bh) wrap
59

```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	39	1584.50
2	12	474.00
3	20	733.00
4	3	37.50
7	2	97.00

chi-squared = 5.096 with 4 d.f.
probability = 0.2776

chi-squared with ties = 8.628 with 4 d.f.
probability = 0.0711

Dunn's Pairwise Comparison of iq4 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	0.201372 0.4202			
3	0.852280 0.3284	0.459885 0.3587		
4	2.766202 0.0284	2.464580 0.0343	2.298277 0.0269	
7	-0.639739 0.3265	-0.694317 0.3482	-0.941479 0.3465	-2.323629 0.0336

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq5, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ieth	Obs	Rank Sum
1	39	1585.50
2	12	384.00
3	20	771.50
4	3	96.00
7	2	89.00

chi-squared = 1.818 with 4 d.f.
probability = 0.7691

chi-squared with ties = 4.548 with 4 d.f.
probability = 0.3369

Dunn's Pairwise Comparison of iq5 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
2	1.877283 0.3024			
3	0.541285 0.3677	-1.289464 0.4931		
4	1.034332 0.000000	0.760484		

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```

1 | 0.3762 0.5000 0.3725
2 | -0.379896 -1.172018 -0.572123 -0.980581
3 | 0.3911 0.4020 0.4052 0.3268

```

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq6, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+-----+
| 1 | 39 | 1547.50 |
| 2 | 12 | 479.50 |
| 3 | 20 | 666.50 |
| 4 | 3 | 139.50 |
| 7 | 2 | 93.00 |
+-----+

```

chi-squared = 1.918 with 4 d.f.
 probability = 0.7508

chi-squared with ties = 3.799 with 4 d.f.
 probability = 0.4338

Dunn's Pairwise Comparison of iq6 by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	-0.053834			
	0.5317			
3	1.472508	1.157760		
	0.7044	0.4116		
4	-0.725506	-0.645877	-1.356183	
	0.4681	0.4320	0.4376	
7	-0.599554	-0.545866	-1.132205	0.000000
	0.3920	0.3657	0.3219	0.5000

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq7, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+-----+
| 1 | 38 | 1459.00 |
| 2 | 12 | 507.00 |
| 3 | 20 | 644.00 |
| 4 | 3 | 144.00 |
| 7 | 2 | 96.00 |
+-----+

```

chi-squared = 2.938 with 4 d.f.
 probability = 0.5683

chi-squared with ties = 4.907 with 4 d.f.
 probability = 0.2970

Dunn's Pairwise Comparison of iq7 by ieth

(Benjamini-Hochberg)

```

1 Col Mean-|
2 Row Mean |          1          2          3          4
-----|-----
3 2 | -0.690387
4   | 0.3500
5 3 | 1.329710  1.632067
6   | 0.3060  0.5133
7 4 | -0.949754 -0.528220 -1.513248
8   | 0.3422  0.3733  0.3255
9 7 | -0.785104 -0.446427 -1.263331 0.000000
10  | 0.3603  0.3640  0.2581  0.5000
11

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq8, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+-----+
| 1 | 39 | 1519.00 |
| 2 | 12 | 510.00 |
| 3 | 20 | 673.50 |
| 4 | 3 | 106.50 |
| 7 | 2 | 117.00 |
+-----+

```

chi-squared = 3.060 with 4 d.f.

probability = 0.5478

chi-squared with ties = 3.502 with 4 d.f.

probability = 0.4775

Dunn's Pairwise Comparison of iq8 by ieth
(Benjamini-Hochberg)

```

35 Col Mean-|
36 Row Mean |          1          2          3          4
-----|-----
37 2 | -0.521135
38   | 0.3764
39 3 | 0.928892  1.170773
40   | 0.2941  0.3021
41 4 | 0.278839  0.525328 -0.142791
42   | 0.4335  0.4281  0.4432
43 7 | -1.306345 -1.014820 -1.621568 -1.220522
44   | 0.4786  0.3102  0.5245  0.3704
45

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq9, by(ieth) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ieth | Obs | Rank Sum |
+-----+-----+
| 1 | 39 | 1358.00 |
| 2 | 12 | 488.50 |
| 3 | 20 | 821.00 |
| 4 | 3 | 142.50 |
+-----+

```

```

| 7 | 2 | 116.00 |
+-----+

```

```

1
2 chi-squared = 3.527 with 4 d.f.
3 probability = 0.4738
4
5 chi-squared with ties = 4.191 with 4 d.f.
6 probability = 0.3808
7

```

Dunn's Pairwise Comparison of iq9 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	-0.880360			
	0.3156			
3	-1.118000	-0.046185		
	0.4393	0.4816		
4	-1.044571	-0.519338	-0.514209	
	0.2962	0.3772	0.3373	
7	-1.578074	-1.117498	-1.128123	-0.567738
	0.5727	0.3297	0.6482	0.4073

```

20 False Discovery Rate = 0.05
21 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
22

```

```

23 . dunntest iq10, by(ieth) ma(bh) wrap
24

```

```

25 Warning: by() values are unlabeled, option nolabel implicit
26

```

Kruskal-Wallis equality-of-populations rank test

```

29 +-----+
30 | ieth | Obs | Rank Sum |
31 |-----+-----+
32 | 1 | 39 | 1603.50 |
33 | 2 | 12 | 415.50 |
34 | 3 | 20 | 687.00 |
35 | 4 | 3 | 132.00 |
36 | 7 | 2 | 88.00 |
37 +-----+

```

```

36 chi-squared = 1.933 with 4 d.f.
37 probability = 0.7481
38
39 chi-squared with ties = 5.194 with 4 d.f.
40 probability = 0.2680
41

```

Dunn's Pairwise Comparison of iq10 by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	1.459385			
	0.3611			
3	1.825894	0.055902		
	0.3393	0.5308		
4	-0.357370	-1.078049	-1.156913	
	0.5149	0.3513	0.4122	
7	-0.295328	-0.911118	-0.965845	0.000000
	0.4798	0.3019	0.3341	0.5000

```

54 False Discovery Rate = 0.05
55 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
56

```

```

57 -----
58 . dunntest iq1, by(ihwork) ma(bh) wrap
59

```


Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	16	664.00
1	10	263.00
2	50	1999.00

chi-squared = 3.572 with 2 d.f.
probability = 0.1676

chi-squared with ties = 16.371 with 2 d.f.
probability = 0.0003

Dunn's Pairwise Comparison of iq1 by ihwork
(Benjamini-Hochberg)

Col Mean	Row Mean	0	1
1	3.655494		
		0.0002	
2	0.513034	-3.828465	
		0.3040	0.0002

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq2, by(ihwork) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	16	634.50
1	9	228.00
2	50	1987.50

chi-squared = 3.455 with 2 d.f.
probability = 0.1777

chi-squared with ties = 12.083 with 2 d.f.
probability = 0.0024

Dunn's Pairwise Comparison of iq2 by ihwork
(Benjamini-Hochberg)

Col Mean	Row Mean	0	1
1	2.949684		
		0.0024	
2	-0.028008	-3.416473	
		0.4888	0.0010

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq3, by(ihwork) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  16 |   644.00 |
|      1 |  10 |   298.00 |
|      2 |  50 |  1984.00 |
+-----+

```

chi-squared = 1.795 with 2 d.f.
probability = 0.4075

chi-squared with ties = 4.220 with 2 d.f.
probability = 0.1213

Dunn's Pairwise Comparison of iq3 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          0          1
+-----+
|      1 |  1.799706
|      |  0.0539
|      |
|      2 |  0.137772 -1.980059
|      |  0.4452   0.0715
+-----+

```

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

.
. dunntest iq4, by(ihwork) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  17 |   685.50 |
|      1 |  10 |   300.50 |
|      2 |  50 |  2017.00 |
+-----+

```

chi-squared = 1.839 with 2 d.f.
probability = 0.3987

chi-squared with ties = 3.042 with 2 d.f.
probability = 0.2185

Dunn's Pairwise Comparison of iq4 by ihwork
(Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          0          1
+-----+
|      1 |  1.481917
|      |  0.1038
|      |
|      2 | -0.003372 -1.707601
|      |  0.4987   0.1316
+-----+

```

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

.
. dunntest iq5, by(ihwork) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| ihwork | Obs | Rank Sum |
+-----+
|      0 |  16 |   712.00 |
|      1 |  10 |   220.00 |
+-----+

```

```

|      2 | 50 | 1994.00 |
+-----+

```

```

1
2 chi-squared =      6.959 with 2 d.f.
3 probability =      0.0308

```

```

4 chi-squared with ties =      17.404 with 2 d.f.
5 probability =      0.0002
6

```

Dunn's Pairwise Comparison of iq5 by ihwork
(Benjamini-Hochberg)

```

9 Col Mean-|
10 Row Mean |      0      1
11 -----+-----
12 1 | 3.997040
13   | 0.0001
14 2 | 1.151855 -3.696235
15   | 0.1247 0.0002

```

```

16 False Discovery Rate = 0.05
17 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

18 .
19 . dunntest iq6, by(ihwork) ma(bh) wrap

```

```

20 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

24 +-----+
25 | ihwork | Obs | Rank Sum |
26 +-----+-----+
27 |      0 | 16 | 559.00 |
28 |      1 | 10 | 308.00 |
29 |      2 | 50 | 2059.00 |

```

```

30 chi-squared =      2.369 with 2 d.f.
31 probability =      0.3060

```

```

32 chi-squared with ties =      4.692 with 2 d.f.
33 probability =      0.0958
34

```

Dunn's Pairwise Comparison of iq6 by ihwork
(Benjamini-Hochberg)

```

37 Col Mean-|
38 Row Mean |      0      1
39 -----+-----
40 1 | 0.654135
41   | 0.2565
42 2 | -1.385120 -1.909689
43   | 0.1245 0.0843

```

```

44 False Discovery Rate = 0.05
45 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

46 .
47 . dunntest iq7, by(ihwork) ma(bh) wrap

```

```

48 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

52 +-----+
53 | ihwork | Obs | Rank Sum |
54 +-----+-----+
55 |      0 | 16 | 644.50 |
56 |      1 | 9 | 353.00 |
57 |      2 | 50 | 1852.50 |

```

```

58 chi-squared =      0.299 with 2 d.f.
59 probability =      0.8613

```

1 chi-squared with ties = 0.499 with 2 d.f.
 2 probability = 0.7793

3
 4 Dunn's Pairwise Comparison of iq7 by ihwork
 5 (Benjamini-Hochberg)

Col Mean-		
Row Mean	0	1
1	0.150716	
	0.4401	
2	0.667091	0.355734
	0.7571	0.5415

12 False Discovery Rate = 0.05
 13 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

15 . dunntest iq8, by(ihwork) ma(bh) wrap

17 Warning: by() values are unlabeled, option nolabel implicit

18
 19 Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	16	521.00
1	10	393.00
2	50	2012.00

26 chi-squared = 1.480 with 2 d.f.
 27 probability = 0.4771

29 chi-squared with ties = 1.694 with 2 d.f.
 30 probability = 0.4287

31
 32 Dunn's Pairwise Comparison of iq8 by ihwork
 33 (Benjamini-Hochberg)

Col Mean-		
Row Mean	0	1
1	-0.809654	
	0.3136	
2	-1.294852	-0.131451
	0.2931	0.4477

40 False Discovery Rate = 0.05
 41 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

43 . dunntest iq9, by(ihwork) ma(bh) wrap

45 Warning: by() values are unlabeled, option nolabel implicit

46
 47 Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	16	639.00
1	10	379.00
2	50	1908.00

54 chi-squared = 0.087 with 2 d.f.
 55 probability = 0.9574

57 chi-squared with ties = 0.103 with 2 d.f.
 58 probability = 0.9496

Dunn's Pairwise Comparison of iq9 by ihwork
(Benjamini-Hochberg)

Col Mean-		
Row Mean	0	1
1	0.249482	
	0.6022	
2	0.305457	-0.037047
	1.0000	0.4852

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq10, by(ihwork) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

ihwork	Obs	Rank Sum
0	16	666.50
1	10	322.00
2	50	1937.50

chi-squared = 1.147 with 2 d.f.

probability = 0.5635

chi-squared with ties = 3.082 with 2 d.f.

probability = 0.2141

Dunn's Pairwise Comparison of iq10 by ihwork
(Benjamini-Hochberg)

Col Mean-		
Row Mean	0	1
1	1.741221	
	0.1225	
2	0.751048	-1.403500
	0.2263	0.1204

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

HPESS Survey Statistics on Factor Analysis Produced Variables

- Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by age?

Answer – NO, not for either variable

- Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by gender?

Answer – NO, not for either variable

- Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by level of education

Answer – NO, not for either variable

- Question: For each of the factor variables (knowledge, participation), is there a difference in the average response based upon racer or ethnicity

Answer – K-Wallis (nonparametric ANOVA reports a significant p value for "knowledge" but the Dunn test finds no significant difference among the pairs tested. No significant difference was found for "participate"

- Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by age?

