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HHS Public Access

Author manuscript

AIDS Behav. Author manuscript; available in PMC 2017 June 01.

Published in final edited form as:

AIDS Behav. 2017 June ; 21(6): 1588–1600. doi:10.1007/s10461-016-1569-5.

Factors Associated with Health Information Seeking, Processing, and Use Among HIV Positive Adults in the Dominican Republic

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Abstract

Effective treatment and management of human immunodeficiency virus (HIV) depend on patients' ability to locate, comprehend, and apply health information. This study's purpose was to identify characteristics associated with these skills among HIV positive adults in the Dominican Republic. An information behavior survey was administered to 107 participants then three logistic regressions were conducted to identify characteristics associated with information seeking, processing, and use. Never having cared for someone who was sick was significantly associated with less information seeking, processing, and use. Males were more likely to be active information seekers and those who had attended the clinic for six or fewer years were less likely to actively seek information. Younger individuals had increased odds of higher information processing and those without comor-bidities had increased odds of more information use. Results may inform researchers, organizations, and providers about how patients interact with health information in limited resource settings

Resumen

El tratamiento y manejo eficaz del virus de inmunodeficiencia humana (VIH) depende en la habilidad de un paciente de encontrar, comprender y aplicar la información acerca de la salud. El objetivo de este studio fue identificar las características asociadas con estas capacidades necesarias entre adultos VIH positivos en La República Dominicana. Se realizó una entre vista con 107 participantes sobre el comportamiento de la información de la salud para luego ser analizada mediante regresión logística para identificar las características asociadas con la búsqueda, el

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Compliance with Ethical Standards

Conflict of Interest The authors declare that there are no conflicts of interest.

Ethical Approval All procedures performed in this study were approved by the Columbia University Medical Center IRB and by the committee responsible for the ethical conduct of research in the Dominican Republic, the Consejo Nacional de Bioética en Salud (CONABIOS).

Informed Consent Verbal informed consent was obtained from all participants included in this study.

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procesamiento y el uso de la información de la salud. Los resultados mostraron que no haber cuidado de alguien en estado grave de salud estuvo asociado significativamente con menos búsqueda, procesamiento y uso de la información de la salud. Hombres tuvieron más probabilidad de buscar información de forma activa y aquellos con seis o menos anos recibiendo atención en la clínica tuvieron menos probabilidad de buscar información de forma activa. Los participantes con menos de 42 años tuvieron más probabilidad de procesar la información en una manera alta y los participantes sin comorbilidades tuvieron más probabilidad de usar la información. Estos resultados pueden informar investigadores, organizaciones y proveedores de salud sobre como pacientes puedan interactuar y beneficiarse con la información de la salud en lugares con bajo recursos.

Keywords

HIV/AIDS; Developing country; Health literacy; Health information; Information behavior

Introduction

Regardless of widespread availability of antiretroviral therapy (ART) and increased international and governmental response to the human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS) epidemic in the Dominican Republic (DR) [1], 0.1 % of the country's population is still estimated to be living with the virus [2, 3]. Incidence rates declined by more than 50 % between 2001 and 2012 in the DR [4], but there are still approximately 1800 (0.03 % of the population) new diagnoses annually [5, 6]. Effective treatment and prevention of HIV is dependent on patients being able to find, receive, and use health information, for example, knowing where to get ART medication and how to take it correctly [7–12]. Unfortunately, individuals living in developing countries, especially in rural areas, face numerous barriers to accessing, processing, and using the information necessary for successful health management [13–15]. Some of these barriers may include: lack of educational infrastructure, limited financial resources, unavailability of information, cultural differences between patients and providers, spiritual beliefs, and transportation restrictions [14, 16, 17]. In the context of HIV, information seeking and use is further complicated by negative emotional responses to a positive diagnosis and widespread stigma, among other psychosocial factors [1, 7, 18–20]. Despite the importance of information in the battle against HIV, studies pertaining to health information seeking, processing, and use are missing from many regions. In particular, how individuals interact with health information has not yet been fully explored in the developing country context [15, 21]. These studies are necessary for providers and organizations to understand how to more effectively offer health education [22, 23]. The DR is one country where research regarding how people living with HIV/AIDS may seek, process, and use health information is lacking.

