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Secondary Data Analysis of the Association of Screen Time With Selected Health Behaviors

Kellany Cadogan Noland
Walden University

Walden University

College of Health Professions

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Kellany S. Cadogan Noland

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Sue Subocz, Ph.D.

Walden University
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Abstract

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

The noticeable disparity in youth access of preventive healthcare and youth's tendency towards excessive screen time have been linked to poor health outcomes. This issue prompted the current study, which had three core purposes: to identify associations between screen time and selected health behaviors, to identify target sociocultural and personal determinants of youth health, and to provide evidence to prompt innovation in promoting youth health via screen-based strategies. The social cognitive theory provided a context for triadic reciprocity between youth personal factors, environmental factors, and behaviors. A quantitative secondary analysis was completed using SPSS-27 to identify whether there was an association between screen time and sexual health, nonviolent accidental injury death prevention (NVAIDP), and healthy weight management (HWM) behaviors, while controlling for race, sex, age, and grade level. The Centers for Disease Control and Prevention's 2019 Youth Risk Behavior Survey System data were used in the binomial logistic regressions with bidirectional stepwise elimination. Screen time > 2 hours was significantly associated ($p < 0.005$) with sexual health behaviors and HWM behaviors. However, screen time > 2 hours was negatively associated with NVAIDP behaviors, while non-White race and older youth were negatively associated with sexual health behaviors. Sex and grade level were not significant predictors of health behaviors among youth. There is opportunity for research and policy driven, practitioner-facilitated positive social change to promote youth health by actively and deliberately harnessing excess screen time tendencies among youth rather than suppressing these tendencies, especially among non-White, older youth.

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Dedication

This work is dedicated to Gregory and Harper-Grace, for being patient and understanding even when I was not patient or forgiving of myself. For reassuring me that “it was ok" when “a few hours” turned into an entire day and “soon” turned out to be 2 years. I can only hope that I can repay you every day by being all to you that you have been to me during this chapter. I love you both endlessly.

And to my mom, Maxine for stepping in as surrogate especially when I felt too guilty to ask.

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Section 1: Foundation of the Study and Literature Review

Introduction

There has been significant discussion by experts and healthcare practitioners related to screen time trends among children and adolescents and its negative impacts on health and well-being globally (Bucksch et al., 2014). Despite these discussions, research remains relatively limited, and studies have predominantly focused on the negative behaviors and outcomes of screen time usage more than 2 hours per day. Screen time in this dissertation was identified as the engagement with digital screens for other than academic purposes among youth. Youth screen time trends have been positioned by experts as a negative influencer of health and wellbeing. It has been linked to sedentary behaviors, sleep pattern disruptions, and impaired social interactions among children and adolescents. Screen time excess has been further correlated with increased risk for obesity as well as mental, cognitive, and behavioral health problems associated with poor health outcomes, creating increased predisposition to chronic disease morbidity and mortality among youth (Costigan et al., 2013; Višnjić et al., 2015) and young adults. The Youth Risk Behavior Surveillance System (YRBSS) has discerned that frequently, behaviors established during youth are markedly responsible for the leading causes of death, disability, and social issues among youth and adults in the United States (as cited in Centers for Disease Control and Prevention [CDC], 2015). Behaviors linked to nonviolent accidental injury death from motor vehicle accidents (MVA), obesity, and HIV/AIDS are highly notable among teens and were examined in the study. Additionally, previous studies have fallen short in that they have yet to produce results for defining

excessive screen time, especially among teens with their unique developmental nuances and norms. With further increase in the use of screen-based activities stemming from the policies and recommendations arising from the COVID-19 pandemic, the need to revisit the goals and strategies related to screen time among youth is even more vital (Robbins et al., 2020; Ting et al., 2021; UNICEF Office of Global Insight & Policy, 2020). With the generally underwhelming existing evidence upon which recommendations have been made for curtailing the number of hours that children spend engaged with digital screens, this quantitative secondary analysis of the YRBSS 2019 data highlights opportunities to revisit screen time related efforts in adolescent health beyond those geared at time reduction. This analysis was focused on identifying associations between screen time trends and voluntary health behaviors linked to nonviolent accidental injury death prevention (NVAIDP), healthy weight management (HWM), and sexual health. A reflection on the sociocultural and personal determinants of health among youth in alignment with the social cognitive theory (SCT) and triadic reciprocity were used as a framework for the secondary analysis of the YRBSS data.

Problem Statement

Accessibility of technological devices and platforms has grown remarkably in the last 10 years, and adolescent inherent inclination to engage with digital screen-based activities has posed great concern among health care practitioners and policymakers. To date, there is insufficient evidence to confirm the effectiveness of such strategies to reduce screen time. Meanwhile, access to media technology is on the rise with mobile internet-based media. Existing strategies have positioned screen time trends among youth

as the health problem itself, rather than a conduit for health risks. Stiglic and Viner (2019) argued that screen time trends among youth posed significant risk for negative impacts on health and wellbeing. Screen time related research has focused on the correlation between screen time greater than 2 hours per day and negative health behaviors and outcomes, such as poor sleep patterns, sedentary behaviors, and poor dietary management. Nevertheless, Wu et al. (2016) posited that although the researchers have provided recommendations that excessive screen time should be reduced as a youth health promotion strategy, the discerned evidence to support the recommendations is limited and has fallen short in presenting a clear consensus on the definition of excessive screen time, especially among teens. Further, Saunders and Valance (2017) acknowledged that suggested screen time reduction strategies have yet to demonstrate any incomparable influence on youth health outcomes. In other words, while screen time excess has been linked to negative health outcomes, its reduction or absence has not been proven to significantly improve these outcomes.

