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# Access to and use of health information technology among obese and non-obese Americans: Analysis of the Health Information National Trends Survey data

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## ABSTRACT

**Introduction:** Health information technology (HIT) is essential in the prevention, management, and treatment of obesity due to the medical data and information available to health care providers and patients. However, exploration of HIT access and use among obese individuals remains limited. **Objective:** The purpose of this study was to compare access to and use of HIT among obese and non-obese Americans. **Methods:** We considered cross-sectional secondary data from 3,865 United States adults that were collected through the Health Information National Trends Survey in 2020. Contingency tables were performed stratifying between men and women to assess whether they differed according to body mass index (BMI) levels with respect to HIT categories. **Results:** Elevated BMI in women was associated with the use of a computer, smartphone, or other electronic device to e-mail or use the Internet to communicate with a doctor or a doctor's office. In addition, elevated BMI in both genders was associated with sharing information from a smartphone/electronic device with a health professional. Finally, the use of an electronic device to monitor or track health or activity was found to be more prevalent among women with elevated BMI compared to those with normal BMI. **Conclusion:** Future studies should expand research in terms of interventions linked to health information technology in adults with obesity by considering the gender factor. Moreover, the expansion of research into electronic health (eHealth) interventions is particularly important because it would favour the prevention, management, control, and treatment of obesity.

**Keywords:** BMI, eHealth, obesity, smartphone, telemedicine

## INTRODUCTION

Obesity is among the leading causes of death in the world and is a determining factor for the development of metabolic syndrome (Booranasuksakul *et al.*, 2019; Stokes *et al.*, 2018). Globally, a remarkable increase in the prevalence of obesity was evidenced in the last

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decade, from 30.5% in 2000 to 40.4% in 2018 (Booranasuksakul *et al.*, 2019). In the United States (U.S.), the burden of obesity continues to grow at a dizzying rate. In fact, in 2020, according to a report published by the Centre for Disease Control and Prevention (CDC), the prevalence of obesity was over 40% (CDC, 2020). This prevalence remained significantly higher in adults living in rural areas, representing more than a third of the U.S. population classified as obese (34.2%), compared with those living in urban areas (28.7%) (CDC, 2020).

Health information technology (HIT) refers to technological tools that provide information, data, and knowledge used by healthcare providers, patients, insurance companies, and government entities for storing, retrieving, and communicating medical information, as well as making decisions (Onyeaka *et al.*, 2021). In the U.S., the adoption of policies such as the implementation of the Health Information Technology for Economic and Clinical Health Act has favoured accelerated access to and use of HIT in healthcare (DesRoches *et al.*, 2013). With the advent of new communication tools, such as smartphones/tablets, other electronic devices, and social networks, there has been a dramatic improvement in the use of HIT in recent years (Pew Research Centre, 2021). The extension of electronic health (eHealth) tools, such as health-related apps to smartphones and electronic devices like Fitbit and smartwatches (Shan *et al.*, 2019), as well as remote patient monitoring systems through text messages and video calls are becoming increasingly important strategies for a better provision of health services (Onyeaka *et al.*, 2020). In addition, patients are increasingly embracing the integration of these digital tools while being cared for by healthcare professionals (Anstey Watkins *et al.*, 2018). In fact, patients' use of eHealth tools is associated with increased access to health information, lower health care costs, better emotional support, improved self-care, and management of chronic conditions (Tarver *et al.*, 2018).

Although there has been evidence of a significant increase in the ownership of smartphones and tablets with health-related apps in the last decade (Saintila *et al.*, 2021); however, it is not clear how the use of HIT can improve the health of people with obesity. On the other hand, the use of eHealth depends mainly on Internet access. Therefore, understanding the current patterns in terms of access, use, and preferences for health information technology in individuals with obesity is important to address related issues through the implementation of health policies that positively impact on this group of people in the U.S.

The availability of smart devices, the use of HIT, and applications related to health can improve current strategies for the treatment, control, and prevention of obesity by modifying risk factors, given that 97% of U.S. adults own some type of cell phone and 85% reportedly have a smartphone in 2021 (Pew Research Centre, 2021). The aim of this study was to compare the access to and use of HIT in obese and non-obese American adults.