Health Information Seeking, Processing, and Use

The three concepts of health information—seeking, processing, and use—are equally relevant to consider in health information behavior studies, as an individual must complete all three processes before effective health management is possible. The concept of health

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information seeking or health information seeking behavior has been used since the 1940s, but includes many definitions and debate over its conceptual meaning [24–26]. After reviewing the various definitions, Lalazaryan and Zare-Farashbandi concluded that, “the ultimate and final goal of all information seeking behavior is to satisfy the information need of the people” [26]. In healthcare settings, this refers to patients obtaining the information they need to effectively manage their condition, which is not straightforward since individuals may not have the skills or resources necessary to complete these tasks [27]. For example, finding health information means knowing what information to look for, where that information might be available, and being able to afford the transportation to get there. Even if those requisites are satisfied, individuals may simply choose to avoid information because they are overwhelmed with their diagnosis or because too much available information may be daunting [18, 26, 28]. Once an individual is able to obtain information, they must be able to understand and use that information for it to be effective.

The concepts of health information processing and use have not received as much attention in the literature but are closely associated with health literacy, which has emerged as an international research priority [29]. Health literacy is the degree to which individuals have the capacity to obtain, process, and utilize basic health information and services to make appropriate health decisions [30, 31]. According to this definition, health literacy includes all three concepts, information seeking, processing, and use. However, studies that measure an individual’s health literacy and its association to health outcomes do not always consider all three components and must be interpreted cautiously. Although the way health literacy is measured varies across studies, low/limited health literacy has been associated with worse health outcomes [31], worse adherence to medications [32], and less information seeking [33, 34]. This is especially true in patients with conditions such as HIV, where the perceived severity of the diagnosis, complexity of illness and treatment, possible cognitive effects of medications, stigma, and comorbidities create additional challenges to health management [20, 35–38]. Studies have confirmed this by showing that low health literacy can lead to poorer understanding of HIV in a variety of settings [39–43]. Because numerous complex factors can influence how patients interact with information, organizations and healthcare providers must understand what helps and hinders their patient population to access and use health information so services may be tailored to deliver information in a meaningful way. Therefore, the purpose of this study was to identify factors associated with health information seeking, processing, and use among HIV positive adults living in a limited resource setting.

Methods

Study Setting and Ethical Approval

Data collection took place through individual interviews conducted at Clínica de Familia in La Romana, DR from August to October 2015. Located on the southeast coast of the country, Clínica de Familia La Romana is a non-profit organization licensed by the Dominican Ministry of Health to provide outpatient and community-based health care. The Clinic was founded in 2004 by the Columbia University International Family AIDS Program (IFAP) and then in 2010, it established independent Dominican governance while

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maintaining its affiliation with Columbia University. Clínica de Familia specializes in the diagnosis, treatment, and management of sexually transmitted infections, especially HIV. Because few centers offer this type of care in the Dominican Republic, the Clinic may receive patients from the province of La Romana, and other eastern provinces, from both urban and rural areas. In 2015, there were more than 48,000 visits to the Clinic by over 8000 men, women, and children who received a variety of services [44]. Free consultations, treatment, and support services are offered to over 1700 HIV positive patients which makes it the third largest HIV care center in the country [44]. All research activities for this study were approved by the Columbia University Medical Center IRB and by the committee responsible for the ethical conduct of research in the DR, the Consejo Nacional de Bioética en Salud (CONABIOS).

Sampling and Data Collection

Sample size was calculated using a power analysis for multivariate regression with a fixed model containing 17 predictor variables assessing the contribution of one variable at a time, with the full R-squared value of 0.6 and the R-squared difference ranging from 0.01 to 0.1 in 0.01 intervals to achieve a power of 0.8. This analysis generated sample sizes between 36 and 316 depending on the desired R-squared difference. A sample of 107 participants was determined to be the largest sample size attainable during the allotted time period while maintaining the ability to detect the smallest R-squared difference possible.

Researchers used a non-probability, consecutive sampling method in which a healthcare provider introduced eligible participants who presented for any service at the Clinic between August and October 2015 to the study and then referred interested participants to speak to the on-site interviewer (SS). Prior to recruitment, healthcare providers at the Clinic learned about the purpose and procedure of the study and were given a study information sheet and recruitment script to help them introduce the study to eligible participants. Participants were eligible if they were over the age of 18, Spanish speaking, and HIV positive as recorded in their medical record or confirmed by their healthcare provider. Prior to initiating interviews, the on-site interviewer further explained the study, asked participants if they had any questions, and obtained verbal consent. Surveys were administered through individual interviews in a private room to maintain confidentiality. Drinks and snacks were offered during each session. Data were entered into and managed with Research Electronic Data Capture (REDCap) software, hosted by Columbia University [45].