```
. dunntest iknowledge, by(iage) ma(bh) wrap
Kruskal-Wallis equality-of-populations rank test
```

iage	Obs	Rank Sum
1	1	3.50
2	22	876.00
3	35	1415.50
4	11	324.50
5	5	209.50
6	1	21.00

```
chi-squared = 5.540 with 5 d.f.
probability = 0.3535

chi-squared with ties = 7.568 with 5 d.f.
probability = 0.1817
```

Dunn's Pairwise Comparison of iknowledge by iage (Benjamini-Hochberg)

Col Mean-	1	2	3	4	5
Row Mean					
2	-1.904824				
	0.2130				
3	-1.953424	-0.123125			
	0.3808	0.4510			
4	-1.334942	1.498433	1.697718		

```

1      |      0.2274      0.2010      0.1679
2      |
3      |
4      |      -1.879853  -0.225341  -0.163446  -1.232896
5      |      0.1503      0.4741      0.4662      0.2332
6      |
7      |      -0.663600  0.986980  1.028078  0.436423  1.023149
8      |      0.3456      0.2427      0.2849      0.4141      0.2552

```

```

6 False Discovery Rate = 0.05
7 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

9 . dunnstest iparticipate, by(iage) ma(bh) wrap

```

```

10 Kruskal-Wallis equality-of-populations rank test

```

```

12 +-----+
13 | iage | Obs | Rank Sum |
14 +-----+
15 | 1 | 1 | 10.00 |
16 | 2 | 22 | 810.00 |
17 | 3 | 35 | 1355.00 |
18 | 4 | 11 | 407.50 |
19 | 5 | 5 | 221.50 |
20 +-----+

```

```

21 chi-squared = 2.326 with 5 d.f.
22 probability = 0.8024

```

```

23 chi-squared with ties = 2.448 with 5 d.f.
24 probability = 0.7843

```

```

26 Dunn's Pairwise Comparison of iparticipate by iage
27 (Benjamini-Hochberg)

```

```

28 Col Mean-|
29 Row Mean |      1      2      3      4      5
30 -----|-----
31 2 | -1.234590
32   | 0.5425
33 3 | -1.332682 -0.328032
34   | 0.6849 0.4643
35 4 | -1.218838 -0.028970 0.227253
36   | 0.4179 0.4884 0.4732
37 5 | -1.473837 -0.710833 -0.549938 -0.633107
38   | 1.0000 0.5965 0.5460 0.5643
39 6 | -1.198211 -0.422690 -0.338143 -0.403548 -0.073047
40   | 0.3463 0.5604 0.5013 0.5149 0.5045

```

```

41 False Discovery Rate = 0.05
42 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by gender?

```

48 . ranksum iknowledge, by(igender)

```

```

49 Two-sample Wilcoxon rank-sum (Mann-Whitney) test

```

```

51 igender |      obs      rank sum      expected
52 -----|-----
53 1 |      17      579      646
54 2 |      58     2271     2204
55 -----|-----
56 combined |      75     2850     2850

```

```

56 unadjusted variance 6244.67
57 adjustment for ties -1673.27
58 -----
59 adjusted variance 4571.40

```

```

1 Ho: iknowl~e(igender==1) = iknowl~e(igender==2)
2     z = -0.991
3     Prob > |z| = 0.3217

```

```

4 .
5 . ranksum iparticipate, by(igender)

```

```

6 Two-sample Wilcoxon rank-sum (Mann-Whitney) test

```

```

7     igender |      obs   rank sum   expected
8 -----+-----+-----+-----+
9     1 |      17   599.5   646
10    2 |      58  2250.5  2204
11 -----+-----+-----+
12    combined |      75   2850   2850

```

```

13 unadjusted variance    6244.67
14 adjustment for ties   -310.99
15 -----+-----+
16 adjusted variance     5933.68

```

```

17 Ho: iparti~e(igender==1) = iparti~e(igender==2)
18     z = -0.604
19     Prob > |z| = 0.5461

```

- **Question – For each of the factor variables (knowledge, participation), is there a difference in the average response by level of education**

```

24 .
25 . dunntest iknowledge, by(ied) ma(bh) wrap

```

```

26 Kruskal-Wallis equality-of-populations rank test

```

```

27
28 +-----+
29 | ied | Obs | Rank Sum |
30 |-----+-----+
31 | 1 | 26 | 952.00 |
32 | 2 | 48 | 1894.50 |
33 | 3 | 1 | 3.50 |
34 +-----+

```

```

34 chi-squared = 2.829 with 2 d.f.
35 probability = 0.2431

```

```

36 chi-squared with ties = 3.864 with 2 d.f.
37 probability = 0.1449

```

```

38
39           Dunn's Pairwise Comparison of iknowledge by ied
40           (Benjamini-Hochberg)

```

```

41 Col Mean-|
42 Row Mean |           1           2
43 -----+-----+-----+
44     2 | -0.628394
45     | 0.2649
46     |
47     3 | 1.742681  1.909111
48     | 0.0610   0.0844

```

```

49 False Discovery Rate = 0.05
50 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

51 .
52 . dunntest iparticipate, by(ied) ma(bh) wrap

```

```

53 Kruskal-Wallis equality-of-populations rank test

```

```

54 +-----+
55 | ied | Obs | Rank Sum |
56 |-----+-----+
57 | 1 | 26 | 1051.50 |
58 | 2 | 48 | 1784.00 |
59 | 3 | 1 | 14.50 |
60 +-----+

```



```
chi-squared = 1.559 with 2 d.f.
probability = 0.4586
```

```
chi-squared with ties = 1.641 with 2 d.f.
probability = 0.4402
```

Dunn's Pairwise Comparison of iparticipate by ied
(Benjamini-Hochberg)

Col Mean-	1	2
2 0.633189		
0.2633		
3 1.198283	1.055981	
0.3462	0.2182	

```
False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

- Question: For each of the factor variables (knowledge, participation), is there a difference in the average response based upon racer or ethnicity

```
. dunntest iknowledge, by(ieth) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

ieth	Obs	Rank Sum
1	38	1601.50
2	12	333.00
3	20	759.00
4	3	53.50
7	2	103.00

```
chi-squared = 7.365 with 4 d.f.
probability = 0.1178
```

```
chi-squared with ties = 10.060 with 4 d.f.
probability = 0.0394
```

Dunn's Pairwise Comparison of iknowledge by ieth
(Benjamini-Hochberg)

Col Mean-	1	2	3	4
2 2.331226				
0.0987				
3 0.814293	-1.498008			
0.2308	0.1118			
4 2.173971	0.823862	1.742413		
0.0743	0.2563	0.1018		
7 -0.691538	-1.667587	-0.979809	-1.977762	
0.2446	0.0954	0.2337	0.0799	

```
False Discovery Rate = 0.05
Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
```

```
. dunntest iparticipate, by(ieth) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```

+-----+
| ieth | Obs | Rank Sum |
+-----+
| 1 | 38 | 1430.50 |
| 2 | 12 | 507.00 |
| 3 | 20 | 659.50 |
| 4 | 3 | 128.00 |
| 7 | 2 | 125.00 |
+-----+
    
```

chi-squared = 4.195 with 4 d.f.
 probability = 0.3803

chi-squared with ties = 4.414 with 4 d.f.
 probability = 0.3528

Dunn's Pairwise Comparison of iparticipate by ieth
 (Benjamini-Hochberg)

Col Mean-	1	2	3	4
Row Mean				
2	-0.654633 0.3204			
3	0.795667 0.3552	1.195612 0.2898		
4	-0.394164 0.3853	-0.030384 0.4879	-0.736811 0.3295	
7	-1.612653 0.2670	-1.247994 0.3534	-1.873935 0.3047	-1.022662 0.3065

False Discovery Rate = 0.05
 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

National Survey Statistics Report

Summary

- Question – For each of the questions, 1-10, are there differences in the average response by age?
Answer – YES, for ALL questions there are significant differences among the responses of the various age groups
- Question – For each of the questions, 1-10, are there differences in the average response by gender?
Answer – YES, for ALL questions there are significant differences between the responses of the genders.
- Question – For each of the questions, 1-10, are there differences in the average response by income level?
Answer – YES, for questions 1, 2, 3, 4, and 6 there are differences in responses among income levels.
- Question: For each of the questions, are there differences in the average responses among regions?
Answer – YES, but only for question 9.
- Question – For each of the questions, 1-10, are there differences in the average responses among the devices used?
Answer – Yes, for all questions, except 2, 8 and 9, there are differences in the average responses among the devices used.

Statistics

- Question – For each of the questions, 1-10, are there differences in the average response by age among those who identified their age group?

```
. dunnstest iq1, by(iage) ma(bh) wrap
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| iage | Obs | Rank Sum |
+-----+-----+
| 2 | 297 | 136808.00 |
| 3 | 230 | 120095.00 |
| 4 | 343 | 193579.00 |
| 5 | 197 | 119296.00 |
+-----+
```

```
chi-squared = 31.130 with 3 d.f.
probability = 0.0001
```

```
chi-squared with ties = 53.379 with 3 d.f.
probability = 0.0001
```

```
Dunn's Pairwise Comparison of iq1 by iage
(Benjamini-Hochberg)
```

```
Col Mean-|
Row Mean |
```

²For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

```

-----+-----
1      3 | -2.976209
2      | 0.0022
3      4 | -5.561425 -2.104981
4      | 0.0000 0.0212
5      5 | -6.702295 -3.651101 -1.958054
6      | 0.0000 0.0003 0.0251

```

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

```

.
. dunntest iq2, by(iage) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+
| 2 | 297 | 137489.50 |
| 3 | 230 | 117935.00 |
| 4 | 343 | 193709.50 |
| 5 | 197 | 120644.00 |
+-----+

```

chi-squared = 33.059 with 3 d.f.
 probability = 0.0001

chi-squared with ties = 47.662 with 3 d.f.
 probability = 0.0001

Dunn's Pairwise Comparison of iq2 by iage
 (Benjamini-Hochberg)

```

Col Mean-|
Row Mean |          2          3          4
-----+-----
3 | -2.210640
   | 0.0162
4 | -5.005456 -2.376918
   | 0.0000 0.0131
5 | -6.338529 -3.999461 -2.077098
   | 0.0000 0.0001 0.0189

```

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

```

.
. dunntest iq3, by(iage) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iage | Obs | Rank Sum |
+-----+
| 2 | 297 | 139770.50 |
| 3 | 230 | 117843.00 |
| 4 | 343 | 191441.00 |
| 5 | 197 | 120723.50 |
+-----+

```

chi-squared = 28.691 with 3 d.f.
 probability = 0.0001

chi-squared with ties = 53.833 with 3 d.f.
 probability = 0.0001

Dunn's Pairwise Comparison of iq3 by iage

(Benjamini-Hochberg)

```

1 Col Mean-|
2 Row Mean |          2          3          4
-----|-----
3 3 | -2.113003
4   | 0.0173
5   |
6 4 | -4.908660 -2.387522
7   | 0.0000 0.0102
8   |
9 5 | -6.879036 -4.599409 -2.718488
10  | 0.0000 0.0000 0.0049

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq4, by(iage) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

18 +-----+
19 | iage | Obs | Rank Sum |
20 |-----+-----|
21 | 2 | 297 | 131759.50 |
22 | 3 | 230 | 116810.50 |
23 | 4 | 343 | 196304.50 |
24 | 5 | 197 | 124903.50 |
25 +-----+

```

chi-squared = 53.252 with 3 d.f.

probability = 0.0001

chi-squared with ties = 70.467 with 3 d.f.

probability = 0.0001

Dunn's Pairwise Comparison of iq4 by iage
(Benjamini-Hochberg)

```

32 Col Mean-|
33 Row Mean |          2          3          4
-----|-----
34 3 | -2.730052
35   | 0.0038
36   |
37 4 | -6.060387 -2.822725
38   | 0.0000 0.0036
39   |
40 5 | -7.734777 -4.851098 -2.576905
41  | 0.0000 0.0000 0.0050

```

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq5, by(iage) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

49 +-----+
50 | iage | Obs | Rank Sum |
51 |-----+-----|
52 | 2 | 297 | 130735.50 |
53 | 3 | 230 | 118988.50 |
54 | 4 | 343 | 197372.50 |
55 | 5 | 197 | 122681.50 |
56 +-----+

```

chi-squared = 50.736 with 3 d.f.

probability = 0.0001

chi-squared with ties = 74.894 with 3 d.f.

probability = 0.0001

Dunn's Pairwise Comparison of iq5 by iage
(Benjamini-Hochberg)

Col Mean-	2	3	4
3 -3.463252			
	0.0004		
4 -6.727241	-2.687273		
	0.0000	0.0043	
5 -7.833291	-4.280955	-2.086904	
	0.0000	0.0000	0.0184

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq6, by(iage) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	139523.00
3	230	121315.50
4	343	196979.50
5	197	111960.00

chi-squared = 21.310 with 3 d.f.
probability = 0.0001

chi-squared with ties = 31.684 with 3 d.f.
probability = 0.0001

Dunn's Pairwise Comparison of iq6 by iage
(Benjamini-Hochberg)

Col Mean-	2	3	4
3 -2.598612			
	0.0094		
4 -5.217225	-2.174021		
	0.0000	0.0223	
5 -4.243787	-1.665690	0.263774	
	0.0000	0.0575	0.3960

False Discovery Rate = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq FDR/2$ with stopping rule

. dunntest iq7, by(iage) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	134994.00
3	230	118404.00
4	343	195415.00
5	197	120965.00

chi-squared = 38.545 with 3 d.f.
probability = 0.0001

1 chi-squared with ties = 47.396 with 3 d.f.
 2 probability = 0.0001

3
 4 Dunn's Pairwise Comparison of iq7 by iage
 5 (Benjamini-Hochberg)

Col Mean-			
Row Mean	2	3	4
3	-2.469339		
	0.0102		
4	-5.229834	-2.318978	
	0.0000	0.0122	
5	-6.246620	-3.678399	-1.783685
	0.0000	0.0002	0.0372

14 False Discovery Rate = 0.05
 15 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

17 . dunntest iq8, by(iage) ma(bh) wrap

19 Warning: by() values are unlabeled, option nolabel implicit

21 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	144264.00
3	230	123659.00
4	343	195323.50
5	197	106531.50

29 chi-squared = 11.953 with 3 d.f.
 30 probability = 0.0075

31 chi-squared with ties = 13.243 with 3 d.f.
 32 probability = 0.0041

35 Dunn's Pairwise Comparison of iq8 by iage
 36 (Benjamini-Hochberg)

Col Mean-			
Row Mean	2	3	4
3	-2.018706		
	0.0435		
4	-3.607781	-1.274845	
	0.0009	0.1518	
5	-2.045700	-0.109821	1.096108
	0.0612	0.4563	0.1638

45 False Discovery Rate = 0.05
 46 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

48 . dunntest iq9, by(iage) ma(bh) wrap

50 Warning: by() values are unlabeled, option nolabel implicit

52 Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	145982.00
3	230	123673.00
4	343	185055.00
5	197	115068.00