## MATERIALS AND METHODS

### Data sources and participants

In this study, we used secondary data from the Health Information National Trends Survey (HINTS), a cross-sectional and nationally representative survey conducted via mail in U.S. adults ≥ 18 years of age. The HINTS focused on the collection of relevant health information and included questions on the access to and use of health information technology. In this study, the HINTS 5 cycle 4 data collected between February and June

2020 were used, using the next birthday method for the selection of participants. There were 3,865 responses in the full dataset, which were used to perform the statistical analyses. The survey used a two-stage sampling technique: In the first stage, a stratified sample of addresses was selected from a list of residual addresses and then one adult was selected within each household. The HINTS 5 survey was approved by the Institutional Review Board of Westat. Since the data were not identified and extracted from the National Cancer Institute, therefore, informed consent was not required from the participants. All procedures followed were conducted in accordance with the U.S. Federal Policy for the Protection of Human Subjects.

**HIT measures**

HIT was evaluated through responses to 13 questions listed in Table 1. Measures included: *"Own smartphone", "Own tablet", "Have a health/wellness app", "Use e-mail to converse with a clinician", "Use of smartphone/tablet to track health progress", "Use of smartphone/ tablet to make health decisions", "Use smartphone/tablet to converse with health care provider", "Look for health information.", "Go online to access the Internet, or to send and receive e-mails", "Health tracking", "Look up medical test results", "Monitoring health or activity"*, and *"Use of an electronic device or smartphone to share information with a healthcare professional".*

**Sociodemographic data**

Sociodemographic variables in the study included gender (female and male), education level (high school or less, incomplete university, and university graduate), employment (yes or no), income range (USD 0 to 19,999, USD 20,000 to 49,999, USD 50,000 to 99,999 and ≥ USD 100,000), and race (white, African American, and others).

**Body mass index (BMI)**

Anthropometric data, such as weight and height, were considered. Participants were asked *"About how tall are you without shoes?"* and *"About how much do you weigh, in pounds, without shoes?"*. These data were self-reported. In addition, the data obtained were converted into kilograms and meters to estimate BMI. The Quetelet index was used to calculate BMI - dividing weight (measured in kilograms) by the square of height (measured in meters). BMI was categorised into a binary variable: normal BMI ($\geq 18.5 – \leq 24.9$ kg/m$^2$) and elevated BMI ($>25$ kg/m$^2$) (WHO, 1998).

**Statistical analysis**

Descriptive statistics of absolute frequency and proportions were used to examine the difference in HIT access and use between participants with normal and elevated BMI. Contingency tables were performed stratifying men and women to evaluate if there were differences according to normal BMI ($\geq 18.5$ - $\leq 24.9$ kg/m$^2$) and elevated BMI ($>25$ kg/m$^2$) with respect to the health information technology variables. Chi-square test was used and a *p*-value of less than 0.05 was considered as a parameter of statistical significance. All analyses were performed using JASP (version 0.15.1), an open-source statistical software programme (Department of Psychological Methods University of Amsterdam, Amsterdam, The Netherlands).

**RESULTS**

Table 2 shows the socio-demographic profile of respondents based on BMI classification. Data from a total of 3,865 respondents were analysed. The

**Table 1.** Health Information National Trends Survey (HINTS) (cycle 4 de HINTS 5) - Survey questions assessing health information technology