Information Behavior Survey

Development of the information behavior survey was guided by an adapted version of Wilson’s 1996 model of information behavior [46, 47], incorporated findings of a previously conducted chart review and focus group discussions, and included input from health professionals at the Clinic. Full survey development and testing has been reported elsewhere [48]. In short, the instrument was developed in Spanish and contained 64-items pertaining to the following components of the theoretical model: information need, decision to take action, barriers and facilitators, selection of information source, information seeking behavior and information processing and use. There were 21 demographic questions, 13 knowledge questions (initially developed for use in the 2013 Demographic and Health

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Survey administered in the DR) [3] and 30 questions pertaining to information behavior. Experts in the fields of health literacy, community health, nursing, and epidemiology verified the content and face validity of questions. In addition to the survey, the Short Assessment of Health Literacy—Spanish and English (SAHL S&E), previously validated in both Spanish and English [49], was administered during interviews to obtain a time efficient estimate of general literacy [50]. The SAHL S&E assesses participants' likelihood of having adequate health literacy based on their ability to read 18 medical words out loud and identify words with similar meanings. One point is given if the participant can pronounce the medical word and select the word it is most closely associated to, of the two possible choices provided. Individuals who are able to get 15 or more points of the possible 18 are considered likely to have adequate health literacy [49]. Before administering the health literacy assessment, participants were asked if they were able to read written words and those who responded that they were not, were not asked to complete the health literacy assessment.

Study Variables

Dependent Variables—Three theoretically driven outcome variables were created a priori by developing a scoring system from components of the health information behavior survey to measure participants' information seeking, processing, and use (Table 1). The first dependent variable was *information seeking* which, guided by Wilson's model, was dichotomized as active or passive, where active seekers are more engaged in the pursuit of heath information and passive seekers may obtain information that is relevant to them while engaging in another behavior or without looking for it [46]. Scoring for this variable was based on participants' responses regarding how often they seek information to answer their health questions, their elaboration on how often they search for information, and if they could think of or wanted to ask a question related to their health. Some questions solicited open-ended responses which were incorporated into the coding of the dependent variables by assigning "points" to responses where participants received one point for indicating an active search and one point if they asked any question related to their health (Table 1).

The second dependent variable was *information processing*, where scoring was based on five knowledge questions for which participants received one point for a correct answer and then also received a point if they were identified as having adequate health literacy on the health literacy exam (Table 1). From the sum of their scores, participants were classified as having either higher or lower information processing.

The third dependent variable was *information use* and was calculated based on participants' self-reported adherence, self-efficacy, and frequency of information use, if they used a condom during their last sexual encounter, and if they were able to list useful things that they had learned about HIV. Points were assigned to each response and participants were then classified from their score as either having more or less information use (Table 1).

Independent Variables—The continuous independent variables were: age (years), time living with a positive HIV diagnosis (years), the length of time a participant had been attending the clinic (years), and household income per person (household income divided by the number of people living in the home) which was further divided by 100 for the analysis

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to obtain an appropriate scale and interpretation. Dichoto-mous independent variables were: gender (male or female), highest level of education attained (primary school and below or high school and above), employed outside the home (yes or no), ever having cared for someone who was very sick (yes or no), having any medical condition besides HIV (yes or no), married or in a serious relationship (yes or no), used a condom during last sexual relation (yes or no), ever given money for a sexual activity (yes or no), ever received money for a sexual activity (yes or no), drank alcohol in a normal week (yes or no), health literacy level (health literate or not health literate based on SAHL S&E), and having support from at least one friend or family member (yes or no). The one categorical independent variable was where the participant resides (La Romana, other city, or rural area).

Statistical Analyses

Bivariate analyses were used to assess associations between the independent and each of the dependent variables defined above. Chi squared or Fisher's exact tests (as appropriate based on cell sizes) were used for dichotomous and categorical variables while continuous variables were assessed using simple logistic regression. Variables associated with dependent variables with a p value of ≤ 0.25 were included in final regression models so as to include variables that might be important when considered together [51]. A multivariable logistic regression model was then fit for each dependent variable assessing the contribution of each independent variable identified as significant in bivariate analyses. Two participants indicated that they were transgender and because of the small sample size of this group, we were not able to include those observations in the analysis, which left a final sample size of 105.