These are noteworthy findings as youth represent a unique public health demographic with distinctive motivations and barriers to health and wellbeing. Beyond screen time excess and its associated health outcomes, disparities in accessing primary health promotion and disease prevention strategies further place teens at an increased health risk. Although much effort has been put forth to promote teen access to adequate primary and preventive healthcare, teens continue to demonstrate declining-with-age rates for primary wellness visits uptake compared to adults and young children (Black et al., 2016; Daley et al., 2017; Larson et al., 2015), further reiterating the unique nature of

the population. It is, therefore, evident that many young persons will fail to seek and receive the primary care that would bolster health risk reduction behaviors unless they are able to access it easily and in a way that is compatible and meaningful to them, such as well-designed screen-based interventions. Meanwhile, screen time efforts have focused on the time reduction component as the ultimate strategy. African Americans have also demonstrated disproportionately higher risk when compared to Hispanic and White youth (Kochanek et al., 2019) for defaulting from primary and preventative health care access, alluding that those extraneous factors, such as race, compound issues of youth health promotion and interventions that will remain constant even when screen time use has been restricted according to expert recommendations.

The YRBSS 2019 data demonstrate that some youths are inclined to health seeking behaviors despite screen time and healthcare access patterns. Moreover, adolescents' increased inclination to engage in electronic media activities may present an opportunity for primary care practitioners to improve the reach of pediatric wellness and screening efforts, thereby empowering youth towards enhanced health promotion and disease prevention activities. The healthcare community will best do so through readiness to contribute positively to the design, development, and/or endorsement of credible screen-based health screening, education, and interventional resources specifically tailored for youth (Boyar et al., 2011).

Burke-Garcia and Scally (2014) also stressed the value of harnessing the digital environment for health promotion in that it further serves as a remarkable means of communication and measuring public health outcomes. However, for as long as screen

time discussions remain focused on positioning it as a health risk factor rather than as an opportunity for promoting healthy behaviors among youth, the opportunities to efficiently influence teens where they seek health support most will remain evasive. The SCT proposes that behavior change occurs in the presence of appropriate motivations and environments. Exploring the correlations of screen times and voluntary health behaviors among youth can provide additional insights into existing opportunities to promote youth health behaviors and outcomes more proactively as it relates to screen time.

Purpose of the Study

The study was a quantitative secondary analysis of the relationship between the nonacademic use of digital screen-based activities among teens and their self-reports of select health behaviors that are not otherwise required for school attendance. In the secondary analysis of teen self-reported data from the CDC 2019 YRBSS, the selected independent variable was screen time use greater than 2 hours per day that was correlated to the dependent variables of select health behaviors associated with NVAIDP, HWM, and sexual health. Respondents were 13 to 17 years old, and the analysis was controlled for age, sex, race, and grade level (or attained education).

Because teens are noticeably disparate in how and when they will access preventive healthcare, it may prove more prudent to harness screen time tendencies in promoting health among youth rather than suppressing them. The study brings to question the value of dedicated efforts to reduce nonacademic screen time among youth rather than dedicated efforts to promote health care access to this unique population by harnessing the clearly inherent inclination towards technology and screen-based

activities. Additionally, although there is obvious increase in the development and availability of screen-based interventions for promoting health in these and other areas, the literature has demonstrated that health practitioners have focused on the nuances and needs of adult consumers, with youth as incidental candidates for these health strategies. However, teens are most inclined to screen based activity uptake. Overall, the study had three overarching purposes.

Correlating Screen Time With Select Health Behaviors

The primary purpose of this quantitative study was to add to the existing body of knowledge related to screen time and youth health by shifting focus from the negative outcomes of screen time to the potential for positive outcomes. The analysis correlated screen time trends greater than 2 hours per day, which has been deemed to be excessive in previous research, with the selected positive health behaviors among youth that are not otherwise required for school attendance. The prevalence and extent of nonacademic use of technology among teens who reported engagement in the selected health behaviors was the ultimate purpose. The aim was to determine whether there is any association between excessive screen time use greater than 2 hours per day and the selected behaviors identified from the 2019 YRBSS data.

Identifying Target Health Behaviors

Secondly, the study provided some insights into target health behaviors with the greatest potential for outcomes that might be influenced through screen and media-based health strategies. The specific behaviors examined in the study -- seatbelt use (NVAIDP); weight management, dietary choices (HWM); and HIV testing and condom use (sexual

health) -- have been linked to some of the leading causes of morbidity and mortality among adults and have stemmed from behaviors initiated in youth.