```

1 chi-squared = 10.994 with 3 d.f.
2 probability = 0.0118
3 chi-squared with ties = 12.738 with 3 d.f.
4 probability = 0.0052

```

```

6          Dunn's Pairwise Comparison of iq9 by iage
7          (Benjamini-Hochberg)

```

Col Mean-	2	3	4
3	-1.836776		
	0.0662		
4	-2.115200	-0.074195	
	0.0516	0.4704	
5	-3.519369	-1.669304	-1.742007
	0.0013	0.0570	0.0611

```

16 False Discovery Rate = 0.05
17 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

```

19 .
20 . dunntest iq10, by(iage) ma(bh) wrap

```

```

21 Warning: by() values are unlabeled, option nolabel implicit

```

```

23 Kruskal-Wallis equality-of-populations rank test

```

iage	Obs	Rank Sum
2	297	134627.00
3	230	122540.00
4	343	194647.50
5	197	117963.50

```

31 chi-squared = 33.137 with 3 d.f.
32 probability = 0.0001
33
34 chi-squared with ties = 60.194 with 3 d.f.
35 probability = 0.0001

```

```

37          Dunn's Pairwise Comparison of iq10 by iage
38          (Benjamini-Hochberg)

```

Col Mean-	2	3	4
3	-3.958265		
	0.0001		
4	-6.301218	-1.780890	
	0.0000	0.0450	
5	-6.925950	-2.974246	-1.532010
	0.0000	0.0022	0.0628

```

47 False Discovery Rate = 0.05
48 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule

```

• Question – For each of the questions, 1-10, are there differences in the average response by gender?

```

53 . dunntest iq1, by(igender)

```

```

54 Warning: by() values are unlabeled, option nolabel implicit

```

```

56 Kruskal-Wallis equality-of-populations rank test

```

```

59 +-----+

```



```

1 | igender | Obs | Rank Sum |
2 |-----+-----+-----|
3 |         |     |         |
4 |         1 | 497 | 248163.00 |
5 |         2 | 570 | 321615.00 |
6 |-----+-----+-----|
7
8 chi-squared =    11.781 with 1 d.f.
9 probability =     0.0006
10
11 chi-squared with ties =    20.202 with 1 d.f.
12 probability =    0.0001
13
14
15
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60

```

Dunn's Pairwise Comparison of iq1 by igender
(No adjustment)

Col Mean-	Row Mean	1
2	-4.494629	0.0000

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```

.
. dunntest iq2, by(igender)
Warning: by() values are unlabeled, option nolabel implicit
Kruskal-Wallis equality-of-populations rank test
+-----+
| igender | Obs | Rank Sum |
|-----+-----+-----|
|         |     |         |
|         1 | 497 | 245930.00 |
|         2 | 570 | 323848.00 |
|-----+-----+-----|
chi-squared =    15.032 with 1 d.f.
probability =     0.0001
chi-squared with ties =    21.672 with 1 d.f.
probability =    0.0001
Dunn's Pairwise Comparison of iq2 by igender
(No adjustment)
Col Mean-|
Row Mean |
-----+-----+
2 | -4.655324
| 0.0000
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunntest iq3, by(igender)
Warning: by() values are unlabeled, option nolabel implicit
Kruskal-Wallis equality-of-populations rank test
+-----+
| igender | Obs | Rank Sum |
|-----+-----+-----|
|         |     |         |
|         1 | 497 | 254937.00 |
|         2 | 570 | 314841.00 |
|-----+-----+-----|
chi-squared =     4.340 with 1 d.f.
probability =    0.0372
chi-squared with ties =     8.144 with 1 d.f.
probability =    0.0043

```

Dunn's Pairwise Comparison of iq3 by igender
(No adjustment)

```

1 Col Mean-|
2 Row Mean |           1
3 -----+-----
4         2 | -2.853738
5         |           0.0022

```

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
.
. dunntest iq4, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

14 +-----+
15 | igender | Obs | Rank Sum |
16 |-----+-----|
17 |         1 | 497 | 245219.00 |
18 |         2 | 570 | 324559.00 |
19 +-----+

```

chi-squared = 16.150 with 1 d.f.
probability = 0.0001

chi-squared with ties = 21.371 with 1 d.f.
probability = 0.0001

Dunn's Pairwise Comparison of iq4 by igender
(No adjustment)

```

26 Col Mean-|
27 Row Mean |           1
28 -----+-----
29         2 | -4.622902
30         |           0.0000

```

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
.
. dunntest iq5, by(igender)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

39 +-----+
40 | igender | Obs | Rank Sum |
41 |-----+-----|
42 |         1 | 497 | 250255.00 |
43 |         2 | 570 | 319523.00 |
44 +-----+

```

chi-squared = 9.095 with 1 d.f.
probability = 0.0026

chi-squared with ties = 13.426 with 1 d.f.
probability = 0.0002

Dunn's Pairwise Comparison of iq5 by igender
(No adjustment)

```

51 Col Mean-|
52 Row Mean |           1
53 -----+-----
54         2 | -3.664079
55         |           0.0001

```

alpha = 0.05
Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
.
. dunntest iq6, by(igender)
```

1 Warning: by() values are unlabeled, option nolabel implicit

2

3 Kruskal-Wallis equality-of-populations rank test

4

```
5 +-----+
6 | igender | Obs | Rank Sum |
7 |-----+-----|
8 |         | 1 | 497 | 253170.50 |
9 |         | 2 | 570 | 316607.50 |
10 +-----+
```

9

10 chi-squared = 5.930 with 1 d.f.

11 probability = 0.0149

12 chi-squared with ties = 8.817 with 1 d.f.

13 probability = 0.0030

14

15 Dunn's Pairwise Comparison of iq6 by igender

16 (No adjustment)

```
17 Col Mean-|
18 Row Mean | 1
19 +-----+-----|
20 |         | 2 | -2.969281
21 |         |   | 0.0015
```

21 alpha = 0.05

22 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

23

24 . dunntest iq7, by(igender)

25

26 Warning: by() values are unlabeled, option nolabel implicit

27

28 Kruskal-Wallis equality-of-populations rank test

29

```
30 +-----+
31 | igender | Obs | Rank Sum |
32 |-----+-----|
33 |         | 1 | 497 | 242886.00 |
34 |         | 2 | 570 | 326892.00 |
35 +-----+
```

34

35 chi-squared = 20.100 with 1 d.f.

36 probability = 0.0001

37 chi-squared with ties = 24.716 with 1 d.f.

38 probability = 0.0001

39

40 Dunn's Pairwise Comparison of iq7 by igender

41 (No adjustment)

```
42 Col Mean-|
43 Row Mean | 1
44 +-----+-----|
45 |         | 2 | -4.971520
46 |         |   | 0.0000
```

46 alpha = 0.05

47 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

48

49 . dunntest iq8, by(igender)

50

51 Warning: by() values are unlabeled, option nolabel implicit

52

53 Kruskal-Wallis equality-of-populations rank test

54

```
55 +-----+
56 | igender | Obs | Rank Sum |
57 |-----+-----|
58 |         | 1 | 497 | 243180.50 |
59 |         | 2 | 570 | 326597.50 |
60 +-----+
```

59

60

```
chi-squared = 19.578 with 1 d.f.
probability = 0.0001
```

```
chi-squared with ties = 21.691 with 1 d.f.
probability = 0.0001
```

Dunn's Pairwise Comparison of iq8 by igender
(No adjustment)

```
Col Mean-|
Row Mean |          1
-----+-----
      2 | -4.657396
      |      0.0000
```

```
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
```

```
. dunntest iq9, by(igender)
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| igender | Obs | Rank Sum |
+-----+-----+
|          |     |           |
|          1 | 497 | 250477.00 |
|          2 | 570 | 319301.00 |
+-----+-----+
```

```
chi-squared = 8.830 with 1 d.f.
probability = 0.0030
```

```
chi-squared with ties = 10.231 with 1 d.f.
probability = 0.0014
```

Dunn's Pairwise Comparison of iq9 by igender
(No adjustment)

```
Col Mean-|
Row Mean |          1
-----+-----
      2 | -3.198645
      |      0.0007
```

```
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
```

```
. dunntest iq10, by(igender)
```

```
Warning: by() values are unlabeled, option nolabel implicit
```

```
Kruskal-Wallis equality-of-populations rank test
```

```
+-----+
| igender | Obs | Rank Sum |
+-----+-----+
|          |     |           |
|          1 | 497 | 246943.50 |
|          2 | 570 | 322834.50 |
+-----+-----+
```

```
chi-squared = 13.508 with 1 d.f.
probability = 0.0002
```

```
chi-squared with ties = 24.537 with 1 d.f.
probability = 0.0001
```

Dunn's Pairwise Comparison of iq10 by igender
(No adjustment)

```
Col Mean-|
Row Mean |          1
-----+-----
      2 | -4.953449
```

```
| 0.0000
```

```
1 alpha = 0.05
2 Reject Ho if p = P(Z <= |z|) <= alpha/2
3
```

-
- Question – For each of the questions, 1-10, are there differences in the average response by income level?

```
8 . dunnstest iq1, by(iincome)
```

```
9 Warning: by() values are unlabeled, option nolabel implicit
```

```
11 Kruskal-Wallis equality-of-populations rank test
```

```
13 +-----+
14 | iincome | Obs | Rank Sum |
15 +-----+
16 | 1 | 85 | 39647.00 |
17 | 2 | 124 | 60999.00 |
18 | 3 | 220 | 109906.00 |
19 | 4 | 194 | 109253.00 |
20 | 5 | 138 | 73959.00 |
21 +-----+
22 | 6 | 81 | 47674.00 |
23 | 7 | 45 | 26205.00 |
24 | 8 | 29 | 18958.00 |
25 | 9 | 13 | 7766.00 |
26 | 10 | 22 | 13681.00 |
27 +-----+
28 | 11 | 116 | 61730.00 |
29 +-----+
```

```
27 chi-squared = 21.252 with 10 d.f.
28 probability = 0.0194
```

```
29 chi-squared with ties = 36.441 with 10 d.f.
30 probability = 0.0001
```

```
32 Dunn's Pairwise Comparison of iq1 by iincome
33 (No adjustment)
```

Col Mean-	1	2	3	4	5	6
2	-0.769253					
Row Mean	0.2209					
3	-1.102569	-0.289304				
Row Mean	0.1351	0.3862				
4	-3.159808	-2.632641	-2.743449			
Row Mean	0.0008	0.0042	0.0030			
5	-2.141875	-1.511267	-1.422898	1.038856		
Row Mean	0.0161	0.0654	0.0774	0.1494		
6	-3.342301	-2.874429	-2.909733	-0.816141	-1.597847	
Row Mean	0.0004	0.0020	0.0018	0.2072	0.0550	
7	-2.671383	-2.207428	-2.149485	-0.492410	-1.148526	0.142490
Row Mean	0.0038	0.0136	0.0158	0.3112	0.1254	0.4433
8	-3.700701	-3.333112	-3.315692	-1.932950	-2.450205	-1.279432
Row Mean	0.0001	0.0004	0.0005	0.0266	0.0071	0.1004
9	-1.868475	-1.537144	-1.456172	-0.507627	-0.900035	-0.125393
Row Mean	0.0308	0.0621	0.0727	0.3059	0.1841	0.4501
10	-2.761056	-2.386668	-2.323942	-1.108837	-1.590545	-0.588491
Row Mean	0.0029	0.0085	0.0101	0.1338	0.0559	0.2781
11	-1.955930	-1.323354	-1.206620	1.122513	0.127501	1.655509
Row Mean	0.0252	0.0929	0.1138	0.1308	0.4493	0.0489
Col Mean-						
Row Mean	7	8	9	10		

```

-----+-----
1      8 | -1.273936
2      |      0.1013
3      9 | -0.203120  0.717258
4      |      0.4195  0.2366
5     10 | -0.645693  0.478844 -0.297344
6      |      0.2592  0.3160  0.3831
7     11 |  1.214096  2.488185  0.947688  1.639269
8      |      0.1124  0.0064  0.1716  0.0506
9

```

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

```

. dunntest iq2, by(iincome)
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iincome | Obs | Rank Sum |
+-----+
| 1 | 85 | 39413.00 |
| 2 | 124 | 62680.50 |
| 3 | 220 | 113218.00 |
| 4 | 194 | 104957.50 |
| 5 | 138 | 77734.00 |
+-----+
| 6 | 81 | 46268.50 |
| 7 | 45 | 27142.00 |
| 8 | 29 | 14295.00 |
| 9 | 13 | 8091.00 |
| 10 | 22 | 12619.00 |
+-----+
| 11 | 116 | 63359.50 |
+-----+

```

```

chi-squared = 13.281 with 10 d.f.
probability = 0.2084

chi-squared with ties = 19.148 with 10 d.f.
probability = 0.0384