Logistic regression diagnostics considered for each model were: linearity of continuous independent variables with the logit of each dependent variable, the collinearity of independent variables included in each model, and identification of outliers according to graphs of influence and leverage [51]. Based on the diagnostic tests, continuous variables not linearly associated with the logit of the outcome were either categorized or dichotomized to create homogenous groups for final models. Household income per person was separated by those earning more and less than 2417 Dominican Pesos per month and length of time being seen at the clinic was dichotomized into those who had attended the clinic for more and less than 6 years based on cutoffs for homogenous groups identified with diagnostic calculations. According to the diagnostic tests, age was left as a continuous variable in the model for information seeking but was divided into three groups, those who are over 42 years, those between 37 and 42 and those less than 37 years old for the information processing model. Two variables (time living with HIV and time attending the clinic) were found to be collinear in the health information processing model. To retain the inter-pretability of at least one of the odds ratios associated with these variables and to correctly specify the model, we retained the variable, 'time attending the clinic', and excluded 'time living with HIV' from the final model. We also verified that the model convergence criterion was satisfied, and assessed model fit using the Hosmer and Lemeshow Goodness of Fit test and the area under the receiver operating characteristic (AUROC) curve [51]. An AUROC curve of 0.51–0.65 was considered poor, 0.66–0.80 considered moderate, and >0.8 a good

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model fit to the data [52, 53]. All analyses were conducted with SAS version 9.3 (SAS Institute, Cary, NC).

Results

The characteristics of the 105 participants included in the analyses can be found in Table 2 for each of the three outcomes of interest. Participant characteristics were consistent with a previous study conducted at the Clinic [54] and were representative of the HIV positive patient population. Most participants were women (61 %) and lived in La Romana (57 %). The average age was 39.9 years (range 19–75) and the average income per person (total household income divided by the number of people living in the household) was 2614 Dominican Pesos (approximately 60 U.S. Dollars) per month (range 0–17,500). Slightly less than half (49 %) were married or in a serious relationship, and less than half were employed outside of the home (46 %). Approximately 32 % of participants reported having completed some or all of high school and above while 68 % reported some or all of primary school or had no formal education.

Health Information Seeking

Independent variables significantly associated with health information seeking in initial bivariate analyses are reported in Table 2. In the final logistic regression model, men had 4.57 times the odds (95 % CI 1.43–17.14) of actively seeking information than women (Table 3). Participants who had never cared for someone who was very sick had 0.36 times the odds (95 % CI 0.12–0.99) of active information seeking than those who had. Those who had been attending the Clinic for 6 or less years had 0.35 times the odds (95 % CI 0.11–0.98) of being active information seekers than those who had attended the Clinic for more than 6 years. The AUROC curve was 0.79 indicating a moderate fit. Of note, weekly alcohol consumption, social support, and income were not significantly associated with information seeking ($p > 0.05$).

Health Information Processing

Independent variables significantly associated with health information processing in the initial bivariate analyses are reported in Table 2. In the final logistic regression model, the independent variables significantly associated with health information processing were ever having taken care of someone who was very sick and age. Individuals who had not ever taken care of someone who was very sick had 0.33 times the odds (95 % CI 0.12–0.85) of higher information processing than those who had (Table 3). Participants who were less than 37 had 3.98 times the odds (95 % CI 1.26–14.02) of more information processing while those who were between the ages of 37 and 42 had 5.47 times the odds (95 % CI 1.66–24.55) of more information processing than those over the age of 42. The AUROC curve was 0.78 indicating a moderate fit. Notably, highest level of education attained was not significantly associated with the information processing outcome ($p > 0.05$).

Health Information Use

Independent variables identified as significantly associated with health information use in initial bivariate analyses are reported in Table 2. In the final logistic regression model,

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participants who had never taken care of someone who was very sick had 0.28 times the odds (95 % CI 0.11–0.67) of higher information processing than those who had (Table 3). Also, participants who did not have another medical condition besides HIV had 2.63 times the odds (95 % CI 1.06–6.92) of more information use than those with comorbidities (Table 3). The AUROC curve was 0.72 indicating a moderate fit. It is notable that education level, health literacy, and household income per person were not significantly associated with information use.

Discussion

The purpose of this study was to identify factors significantly associated with information seeking, processing, and use among HIV positive adults living in the DR. Never having been a caregiver was found to be significantly associated with less/lower information seeking, processing, and use. Additionally, men were more likely to be active information seekers than women and those who have attended the clinic for 6 or fewer years were less likely to be active information seekers. Participants under the age of 42 were found to be more likely to have higher information processing than those over the age of 42 and individuals without comorbidities were found to have more information use than those with comorbidities.