| *Outcome measure* | *Survey question(s)* |
|---|---|
| Own smartphone | "Please indicate if you have a - Smartphone (for example, an iPhone, Android, Blackberry, or Windows Phone)" |
| Own tablet | "Please indicate if you have a - Tablet computer (for example, an iPad, Samsung Galaxy, Motorola Xoom, or Kindle Fire)" |
| Have a health/wellness app | "On your tablet or smartphone, do you have any apps related to health and wellness?" |
| Electronic conversation with doctor | Used e-mail or the Internet to communicate with a doctor or a doctor's office the past 12 months? |
| Used smartphone/tablet to track health progress | "Has your tablet or smartphone helped you track progress on a health-related goal, such as quitting smoking, losing weight, or increasing physical activity?" |
| Used smartphone/tablet to make health decision | "Has your tablet or smartphone helped you make a decision about how to treat an illness or condition?" |
| When interacting with a clinician, smartphone or tablet helped discussion | "Has your tablet or smartphone helped you in discussions with your health care provider? |
| Look for health information | Looked for health or medical information for yourself the past 12 months? |
| Go online to access the Internet, or to send and receive e-mails | Do you ever go online to access the Internet or World Wide Web, or to send and receive e-mail? |
| Health tracking | In the last month have you used at least once a week any portable device to monitor your health? |
| Test results | Looked up medical test results the past 12 months? |
| Shared health device information | Have you shared health information from either an electronic monitoring device or smartphone with a health professional within the last 12 months? |
| Wearable device to track health | In the last 12 months, have you used an electronic wearable device to monitor or track your health or activity? For example, a Fitbit, Apple Watch, or Garmin Vivofit. |

**Table 2.** Description of the sociodemographic profile of the respondents according to BMI classification

| *Characteristics* | *BMI* | | | $\chi^2$ | *p-value* |
|---|---|---|---|---|---|
| | *Total* *n=3,865* | *Normal* *n=1,474* | *Elevated* *n=2,391* | | |
| | % | % | % | | |
| Age (years) (Mean±*SD*) | 55.4±18.3 | 54.5±19.7 | 56.4±16.9 | | <0.001*** |
| Gender | | | | 7.69 | 0.006** |
| Female | 43.0 | 40.2 | 44.7 | | |
| Male | 57.0 | 59.8 | 55.3 | | |
| Education level | | | | 51.15 | <0.001*** |
| High school or less | 8.4 | 12.0 | 6.2 | | |
| University incomplete | 48.6 | 38.8 | 54.5 | | |
| University graduate | 43.0 | 49.3 | 39.3 | | |
| Employment | | | | 0.03 | 0.958 |
| Yes | 51.1 | 51.2 | 51.1 | | |
| No | 48.9 | 48.8 | 48.9 | | |
| Income range | | | | 29.52 | <0.001*** |
| USD 0 to 19,999 | 26.9 | 32 | 24.1 | | |
| USD 20,000 to 49,999 | 23.6 | 24.8 | 22.9 | | |
| USD 50,000 to 99,999 | 25.7 | 24.1 | 26.7 | | |
| ≥ USD 100,000 | 23.8 | 19.1 | 26.4 | | |
| Race | | | | | |
| White | 70.0 | 70.7 | 69.6 | 36.84 | <0.001*** |
| African American | 16.8 | 12.1 | 19.7 | | |
| Others | 13.2 | 17.2 | 10.7 | | |

*SD*: Standard deviation, BMI: Body mass index, USD: United States dollar
***$p<0.001$ **$p<0.01$, *$p<0.05$

participants were aged 55.4±18.3 years, predominantly males (57.0%), and 48.6% were individuals who did not complete university. In addition, 48.9% were not employed. Approximately 26.9% of the participants had household incomes of less than $19,999 per year. Finally, 70% of the participants were white. Participants with elevated BMI had mean age of 56.4±16.9 years compared to those with normal BMI (54.5±19.7 years), $p<0.001$. There were significant differences between the proportion of adults with normal and elevated BMI across gender ($p=0.006$), education ($p<0.001$), and race ($p<0.001$).

In Table 3, we found that elevated BMI in women was associated with the use of e-mail to converse with a doctor ($p=0.034$). However, there was no difference between participants with normal or high BMI in ownership of smartphone/tablet and ownership of any health/wellness-related apps. Similarly, in both genders, we did not find an association between smartphone/ tablet use for tracking progress towards a health-related goal (e.g., quitting