```

Dunn's Pairwise Comparison of iq2 by iincome
 (No adjustment)

```

Col Mean-|
Row Mean |      1      2      3      4      5      6
-----+-----
41      2 | -1.156759
42      |      0.1237
43      3 | -1.554296 -0.317118
44      |      0.0601  0.3756
45      4 | -2.316595 -1.204085 -1.044061
46      |      0.0103  0.1143  0.1482
47      5 | -2.814820 -1.820137 -1.746089 -0.779272
48      |      0.0024  0.0344  0.0404  0.2179
49      6 | -2.698388 -1.792626 -1.696535 -0.889441 -0.220641
50      |      0.0035  0.0365  0.0449  0.1869  0.4127
51      7 | -2.947791 -2.186686 -2.108330 -1.463268 -0.904860 -0.669351
52      |      0.0016  0.0144  0.0175  0.0717  0.1828  0.2516
53      8 | -0.529937  0.237196  0.427915  0.941103  1.342026  1.409567
54      |      0.2981  0.4063  0.3344  0.1733  0.0898  0.0793
55      9 | -2.076410 -1.562379 -1.471004 -1.106612 -0.793658 -0.667291
56      |      0.0189  0.0591  0.0706  0.1342  0.2137  0.2523
57     10 | -1.790286 -1.147028 -1.027451 -0.564161 -0.174837 -0.038489

```

		0.0367	0.1257	0.1521	0.2863	0.4306	0.4846
1							
2	11	-2.251971	-1.228138	-1.072211	-0.172116	0.528550	0.673092
3		0.0122	0.1097	0.1418	0.4317	0.2986	0.2504
4	Col Mean-						
5	Row Mean	7	8	9	10		
6	8	1.803556					
7		0.0357					
8	9	-0.237949	-1.511200				
9		0.4060	0.0654				
10	10	0.442807	-1.111590	0.543469			
11		0.3290	0.1332	0.2934			
12	11	1.263574	-0.999773	1.014893	0.458911		
13		0.1032	0.1587	0.1551	0.3231		

```

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunntest iq3, by(iincome)
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	38988.50
2	124	65318.50
3	220	111481.50
4	194	108216.50
5	138	75233.00
6	81	46445.50
7	45	26126.00
8	29	16689.00
9	13	8034.00
10	22	13280.50
11	116	59965.00

```

chi-squared = 13.531 with 10 d.f.
probability = 0.1955

chi-squared with ties = 25.388 with 10 d.f.
probability = 0.0047

```

Dunn's Pairwise Comparison of iq3 by iincome
(No adjustment)

		1	2	3	4	5	6
2		-2.148829					
		0.0158					
3		-1.672250	0.792784				
		0.0472	0.2140				
4		-3.387523	-1.200612	-2.305484			
		0.0004	0.1150	0.0106			
5		-2.787910	-0.661150	-1.573197	0.504950		
		0.0027	0.2543	0.0578	0.3068		
6		-3.283862	-1.451113	-2.280115	-0.523645	-0.896635	
		0.0005	0.0734	0.0113	0.3003	0.1850	
7		-2.938900	-1.374539	-2.006238	-0.611462	-0.916926	-0.171575
		0.0016	0.0846	0.0224	0.2704	0.1796	0.4319
8		-2.414087	-1.049909	-1.546854	-0.394415	-0.659672	-0.042756

		0.0079	0.1469	0.0609	0.3466	0.2547	0.4829
1							
2	9	-2.377882	-1.391143	-1.732772	-0.933760	-1.115905	-0.663510
3		0.0087	0.0821	0.0416	0.1752	0.1322	0.2535
4	10	-2.693915	-1.477507	-1.926749	-0.905783	-1.132569	-0.559433
5		0.0035	0.0698	0.0270	0.1825	0.1287	0.2879
6	11	-1.813516	0.338009	-0.395350	1.548125	0.996072	1.733268
7		0.0349	0.3677	0.3463	0.0608	0.1596	0.0415
8	Col Mean-						
9	Row Mean	7	8	9	10		

10	8	0.095106					
11		0.4621					
12	9	-0.528284	-0.566220				
13		0.2987	0.2856				
14	10	-0.394380	-0.442980	0.182222			
15		0.3467	0.3289	0.4277			
16	11	1.610698	1.253413	1.535893	1.657645		
17		0.0536	0.1050	0.0623	0.0487		

```

19 alpha = 0.05
20 Reject Ho if p = P(Z <= |z|) <= alpha/2
21 .
22 . dunntest iq4, by(iincome)
23 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	37107.00
2	124	65210.00
3	220	110440.00
4	194	111545.50
5	138	75994.50
6	81	42547.50
7	45	27401.50
8	29	15829.50
9	13	7802.00
10	22	13522.00
11	116	62378.50

```

41 chi-squared = 19.683 with 10 d.f.
42 probability = 0.0324
43 chi-squared with ties = 26.046 with 10 d.f.
44 probability = 0.0037

```

Dunn's Pairwise Comparison of iq4 by iincome
(No adjustment)

		1	2	3	4	5	6
50	2	-2.368171					
51		0.0089					
52	3	-1.912976	0.794063				
53		0.0279	0.2136				
54	4	-3.972534	-1.593812	-2.765956			
55		0.0000	0.0555	0.0028			
56	5	-3.089953	-0.748099	-1.673598	0.814298		
57		0.0010	0.2272	0.0471	0.2077		
58	6	-2.133003	0.015921	-0.668591	1.402405	0.677582	

1		0.0165	0.4936	0.2519	0.0804	0.2490
2	7	-3.490216	-1.781082	-2.439558	-0.765840	-1.266400
3		0.0002	0.0374	0.0074	0.2219	0.1027
4	8	-1.897109	-0.361180	-0.828471	0.546218	0.088444
5		0.0289	0.3590	0.2037	0.2925	0.4648
6	9	-2.050700	-0.950966	-1.283692	-0.328050	-0.636509
7		0.0201	0.1708	0.0996	0.3714	0.2622
8	10	-2.779079	-1.432053	-1.880365	-0.658084	-1.039898
9		0.0027	0.0761	0.0300	0.2552	0.1492
10	11	-2.645686	-0.342701	-1.162901	1.184141	0.383446
11		0.0041	0.3659	0.1224	0.1182	0.3507

Col Mean-				
Row Mean		7	8	9
	8	0.988807		
		0.1614		
	9	0.103952	-0.607388	
		0.4586	0.2718	
	10	-0.081994	-0.908257	-0.154540
		0.4673	0.1819	0.4386
	11	1.512891	0.145623	0.796518
		0.0652	0.4421	0.2129
				1.234306
				0.1085

alpha = 0.05

Reject Ho if p = P(Z <= |z|) <= alpha/2

```
.
. dunnstest iq5, by(iincome)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	43091.50
2	124	66453.50
3	220	109374.50
4	194	106261.50
5	138	75463.00
6	81	44934.00
7	45	24609.50
8	29	17201.00
9	13	8082.00
10	22	13958.00
11	116	60349.50

chi-squared = 9.564 with 10 d.f.
probability = 0.4796

chi-squared with ties = 14.118 with 10 d.f.
probability = 0.1677

Dunn's Pairwise Comparison of iq5 by iincome
(No adjustment)

Col Mean-					
Row Mean		1	2	3	4
	2	-0.810736			
		0.2088			
	3	0.302602	1.360806		
		0.3811	0.0868		
	4	-1.236093	-0.405473	-2.024892	

		0.1082	0.3426	0.0214		
5		-1.140193	-0.347880	-1.803628	0.032089	
		0.1271	0.3640	0.0356	0.4872	
6		-1.213243	-0.519526	-1.746860	-0.208654	-0.222731
		0.1125	0.3017	0.0403	0.4174	0.4119
7		-0.853708	-0.248352	-1.198176	0.020538	-0.001021
		0.1966	0.4019	0.1154	0.4918	0.4996
8		-1.579954	-1.093750	-1.915503	-0.899027	-0.893698
		0.0571	0.1370	0.0277	0.1843	0.1857
9		-1.518954	-1.160057	-1.720222	-1.017718	-1.017309
		0.0644	0.1230	0.0427	0.1544	0.1545
10		-2.101410	-1.679350	-2.420832	-1.519726	-1.504827
		0.0178	0.0465	0.0077	0.0643	0.0662
11		-0.367139	0.478014	-0.793637	0.923288	0.831911
		0.3568	0.3163	0.2137	0.1779	0.2027
Col Mean						
Row Mean		7	8	9	10	

8		-0.765919				
		0.2219				
9		-0.936777	-0.337291			
		0.1744	0.3679			
10		-1.327258	-0.576151	-0.143834		
		0.0922	0.2823	0.4428		
11		0.597686	1.384077	1.367391	1.936218	
		0.2750	0.0832	0.0858	0.0264	

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

```
. dunnstest iq6, by(iincome)
Warning: by() values are unlabeled, option nolabel implicit
```

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	39943.00
2	124	65934.00
3	220	112644.00
4	194	111196.50
5	138	76173.50
6	81	42432.00
7	45	27899.50
8	29	16523.00
9	13	7017.00
10	22	12425.00
11	116	57590.50

chi-squared = 14.334 with 10 d.f.
 probability = 0.1583
 chi-squared with ties = 21.312 with 10 d.f.
 probability = 0.0190

Dunn's Pairwise Comparison of iq6 by iincome
 (No adjustment)

Col Mean					
Row Mean	1	2	3	4	5
2	-1.736761				

1			0.0412								
2	3	-1.304384	0.694423								
3		0.0961	0.2437								
4	4	-3.141146	-1.426563	-2.457107							
5		0.0008	0.0769	0.0070							
6	5	-2.355036	-0.647742	-1.456204	0.753132						
7		0.0093	0.2586	0.0727	0.2257						
8	6	-1.374388	0.218080	-0.360277	1.475366	0.795202					
9		0.0847	0.4137	0.3593	0.0701	0.2132					
10	7	-3.220984	-2.006780	-2.611245	-1.119447	-1.567548	-2.045979				
11		0.0006	0.0224	0.0045	0.1315	0.0585	0.0204				
12	8	-1.837011	-0.729574	-1.156479	0.067955	-0.344334	-0.839400				
13		0.0331	0.2328	0.1237	0.4729	0.3653	0.2006				
14	9	-0.928093	-0.109172	-0.384708	0.461416	0.166563	-0.210799				
15		0.1767	0.4565	0.3502	0.3223	0.4339	0.4165				
16	10	-1.569049	-0.565228	-0.933516	0.147834	-0.220464	-0.673484				
17		0.0583	0.2860	0.1753	0.4412	0.4128	0.2503				
18	11	-0.735847	1.079976	0.536170	2.586049	1.743757	0.748257				
19		0.2309	0.1401	0.2959	0.0049	0.0406	0.2272				
20	Col Mean-										
21	Row Mean	7	8	9	10						
22											
23	8	0.834645									
24		0.2020									
25	9	1.008073	0.355517								
26		0.1567	0.3611								
27	10	0.839834	0.069777	-0.282811							
28		0.2005	0.4722	0.3887							
29	11	2.782937	1.396782	0.585780	1.162216						
30		0.0027	0.0812	0.2790	0.1226						

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunntest iq7, by(iincome)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	40655.00
2	124	63730.00
3	220	112270.00
4	194	105789.00
5	138	76798.00
6	81	41235.00
7	45	24842.00
8	29	18999.00
9	13	8325.00
10	22	13773.00
11	116	63362.00

chi-squared = 14.459 with 10 d.f.

probability = 0.1531

chi-squared with ties = 17.779 with 10 d.f.

probability = 0.0588

Dunn's Pairwise Comparison of iq7 by iincome
(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.911185 0.1811					
3	-0.902310 0.1834	0.116431 0.4537				
4	-1.853772 0.0319	-0.981248 0.1632	-1.278245 0.1006			
5	-2.041196 0.0206	-1.237557 0.1079	-1.530584 0.0629	-0.362009 0.3587		
6	-0.713304 0.2378	0.122853 0.4511	0.034446 0.4863	0.985495 0.1622	1.219413 0.1113	
7	-1.439516 0.0750	-0.787636 0.2155	-0.917725 0.1794	-0.146588 0.4417	0.093548 0.4627	-0.831651 0.2028
8	-2.959064 0.0015	-2.463005 0.0069	-2.637831 0.0042	-1.985144 0.0236	-1.737404 0.0412	-2.428826 0.0076
9	-1.958548 0.0251	-1.560599 0.0593	-1.639754 0.0505	-1.194228 0.1162	-1.040342 0.1491	-1.581461 0.0569
10	-2.222639 0.0131	-1.743556 0.0406	-1.862341 0.0313	-1.291486 0.0983	-1.089991 0.1379	-1.750747 0.0400
11	-1.712027 0.0434	-0.899033 0.1843	-1.126019 0.1301	-0.028207 0.4887	0.293755 0.3845	-0.923223 0.1779
Col Mean- Row Mean	7	8	9	10		
8	-1.557863 0.0596					
9	-1.009557 0.1564	0.159054 0.4368				
10	-1.023591 0.1530	0.370267 0.3556	0.147496 0.4414			
11	0.119255 0.4525	1.887710 0.0295	1.158465 0.1233	1.235174 0.1084		