An Argument for Practitioner Innovation

Finally, the study was aimed at proposing consideration and justification for promoting nontraditional and specifically eStrategies, including Web 3.0 features for health promotion and disease prevention among youth in the United States. The study was aimed at bolstering arguments in favor of a healthcare practitioner call to innovation in promoting screen-based strategies uniquely tailored for promoting health and preventing disease among youth. Health practitioners have been called to innovation to promote population health through m-health and e-health efforts (Vandelanotte et al., 2016). Public health efforts should be no exception.

Research Questions and Hypotheses

The following three research questions have been formulated with hypotheses for secondary analysis of data from the YRBSS 2019 cross-sectional study:

Research Question (RQ)1: Is there an association between screen time and sexual health behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level?

$H_0$1: There is no association between screen time and sexual health behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

H_a1: There is an association between screen time and sexual health behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

RQ2: Is there an association between screen time and NVAIDP behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level?

$H_0 2$: There is no association between screen time and NVAIDP behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

$H_a 2$: There is a significant association between screen time and NVAIDP behaviors youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

RQ3: Is there an association between screen time and HWM behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level?

$H_0 3$: There is no association between screen time and HWM behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

$H_a 3$: There is a significant association between screen time and HWM behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

Theoretical Foundation of the Study

The theoretical framework selected for conducting this research was the SCT. In alignment with the SCT (Bandura, 1986; Sharma, 2017), appropriate reflection of the sociocultural as well as the personal determinants of health among youth are reflected in the study. SCT provides a framework for triadic reciprocity between personal factors, environmental factors, and behaviors. In this study, I focused on understanding the interrelationships between selected voluntary health behaviors. SCT provided an underlying framework for this study while not directly operationalizing the personal or environmental constructs but indirectly alluding to them. The personal SCT constructs of self-efficacy, self-control and self-expectations, and behavioral capabilities shape these behaviors. Likewise, the physical and social environment also shape these behaviors. In discussing the implications of this study, how these constructs might be modified are reflected on in the discussion section of this work.

Nature of the Study

SPSS-27 statistical software was used to perform quantitative secondary analysis using data from the 2019 YRBSS cross-sectional study conducted by the CDC YRBSS. All study variables were dichotomous, and a binomial logistic regression with bidirectional elimination was carried out using SPSS software to determine the association and significance of screen time on selected health risk reduction behaviors among youth ages 13 to 17 years old. Chi-squared test of best fit provided assurance that differences in means were not arrived at by chance.

Three specific categories of health risk reduction behaviors were selected and identified as voluntary health seeking behaviors among youth. These behaviors were not otherwise implicated as mandated or specifically required for school attendance – HIV testing, condom use, seatbelt use, dietary consumption of vegetables, and weight management behaviors. The behaviors were identified from the dataset user guide and have been recoded and appropriately combined to represent the dichotomous dependent variables of NVAIDP, HWM and sexual health. From the dataset, the variables age group 13 to 17 years (Q1 B, C, D, E, F, G), condom use (Q64), weight management (Q69, Q77), healthy dietary choices (Q70, Q71, Q72, Q73, Q93), exercise (Q790), and HIV testing (Q85) were recoded and combined as described. The independent variable excessive screen time or screen time greater than 2 hours was derived from recoding the variables of TV screen time and gaming screen time greater than 2 hours (Q80, Q81). Recommended screen time or screen time less than 2 hours was derived from recoding TV screen time and gaming screen time to one combined dichotomous variable equal to or less than 2 hours. Extraneous variables of age, sex, race, and grade level (or attained education) are described in discussion of the study results.

Literature Search Strategy

The search for related literature to establish a background for the study was conducted with systematic search of online databases in Thoreau, MEDLINE, CINAHL, and Google Scholar. The search was expanded by applying Boolean/phrases and equivalent subjects. Initially, the search was limited to peer-reviewed and scholarly journals, full text articles with publication years 2015 to 2020. The search was then

expanded with no minimum limit for year of publication to identify any additional seminal works. Some additional searches were done with a manual search of references within meta-analyses and systematic reviews identified during initial database searches. The following keywords were used in the literature search: *screen time, trends, youth, teen, adolescent, health, health promotion, health strategies, primary health, preventive health, risk reduction, meta-analysis, systematic review, computer, mobile, games, TV, apps, social media, risk, at-risk, seat belt, HIV, obesity,* and *accidental injury*.

Literature Review Related to Key Variables and/or Concepts

The digital media environment is developing and expanding in reach quite rapidly and at a rate exceeding the related research on its effects (Canadian Pediatric Society DHTFOO, 2017; Domingues-Montanari, 2017). If adolescent use of electronic media is to be harnessed as a primary health promotion strategy rather than be condemned for its recognized negative impacts on health, it then becomes necessary to determine whether there is any association between the excessive and recommended nonacademic use of technology or screen time and the voluntary health risk reduction behaviors among adolescents.