**Table 3.** Access to and use of electronic devices among women and men with normal and elevated BMI

| Outcome measure | Women | | | | Men | | | |
|---|---|---|---|---|---|---|---|---|
| | BMI | | $\chi^2$ | *p-value* | BMI | | $\chi^2$ | *p-value* |
| | *Normal* % | *Elevated* % | | | *Normal* % | *Elevated* % | | |
| Own a smartphone | 30.3 | 30.6 | 3.36 | 0.067 | 30.2 | 31.2 | 0.34 | 0.561 |
| Own tablet | 45.9 | 45.8 | 0.04 | 0.821 | 42.9 | 43.1 | 0.07 | 0.788 |
| Have a health/wellness-related app | 23.9 | 23.6 | 1.27 | 0.260 | 26.9 | 25.7 | 1.52 | 0.227 |
| Use e-mail to converse with a doctor | 34.4 | 65.6 | 4.50 | 0.034* | 40.4 | 59.6 | 0.03 | 0.953 |
| Use of smartphone/tablet to track health progress | 34.0 | 34.1 | 0.39 | 0.533 | 35.4 | 36.4 | 3.06 | 0.080 |
| Use of smartphone/tablet to make a health decision | 31.6 | 33.4 | 1.64 | 0.201 | 32.1 | 31.2 | 0.39 | 0.529 |
| Use smartphone/tablet to converse with health care provider | 34.4 | 32.5 | 0.03 | 0.854 | 32.5 | 32.4 | 1.20 | 0.273 |

BMI: Body mass index
*$p<0.05$

smoking or increasing physical activity), making a decision about how to treat a disease or condition, and having conversations with their health care provider.

In Table 4, we found that elevated BMI in women and men was associated with sharing information from a smartphone/electronic device to a doctor ($p$=0.038 and $p$<0.001, respectively). In addition, women with elevated BMI were more likely to use an electronic device to monitor or track their health or activity (e.g., Fitbit, Apple Watch, or Garmin Vivofit) compared to those with normal BMI ($p$=0.030). However, we found no difference in normal and elevated BMI in the use of a computer, smartphone, or other electronic devices to look up medical/health information, go online or to send and receive email, monitor health and look up medical test results, and to monitor or track health or activity.

## DISCUSSION

### Comparison with previous studies

Our findings showed that women with high BMI reported using e-mail to communicate with a doctor or a doctor's office. A previous study reported that adult patients who communicated via e-mail with health care providers were more likely to be females (Kindratt *et al.*, 2021). It may be speculative, however, a possible justification for this finding could be that women having this condition of excess body weight have a greater need to use e-mail to exchange medical information with their providers compared to those of normal weight. On the other hand,

**Table 4.** Use of electronic devices to exchange information with health care providers among women and men with normal and elevated BMI

| *Outcome measure* | *Women* | | | | *Men* | | | |
|---|---|---|---|---|---|---|---|---|
| | *BMI* | | | | *BMI* | | | |
| | *Normal* | *Elevated* | $\chi^2$ | *p-value* | *Normal* | *Elevated* | $\chi^2$ | *p-value* |
| | % | % | | | % | % | | |
| Look for health information | 32.4 | 30.8 | 0.05 | 0.824 | 32.0 | 30.8 | 2.21 | 0.137 |
| Go on-line to access the Internet, or to send and receive e-mails | 21.5 | 21.8 | 1.61 | 0.205 | 21.0 | 20.4 | 0.46 | 0.497 |
| Health tracking | 18.4 | 18.5 | 1.05 | 0.305 | 19.4 | 19.5 | 0.01 | 0.910 |
| Look up medical test results | 22.1 | 21.7 | 0.58 | 0.444 | 22.6 | 22.1 | 0.25 | 0.614 |
| Use of an electronic device or smartphone to share information with a healthcare professional | 5.7 | 7.1 | 4.29 | 0.038* | 5.0 | 7.2 | 11.15 | <0.001*** |
| Monitoring health or activity | 35.3 | 64.7 | 0.87 | 0.030* | 41.9 | 58.1 | 1.54 | 0.214 |

BMI: Body mass index
***$p<0.001$, *$p<0.05$

another justification could be the fact that women felt a greater demand to be digitally connected with their healthcare provider, because regular and effective patient-provider communication can positively influence patients' well-being. Finally, in some ways, women are more concerned about their health (Langford *et al.*, 2020); therefore, they may be more likely than men in terms of managing decisions related to health, including that of their family members, who, in many cases, are usually children, parents, and even partners (Langford *et al.*, 2020). A previous study also showed that patients with diabetes, cardiovascular disease, or hypertension were more likely to report increased use of e-mail to exchange medical information with their health care providers (Asan *et al.*, 2018). This demonstrates that there is an interest on the part of patients to communicate with their medical provider via e-mail. Communication is an essential component of medical care, and the use of e-mail and other technological tools, such as health apps, are transforming the doctor-patient relationship (Ye *et al.*, 2010). Therefore, healthcare professionals should consider technological tools, particularly the use of e-mail, as a communication strategy with their patients. Finally, the results of the current study showed the need for an additional study that considers the development of eHealth interventions in individuals with excess body weight, in which the gender factor is considered.