```
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunnstest iq8, by(iincome)
Warning: by() values are unlabeled, option nolabel implicit
```

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	44398.00
2	124	67446.50
3	220	114674.50
4	194	109552.50
5	138	77545.00
6	81	39286.00
7	45	27072.00
8	29	11459.50
9	13	7777.00
10	22	11179.00
11	116	59388.00

chi-squared = 15.098 with 10 d.f.

probability = 0.1285

1 chi-squared with ties = 16.728 with 10 d.f.
 2 probability = 0.0806

Dunn's Pairwise Comparison of iq8 by iincome
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.523795 0.3002					
3	0.028930 0.4885	0.689738 0.2452				
4	-1.112733 0.1329	-0.617347 0.2685	-1.507100 0.0659			
5	-0.980783 0.1633	-0.496797 0.3097	-1.279359 0.1004	0.085372 0.4660		
6	0.820893 0.2059	1.408492 0.0795	0.952324 0.1705	2.057639 0.0198	1.876777 0.0303	
7	-1.468715 0.0710	-1.132022 0.1288	-1.677545 0.0467	-0.761682 0.2231	-0.789533 0.2149	-2.141891 0.0161
8	2.019931 0.0217	2.463517 0.0069	2.180125 0.0146	2.908858 0.0018	2.788476 0.0026	1.418337 0.0780
9	-0.870561 0.1920	-0.636301 0.2623	-0.921258 0.1785	-0.399729 0.3447	-0.427500 0.3345	-1.294341 0.0978
10	0.202668 0.4197	0.528388 0.2986	0.200283 0.4206	0.858878 0.1952	0.800248 0.2118	-0.328534 0.3713
11	0.247939 0.4021	0.845071 0.1990	0.276314 0.3912	1.534811 0.0624	1.354597 0.0878	-0.635813 0.2624
Col Mean- Row Mean	7	8	9	10		
8	2.961248 0.0015					
9	0.036549 0.4854	-2.078189 0.0188				
10	1.227169 0.1099	-1.364937 0.0861	0.879687 0.1895			
11	1.743327 0.0406	-1.921793 0.0273	1.007449 0.1569	-0.056245 0.4776		

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

. dunntest iq9, by(iincome)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	42614.00
2	124	71402.00
3	220	115021.00
4	194	107204.00
5	138	73164.00
6	81	36234.00
7	45	25791.00
8	29	18002.00
9	13	6129.00

```

|      10 | 22 | 12144.00 |
|-----+-----+-----|
|      11 | 116 | 62073.00 |
|-----+-----+-----|
    
```

chi-squared = 14.299 with 10 d.f.
 probability = 0.1598

chi-squared with ties = 16.568 with 10 d.f.
 probability = 0.0845

Dunn's Pairwise Comparison of iq9 by iincome
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-1.847551 0.0323					
3	-0.587541 0.2784	1.648615 0.0496				
4	-1.376451 0.0843	0.705584 0.2402	-1.056011 0.1455			
5	-0.730439 0.2326	1.288633 0.0988	-0.236466 0.4065	0.703374 0.2409		
6	1.214944 0.1122	3.141555 0.0008	2.028888 0.0212	2.779463 0.0027	2.067305 0.0194	
7	-1.360262 0.0869	0.053977 0.4785	-1.074127 0.1414	-0.433524 0.3323	-0.874138 0.1910	-2.363446 0.0091
8	-1.939659 0.0262	-0.760958 0.2233	-1.731626 0.0417	-1.195867 0.1159	-1.548947 0.0607	-2.799362 0.0026
9	0.350465 0.3630	1.250438 0.1056	0.628553 0.2648	0.989247 0.1613	0.706893 0.2398	-0.282083 0.3889
10	-0.739751 0.2297	0.359696 0.3595	-0.455786 0.3243	0.009284 0.4963	-0.332100 0.3699	-1.520705 0.0642
11	-0.826199 0.2043	1.100886 0.1355	-0.374111 0.3542	0.520401 0.3014	-0.136936 0.4455	-2.117528 0.0171
Col Mean- Row Mean	7	8	9	10		
8	-0.698600 0.2424					
9	1.127888 0.1297	1.562424 0.0591				
10	0.283759 0.3883	0.849481 0.1978	-0.804181 0.2106			
11	0.756224 0.2248	1.440971 0.0748	-0.760168 0.2236	0.253676 0.3999		

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

```
. dunntest iq10, by(iincome)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iincome | Obs | Rank Sum |
|-----+-----+
|      1 | 85 | 40198.50 |
|      2 | 124 | 64675.00 |
|      3 | 220 | 115226.00 |
|      4 | 194 | 105304.00 |
    
```

5	138	75828.00
6	81	43222.00
7	45	27158.00
8	29	17443.00
9	13	7630.50
10	22	12461.00
11	116	60632.00

chi-squared = 8.754 with 10 d.f.
 probability = 0.5556

chi-squared with ties = 15.902 with 10 d.f.
 probability = 0.1025

Dunn's Pairwise Comparison of iq10 by iincome
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-1.510986 0.0654					
3	-1.740758 0.0409	-0.084983 0.4661				
4	-2.349653 0.0094	-0.807641 0.2096	-0.845934 0.1988			
5	-2.428329 0.0076	-0.986350 0.1620	-1.036053 0.1501	-0.262123 0.3966		
6	-1.709198 0.0437	-0.368355 0.3563	-0.331484 0.3701	0.304134 0.3805	0.495983 0.3100	
7	-3.098024 0.0010	-2.059211 0.0197	-2.132063 0.0165	-1.604670 0.0543	-1.376629 0.0843	-1.644439 0.0500
8	-2.614557 0.0045	-1.694358 0.0451	-1.720791 0.0426	-1.289040 0.0987	-1.113423 0.1328	-1.371867 0.0851
9	-1.674775 0.0470	-0.980992 0.1633	-0.968521 0.1664	-0.674109 0.2501	-0.565066 0.2860	-0.781047 0.2174
10	-1.709276 0.0437	-0.847650 0.1983	-0.834294 0.2021	-0.458910 0.3231	-0.322558 0.3735	-0.596764 0.2753
11	-1.524450 0.0637	-0.037823 0.4849	0.040590 0.4838	0.749543 0.2268	0.930124 0.1762	0.329695 0.3708
Col Mean- Row Mean	7	8	9	10		
8	0.037254 0.4851					
9	0.229874 0.4091	0.190278 0.4245				
10	0.623759 0.2664	0.542557 0.2937	0.256952 0.3986			
11	2.012741 0.0221	1.659858 0.0485	0.961094 0.1683	0.822269 0.2055		

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

- Question: For each of the questions, are there differences in the average response among regions?

```
. dunnstest iq1, by(iiregion)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iregion | Obs | Rank Sum |
+-----+-----+
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
+-----+-----+
    
```

chi-squared = 2.163 with 8 d.f.
 probability = 0.9756
 chi-squared with ties = 3.726 with 8 d.f.
 probability = 0.8809

Dunn's Pairwise Comparison of iq1 by iregion
 (No adjustment)

Col Mean-	1	2	3	4	5	6
Row Mean						
2	0.042474					
	0.4831					
3	0.269342	0.316211				
	0.3938	0.3759				
4	0.888316	1.052593	0.872168			
	0.1872	0.1463	0.1916			
5	1.026723	1.386337	1.206927	-0.042564		
	0.1523	0.0828	0.1137	0.4830		
6	0.457191	0.530134	0.302107	-0.505166	-0.597188	
	0.3238	0.2980	0.3813	0.3067	0.2752	
7	0.677356	0.837319	0.615384	-0.329566	-0.387744	0.223575
	0.2491	0.2012	0.2692	0.3709	0.3491	0.4115
8	0.660596	0.791341	0.580345	-0.294747	-0.330689	0.227308
	0.2544	0.2144	0.2808	0.3841	0.3704	0.4101
9	0.268329	0.314656	-0.001383	-0.872573	-1.206703	-0.302920
	0.3942	0.3765	0.4994	0.1914	0.1138	0.3810
Col Mean-						
Row Mean	7	8				
8	0.018968					
	0.4924					
9	-0.615972	-0.580954				
	0.2690	0.2806				

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

. dunntest iq2, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iregion | Obs | Rank Sum |
+-----+-----+
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
|         |     |           |
+-----+-----+
    
```



```

1 |      3 | 190 | 100366.50 |
2 |      4 |  60 |  31012.00 |
3 |      5 | 196 | 100609.50 |
4 |-----+-----+
5 |      6 |  74 |  36875.00 |
6 |      7 | 102 |  54881.50 |
7 |      8 |  77 |  44283.00 |
8 |      9 | 189 |  99614.50 |
9 |-----+-----+

```

```

10 chi-squared =      4.999 with 8 d.f.
11 probability =      0.7577
12
13 chi-squared with ties =      7.247 with 8 d.f.
14 probability =      0.5102

```

Dunn's Pairwise Comparison of iq2 by iregion
(No adjustment)

Col Mean-	1	2	3	4	5	6
Row Mean						
2	-1.401196 0.0806					
3	-0.673408 0.2503	1.128301 0.1296				
4	-0.333024 0.3696	1.113944 0.1327	0.302762 0.3810			
5	-0.313209 0.3771	1.646623 0.0498	0.577895 0.2817	0.094889 0.4622		
6	0.044227 0.4824	1.689339 0.0456	0.860804 0.1947	0.420891 0.3369	0.433300 0.3324	
7	-0.841525 0.2000	0.686424 0.2462	-0.314897 0.3764	-0.513148 0.3039	-0.798495 0.2123	-1.025584 0.1525
8	-1.590200 0.0559	-0.372086 0.3549	-1.366818 0.0858	-1.332635 0.0913	-1.810343 0.0351	-1.858851 0.0315
9	-0.644434 0.2596	1.167399 0.1215	0.045410 0.4819	-0.271087 0.3932	-0.531360 0.2976	-0.826147 0.2044
Col Mean-						
Row Mean	7	8				
8	-0.967067 0.1668					
9	0.352577 0.3622	1.400283 0.0807				

```

41 alpha =      0.05
42 Reject Ho if p = P(Z <= |z|) <= alpha/2

```

```

43 .
44 . dunnstest iq3, by(iregion)
45 Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

49 +-----+
50 | iregion | Obs | Rank Sum |
51 |-----+-----+
52 |      1 |  47 | 24663.50 |
53 |      2 | 123 | 68571.50 |
54 |      3 | 190 | 103626.00 |
55 |      4 |  60 | 29282.00 |
56 |      5 | 196 | 101056.00 |
57 |-----+-----+
58 |      6 |  74 | 36988.00 |
59 |      7 | 102 | 51807.00 |
60 |      8 |  77 | 42563.50 |
61 |      9 | 189 | 101653.50 |
62 |-----+-----+

```

1 chi-squared = 4.863 with 8 d.f.
 2 probability = 0.7721
 3 chi-squared with ties = 9.241 with 8 d.f.
 4 probability = 0.3224

Dunn's Pairwise Comparison of iq3 by iregion
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.861221 0.1946					
3	-0.571695 0.2838	0.471363 0.3187				
4	0.850479 0.1975	1.989908 0.0233	1.747619 0.0403			
5	0.254530 0.3995	1.643252 0.0502	1.320843 0.0933	-0.842644 0.1997		
6	0.602672 0.2734	1.767949 0.0385	1.500029 0.0668	-0.306543 0.3796	0.520904 0.3012	
7	0.431017 0.3332	1.670219 0.0474	1.377797 0.0841	-0.551195 0.2908	0.283785 0.3883	-0.238533 0.4057
8	-0.682835 0.2474	0.146504 0.4418	-0.246206 0.4028	-1.696032 0.0449	-1.247144 0.1062	-1.466964 0.0712
9	-0.362407 0.3585	0.764912 0.2222	0.331578 0.3701	-1.516629 0.0647	-0.984934 0.1623	-1.250510 0.1056
7		8				
8	-1.340578 0.0900					
9	-1.099269 0.1358	0.497979 0.3092				

34 alpha = 0.05
 35 Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

36 .
 37 . dunntest iq4, by(iregion)

38 Warning: by() values are unlabeled, option nolabel implicit

40 Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	23898.00
2	123	70371.00
3	190	99803.00
4	60	29574.00
5	196	99327.50
6	74	39668.00
7	102	56000.00
8	77	43087.50
9	189	98482.00

53 chi-squared = 5.937 with 8 d.f.
 54 probability = 0.6543
 55
 56 chi-squared with ties = 7.884 with 8 d.f.
 57 probability = 0.4449

Dunn's Pairwise Comparison of iq4 by iregion

(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-1.399868 0.0808					
3	-0.389159 0.3486	1.526466 0.0634				
4	0.301407 0.3816	1.897289 0.0289	0.824575 0.2048			
5	0.039361 0.4843	2.142444 0.0161	0.685502 0.2465	-0.354599 0.3614		
6	-0.557758 0.2885	0.924573 0.1776	-0.296550 0.3834	-0.936798 0.1744	-0.809347 0.2092	
7	-0.867458 0.1928	0.650583 0.2577	-0.729396 0.2329	-1.300823 0.0967	-1.304961 0.0960	-0.320211 0.3744
8	-1.041294 0.1489	0.325541 0.3724	-0.957487 0.1692	-1.460253 0.0721	-1.480649 0.0694	-0.544963 0.2929
9	-0.291544 0.3853	1.661935 0.0483	0.154551 0.4386	-0.716903 0.2367	-0.528838 0.2985	0.412115 0.3401
8	-0.263754 0.3960					
9	0.857955 0.1955	1.074198 0.1414				

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq5, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	25000.00
2	123	70157.00
3	190	97806.00
4	60	31315.00
5	196	99921.50
6	74	41475.00
7	102	54597.00
8	77	40836.00
9	189	99103.50

chi-squared = 4.348 with 8 d.f.

probability = 0.8244

chi-squared with ties = 6.456 with 8 d.f.

probability = 0.5962

Dunn's Pairwise Comparison of iq5 by iregion

(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.894537 0.1855					
3	0.419717 0.3373	1.916327 0.0277				