A myriad of factors has contributed to the prevalence of youth health risk. Among them in the last 2 decades is screen time access and exposure (Reid Chassiakos et al., 2016). However, the impacts of screen time access and exposure have continued to be debatable since 1949 when studies demonstrated that screen time was linked to increased family cohesion and did not equate to a displacement of positive social interactions and outdoor physical activities (Whitlock & Masur, 2019). Further, existing research does not

provide longitudinal results to confirm causation or negative long-term effects on youth health (Kaye et al., 2020). Solutions have been heavily focused on school-based interventions and enforcements, family involvement and parental controls, and political strategies that are aimed at creating awareness and curbing the negative impacts of excessive screen time on youth health and health risk reduction behaviors (Reid Chassiakos et al., 2016). An exploration of the existing evidence and arguments has highlighted a gap in the research related to screen time and its association with positive youth health behaviors and outcomes that this study aimed to address. Literature related to trends in nonacademic screen time, screen time reduction efforts, health behaviors related to obesity, nonviolent accidental injury deaths, and HIV/AIDS infection have been examined as a background to the study.

Screen Time Trends

To date, there has been insufficient evidence to confirm the effectiveness of existing policies, parental controls, and school-based interventions and enforcement strategies to reduce screen time and its effects. Meanwhile, access to media technology is on the rise with mobile internet-based media and being compounded by new laws, policies, and recommendations arising from the COVID-19 pandemic, thus making screen time an inevitable necessity that is beneficial for both education and social interactions (Nagata et al., 2020). Rostad et al. (2018) asserted that with the increased availability of mobile internet-enabled devices, adolescent access and exposure to diverse media content options has also demonstrated a significant increase. The authors reiterated that increased access has presented itself as a precursor for the additional complications

of excessive nonacademic screen time (Rostad et al., 2018). The screen time trends observed among teens is therefore not surprising but is alarming for its risk potential to health. Adolescents may be more readily engaged by approaches accessed through nonacademic use of technology media. However, these tools may prove to be only as effective as the strategic nature of their implementation to garner the desired effects (Sarringhaus, 2011). Nagata et al. (2020) proposed the need for and value of specifically harnessing screen time engagement among youth for its strengths and benefits while simultaneously addressing its identified health risks (Sultan et al, 2021).

The internet is most widely used by children and adolescents. This group tends to demonstrate greater levels of competency with technology (Park & Kwon, 2018). The COVID-19 pandemic has all but mandated even small children whose parents are required to telework from home to have increased uptake of screen-based activities as a means of continuing schooling and as well as engaging in other social interactions (Nagata et al., 2020). Grist et al. (2018) described youth as “digital natives” who, for the most part, have exclusive access to their own smartphones with internet capabilities and the ability to use various applications (apps) and websites at whim. Adolescents are most likely to access and routinely engage with apps and web resources that are also subscribed to by their peers and those that have been normalized by their peers and role models. Beyond this, teens must believe that the resources are able to address their perceived pubescent needs (Wetterlin et al., 2014) and promote their efforts to navigate the psychosocial crisis of identity versus role confusion with positive health outcomes. Freeman et al. (2018) recognized that teens 13 to 18 years were inclined to eHealth

strategies based on their evaluation under basic categories: the website's name and reputation, the first impression of website, and the website's content. These findings are echoed by Krebs and Duncan (2015) and Carroll et al. (2017), who identified extraneous factors such as socioeconomics, education attainment, and IQ, as well as participants' access to internet and autonomous ownership of devices used for screen time. Elavsky et al. (2017) also supported the likelihood that much of the screen time attributed to higher functioning teens and likely those teens who would exhibit the behaviors examined in this study would be invested in healthy lifestyle web and mobile application use.

Screen Time Reduction

With a focus on small children, the Canadian Paediatric Society (2017) presented its position statement regarding screen time with consideration for the evolution of digital media in the current healthcare, health promotion environment. The society recognizes the value of harnessing digital media with care. The position statement supports the idea that there are benefits to be gained from screen time among children once appropriately harnessed and that policies regarding time limits cannot be cut and dry and must be revised frequently and that negative health impacts of screen time should be addressed with a variety of strategies beyond simply reducing time spent. The Canadian Paediatric Society, while in agreement with the principle of minimizing screen time for youth health, also proposed additional mechanisms for positive change, including mindful use and modeling of healthy use of digital screens. Congruently, Mutz et al. (2019) argued that a focus on strategies to reduce screen time can be best operationalized in the presence of structured outdoor activities to represent a valid solution for mitigating the

negative health impacts of screen time. Arguments related to the negative impacts of excessive screen time are derived from weak and, to some degree, unconvincing literature with significant limitations (Stiglic & Viner, 2019). The strongest of evidence is linked to obesity, depression symptoms, and reduced quality of life. With that said, active versus passive screen time engagement speaks to the importance of messaging and enforcements through repetitive physical behaviors and cognitive efforts and reinforcement. This should not be overlooked when considering screen time as causation of negative health risk or outcomes. Additionally, Lupton (2014) shared perspectives in the expansion of digital media and screen time use even in the healthcare arena. The COVID-19 pandemic has further increased the expansion and has even required an uptake of screen-based activities (Nagata et al., 2020; Robbins et al., 2020). The author discussed the autonomous use of groups and individuals to affect their own health. Beyond this, the author recognized the influence and thus the need for support of sociopolitical agents involved in health and technology advancements for there to be realistic expectations of outcomes from digitally driven health promotion strategies. This is the undercurrent of this study. Researchers have acknowledged the evidence of negative outcomes and associations between screen time use and health among youth but have also recognized the credence of works of Boyar et al. (2011), Canadian Paediatric Society (2015), and Harris et al. (2017) that have called on practitioners and policymakers to act beyond reducing screen time trends and instead to recognize benefits to be derived from this trend if harnessed strategically at the appropriate levels.

