

The Proportion of Adult Americans at Risk of Severe COVID-19 Illness



J Gen Intern Med 36(1):259–61
DOI: 10.1007/s11606-020-06325-9
© Society of General Internal Medicine 2020

INTRODUCTION

The COVID-19 pandemic has affected more than 23 million people worldwide, including 5.6 million Americans. Because of these numbers, identifying the population(s) at risk is important. The US Centers for Disease Control and Prevention (CDC) announced on July 17, 2020, that conditions including obesity, diabetes mellitus (DM), chronic kidney disease (CKD), heart disease, and chronic obstructive pulmonary disease (COPD) are well-established risk factors predisposing individuals to severe illness from COVID-19.¹ Other probable risk factors with less robust evidence include asthma and hypertension. We aimed to estimate the proportion of adult Americans at risk from severe COVID-19 illness.

METHODS

In this analysis, participants in the United States National Health and Nutrition Examination Survey (NHANES) 2011–2016² aged ≥ 20 years were included. Pregnant participants and those with missing relevant laboratory/examination/self-reported data were excluded. The prevalence and 95% confidence intervals (95% CI) of established risk factors (obesity, DM, CKD, heart disease, and COPD), probable risk factors (asthma, stroke, hypertension, taking immunosuppressive agents, and liver disease), and any risk factors (established or probable risk factors) were calculated. Subgroups according to age (< 50 and ≥ 50 years), sex, ethnicity, education, and income level were compared. Data analysis was performed using the R statistical package “survey” (version 3.6.3).

RESULTS

Altogether, 7744 NHANES participants with a mean age of 49.5 years were included (Table 1). Overall, the prevalence of having ≥ 1 established, probable, or any risk factor were

58.9% (95% CI 56.7–61.0), 55.5% (95% CI 53.2–58.0), and 73.7% (95% CI 71.6–76.0), respectively (Table 2).

Obesity was the most common established risk factor (41.0%), followed by DM (24.0%) and CKD (18.4%). Hypertension was the most common probable risk factor (50.1%), followed by asthma (8.9%) and stroke (3.6%). Obesity and hypertension were consistently the leading risk factors in both age groups: the prevalence of obesity and hypertension in the younger age group were 38.9% and 31.1%, respectively, whereas in the older age group, 43.0% and 68.4% had obesity and hypertension, respectively.

Older participants were more likely to have ≥ 1 any risk factor; 86.2% of people aged ≥ 50 years had ≥ 1 any risk factor, compared to 60.9% in people aged < 50 years ($P < 0.001$). Whereas obesity was almost equally common in the young and the old, DM, CKD, heart disease, COPD, stroke, and hypertension were all much more common in people aged 50 years or older.

There were minor differences in the percentage of people with ≥ 1 established and ≥ 1 any risk factor according to sex, ethnicity, education, and income level, but the percentages remained around 60% and 75%, respectively. Non-Hispanic Asian appeared to have a lower risk.

DISCUSSION

This is the first study to estimate the proportion of the Americans in the general population at risk from severe COVID-19 illness using data from a nationally representative survey. Alarming, three-quarters of adult Americans are at risk. COVID-19 is a threat to people across all age groups, sexes, ethnicities, education, and income levels. Consequently, the three-quarters of adult Americans at risk should stay at home as much as possible during a pandemic. They should observe strict social distancing and personal hygiene measures, such as face covering and hand disinfection.³ They should have priority access to masks, viral tests, treatment facilities, drugs, and vaccines.⁴

Our study shows that obesity and hypertension are the leading risk factors for severe COVID-19 illness, especially in those aged < 50 years. Those at risk should seriously consider lifestyle modifications, including weight control, healthy diet, alcohol moderation, smoking cessation, and regular physical activity. These can also alleviate other risk factors

Prior presentations: presented at 2020 CARE Summer Research Symposium on August 14, 2020.