1	4	0.204685	1.227342	-0.192492			
2		0.4189	0.1098	0.4237			
3	5	0.542899	2.100075	0.194468	0.327393		
4		0.2936	0.0179	0.4229	0.3717		
5	6	-0.610565	0.268597	-1.330089	-0.885045	-1.480943	
6		0.2707	0.3941	0.0917	0.1881	0.0693	
7	7	-0.075772	1.045718	-0.665873	-0.327165	-0.831627	0.658314
8		0.4698	0.1478	0.2527	0.3718	0.2028	0.2552
9	8	0.033979	1.098894	-0.459584	-0.195009	-0.608833	0.738209
10		0.4864	0.1359	0.3229	0.4227	0.2713	0.2302
11	9	0.184904	1.584274	-0.372203	-0.065677	-0.569284	1.050261
12		0.4267	0.0566	0.3549	0.4738	0.2846	0.1468

Col Mean-
Row Mean

7 8

13	8	0.130148					
14		0.4482					
15	9	0.354032	0.176403				
16		0.3617	0.4300				

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iq6, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	24290.50
2	123	67846.50
3	190	101167.00
4	60	31261.00
5	196	103413.00
6	74	36430.00
7	102	52408.00
8	77	40753.50
9	189	102641.50

chi-squared = 2.535 with 8 d.f.
probability = 0.9601

chi-squared with ties = 3.778 with 8 d.f.
probability = 0.8766

Dunn's Pairwise Comparison of iq6 by iregion
(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.810245					
	0.2089					
3	-0.383515	0.660725				
	0.3507	0.2544				
4	-0.086090	0.775858	0.308663			
	0.4657	0.2189	0.3788			
5	-0.265616	0.832852	0.189948	-0.178732		
	0.3953	0.2025	0.4247	0.4291		
6	0.525236	1.610354	1.170901	0.660455	1.034219	
	0.2997	0.0537	0.1208	0.2545	0.1505	

1	7	0.068329	1.127482	0.607136	0.177112	0.452013	-0.562680
2		0.4728	0.1298	0.2719	0.4297	0.3256	0.2868
3	8	-0.268646	0.613941	0.094387	-0.191391	-0.048979	-0.907275
4		0.3941	0.2696	0.4624	0.4241	0.4805	0.1821
5	9	-0.643588	0.293845	-0.412947	-0.594761	-0.605829	-1.479401
6		0.2599	0.3844	0.3398	0.2760	0.2723	0.0695
7	Col Mean-						
8	Row Mean	7	8				
9	8	-0.409188					
10		0.3412					
11	9	-0.951871	-0.408107				
12		0.1706	0.3416				

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

```
. dunntest iq7, by(iregion)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	25775.50
2	123	69441.50
3	190	96261.50
4	60	29885.00
5	196	104560.50
6	74	36689.50
7	102	55909.00
8	77	41935.00
9	189	99753.50

chi-squared = 5.004 with 8 d.f.
 probability = 0.7572
 chi-squared with ties = 6.168 with 8 d.f.
 probability = 0.6284

Dunn's Pairwise Comparison of iq7 by iregion
 (No adjustment)

Col Mean-							
Row Mean		1	2	3	4	5	6
2	-0.342213						
	0.3661						
3	0.931783	1.818737					
	0.1757	0.0345					
4	0.938892	1.534078	0.209944				
	0.1739	0.0625	0.4169				
5	0.334313	0.982182	-0.957666	-0.871545			
	0.3691	0.1630	0.1691	0.1917			
6	1.024920	1.698322	0.287329	0.047674	1.003173		
	0.1527	0.0447	0.3869	0.4810	0.1579		
7	0.005924	0.446007	-1.228147	-1.117670	-0.436178	-1.245082	
	0.4976	0.3278	0.1097	0.1319	0.3314	0.1066	
8	0.074683	0.498964	-1.021316	-0.981768	-0.300926	-1.089410	
	0.4702	0.3089	0.1536	0.1631	0.3817	0.1380	
9	0.459648	1.153261	-0.748309	-0.728610	0.202295	-0.847727	
	0.3229	0.1244	0.2271	0.2331	0.4198	0.1983	

Col Mean-		
Row Mean	7	8
8	0.084653	
	0.4663	
9	0.601297	0.451909
	0.2738	0.3257

alpha = 0.05

Reject Ho if p = P(Z <= |z|) <= alpha/2

. dunntest iq8, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	24173.50
2	123	63543.50
3	190	99851.00
4	60	30860.50
5	196	106283.50
6	74	37277.50
7	102	58555.00
8	77	38886.50
9	189	100780.00

chi-squared = 4.074 with 8 d.f.
probability = 0.8504

chi-squared with ties = 4.516 with 8 d.f.
probability = 0.8078

Dunn's Pairwise Comparison of iq8 by iregion
(No adjustment)

Col Mean-						
Row Mean	1	2	3	4	5	6
2	-0.045892					
	0.4817					
3	-0.236920	-0.265506				
	0.4064	0.3953				
4	-0.000210	0.049717	0.260358			
	0.4999	0.4802	0.3973			
5	-0.592588	-0.768275	-0.566239	-0.652046		
	0.2767	0.2212	0.2856	0.2572		
6	0.195439	0.301278	0.547699	0.210071	0.972587	
	0.4225	0.3816	0.2919	0.4168	0.1654	
7	-1.167548	-1.478256	-1.362451	-1.264884	-0.897613	-1.586690
	0.1215	0.0697	0.0865	0.1030	0.1847	0.0563
8	0.173304	0.274910	0.523165	0.186526	0.954118	-0.026870
	0.4312	0.3917	0.3004	0.4260	0.1700	0.4893
9	-0.399480	-0.494122	-0.258114	-0.439142	0.305373	-0.740665
	0.3448	0.3106	0.3982	0.3303	0.3800	0.2294

Col Mean-		
Row Mean	7	8
8	1.575938	
	0.0575	
9	1.145365	-0.718903
	0.1260	0.2361

```

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunnstest iq9, by(iregion)
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

iregion	Obs	Rank Sum
1	47	20677.00
2	123	72186.50
3	190	102587.00
4	60	28965.00
5	196	99733.50
6	74	42108.50
7	102	55248.00
8	77	42429.00
9	189	96276.50

```

chi-squared = 13.497 with 8 d.f.
probability = 0.0958

```

```

chi-squared with ties = 15.670 with 8 d.f.
probability = 0.0473

```

Dunn's Pairwise Comparison of iq9 by iregion
(No adjustment)

Col Mean-	1	2	3	4	5	6
Row Mean						
2	-3.021716 0.0013					
3	-2.164465 0.0152	1.430595 0.0763				
4	-0.775061 0.2192	2.331881 0.0099	1.361625 0.0867			
5	-1.496111 0.0673	2.392263 0.0084	1.076742 0.1408	-0.623663 0.2664		
6	-2.440672 0.0073	0.427811 0.3344	-0.748920 0.2270	-1.751408 0.0399	-1.555611 0.0599	
7	-2.034428 0.0210	1.191120 0.1168	-0.049282 0.4803	-1.276529 0.1009	-0.947432 0.1717	0.632439 0.2635
8	-2.116297 0.0172	0.870093 0.1921	-0.289594 0.3861	-1.398130 0.0810	-1.105946 0.1344	0.390079 0.3482
9	-1.502790 0.0664	2.358466 0.0092	1.048006 0.1473	-0.634183 0.2630	-0.019200 0.4923	1.533501 0.0626
Col Mean-						
Row Mean	7	8				
8	-0.219074 0.4133					
9	0.925552 0.1773	1.085736 0.1388				

```

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2

```

```

.
. dunnstest iq10, by(iregion)
Warning: by() values are unlabeled, option nolabel implicit

```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
| iregion | Obs | Rank Sum |
+-----+
| 1 | 47 | 24342.50 |
| 2 | 123 | 68159.50 |
| 3 | 190 | 103335.00 |
| 4 | 60 | 29614.00 |
| 5 | 196 | 100986.00 |
+-----+
| 6 | 74 | 36223.00 |
| 7 | 102 | 54254.00 |
| 8 | 77 | 40915.50 |
| 9 | 189 | 102381.50 |
+-----+
    
```

```

chi-squared = 4.123 with 8 d.f.
probability = 0.8458

chi-squared with ties = 7.555 with 8 d.f.
probability = 0.4781
    
```

Dunn's Pairwise Comparison of iq10 by iregion
(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-0.935595 0.1747					
3	-0.705458 0.2403	0.393271 0.3471				
4	0.553976 0.2898	1.704126 0.0442	1.504759 0.0662			
5	0.073394 0.4707	1.498376 0.0670	1.245921 0.1064	-0.650586 0.2577		
6	0.675122 0.2498	1.946495 0.0258	1.757676 0.0394	0.103700 0.4587	0.835569 0.2017	
7	-0.351199 0.3627	0.735705 0.2310	0.431870 0.3329	-1.043803 0.1483	-0.604764 0.2727	-1.230118 0.1093
8	-0.321760 0.3738	0.694206 0.2438	0.409844 0.3410	-0.972509 0.1654	-0.531464 0.2975	-1.139406 0.1273
9	-0.646183 0.2591	0.475741 0.3171	0.093459 0.4628	-1.439010 0.0751	-1.150070 0.1251	-1.686357 0.0459
8	0.015606 0.4938					
9	-0.353323 0.3619	-0.338514 0.3675				

```

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
    
```

• Question – For each of the questions, 1-10, are there differences in the average response among the devices used?

```

. dunntest iq1, by(idevice) ma(bh) wrap
Warning: by() values are unlabeled, option nolabel implicit
    
```

Kruskal-Wallis equality-of-populations rank test

```

+-----+
    
```



```

1 | idevice | Obs | Rank Sum |
2 |-----+-----+-----|
3 | 1 | 455 | 235385.00 |
4 | 2 | 464 | 243130.00 |
5 | 4 | 117 | 72496.00 |
6 | 5 | 22 | 13796.00 |
7 | 6 | 9 | 4971.00 |
8 |-----+-----+-----|

```

chi-squared = 12.894 with 4 d.f.
probability = 0.0118

chi-squared with ties = 22.109 with 4 d.f.
probability = 0.0002

Dunn's Pairwise Comparison of iq1 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
2	-0.428773			
	0.4176			
4	-4.193416	-3.928305		
	0.0001	0.0002		
5	-2.136598	-2.007905	-0.136539	
	0.0544	0.0558	0.4457	
6	-0.441873	-0.357900	0.826607	0.802829
	0.4704	0.4002	0.4085	0.3517

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq2, by(idevice) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

34 | idevice | Obs | Rank Sum |
35 |-----+-----+-----|
36 | 1 | 455 | 238731.50 |
37 | 2 | 464 | 243803.00 |
38 | 4 | 117 | 69497.50 |
39 | 5 | 22 | 13042.00 |
40 | 6 | 9 | 4704.00 |
41 |-----+-----+-----|

```

chi-squared = 6.023 with 4 d.f.
probability = 0.1975

chi-squared with ties = 8.683 with 4 d.f.
probability = 0.0695

Dunn's Pairwise Comparison of iq2 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
2	-0.044463			
	0.6890			
4	-2.605346	-2.582173		
	0.0459	0.0245		
5	-1.216133	-1.203232	0.019744	
	0.3732	0.2861	0.4921	
6	0.023358	0.032079	0.803447	0.690797
	0.5452	0.6090	0.4217	0.4081

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq3, by(idevice) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| idevice | Obs | Rank Sum |
+-----+
|      1 | 455 | 231099.50 |
|      2 | 464 | 249881.00 |
|      4 | 117 | 70070.00  |
|      5 |  22 | 13920.00  |
|      6 |   9 |  4807.50  |
+-----+
```

chi-squared = 10.808 with 4 d.f.

probability = 0.0288

chi-squared with ties = 20.278 with 4 d.f.

probability = 0.0004

Dunn's Pairwise Comparison of iq3 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
Row Mean				
2	-2.063320			
	0.0489			
4	-3.901314	-2.593174		
	0.0005	0.0238		
5	-2.541578	-1.918820	-0.647263	
	0.0184	0.0550	0.3234	
6	-0.346709	0.057717	0.831681	1.107209
	0.4049	0.4770	0.2897	0.2235

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```
. dunntest iq4, by(idevice) ma(bh) wrap
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```
+-----+
| idevice | Obs | Rank Sum |
+-----+
|      1 | 455 | 233917.50 |
|      2 | 464 | 245190.00 |
|      4 | 117 | 71356.50  |
|      5 |  22 | 13558.00  |
|      6 |   9 |  5756.00  |
+-----+
```

chi-squared = 11.767 with 4 d.f.

probability = 0.0192

chi-squared with ties = 15.571 with 4 d.f.

probability = 0.0037

Dunn's Pairwise Comparison of iq4 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
Row Mean				
2	-0.810343			
	0.2984			

```

1      4 | -3.449252 -2.939310
2      | 0.0028    0.0082
3      5 | -1.747119 -1.502874 -0.102617
4      | 0.1344    0.1661    0.4591
5      6 | -1.391205 -1.232608 -0.320191 -0.219652
6      | 0.1642    0.1814    0.4680    0.4590
7
8 False Discovery Rate = 0.05
9 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
10
11 .
12 . dunntest iq5, by(idevice) ma(bh) wrap
13
14 Warning: by() values are unlabeled, option nolabel implicit
15
16 Kruskal-Wallis equality-of-populations rank test
17
18 +-----+
19 | idevice | Obs | Rank Sum |
20 +-----+-----+
21 | 1 | 455 | 233689.00 |
22 | 2 | 464 | 246682.00 |
23 | 4 | 117 | 72399.00 |
24 | 5 | 22 | 13029.00 |
25 | 6 | 9 | 3979.00 |
26 +-----+
27
28 chi-squared = 12.465 with 4 d.f.
29 probability = 0.0142
30
31 chi-squared with ties = 18.400 with 4 d.f.
32 probability = 0.0010
33
34
35
36
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60