Youth Health Risk

The teen years represent an often complex but crucial period of development, typically featuring a relative surge in social pressures, with a simultaneous increase in cognitive capacity and relative autonomy. Freeman et al. (2018) posited that a healthy transition period is a significant determinant of a healthy adulthood experiences. Youth health risk is further compounded by screen time tendencies all while youth continue to demonstrate reduced rates of uptake of primary wellness visits. Black et al. (2016) acknowledged that the adolescent years are a critical point for establishing health habits for adulthood and overall public health direction. The researchers recognized the declining with age rate of uptake of traditional/formal regular primary and preventative health interventions among this group and shed light on the importance of identifying opportunities for identifying and embracing strategies that may prove feasible for promoting youth health (Black et al., 2016). Harris et al. (2017) found that system-level and provider visit-level interventions and strategies to enhance clinical prevention among youth were lacking in quality and outcomes despite evidence-based consensus, enhanced recommendations, and improved financial access through the Affordable Care Act. There is prospect for harnessing the screen time tendencies of youth in health promotion efforts with enough understanding of the full potential of screen time impacts on youth health risk and risk reduction behaviors. Keselman et al. (2019) acknowledged the importance of promoting health risk reduction behaviors among youth. Targeting youth health literacy through social change related to the perception and use of screen time among youth is observed as a feasible strategy for reducing the global burden of health, as

behaviors linked to health are developed in the teenage years (Keselman et al., 2019). Nevertheless, Twenge and Farley (2021) recognized that there is evidence indicating that different screen-based media activities can affect different youth in different ways. This highlights the need for further research and effort into providing screen-based content that youth will uptake, especially as the COVID-19 pandemic has created an environment where screen time has increased association with health and well-being. Kelly et al. (2017) highlighted the implications for focusing on mediating factors for reducing nonacademic use of electronic media, thereby complementing the recommendations of Bucksch et al. (2014) and posing impetus for this study.

Web-based strategies have been successfully employed across at-risk adult and pediatric groups to assess and promote mental and physical health. However, there is limited evidence to support the deliberate and specific application of internet-based tools to address youth risk despite clear evidence of engagement to the degree of excess. As teens are increasingly less likely to present to health and wellness visits (Daley et al., 2017; Larson et al., 2015), excessive screen time presents an essential point of access for health promotion and disease prevention interventions. One key finding expressed by Daley et al. (2017) is that there are too few health strategies specifically designed with an aim to screen and intervene for youth health despite the rate of mortality and morbidity associated with preventable conditions. Further, the authors uncovered evidence that teen health and intentions to health rely on a quality relationship with care providers (Daley et al., 2017). This echoes the importance of care practitioners' investment in reaching teens where they are regarding health promotion and digital landscape (Boyar et al., 2011). In

this study, I aimed to identify trends among youth screen time usage and health behaviors as further impetus for healthcare practitioners embracing digital media to address health of at-risk youth. The literature provided support that the internet and nonacademic use of technology media may be a significant resource and access-point for self-care and health promotion interventions and services in the United States.

Elavsky et al. (2017) emphasized the findings of previous research that mhealth and mobile healthy lifestyle digital apps are used by many across the United States and United Kingdom. The trend is increasing use, and youth are the predominant group engaged with such platforms. The researchers proposed that it is most important to tailor design and content with the targeted health audience based on their predispositions to best reduce the potential for negative health and social impacts of the apps. This speaks to the goal of this study to identify the potential for positive health actions versus negative health outcomes related to screen time usage. Larson et al. (2015) discussed one specific strategy used among youth in Minnesota to reduce barriers to accessing routine and preventive health care. While the researchers identified structural barriers, there are other observed barriers associated with provider relationship, communication, and privacy concerns. The researchers suggested solutions related to outreach efforts that may include outreach via digital means tailored for youth appeal and uptake. As such, Larson et al. supported the ideas included in this study that screen time excess is a potential conduit and solution rather than merely a source of poor health behaviors and outcomes.

Obesity

Al-Khudairy et al. (2017) attested that obesity among youth is in fact a condition of concern that has been on the rise globally. The researchers posited that modification of risk occurs through behavior change interventions aimed at dietary and weight management activities. Additionally, research has yet to prove that the screen time use displaced physical activity that would support healthy weights. Further, O'Brien et al. (2021) found that physical activity was not a significant predictor of adolescent weight which further suggests that sedentary behaviors stemming from screen time may be independent indicators for youth health. Marker et al. (2019) found that the association between screen-based gaming and body mass was small and more prevalent among adults than youth. This reiterates that the evidence of the negative impacts of screen time on health-related measures such as HWM among youth remains debatable and requires further consideration and longitudinal studies to demonstrate long-term impacts. The longitudinal study completed by Keel et al. (2020) highlighted the ambiguity and limitations of evidence derived from self-perception and self-reports of health. In this work, college students reported that perception of their weight changes over time did not align with the evidence of their actual measured weights (Keele et al., 2020).