Received August 24, 2020

Accepted October 15, 2020

Published online October 26, 2020

Table 1 Characteristics of the NHANES Participants Analyzed

	Overall	Age < 50 years	Age ≥ 50 years	P value
N	7744	3590	4154	
Age	49.5 ± 0.4	35.1 ± 0.3	63.5 ± 0.2	
Male	49.4 (48.2–51.0)	50.6 (49.0–52.0)	48.3 (46.5–50.0)	0.051
Ethnicity				
Non-Hispanic White	67.2 (62.8–71.0)	59.9 (54.8–65.0)	74.2 (70.0–78.0)	< 0.001
Non-Hispanic Black	10.3 (8.4–13.0)	11.2 (9.0–14.0)	9.5 (7.5–12.0)	
Mexican American	8.3 (6.3–11.0)	11.6 (9.0–15.0)	5.1 (3.5–7.0)	
Other Hispanics	6.0 (4.6–8.0)	7.5 (5.8–10.0)	4.5 (3.3–6.0)	
Non-Hispanic Asian	5.4 (4.4–7.0)	6.6 (5.4–8.0)	4.2 (3.3–5.0)	
Other ethnicities	2.9 (2.2–4.0)	3.2 (2.5–4.0)	2.6 (1.8–4.0)	
Prevalence of established risk factors				
≥ 1 established risk factor	58.9 (56.7–61.0)	47.9 (45.4–50.0)	69.5 (66.5–72.0)	< 0.001
Obesity	41.0 (38.9–43.0)	38.9 (36.3–41.0)	43.0 (40.1–46.0)	0.016
DM	24.0 (22.4–26.0)	11.7 (10.4–13.0)	35.8 (33.7–38.0)	< 0.001
CKD	18.4 (17.3–20.0)	9.0 (8.2–10.0)	27.6 (25.6–30.0)	< 0.001
Heart disease	8.0 (7.2–9.0)	1.8 (1.3–3.0)	14.0 (12.6–15.0)	< 0.001
COPD	7.6 (6.6–9.0)	4.5 (3.6–6.0)	10.6 (9.1–12.0)	< 0.001
Prevalence of probable risk factors				
≥ 1 probable risk factor	55.5 (53.2–58.0)	37.4 (34.7–40.0)	73.1 (70.3–76.0)	< 0.001
Asthma	8.9 (8.0–10.0)	7.6 (6.5–9.0)	10.2 (8.9–12.0)	0.011
Stroke	3.6 (3.2–4.0)	0.8 (0.5–1.0)	6.4 (5.6–7.0)	< 0.001
Liver disease	2.4 (2.1–3.0)	1.8 (1.3–2.0)	3.0 (2.4–4.0)	0.022
Hypertension	50.1 (47.9–52.0)	31.1 (28.8–34.0)	68.4 (65.3–71.0)	< 0.001
Taking immunosuppressive agents	2.5 (2.0–3.0)	1.2 (0.8–2.0)	3.6 (2.9–5.0)	< 0.001
Prevalence of any risk factors				
≥ 1 any risk factor	73.7 (71.6–76.0)	60.9 (58.2–63.0)	86.2 (83.7–88.0)	< 0.001
≥ 2 any risk factors	46.6 (44.5–49.0)	29.7 (27.5–32.0)	62.9 (60.2–66.0)	< 0.001
≥ 3 any risk factors	26.2 (24.3–28.0)	11.5 (10.0–13.0)	40.5 (37.8–43.0)	< 0.001

Data are presented as weighted mean ± standard error, or weighted percentage (95% confidence interval)

DM, diabetes mellitus; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease

P values for age group comparison were obtained by multivariate logistic regression, adjusted for sex and ethnicity, where appropriate, or by chi-square test, where appropriate

Obesity was defined as body mass index (BMI) ≥ 30 kg/m²

DM was defined as (1) answered “yes” to “(Other than during pregnancy), Have you ever been told by a doctor or other health professional that you have diabetes or sugar diabetes?” or (2) glycosylated hemoglobin ≥ 6.5%, or (3) fasting glucose ≥ 126 mg/dl

Heart disease was defined as answering “yes” to any of the questions below: (1) “Has a doctor or other health professional ever told you that you had congestive heart failure?” or (2) “Has a doctor or other health professional ever told you that you had coronary heart disease?” or (3) “Has a doctor or other health professional ever told you that you had a heart attack (also called myocardial infarction)?”

CKD was defined as (1) answering “yes” to “Have you ever been told by a doctor or other health professional that you had weak or failing kidney?” or (2) estimated glomerular filtration rate (eGFR) < 60 ml/min/1.73 m² using the Chronic Kidney Disease Epidemiology Collaboration (CKD – EPI) equation, or (3) urine albumin – creatinine ratio ≥ 30 mg/g

COPD was defined as answering “yes” to either of the questions below: (1) “Has a doctor or other health professional ever told you that you had emphysema?” or (2) “Has a doctor or other health professional ever told you that you had chronic bronchitis?”

Asthma was defined as answering “yes” to both of the questions below: (1) “Has a doctor or other health professional ever told you that you have asthma?” and (2) “Do you still have asthma?”

Stroke was defined as answering “yes” to the question “Has a doctor or other health professional ever told you that you have asthma?”

Liver disease was defined as answering “yes” to both of the questions below: (1) “Has a doctor or other health professional ever told you that you had any kind of liver condition?” and (2) “Do you still have a liver condition?”