```

Dunn's Pairwise Comparison of iq5 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
Row Mean				
2	-1.078030			
	0.2007			
4	-4.001036	-3.321473		
	0.0003	0.0022		
5	-1.420055	-1.094722	0.450750	
	0.1556	0.2280	0.3261	
6	0.837348	1.048842	2.013779	1.495773
	0.2236	0.1839	0.0734	0.1684

```

41 False Discovery Rate = 0.05
42 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
43
44 .
45 . dunntest iq6, by(idevice) ma(bh) wrap
46
47 Warning: by() values are unlabeled, option nolabel implicit
48
49 Kruskal-Wallis equality-of-populations rank test
50
51 +-----+
52 | idevice | Obs | Rank Sum |
53 +-----+-----+
54 | 1 | 455 | 232150.00 |
55 | 2 | 464 | 249498.50 |
56 | 4 | 117 | 70802.00 |
57 | 5 | 22 | 12735.50 |
58 | 6 | 9 | 4592.00 |
59 +-----+
60
61 chi-squared = 9.534 with 4 d.f.
62 probability = 0.0491

```

chi-squared with ties = 14.174 with 4 d.f.
 probability = 0.0068

Dunn's Pairwise Comparison of iq6 by idevice
 (Benjamini-Hochberg)

Col Mean- Row Mean	1	2	4	5
2	-1.648801 0.1653			
4	-3.623520 0.0015	-2.579191 0.0248		
5	-1.244659 0.2666	-0.746660 0.3794	0.447117 0.4092	
6	-0.000029 0.5000	0.323201 0.4147	1.085795 0.2776	0.686639 0.3516

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

.
 . dunntest iq7, by(idevice) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
1	455	241171.00
2	464	241784.00
4	117	70870.00
5	22	12133.00
6	9	3820.00

chi-squared = 8.437 with 4 d.f.
 probability = 0.0768

chi-squared with ties = 10.374 with 4 d.f.
 probability = 0.0346

Dunn's Pairwise Comparison of iq7 by idevice
 (Benjamini-Hochberg)

Col Mean- Row Mean	1	2	4	5
2	0.488676 0.3473			
4	-2.627194 0.0215	-2.944079 0.0162		
5	-0.353648 0.3618	-0.501570 0.3850	0.839686 0.2865	
6	1.128879 0.2589	1.033292 0.2512	1.885785 0.0989	1.155457 0.3099

False Discovery Rate = 0.05
 Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

.
 . dunntest iq8, by(idevice) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
---------	-----	----------

```

1 |-----+-----+-----|
2 |      1 | 455 | 236191.50 |
3 |      2 | 464 | 255170.50 |
4 |      4 | 117 | 60562.50 |
5 |      5 | 22  | 13139.50 |
6 |      6 | 9   | 4714.00 |
7 |-----+-----+-----|

```

chi-squared = 3.571 with 4 d.f.
probability = 0.4671

chi-squared with ties = 3.957 with 4 d.f.
probability = 0.4119

Dunn's Pairwise Comparison of iq8 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
Row Mean				
2	-1.596325			
	0.5521			
4	0.048571	1.066739		
	0.5340	0.3576		
5	-1.222802	-0.740661	-1.170335	
	0.5535	0.4589	0.4031	
6	-0.047444	0.265489	-0.060723	0.634244
	0.4811	0.5647	0.5947	0.4383

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

. dunntest iq9, by(idevice) ma(bh) wrap

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+-----+-----+
| idevice | Obs | Rank Sum |
+-----+-----+-----+
|      1 | 455 | 233402.00 |
|      2 | 464 | 251754.00 |
|      4 | 117 | 69053.00 |
|      5 | 22  | 11048.00 |
|      6 | 9   | 4521.00 |
+-----+-----+-----+

```

chi-squared = 6.698 with 4 d.f.
probability = 0.1527

chi-squared with ties = 7.761 with 4 d.f.
probability = 0.1007

Dunn's Pairwise Comparison of iq9 by idevice
(Benjamini-Hochberg)

Col Mean-	1	2	4	5
Row Mean				
2	-1.567210			
	0.1951			
4	-2.602321	-1.607996		
	0.0463	0.2696		
5	0.172649	0.646611	1.322982	
	0.5393	0.4316	0.2323	
6	0.110391	0.417646	0.887233	-0.001338
	0.5067	0.4830	0.3750	0.4995

False Discovery Rate = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \text{FDR}/2$ with stopping rule

```

1 .
2 . dunntest iq10, by(idevice) ma(bh) wrap
3 Warning: by() values are unlabeled, option nolabel implicit
4

```

Kruskal-Wallis equality-of-populations rank test

```

7 +-----+
8 | idevice | Obs | Rank Sum |
9 +-----+-----+
10 |         |     |         |
11 |         |     |         |
12 |         |     |         |
13 +-----+-----+

```

idevice	Obs	Rank Sum
1	455	230212.00
2	464	251454.50
4	117	70292.50
5	22	13460.00
6	9	4359.00

```

14 chi-squared = 11.207 with 4 d.f.
15 probability = 0.0243

```

```

16 chi-squared with ties = 20.357 with 4 d.f.
17 probability = 0.0004
18

```

Dunn's Pairwise Comparison of iq10 by idevice
(Benjamini-Hochberg)

```

21 Col Mean-|
22 Row Mean |         1         2         4         5
23 -----|-----
24 2 | -2.384264
25   | 0.0285
26 4 | -4.001160 -2.488534
27   | 0.0003 0.0321
28 5 | -2.120896 -1.400904 -0.207547
29   | 0.0424 0.1152 0.4178
30 6 | 0.280999 0.748461 1.472429 1.409124
31   | 0.4326 0.2839 0.1409 0.1323

```

```

32 False Discovery Rate = 0.05
33 Reject Ho if p = P(Z <= |z|) <= FDR/2 with stopping rule
34
35
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```

National Survey Statistics on Factor Analysis Produced Variables

- Question – For each of the factor variables (knowledge and other), are there differences in the average response by age?

Answer – YES, there are significant differences among the age categories for both factor variables, and with the exception of group 4 vs group 5 for the factor variable "other" all groups differed significantly from each other.

Difference

```
. dunnstest iknowledge, by(iage)
Kruskal-Wallis probability = 0.0001
```

```
Dunn's Pairwise Comparison of iknowledge by iage
(No adjustment)
```

Col Mean-			
Row Mean	2	3	4
3	-3.047089		
	0.0012		
4	-6.647864	-3.042354	
	0.0000	0.0012	
5	-8.540506	-5.326895	-2.884203
	0.0000	0.0000	0.0020

```
alpha = 0.05
```

```
Reject Ho if p = P(Z <= |z|) <= alpha/2
```

```
. dunnstest iother, by(iage)
Kruskal-Wallis probability = 0.0001
```

```
Dunn's Pairwise Comparison of iother by iage
(No adjustment)
```

Col Mean-			
Row Mean	2	3	4
3	-3.687658		
	0.0001		
4	-6.409482	-2.160471	
	0.0000	0.0154	
5	-5.995882	-2.338749	-0.480036
	0.0000	0.0097	0.3156

- Question – For each of the factor variables (knowledge and other), are there differences in the average response by gender?

Answer – YES, for both factor variables (knowledge and other) the differences in responses of the genders are very highly significantly different ($p < 0.0001$)

- Question – For each of the factor variables (knowledge and other), are there differences in the average response by income?

Answer – YES, but only for the factor variable knowledge. Most of the differences among pairs are between group 1 and other groups and between group 3 and other groups.

```
. dunnstest iknowledge, by(iincome)
Kruskal-Wallis probability = 0.0005
```

Dunn's Pairwise Comparison of iknowledge by iincome
(No adjustment)

Col Mean-	1	2	3	4	5	6
Row Mean						
2	-2.497470 0.0063					
3	-1.980782 0.0238	0.879087 0.1897				
4	-3.815271 0.0001	-1.257535 0.1043	-2.470334 0.0067			
5	-3.893000 0.0000	-1.495793 0.0674	-2.613509 0.0045	-0.363691 0.3580		
6	-3.353408 0.0004	-1.183058 0.1184	-2.060025 0.0197	-0.184688 0.4267	0.114798 0.4543	
7	-3.552889 0.0002	-1.742852 0.0407	-2.457248 0.0070	-0.959300 0.1687	-0.688698 0.2455	-0.722300 0.2351
8	-1.760408 0.0392	-0.130388 0.4481	-0.635829 0.2624	0.591132 0.2772	0.774389 0.2194	0.656758 0.2557
9	-2.347848 0.0094	-1.192059 0.1166	-1.563387 0.0590	-0.708333 0.2394	-0.559877 0.2878	-0.597431 0.2751
10	-3.169354 0.0008	-1.756891 0.0395	-2.259138 0.0119	-1.163994 0.1222	-0.964239 0.1675	-0.987559 0.1617
11	-3.282179 0.0005	-0.905285 0.1827	-1.879430 0.0301	0.235565 0.4069	0.541013 0.2942	0.359674 0.3595
Col Mean-						
Row Mean	7	8	9	10		
8	1.160782 0.1229					
9	-0.140395 0.4442	-0.960591 0.1684				
10	-0.396438 0.3459	-1.342428 0.0897	-0.168444 0.4331			
11	1.061221 0.1443	-0.433697 0.3323	0.788364 0.2152	1.244967 0.1066		

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

- Question: For each of the factor variables (knowledge and other), are there differences in the average response among regions?

Answer – NO, for both factor variables, there are no significant differences in responses among regions.

- Question: For each of the factor variables (knowledge and other), are there differences in the average response based upon type of device used?

Answer – YES, for both factor variables there are significant differences in response provided on various devices.

. dunntest iknowledge, by(idevice)
Kruskal-Wallis probability = 0.0002

Dunn's Pairwise Comparison of iknowledge by idevice
(No adjustment)

Col Mean-	1	2	4	5
Row Mean				
2	-0.842399			


```

1      |      0.1998
2      |
3      |
4      | 4 | -4.104772 -3.575691
5      |   | 0.0000    0.0002
6      |
7      | 5 | -2.253612 -1.999900 -0.286000
8      |   | 0.0121    0.0228    0.3874
9      |
10     | 6 | -1.116132 -0.951199 0.143918 0.293782
11     |   | 0.1322    0.1708    0.4428    0.3845

```

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

```
. dunnstest iother, by(idevice)
```

Kruskal-Wallis probability = 0.0423

Dunn's Pairwise Comparison of iother by idevice
(No adjustment)

Col Mean-	1	2	4	5
Row Mean				
2	-1.392887			
	0.0818			
4	-3.084003	-2.201813		
	0.0010	0.0138		
5	-0.728643	-0.307796	0.691191	
	0.2331	0.3791	0.2447	
6	0.005101	0.278162	0.929115	0.406324
	0.4980	0.3904	0.1764	0.3423

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

STATISTICS

- Question – For each of the factor variables (knowledge and other), are there differences in the average response by age?

```
. dunnstest iknowledge, by(iage)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

iage	Obs	Rank Sum
2	297	126497.00
3	230	115847.50
4	343	198606.00
5	197	128827.50

chi-squared = 75.931 with 3 d.f.

probability = 0.0001

chi-squared with ties = 85.400 with 3 d.f.

probability = 0.0001

Dunn's Pairwise Comparison of iknowledge by iage
(No adjustment)

Col Mean-	2	3	4
Row Mean			
3	-3.047089		
	0.0012		
4	-6.647864	-3.042354	
	0.0000	0.0012	

```

1      5 | -8.540506 -5.326895 -2.884203
2      | 0.0000 0.0000 0.0020
3 alpha = 0.05
4 Reject Ho if p = P(Z <= |z|) <= alpha/2
5
6 . dunntest iother, by(iage)
7
8 Warning: by() values are unlabeled, option nolabel implicit
9

```

Kruskal-Wallis equality-of-populations rank test

```

11 +-----+
12 | iage | Obs | Rank Sum |
13 +-----+-----+
14 | 2 | 297 | 128210.00 |
15 | 3 | 230 | 122050.50 |
16 | 4 | 343 | 201312.00 |
17 | 5 | 197 | 118205.50 |
18 +-----+
19 chi-squared = 51.926 with 3 d.f.
20 probability = 0.0001
21 chi-squared with ties = 52.814 with 3 d.f.
22 probability = 0.0001

```

Dunn's Pairwise Comparison of iother by iage
(No adjustment)

```

25 Col Mean-|
26 Row Mean | 2 3 4
27 -----
28 3 | -3.687658
29 | 0.0001
30 4 | -6.409482 -2.160471
31 | 0.0000 0.0154
32 5 | -5.995882 -2.338749 -0.480036
33 | 0.0000 0.0097 0.3156

```

```

34 alpha = 0.05
35 Reject Ho if p = P(Z <= |z|) <= alpha/2
36

```

-
- **Question – For each of the factor variables (knowledge and other), are there differences in the average response by gender?**

```

41 . dunntest iknowledge, by(igender)
42
43 Warning: by() values are unlabeled, option nolabel implicit
44

```

Kruskal-Wallis equality-of-populations rank test

```

47 +-----+
48 | igender | Obs | Rank Sum |
49 +-----+-----+
50 | 1 | 497 | 240985.50 |
51 | 2 | 570 | 328792.50 |
52 +-----+
53 chi-squared = 23.638 with 1 d.f.
54 probability = 0.0001
55 chi-squared with ties = 26.585 with 1 d.f.
56 probability = 0.0001

```

Dunn's Pairwise Comparison of iknowledge by igender
(No adjustment)