In our study, having cared for someone who was very sick led to more information seeking, processing, and use. We were surprised by this finding as much of the literature pertaining to informal caregivers of patients with chronic conditions focuses on the negative effects that the acts of caregiving can have on the caregiver [55–58]. These negative effects on caregivers' health may result from neglecting their own care while caring for others, sharing psychological and social burdens, reduced productivity at work or job loss, or depressive symptoms, among other factors [55, 57, 58]. Additionally, many of the negative effects that caregivers experience may depend on the condition of the person for whom they are caring; specifically, caregiving for patients with dementia or HIV has been shown to be particularly challenging [55, 57, 59, 60]. Regardless of these challenges, caregiving for patients with chronic conditions requires numerous skills and abilities that caregivers have no choice but to learn [61]. Although specific skills that caregivers may need vary by context, tasks such as ordering medication on time, effectively communicating with the healthcare team, organizing medical visits, and providing emotional support are those that caregivers may acquire out of necessity [62]. Our study indicates that practice using these skills while caregiving for others may make it so that caregiving is beneficial to the health of caregivers living with HIV, as it can lead to more information seeking, processing, and use. Healthcare providers and researchers can work to streamline this process by helping and supporting informal caregivers to acquire and use the skills they need to effectively care for both their loved one and themselves. Furthermore, outreach to those who have never cared for someone who is sick may be warranted, as we found that these individuals may be less likely to actively seek, process, and use information.

In our study, men were found to have higher odds of information seeking than women which corresponds with another study that assessed HIV-related Internet queries from Latin America, of which 80 % were made by males [63]. In the Dominican Republic, slightly more than half of the cases of HIV/AIDS are among men (53 %) [2], which is not likely to

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significantly contribute to differences in information seeking between men and women. Additionally, 60 % of the HIV positive patients at the clinic are female indicating they may be more likely to seek information [54]. Other potential reasons that men and women may differ in the way they seek health information are, differences in socioeconomic status, disease manifestation, employment, stigma, and level of education [1, 64, 65]. Stigma against HIV in the DR is strong and widespread [66, 67] which may lead to less information seeking among both men and women as stigma against men who have sex with men and the sex work industry is evident [68]. Literature regarding the information seeking behavior of Dominican women is limited, however, one article found that Dominican women described "exhaustive attempts at seeking treatment and cure for their lymphedema," [23] despite widespread stigma toward the condition [69]. Although this condition and the stigma against it may be different than the case of HIV, this article asserts that Dominican women may exert tremendous effort in information seeking behavior when they are concerned about their health. Another article shows Dominican women being actively involved in disease prevention and detection especially in the case of breast cancer [70]. These findings indicate that information seeking behavior may vary based on the disease in question and that more research is needed on the topic.

As expected, older participants (over the age of 42) was associated with less ability to process health information, as older adults who are HIV positive have been found to have a higher prevalence of cognitive disorders and poorer overall cognition [35, 37]. Additionally, symptomatic HIV infection may be associated with mild or moderate neurocognitive impairment depending on how cognition is measured [36, 71, 72]. That our model was able to detect this association, despite our small sample size, speaks to the strength of this association. Organizations and clinicians should consider this finding when providing patient health education to older adults, as older adults may have more difficulty comprehending the information they receive.

Counter-intuitively, having additional comorbidities was associated with less information use. We would have expected that additional health conditions would lead to more experience looking for information, more interaction with healthcare providers, more familiarity with taking medications, etc. In this study, however, we did not inquire as to participants' other comorbidities nor how long they had been present. Depending on the nature of comorbidities, factors associated with decreased information use could be lower socioeconomic status, decreased cognitive ability, information overload, and less effective coping skills [18]. Even in our data, we observed an association between comorbidities and income in unadjusted analyses (data not shown). Future studies should assess the potential interaction between socioeconomic status and comorbidities and their influence on health information seeking behaviors. More specific to our research, studies on information behaviors among people living with HIV should identify and evaluate comorbidities to further establish how they may affect a patient's ability to find and use health information.

Excessive alcohol consumption has been identified as a strong risk factor for HIV transmission and medication non-adherence in the DR [1, 7], but was not found to be associated with any of the outcomes in our study. Our results were, however, consistent with a systematic review and meta-analysis concluding that although alcohol use is related to

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medication non-adherence, that relationship may vary based on how alcohol consumption is measured [73]. We were unable to capture excessive drinking habits with our survey and we may have missed some of the effects that high levels of alcohol consumption might have on health information seeking, processing, and use.

The concept of health literacy theoretically represents a person's ability to use health related information [29, 30] but was not significantly related to information use in our study. Again, this could be related to the way we measured information use. Lastly, lower levels of education are linked with lower health literacy and less information seeking, processing, and use in numerous other studies [38, 65, 74] yet we did not find a significant association between health literacy and either of the two outcome variables that it was compared to, information seeking and use.