Further, Spengler et al. (2015) found that the presence of screen time did not specifically eliminate engagement in physical activity among youth. Sultana et al. (2020) further proposed that while screen time has demonstrated a positive relationship with obesity, there is a greater prevalence of obesity among individuals who had sedentary lifestyles and other unhealthy behaviors. As a demographic audience, teens have an

affinity towards mainstream cultural communication styles and are heavily influenced and receptive to mass media communications. Messaging from screen-based sources and the high impact nature of such communication enhances youth information processing for behavior modification (Glanz et al., 2015) and presents an opportunity for prompting healthy behaviors that might serve to mitigate obesity. Kelly et al. (2017) identified several individual level mediating factors for HWM among youth, including autonomous motivation for mediating screen time. Often, youth eating habits are either precipitated or compounded by further psychosocial factors. Factors such as sleep pattern disruptions, self-esteem problems, inadequate or dysfunctional adult supervision, food insecurity, mood, and psychotic disorders have been linked to poor quality food availability, selection, and intake whether low or in excess.

Sedentary lifestyle choices among youth add further insult and, as such, excessive screen time has been noted to foster sedentary behaviors within a demographic group that has previously been characterized by high energy and free spirit. Nevertheless, there are screen-based activities that are specifically designed to simulate and promote healthy cognitive and physical activity. The systematic review presented by Wu et al. (2017) shifted the conversation of the association between physical activity, sedentary lifestyle, and health-related quality of life (H-RQL) from being focused on youth with chronic illness to focusing instead on the relatively healthy youth at risk. The review spotlighted the value of proactive approaches to preventing death and disability related to physical activity and weight management rather than the reactive processes. This is especially important with adolescents' observed gradual failure to uptake formal sources of

preventative care. Wu et al. reiterated that higher levels of physical activity among youth was linked to better H-RQL while increased sedentary behaviors corresponded with lower H-RQL. The researchers argued in favor of promoting school health programs in this regard, but the value of effectively designed screen-based interventions cannot be overlooked within this population. It is also important to consider whether screen time trends among youth represents a true absence of physical activity and in fact displaces it.

HIV

There was limited evidence of direct connection found within the literature between screen time and sexual health among youth. Although, there was indication that young adults tend to gravitate to mobile apps and websites for sexual health education and information. However, Kim et al. (2019) identified that HIV testing was most prevalent among teens that had been exposed to school based educational interventions. As screen-based activities of teens continue to be on the rise research such as that conducted by Macapagal et al. (2018) highlighted the importance of screen-based content in influencing teen health and health practices. Macapagal et al. (2018) found that adolescent men having sex with men (MSM) utilized a screen based “hook-up” app to meet and engage in sex with other men. Self-report from app users indicated significantly high rates of app use with low rate of condom use. Boyar et al. (2011) focused on youth sexual health as a public health threat while identifying the disproportional rate at which minority youth are affected adversely. Boyar et al. (2011) further acknowledged in discussing their research, the positive relationship between digital media or screen time and the health seeking behaviors of youth from self-reports. The authors pointed to the

need for action from the healthcare fraternity to develop comfort with digital strategies for health promotion if there is to be any real hope of meeting the health care risk reduction needs of youth who are notably demonstrating likelihood of uptake of traditional preventative health services (Black et al., 2016). The authors identified that challenges with mitigating youth health risk and promoting their optimal health outcomes has been linked to healthcare practitioner limitations with technology use and messaging. Boyar et al. (2011) argued the importance of the electronic media environment on youth health behavior and outcomes. The authors found that among youth, health information was triangulated. Searching digital media was identified as the most common initial step to identifying a personal health problem and its solution (Boyar et al., 2011).

Nonviolent Accidental Injury

Salam et al. (2016) reflect on the significant number of children that succumb to death by non-violent accidental injury globally. The researchers emphasized that approximately 10 in every 100,000 teens die in MVAs and that interventions focused on training and education for the use of safety equipment yields improved outcomes in this area. Drake et al. (2017) reiterated these findings that deaths from MVA were among the most common causes of death among youth. Ultimately, the researchers found that a social media-based intervention for promoting seatbelt use among teens was met with positive evaluation and garnered significant attention and “likes” from teens. This is an important factor to be considered in determining the uptake of health strategies that will provide behavior change among youth who are most receptive to high impact media messaging. The researchers recommended further study of behavior change among those

that engaged with the platform. Additionally, Shults et al. (2016) recognized that primary and secondary enforcement laws increased seat belt use among teens and that the typical precursors to seat belt use were in fact race, socioeconomics, and substance use. The overarching idea is that in the case of adolescents, environmental constructs do influence behaviors that will either compound or reduce health risk related to accidentally injury. If previous research holds credence, then teens "excessive" existence in the virtual environments as they engage in non-academic use of screen-based media, carries great potential for influencing their health in one direction or other.