Furthermore, the analyses showed that elevated BMI in both genders was associated with sharing information from a smartphone or handheld device with a doctor. Generally, people who have a health condition are more inclined to use electronic devices to share information with doctors. For example, results from an earlier analysis of the HINTS 2019 dataset found that participants who had a health condition, such as hypertension, diabetes mellitus, or cardiovascular disease, were more likely to use sensors and electronic devices to share this information with doctors than persons without any of these conditions (Shan *et al.*, 2019). However, it is worth mentioning that another previous study reported that in this population (Onyeaka *et al.*, 2021), there is a concern about withholding information from medical providers, and this could be due to existing concerns about the security and confidentiality or privacy of medical records. Confidentiality of medical information and privacy of users are critical elements in an e-health care environment considering the current context; in fact, there is previous evidence describing people's concern about privacy (Torous *et al.*, 2018). However, the retention of medical information by consumers does not always depend on concerns about the confidentiality of their electronic medical records, because there are other intervening factors such as the type of physician-patient relationship and quality of care (Yang *et al.*, 2020). Opportunities to share information with a doctor using an electronic device can undeniably help obese patients find answers to their questions and concerns, which in turn can help them make medical decisions in terms of disease prevention, management, and treatment (Langford *et al.*, 2020).

In recent decades, there has been a growing interest in the use of eHealth interventions that include categories such as telehealth, telemedicine, among others, to support behavioural change, encourage self-care and weight control (Saintila *et al.*, 2021). In general, these interventions are delivered through the use of health information technology, smartphones, health-related apps, text messaging, and personalised medicine (Mahmood *et al.*, 2019). In fact, access to and use of HIT tools can be timely and vital in the management of chronic conditions such as obesity to maintain a healthy weight over the long term (Battersby, Lawn & Pols, 2010). Moreover, there are studies that showed that tablets and smartphones can contribute to the management of chronic diseases (Kim & Lee, 2017). In the current study, as expected, we found that women with elevated BMI were more likely to use an electronic device to monitor or track their health or activity (e.g., Fitbit, Apple Watch, or Garmin Vivofit) compared to those with normal BMI. We speculate some possible justifications why overweight women use electronic devices to monitor health. For example, persons with one or more health conditions compared to those who are apparently healthy are more likely to use digital health tools (Whitehead & Seaton, 2016). Aside from that, due to women's physiology, they may need to use electronic devices to monitor or track their health more frequently than men, which in turn, allows them to have more opportunities to make decisions related to breast and cervical cancer screening, breast reconstruction after mastectomy, among other health decisions (Langford *et al.*, 2020). Our results further complement the findings of Langford *et al.*, (2020) who identified that respondents use other electronic devices beyond smartphones and tablets to monitor health (e.g., Fitbit, blood glucose meter, and blood pressure monitor). In addition, in terms of gender, Langford and colleagues found that men were less likely to use these electronic health devices to support medical decision making compared with women, which is consistent with our findings.

Finally, in the current study, although there was no difference in smartphone/tablet ownership and ownership of any health/wellness-related app between participants with normal and elevated BMI; however, results from an earlier analysis of the 2015 HINTS dataset found that individuals who were more likely to use health-related apps tended to have a BMI in the obese range, were younger, had higher income, had more education, and were Latino/Hispanic (Krebs & Duncan, 2015). In fact, this same study (Krebs & Duncan, 2015) showed a trend between higher use of health-related apps and a higher BMI; they reported that obese persons were approximately 11% more likely to use health-related apps than persons with a normal BMI. This could be due to the fact that the use of health-related applications could be useful in improving health (Comstock, 2015). Health-related apps for smartphones have become popular and are not only focused on fitness and diet, but encompassing more categories such as prevention/lifestyle, self-diagnosis, healthcare provider directories, diagnosis/education, healthy diet options and medical treatment compliance (Krebs & Duncan, 2015). The potential of technology to improve patient communication and management of chronic conditions, such as obesity, is indisputable (Pew Research Center, 2021); therefore, given the burden of obesity, it is imperative to implement policies to encourage the integration of eHealth tools into the workflow of healthcare professionals, particularly doctors, to address the health problems of users (Shan *et al.*, 2019). The use of eHealth applications has the potential to improve health outcomes among those with non-communicable diseases, especially obesity, through better control and monitoring (Whitehead & Seaton, 2016).