There are limitations to this study. The first is that a small sample size of some sub-groups precluded our ability to determine how factors associated with information seeking, processing, and use differ between men who have sex with men, female sex workers, or residents of the bateyes (low-income communities where sugarcane plantation workers and their families live). Second, the scoring system that we used to measure health information seeking, processing, and use differs from measurements of these concepts by others, which may hinder comparisons to other studies. Our method, however, was theoretically driven and identified factors that had been significantly associated with information seeking, processing, and use in the extant literature. Third, in some cases we categorized or dichotomized continuous variables to ensure that the assumptions for our logistic models held, which likely led to a loss of information and lack of variance. Fourth, there may have been some selection bias due to recruitment methods, which could limit how representative our participants were of the patient population. However, the proportion of male to female, level of education, average age, and percent either married or in a serious relationship of our participants was reflective of the HIV positive population at the Clinic [54]. Fifth, we were only able to recruit participants from one clinic in the DR, which could limit generalizability of findings. Lastly, to limit the participant burden resulting from our long survey, we collected minimal data pertaining to caregiving, potential comorbidities or alcohol consumption. Future research might consider whom patients are caring for and how long they have been caring for that person as well as the type and duration of comorbidities.

Regardless of limitations, this study contributes to the literature by showing factors significantly associated with the health information seeking, processing, and use of HIV positive adults living with low levels of education in a limited resource setting. Never having cared for someone who was very sick was significant in all three models and led to less information seeking, processing, and use. Other significant variables from our models were consistent with what has been reported in the literature. Lastly, there are many questions about what is and is not related to information seeking, processing, and use which means models predicting these outcomes are less likely to have a good fit. All of these considerations increase our confidence in our scoring for the outcome variables and the results from the logistic models testing their associations with patient characteristics.

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Conclusion

Never having cared for someone who was very sick was associated with less information seeking, processing, and use after controlling for other variables in the models. Other significant associations that warrant further consideration were gender, length of time being seen at the clinic, age, and comorbidities. Our survey is a valuable first step in examining patients' ability to seek, process, and use health information, but additional psychometric testing of the questions would confirm the stability of the survey for use in further studies. Regardless, these findings can be used throughout the DR and across Latin America to inform healthcare providers about factors that may influence their patients' ability to acquire and use health information. Furthermore, organizations and healthcare providers working with HIV positive adults in any limited resource setting can use these results to inform the way in which they offer health education to patients. Future research should explore what components of caregiving are related to decreased ability to effectively obtain, comprehend and apply health information and should also evaluate methods to improve the way health information is provided to patients.

Acknowledgments

Funding The authors SS and MB are funded as pre-doctoral fellows on the Training in Interdisciplinary Research to Prevent Infections (TIRI) Grant, T32NR013454, funded by National Institute of Nursing Research, National Institutes of Health.

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Table 1

Scoring for health information seeking, processing, and use dependent variables

Outcome	Assessment question	"Points" for each answer
Health information seeking	When you have a question about your health, how often do you look for the information that can help you with your question?	2 Almost always 1 Sometimes 0 Almost never
	Could you tell me a little bit more about why you do (or do not) look for health information?	1 Active seeking 0 Passive seeking
	If you could ask just one question about your health, what would that question be?	1 Asked a question 0 Did not ask a question
	Total score: 4 points possible ≥3 points = Active information seeking <3 points = Passive information seeking	
Information processing	Can people catch the virus that causes AIDS through mosquito bites?	1 No 0 Yes or Unsure
	Can people protect themselves from the virus that causes AIDS using a condom every time they have sexual relations?	1 Yes 0 No or Unsure
	Can a person get more than one sexually transmitted infection at the same time?	1 Yes 0 No or Unsure
	A person with HIV would like to have a number of CD4 cells that is very high?	1 Yes 0 No or Unsure
	A person with HIV would like to have a viral load that is very high?	1 No 0 Yes or Unsure
	SAHL S&E health literacy exam	1 Passed (Score ≥ 15) 0 Did not pass
	Total score: 6 points possible ≥4 points = Higher information processing <4 points = Lower information processing	
Information use	Number of doses that you missed of your antiretroviral therapy in the past 7 days	2 Did not miss any 1 Missed 1–2 doses 0 Missed >3 doses
	Would you say you are able to use the information you get in the clinic?	1 Very or somewhat able 0 Not very able
	How often do you use the information that you get at the clinic to manage your health?	1 Almost always or sometimes 0 Almost never
	Could you please elaborate on your ability and the frequency of information use?	1 Able to use 0 Unable to use
	Did you use a condom during your last sexual relation?	1 Yes 0 No
	What have been the two most useful things that have helped you with HIV?	2 More than one example 1 One example 0 No examples
	Total score: 8 points possible ≥7 points = More information use <7 points = Less information use	