There was a noticeably limited number of studies that focused on the correlation between the major causes of morbidity and mortality among youth. Studies correlating obesity were most common. These variables have been selected for analysis because of their significance to teen health outcomes, the potential for developing screen-based interventions related to the selected health areas, as well as the aim to add to the body of knowledge related to screen time use and health outcomes among teens. For this study, the supposition is made that teen engagement in voluntary health seeking or health risk reduction behaviors results from influences of actual or perceived social support, knowledge, skills, intentions, barriers, opportunities, and norms, self- and collective-efficacies, controls, and outcomes expectations. Further, the assumption that screen time among youth has both direct and indirect, positive, and negative influence on their behaviors provides indication that alteration in messaging at the screen-level has potential to influence behaviors such as voluntary HIV testing, condom use, seatbelt use, dietary consumption of vegetables, and weight management overall.

Definitions

For clarity of the research, the key variables and unique terminology are defined.

Excess screen time: Any time spent engaged in the use of electronic devices with a screen, which may include a smartphone, computer, television, or video game console that exceeds 2 hours.

Healthy sexual behavior: A behavior that has been linked to the reduction in HIV/AIDS mortality and morbidity. Includes condom use and HIV testing.

Healthy weight management: Behaviors that include the routine selection and dietary consumption of fruits and vegetables, adequate water intake, exercise, and intentional efforts to lose excess body mass.

Nonviolent accidental injury death prevention behaviors: Represented by the variable seat-belt use, a behavior that has been linked to lower incidence of death related to motor vehicle accidents among youth.

Recommended screen time: Any time spent engaged in use of electronic devices with a screen, which may include a smartphone, computer, television, or video game console that does not exceed 2 hours.

Screen time: Any time spent engaged with TV and/or computer screens.

Voluntary health risk reduction behavior: Any health seeking behaviors selected from the dataset that are linked to positive health outcomes and are not otherwise required for school enrollment or attendance.

Assumptions

For this study, the supposition was made that teen engagement in voluntary health seeking or health risk reduction behaviors results from influences of actual or perceived social support, knowledge, skills, intentions, barriers, opportunities, and norms, self- and collective-efficacies, controls, and outcomes expectations. Further, the assumption that digital media environment and knowledge derived there by youth has both direct and indirect, positive, and negative influence on their behaviors. This provided indication that alteration in messaging at the screen-level has potential to influence behaviors overall. Key limitations identified from systematic reviews include the lack of attention to other co-existing sedentary lifestyle practices of youth; psychosocial factors influencing food choices; existing infrastructure for physical activity; access to alternate sources of information; active versus passive screen time activities; and overall psychosocial support systems as cofactors to the observed health outcomes (Stiglic & Viner, 2019; Wu et al., 2017). While there is opportunity to explore these cofactors, this study was specifically focused on exploring opportunities to argue in favor of the positive impacts of excess screen time on health behaviors of youth between the ages of 13 and 17 years and the role that must be taken by healthcare practitioners regarding screen time trends among this group as an environmental factor and knowledge source with influence on youth behavior. The research and analysis focused on those behaviors that are specifically linked to risk reduction for HIV/AIDS, obesity, and injury death by motor vehicle accident (MVA). The specific behaviors examined are those that were not mandated for school enrollment or attendance and are therefore deemed voluntary. Further, they

represent key causes of death among teens and adults and specifically with unhealthy behaviors that tend to be established in the adolescent years.

Scope and Delimitations

The secondary analysis utilized data YRBSS 2019 data. The CDC YRBSS data collection and analysis efforts begun in 1990 and the data collection tool and strategy have been revised to meet the data needs as dictated by the social environment and dynamic public health needs of youth. The data also were collected at the national level and afforded a large sample for analysis. The internal validity of this secondary analysis was bolstered by the strength of the primary data collection instrument and dataset. The primary dataset variables were operationalized to represent dichotomous variables in the secondary analysis. My ability to carefully select, define and operationalize the most relevant variables for analysis presented a threat to the external validity of the study. Although the primary data were not collected with the purpose of the secondary analysis in mind it provided the appropriate data from a large representative population and contained variables that aligned with the secondary analysis variables and definitions.

This study was proposed to open the discussion of association between screen time and opportunities for enhanced youth health by exploring associations between voluntary health risk reduction behaviors and screen time as reported by youth in the 2019 YRBSS dataset. The study results add to the debate that based on the triadic reciprocity between personal factors, environmental factors, and behaviors of youths who are digital natives do not only represent a problem but also present an opportunity for

healthcare practitioners to strategically harness screen-based content to promote social change through youth voluntary healthy behaviors.

Significance, Summary, and Conclusions

The digital media environment is developing and expanding in reach quite rapidly and at a rate exceeding the related research on its effects (Canadian Pediatric Society DHTFOO, 2017). Policies and recommendations arising from the COVID-19 pandemic have further increased screen time further emphasizing the need to revisit the impacts of screen time on youth health. For adolescent use of electronic media to be harnessed as a primary health promotion strategy rather than be condemned for its recognized negative impacts on health, then it was necessary to determine whether there is any association between excessive and recommended non-academic use of technology or screen time and voluntary health risk reduction behaviors. This will occur when there is sufficient evidence that identifies a positive relationship between screen time and youth inclination to health behaviors and acknowledges that the presence of screen time does not equate to the absence of healthy behaviors. The Canadian Pediatric Society (2017) while in agreement with the principle of minimizing screen time for youth health, also propose additional mechanisms for positive change which includes mindful use and modeling of healthy uptake of digital screens. Arguments related to the negative impacts of excessive screen time are derived from weak and to some degree unconvincing literature with significant limitations (Stiglic & Viner, 2019). The strongest of evidence was linked to obesity, depression symptoms and quality of life. With that said, active versus passive screen time engagement speaks to the importance of messaging and enforcements

through repetitive physical behaviors and cognitive efforts and reinforcement. This should not be overlooked when considering screen time as causation of negative health risk or outcomes.