Hypertension was defined as (1) having at least three of the blood pressure measurements on the day of examination as ≥ 130 mmHg for systolic measurement or ≥ 80 mmHg for diastolic measurement, or (2) answering “yes” to “Have you ever been told by a doctor or other health professional that you had hypertension, also called high blood pressure?”

including DM, CKD, and asthma, and help reduce the adverse psychological consequences of social distancing.⁵

A limitation of NHANES is the reliance on self-reported medical history that might cause underestimation of risk factors. Moreover, we have not included cancer as it is highly heterogeneous, or less common conditions such as sickle cell anemia and post-transplant immunodeficiency.

In conclusion, an alarming three-quarters of Americans are at increased risk of severe COVID-19 illness. Obesity and hypertension are the leading risk factors. Individuals with increased risk should strictly follow social distancing and personal hygiene measures and adopt lifestyle modifications.

Hang Long Li, BSc¹

Bernard M. Cheung, PhD, FRCP^{1,2}

¹Division of Clinical Pharmacology and Therapeutics, Department of Medicine, The University of Hong Kong,

Pok Fu Lam, Hong Kong

²State Key Laboratory of Pharmaceutical Biotechnology, The University of Hong Kong, Pokfulam, Hong Kong

Corresponding Author: Bernard M. Y. Cheung, PhD, FRCP; State Key Laboratory of Pharmaceutical Biotechnology, The University of Hong Kong, Pokfulam, Hong Kong (e-mail: mycheung@hku.hk).

Table 2 Prevalence of ≥ 1 Established and Any Risk Factor According to Ethnicity, Education Level, and Income level

	≥ 1 established risk factor		≥ 1 any risk factor	<i>P</i> value
Sex				
Male (referent)	56.8 (54.3–59.0)		74.5 (71.0–77.0)	
Female	60.8 (58.2–63.0)	0.055	72.9 (70.7–75.0)	0.019
Ethnicity				
Non-Hispanic White (referent)	58.0 (55.3–61.0)		74.0 (71.2–77.0)	
Non-Hispanic Black	68.7 (65.7–72.0)	< 0.001	82.7 (80.3–85.0)	< 0.001
Mexican American	64.9 (60.4–69.0)	< 0.001	73.1 (69.2–77.0)	0.355
Other Hispanics	57.9 (53.1–62.0)	0.412	68.9 (63.6–74.0)	0.534
Non-Hispanic Asian	39.5 (35.3–44.0)	< 0.001	56.6 (52.4–61.0)	< 0.001
Other ethnicities	64.5 (56.0–72.0)	0.087	79.4 (70.5–86.0)	0.036
Education level				
Low	67.1 (64.6–70.0)	0.324	81.1 (78.4–83.0)	0.977
Middle (referent)	63.2 (61.0–65.0)		77.2 (75.4–79.0)	
High	46.9 (43.3–51.0)	< 0.001	63.7 (59.8–67.0)	< 0.001
Income level				
Low	65.2 (62.6–68.0)	< 0.001	76.9 (74.3–79.0)	< 0.001
Low middle	64.3 (60.3–68.0)	< 0.001	78.8 (75.7–82.0)	0.002
High middle	62.9 (59.0–57.0)	0.002	75.1 (71.4–78.0)	0.144
High (referent)	52.9 (49.8–56.0)		70.5 (67.1–74.0)	

Data are presented as weighted percentage (95% confidence interval)

P values were obtained by multivariate logistic regression, adjusted for age, sex, ethnicity, education level, and income level, where appropriate

Education level was classified as low (less than a high school degree), middle (high school graduate/GED or some college/AA degree), or high (college graduate or above)

Income level was classified as low (poverty income ratio (PIR) < 1.3), low middle (PIR ≥ 1.3 and < 1.85), high middle (PIR ≥ 1.85 and < 3), or high (PIR ≥ 3)

Compliance with Ethical Standards:

Conflict of Interest: The authors declare that they do not have a conflict of interest.

REFERENCES

- Centers for Disease Control and Prevention. Coronavirus Disease 2019 (COVID-19) People Who Need to Take Extra Precautions. <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/index.html>. Published 2020. Accessed 18 Jul 2020.
- National Center for Health Statistics. NHANES Questionnaires, Datasets, and Related Documentation. <https://www.cdc.gov/nchs/nhanes/index.htm>. Accessed 18 Jul 2020.

- Chu DK, Akl EA, Duda S, et al. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *Lancet*. 2020;395(10242):1973-1987.
- World Health Organization. Ethics and COVID-19: resource allocation and priority-setting. <https://www.who.int/ethics/publications/ethics-covid-19-resource-allocation.pdf?ua=1>. Published 2020. Accessed 18 Jul 2020.
- Galea S, Merchant RM, Lurie N. The Mental Health Consequences of COVID-19 and Physical Distancing: The Need for Prevention and Early Intervention. *JAMA Intern Med*. 2020; <https://doi.org/10.1001/jamainternmed.2020.1562>.

Publisher's Note: Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.