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Table 2

Bivariate analvses between participant characteristics and outcomes of interest (N = 105)

Characteristic	Health information seeking			Health information processing			Health information use		
	Active	Passive	*p*	Higher	Lower	*p*	More	Less	*p*
Gender, n (%)									
Male	35 (54.6)	6 (21.4)	**0.04**	25 (36.2)	16 (44.4)	0.43	38(61.3)	26 (60.5)	0.93
Female	42 (45.5)	22 (78.6)		44 (63.8)	20 (55.6)		24(38.7)	17 (39.5)	
Resides, n (%)									
La Romana	43 (55.8)	17 (60.7)	0.95 *	40 (58.0)	20 (55.6)	0.46	37(59.7)	23 (53.5)	0.74
Other city	25 (32.5)	8 (27.6)		23 (33.3)	10 (27.8)		19 (30.7)	14 (32.6)	
Rural area	9 (11.7)	3 (10.7)		6 (8.7)	6 (16.7)		6 (9.7)	6 (14.0)	
Highest level of education achieved, n(%)									
Primary school or below	53 (68.8)	18 (64.3)	0.66	41 (59.4)	30 (83.3)	**0.01**	39 (62.9)	32 (74.4)	**0.22**
High school or above	24 (31.2)	10 (35.7)		28 (40.6)	6 (16.7)		23(37.1)	11 (25.6)	
Employed outside the home, n (%)									
Yes	33 (42.9)	15 (53.6)	0.38	29 (42.0)	19 (52.8)	0.29	30(48.4)	18 (41.9)	0.51
No	44 (57.1)	13 (46.4)		40 (58.0)	17 (47.2)		32(51.6)	25 (58.1)	
Ever taken care of someone sick, n (%)									
Yes	46 (59.7)	10 (35.7)	**0.03**	42 (60.9)	14 (38.9)	**0.03**	40(64.5)	16 (37.2)	**0.01**
No	31 (40.3)	18 (64.3)		27 (39.1)	22 (61.1)		22(35.5)	27 (62.8)	
Other medical conditions, n (%)									
Yes	30 (39.0)	11 (39.3)	0.98	27 (39.1)	14 (38.9)	0.98	21(33.9)	20 (46.5)	**0.19**
No	47 (61.0)	17 (60.7)		42 (60.9)	22 (61.1)		41(66.1)	23 (53.5)	
In a serious relationship, n (%)									
Yes	34 (44.2)	17 (60.7)	**0.13**	36 (52.2)	15 (41.7)	0.30	28(45.2)	23 (53.5)	0.40
No	43 (55.8)	11 (39.3)		33 (47.8)	21 (58.3)		34(54.8)	20 (46.5)	
Used condom at last sexual relation, n(%)									
Yes	54 (70.1)	22 (78.6)	0.39	49 (71.0)	27 (75.0)	0.66	52(83.9)	24 (55.8)	**<.01** †
No	23 (29.9)	6 (21.4)		20 (29.0)	9 (25.0)		10(16.1)	19 (44.2)	
Given money for a sexual activity, n (%)									
Yes	24 (31.2)	6 (21.4)	0.33	18 (26.1)	12 (33.3)	0.44	18(29.0)	12 (27.9)	0.90