```

59 Col Mean-|

```

```

Row Mean |                1
-----+-----
1         2 | -5.156095
2         |    0.0000
3
4 alpha =    0.05
5 Reject Ho if p = P(Z <= |z|) <= alpha/2
6
7 . dunntest iother, by(igender)
8
9 Warning: by() values are unlabeled, option nolabel implicit

```

```

10 Kruskal-Wallis equality-of-populations rank test

```

```

11 +-----+
12 | igender | Obs | Rank Sum |
13 +-----+-----+
14 |         |     |          |
15 |         |     |          |
16 +-----+-----+

```

```

17 chi-squared =    28.299 with 1 d.f.
18 probability =    0.0001
19
20 chi-squared with ties =    28.783 with 1 d.f.
21 probability =    0.0001

```

```

22
23      Dunn's Pairwise Comparison of iother by igender
24      (No adjustment)

```

```

24 Col Mean-|
25 Row Mean |                1
26 -----+-----
27         2 | -5.365020
28         |    0.0000

```

```

29 alpha =    0.05
30 Reject Ho if p = P(Z <= |z|) <= alpha/2

```

-
- **Question – For each of the factor variables (knowledge and other), are there differences in the average response by income?**

```

35 . dunntest iknowledge, by(iincome)
36
37 Warning: by() values are unlabeled, option nolabel implicit
38
39 Kruskal-Wallis equality-of-populations rank test

```

```

40 +-----+
41 | iincome | Obs | Rank Sum |
42 +-----+-----+
43 |         |     |          |
44 |         |     |          |
45 |         |     |          |
46 |         |     |          |
47 +-----+-----+
48 |         |     |          |
49 |         |     |          |
50 |         |     |          |
51 |         |     |          |
52 |         |     |          |
53 +-----+-----+

```

```

54 chi-squared =    28.138 with 10 d.f.
55 probability =    0.0017
56
57 chi-squared with ties =    31.647 with 10 d.f.
58 probability =    0.0005

```

Dunn's Pairwise Comparison of iknowledge by iincome
(No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-2.497470 0.0063					
3	-1.980782 0.0238	0.879087 0.1897				
4	-3.815271 0.0001	-1.257535 0.1043	-2.470334 0.0067			
5	-3.893000 0.0000	-1.495793 0.0674	-2.613509 0.0045	-0.363691 0.3580		
6	-3.353408 0.0004	-1.183058 0.1184	-2.060025 0.0197	-0.184688 0.4267	0.114798 0.4543	
7	-3.552889 0.0002	-1.742852 0.0407	-2.457248 0.0070	-0.959300 0.1687	-0.688698 0.2455	-0.722300 0.2351
8	-1.760408 0.0392	-0.130388 0.4481	-0.635829 0.2624	0.591132 0.2772	0.774389 0.2194	0.656758 0.2557
9	-2.347848 0.0094	-1.192059 0.1166	-1.563387 0.0590	-0.708333 0.2394	-0.559877 0.2878	-0.597431 0.2751
10	-3.169354 0.0008	-1.756891 0.0395	-2.259138 0.0119	-1.163994 0.1222	-0.964239 0.1675	-0.987559 0.1617
11	-3.282179 0.0005	-0.905285 0.1827	-1.879430 0.0301	0.235565 0.4069	0.541013 0.2942	0.359674 0.3595
Col Mean- Row Mean	7	8	9	10		
8	1.160782 0.1229					
9	-0.140395 0.4442	-0.960591 0.1684				
10	-0.396438 0.3459	-1.342428 0.0897	-0.168444 0.4331			
11	1.061221 0.1443	-0.433697 0.3323	0.788364 0.2152	1.244967 0.1066		

```
alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
.
. dunntest iother, by(iincome)
Warning: by() values are unlabeled, option nolabel implicit
```

Kruskal-Wallis equality-of-populations rank test

iincome	Obs	Rank Sum
1	85	40557.50
2	124	68881.50
3	220	111152.50
4	194	109253.00
5	138	76566.00
6	81	38956.50
7	45	26963.00
8	29	15964.00
9	13	7397.50
10	22	12425.50
11	116	61661.00

chi-squared = 12.672 with 10 d.f.

probability = 0.2426

chi-squared with ties = 12.889 with 10 d.f.
 probability = 0.2299

Dunn's Pairwise Comparison of iother by iincome
 (No adjustment)

Col Mean- Row Mean	1	2	3	4	5	6
2	-1.820902 0.0343					
3	-0.719869 0.2358	1.464701 0.0715				
4	-2.164101 0.0152	-0.218148 0.4137	-1.924668 0.0271			
5	-1.843770 0.0326	0.017718 0.4929	-1.494472 0.0675	0.244915 0.4033		
6	-0.080037 0.4681	1.707810 0.0438	0.611758 0.2703	2.033932 0.0210	1.727440 0.0420	
7	-2.166306 0.0151	-0.821450 0.2057	-1.879091 0.0301	-0.712417 0.2381	-0.845545 0.1989	-2.081181 0.0187
8	-1.116035 0.1322	0.079540 0.4683	-0.749513 0.2268	0.208387 0.4175	0.069584 0.4723	-1.051661 0.1465
9	-1.009833 0.1563	-0.152029 0.4396	-0.731528 0.2322	-0.067154 0.4732	-0.160323 0.4363	-0.964946 0.1673
10	-1.199166 0.1152	-0.131556 0.4477	-0.871672 0.1917	-0.023795 0.4905	-0.142123 0.4435	-1.141432 0.1268
11	-1.247245 0.1062	0.606437 0.2721	-0.750743 0.2264	0.881120 0.1891	0.604470 0.2728	-1.144015 0.1263
Col Mean- Row Mean	7	8	9	10		
8	0.669238 0.2517					
9	0.313259 0.3770	-0.181941 0.4278				
10	0.432536 0.3327	-0.165674 0.4342	0.039694 0.4842			
11	1.260049 0.1038	0.298282 0.3827	0.419363 0.3375	0.467740 0.3200		

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

- Question: For each of the factor variables (knowledge and other), are there differences in the average response among regions?

. dunnstest iknowledge, by(iregion)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

i	iregion	Obs	Rank Sum
1	1	47	24583.50
2	2	123	70842.50
3	3	190	100915.00
4	4	60	30070.50
5	5	196	98718.00

```

+-----+-----+-----+
|      6 | 74 | 38057.50 |
|      7 | 102 | 54316.00 |
|      8 | 77 | 42647.50 |
|      9 | 189 | 100060.50 |
+-----+-----+-----+
    
```

```

chi-squared = 5.469 with 8 d.f.
probability = 0.7065

chi-squared with ties = 6.162 with 8 d.f.
probability = 0.6291
    
```

Dunn's Pairwise Comparison of iknowledge by iregion
(No adjustment)

```

Col Mean-|
Row Mean |      1      2      3      4      5      6
+-----+-----+-----+-----+-----+-----+
2 | -1.071609
   | 0.1419
3 | -0.172251  1.345399
   | 0.4316  0.0892
4 | 0.390149  1.649590  0.702685
   | 0.3482  0.0495  0.2411
5 | 0.414702  2.183041  0.937194 -0.058582
   | 0.3392  0.0145  0.1743  0.4766
6 | 0.163190  1.455991  0.426919 -0.262248 -0.270564
   | 0.4352  0.0727  0.3347  0.3966  0.3934
7 | -0.186328  1.126918 -0.039002 -0.669008 -0.820729 -0.414454
   | 0.4261  0.1299  0.4844  0.2517  0.2059  0.3393
8 | -0.578186  0.528077 -0.584510 -1.062830 -1.296538 -0.844421
   | 0.2816  0.2987  0.2794  0.1439  0.0974  0.1992
9 | -0.135699  1.395304  0.057851 -0.662132 -0.877640 -0.383263
   | 0.4460  0.0815  0.4769  0.2539  0.1901  0.3508
Col Mean-|
Row Mean |      7      8
+-----+-----+-----+
8 | -0.491339
   | 0.3116
9 | 0.087340  0.628024
   | 0.4652  0.2650
    
```

```

alpha = 0.05
Reject Ho if p = P(Z <= |z|) <= alpha/2
    
```

```

.
. dunntest iother, by(iregion)
    
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

```

+-----+-----+-----+
| iregion | Obs | Rank Sum |
+-----+-----+-----+
|      1 | 47 | 22561.50 |
|      2 | 123 | 69595.50 |
|      3 | 190 | 98283.50 |
|      4 | 60 | 29825.50 |
|      5 | 196 | 103603.00 |
+-----+-----+-----+
|      6 | 74 | 38500.50 |
|      7 | 102 | 56208.00 |
|      8 | 77 | 40265.50 |
|      9 | 189 | 101368.00 |
+-----+-----+-----+
    
```

```

chi-squared = 4.655 with 8 d.f.
probability = 0.7937
    
```

chi-squared with ties = 4.736 with 8 d.f.
 probability = 0.7854

Dunn's Pairwise Comparison of iother by iregion
 (No adjustment)

Col Mean-	1	2	3	4	5	6
2	-1.651264 0.0493					
3	-0.754747 0.2252	1.384344 0.0831				
4	-0.289090 0.3863	1.440613 0.0748	0.450033 0.3263			
5	-0.986810 0.1619	1.068340 0.1427	-0.366535 0.3570	-0.704618 0.2405		
6	-0.712218 0.2382	1.021777 0.1534	-0.072157 0.4712	-0.440535 0.3298	0.201037 0.4203	
7	-1.329861 0.0918	0.363767 0.3580	-0.908316 0.1819	-1.094902 0.1368	-0.607562 0.2717	-0.665397 0.2529
8	-0.764952 0.2221	0.974207 0.1650	-0.137978 0.4451	-0.495255 0.3102	0.138866 0.4448	-0.053765 0.4786
9	-1.140280 0.1271	0.839921 0.2005	-0.612310 0.2702	-0.874259 0.1910	-0.250994 0.4009	-0.386621 0.3495
8	0.615064 0.2693					
9	0.395481 0.3462	-0.327411 0.3717				

alpha = 0.05
 Reject Ho if p = P(Z <= |z|) <= alpha/2

- Question: For each of the factor variables (knowledge and other), are there differences in the average response based upon type of device used?

```
. dunnstest iknowledge, by(idevice)
```

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
1	455	231846.00
2	464	243925.50
4	117	74083.00
5	22	14355.00
6	9	5568.50

chi-squared = 19.255 with 4 d.f.
 probability = 0.0007

chi-squared with ties = 21.656 with 4 d.f.
 probability = 0.0002

Dunn's Pairwise Comparison of iknowledge by idevice

(No adjustment)

Col Mean-	1	2	4	5
2	-0.842399			
	0.1998			
4	-4.104772	-3.575691		
	0.0000	0.0002		
5	-2.253612	-1.999900	-0.286000	
	0.0121	0.0228	0.3874	
6	-1.116132	-0.951199	0.143918	0.293782
	0.1322	0.1708	0.4428	0.3845

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

. dunntest iother, by(idevice)

Warning: by() values are unlabeled, option nolabel implicit

Kruskal-Wallis equality-of-populations rank test

idevice	Obs	Rank Sum
1	455	232086.50
2	464	249706.50
4	117	71108.00
5	22	12291.00
6	9	4586.00

chi-squared = 9.727 with 4 d.f.

probability = 0.0453

chi-squared with ties = 9.893 with 4 d.f.

probability = 0.0423

Dunn's Pairwise Comparison of iother by idevice
(No adjustment)

Col Mean-	1	2	4	5
2	-1.392887			
	0.0818			
4	-3.084003	-2.201813		
	0.0010	0.0138		
5	-0.728643	-0.307796	0.691191	
	0.2331	0.3791	0.2447	
6	0.005101	0.278162	0.929115	0.406324
	0.4980	0.3904	0.1764	0.3423

alpha = 0.05

Reject Ho if $p = P(Z \leq |z|) \leq \alpha/2$

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*,
ADAPTED FOR A SURVEY STUDY: Informed consent, shared-decision making and a reasonable patient's wished based on a national survey in the United States using a hypothetical scenario.
 An (X) indicates that the checklist item is included in the manuscript if applicable for a survey study.

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract X (b) Provide in the abstract an informative and balanced summary of what was done and what was found X
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported X
Objectives	3	State specific objectives, including any prespecified hypotheses X
Methods		
Study design	4	Present key elements of study design early in the paper X
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection X
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants X
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable X
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group X
Bias	9	Describe any efforts to address potential sources of bias X
Study size	10	Explain how the study size was arrived at X
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why X
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding X (b) Describe any methods used to examine subgroups and interactions X (c) Explain how missing data were addressed NOT APPLICABLE (d) If applicable, describe analytical methods taking account of sampling strategy X (e) Describe any sensitivity analyses NOT APPLICABLE
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed NOT APPLICABLE (b) Give reasons for non-participation at each stage NOT APPLICABLE (c) Consider use of a flow diagram NOT USEFUL
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders X (b) Indicate number of participants with missing data for each variable of interest X
Outcome data	15*	Report numbers of outcome events or summary measures X
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were

		adjusted for and why they were included NOT APPLICABLE
		(b) Report category boundaries when continuous variables were categorized NOT APPLICABLE
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period <i>NOT RELEVANT</i>
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses X
Discussion		
Key results	18	Summarise key results with reference to study objectives X
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias X
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence X
Generalisability	21	Discuss the generalisability (external validity) of the study results X
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based X

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.