It is worth mentioning that the data were collected at the beginning of the COVID-19 pandemic. In fact, the social distancing and closure of stores, sports, and cultural facilities caused by the pandemic have led to a worsening of the obesity epidemic globally (León-Paucar e*t al.,* 2021). The increased prevalence of overweight and obesity could be due to decreased physical activity, dietary changes, and sedentary behaviours (Nuñez-Leyva *et al.,* 2022). Given this concern and the risk of weight gain, it is possible that the COVID-19 pandemic will contribute to the adoption of a healthy lifestyle, including the use of telehealth as a health technology to monitor and maintain a healthy weight. The pandemic has led to changes in the accessibility and availability of online platforms, and this may have impacted the results of the current study (Prescott & Prescott, 2021). On the other hand, it is possible that at the onset of the pandemic, individuals became more aware of the impact of excess body weight on physical and mental health (Ramos-Vera *et al.,* 2022). This could encourage greater use of health-related technological tools, since being aware of excess body weight is a key factor in attempts to achieve a healthy weight.

**Strengths and limitations**

The current study had several strengths. Firstly, our results were based on a large sample size collected from the HINTS 2020 (HINTS 5 cycle 4), a nationally representative survey. Secondly, the HINTS contained a series of questions seeking to elicit information on access to and use of health information technology, which favoured evidence on the role of smartphones and tablets in communicating with health care providers and monitoring health among those with and without excess body weight according to BMI. Thirdly, it was one of the first studies to evaluate the access to and use of health information technology in individuals with excess body weight, thus establishing a baseline knowledge on the use of HIT in the study population.

However, there were some limitations that are worth mentioning. Firstly, these were cross-sectional data. Although they were useful for examining access to and use of health information technology at a given point in time, however, they cannot provide causality information. In addition, it is possible that people's patterns of HIT use may vary over time. Secondly, the HINTS were mailed survey, thus data, such as weight and height, were self-reported. Therefore, there may be inherent reporting errors and recall bias, and responses may be limited by literacy level. In fact, self-reported BMI is known to be biased compared to measured BMI (Assari, 2020). Finally, the fact that the items that were used were constructed with response items, such as "*yes*" or "*no*", could not allow the complete capture of the frequency or intensity of HIT use in the participants. That is, binary questions were not enough to know how often a person uses his or her tablet, smartphone, or health application as this use may correspond to only once or every day (Li & Peng, 2020).

## CONCLUSION

The use of HIT has the potential to improve health outcomes among individuals with obesity through better control and monitoring. The findings showed that elevated BMI in women was associated with the use of e-mail to communicate with a doctor. Additionally, elevated BMI in both genders was associated with sharing information from a smartphone and electronic devices with a doctor. Finally, women with elevated BMI were more likely to use a wearable device to monitor or track health or activity compared to those with normal BMI. Future studies should expand research in terms of health information technology-related interventions in individuals with obesity, considering the gender factor. The expansion of research into eHealth interventions is particularly important because it would favour the prevention, management, control, and treatment of obesity.

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**Authors' contributions**

Saintila J and Ramos-Vera C, designed the study and wrote the protocols. Calizaya-Milla YE and Morales-García WC, performed literature searches and provided abstracts of previous research studies. Ramos-Vera C and Serpa-Barrientos A, performed statistical analysis and data interpretation. Saintila J and Hidalgo Villarreal VI, wrote the first draft of the article. All read and approved the final manuscript.

**Conflicts of interest**

The authors report no conflicts of interest in this work.

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