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Characteristic	Health information seeking			Health information processing			Health information use		
	Active	Passive	*p*	Higher	Lower	*p*	More	Less	*p*
No	53 (68.8)	22 (78.6)		51 (73.9)	24 (66.7)		44(71.0)	31 (72.1)	
Received money for a sexual activity, n (%)									
Yes	26 (33.8)	10 (35.7)	0.85	21 (30.4)	15 (41.7)	**0.25**	20(32.3)	16 (37.2)	0.60
No	51 (66.2)	18 (64.3)		48 (69.6)	21 (58.3)		42(67.7)	27 (62.8)	
Drinks alcohol in a normal week, n (%)									
No	59 (76.6)	16 (57.1)	**0.05**	48 (69.6)	27 (75.0)	0.56	46 (74.2)	29 (67.4)	0.45
Yes	18 (23.4)	12 (42.9)		21 (30.4)	9 (25.0)		16 (25.8)	14 (32.6)	
Health literacy level, n (%) **									
Health literate	25 (32.5)	8 (24.6)	0.70	32 (46.4)	1 (2.8)	**<.01** †	23 (37.1)	10 (23.3)	**0.13**
Not health literate	52 (67.5)	20 (71.4)		37 (53.6)	35 (97.2)		39 (62.9)	33 (76.7)	
Support from friends or family, n (%)									
Yes	71 (92.2)	23 (82.1)	**0.16** *	64 (92.8)	30 (83.3)	**0.18** *	56 (90.3)	38 (88.4)	0.76 *
No	6 (7.8)	5 (17.9)		5 (7.3)	6 (16.7)		6 (9.7)	5 (11.6)	
Age (Years), mean ± SD	42.4 ± 11.7	37.4 ± 8.7	**0.03**	39.0 ± 13.0	45.2 ± 13.0	<.01	41.6 ± 11.5	40.3 ± 10.7	0.57
Income per person in household (Dominican Pesos), mean ± SD	2279 ± 2648	3,534 ± 4283	**0.08**	2,771 ± 3610	2,314 ± 2203	0.49	2915 ± 3379	2179 ± 2889	**0.25**
Length of time living with HIV (Years), mean ± SD	7.9 ± 5.2	7.4 ± 4.6	0.66	8.3 ± 5.0	6.8 ± 5.2	**0.16**	7.4 ± 5.2	8.2 ± 4.9	0.44
Length of time attending the clinic (Years), mean ± SD	6.7 ± 4.5	5.2 ± 3.7	**0.12**	6.9 ± 4.2	5.3 ± 4.4	**0.08**	6.1 ± 4.3	6.7 ± 4.4	0.43

p values were calculated using Chi square for categorical variables unless cell counts warranted a Fisher's exact test (denoted with a *) and for continuous variables, logic regressions were conducted and the Wald *p* value reported

p values ≤0.25 are indicated in bold to show significant associations with dependent variables

** Health literacy levels according to the SAHL (S & E) health literacy assessment

† Not included in final model as variable is part of the scoring scheme to generate the outcome

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Table 3

Adjusted odds ratios from multivariable analysis identifying factors associated with information seeking, processing, and use (N = 105)

Independent variable	Adjusted OR (95 % CI)	*p* value
Model 1: Health information seeking (active or passive)		
Gender		
Female	*Ref*	**0.02**
Male	**4.57 (1.43–17.14)**	
Ever taken care of someone who is sick		
Yes	*Ref*	**0.05**
No	**0.36 (0.12–0.99)**	
Married or in a serious relationship		
Yes	*Ref*	0.09
No	2.45 (0.88–7.30)	
Drinks alcohol in a normal week		
No	*Ref*	0.23
Yes	0.51 (0.17–1.53)	
Has support from a friend and/or family member		
Yes	*Ref*	0.40
No	0.51 (0.10–2.51)	
Household income per person (Dominican Pesos)		
>2417	*Ref*	0.23
≤2417	2.00 (0.65–6.36)	
Time at the clinic		
>6 years	*Ref*	**0.05**
≤6 years	**0.35 (0.11–0.98)**	
Age	1.02 (0.97–1.08)	0.43
Model 2: Health information processing (higher or lower)		
Education		
Secondary school or above	*Ref*	0.11
Primary school or below	0.40 (0.12–1.2)	
Ever taken care of someone who is sick		
Yes	*Ref*	**0.03**
No	**0.33 (0.12–0.85)**	
Ever received money for a sexual activity		
Yes	*Ref*	0.20
No	1.89 (0.71–5.15)	
Has support from a friend and/or family member		
Yes	*Ref*	0.08
No	0.27 (0.06–1.16)	
Age		
>42 Years	*Ref*	**0.01**

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Independent variable	Adjusted OR (95 % CI)	*p* value
37–42 Years	**5.47 (1.66–24.55)**	**0.02**
<37 Years	**3.98 (1.26–14.02)**	
Length of time attending the clinic	1.04 (0.93–1.18)	0.48
Model 3: Health information use (more or less)		
Education		
Secondary school or above	*Ref*	0.62
Primary school or below or above	0.75 (0.23–2.38)	
Ever taken care of someone who is sick		
Yes	*Ref*	**0.01**
No	**0.28 (0.11–0.67)**	
Has other medical conditions		
Yes	*Ref*	**0.04**
No	**2.63 (1.06–6.92)**	
Health literacy score		
Health literate	*Ref*	0.49
Not health literate	0.66 (0.20–2.12)	
Household income per person (Dominican Pesos)		
>2417	*Ref*	0.65
≤2417	1.25 (0.48–3.27)	

Significant ORs indicated in bold