Section 2: Research Design and Data Collection

Introduction

The study was a quantitative secondary analysis to identify the relationship between the nonacademic use of digital screen-based activities for more than 2 hours a day among teens and their self-reports of select health behaviors that are not otherwise required for school attendance. In the secondary analysis of teen self-reported data from the CDC 2019 YRBSS, the selected independent variable was screen time use greater than 2 hours per day that is correlated to dependent variables of select health behaviors linked to NVAIDP, HWM, and sexual health. The study sample *N* was 13 to 17 years old, and the analysis was controlled for age, sex, race, and grade level (or attained education).

Because teens are noticeably disparate in how and when they access preventive healthcare, it may prove more prudent to harness screen time tendencies in promoting health among youth rather than to suppress them. The study questions the value of existing efforts to reduce nonacademic screen time among youth, as compared to the potential value of focusing on dedicated efforts to promote health care access to this unique population by harnessing the clearly inherent inclination towards technology and screen-based activities. Additionally, although there is obvious increase in the development and availability of screen-based interventions for promoting health in these and other areas, the literature has demonstrated that health practitioners have focused on the nuances and needs of adult consumers, with youth as incidental candidates for these health strategies. However, teens are most inclined to screen based activity uptake. Overall, the study had three overarching purposes: identifying a correlation between

screen time and select health behaviors, identifying target health behaviors, and providing further justification for practitioner innovation in promoting youth health through screen-based activities. The research questions were answered using the secondary data analysis of recoded variables from the 2019 YRBSS dataset.

Research Design and Rationale

SPSS-27 statistical software was used to perform a quantitative secondary analysis using data from the YRBSS 2019 cross-sectional study conducted by the CDC YRBSS. All study variables were dichotomous, and a binomial logistic regression with bidirectional elimination was carried out using SPSS software. Chi-squared test of best fit provided assurance that differences in means have not been arrived at by chance.

Three specific categories of health risk reduction behaviors were selected and identified as voluntary health seeking behaviors among youth. These behaviors were not otherwise implicated as mandated or specifically required for school attendance – HIV testing, condom use, seatbelt use, dietary consumption of vegetables, and weight management behaviors. The behaviors were identified from the dataset user guide, were recoded, and were appropriately combined to represent the dichotomous dependent variables of NVAIDP, HWM, and sexual health. From the dataset the variables age group 13 to 17 years (Q1 B, C, D, E, F, G), condom use (Q64), weight management (Q69, Q77), healthy dietary choices (Q70, Q71, Q72, Q73, Q93), exercise (Q790), HIV testing (Q85), and seat belt use were recoded and combined as described. The independent variable excessive screen time or screen time greater than 2 hours was derived from recoding the variables of TV screen time and gaming screen time greater than 2 hours

(Q80, Q81). Recommended screen time or screen time less than 2 hours was derived from recoding TV screen time and gaming screen time to one combined dichotomous variable equal to or less than 2 hours. Extraneous variables of age, sex, race, and grade level (or attained education) are described in discussion of the study results.

The following three research questions were formulated with hypotheses for the secondary analysis of data from the YRBSS 2019 cross sectional study:

RQ1: Is there an association between screen time and sexual health behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level?

$H_0$1: There is no association between screen time and sexual health behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

H_a1: There is an association between screen time and sexual health behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

RQ2: Is there an association between screen time and NVAIDP behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level?

$H_0$2: There is no association between screen time and NVAIDP behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

H_a2: There is a significant association between screen time and NVAIDP behaviors youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

RQ3: Is there an association between screen time and HWM behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level?

$H_0 3$: There is no association between screen time and HWM behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

$H_a 3$: There is a significant association between screen time and HWM behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

Methodology

Population

The 2019 YRBSS includes data from students in 181 private and public schools across the United States in Grades 9 to 12 from the 50 states and the District of Columbia. The dataset includes respondent age categories of less than 12 years to 18 years or older as the data are collected from middle school and high school students. From the probability sample, the school response rate was 136 (75%) of schools sampled. The usable student response rate was 13,677 (80.3%) of students sampled from 136 participating schools, allowing for a total response rate of 60.3% of the sample being included in the dataset.

Sampling and Sampling Procedures

For this analysis of 13,677 student responses from the 2019 YRBSS, the sample was purposive and included only those in the age group 13 to 17 years old to identify and focus on the age group in the teen years only, more specifically. The dataset was filtered for the variable age to include all cases in categories that fall within the age group 13 to 17 years based on the dataset user guide and code book.

Instrumentation and Operationalization of Constructs

Once the age group for analysis was set, the dependent variables were arrived at using the SPSS-27 software to recode new dichotomous variables with value labels no and yes.

Table 1

Study Variables Showing Operationalization

Variable	Definition	Scale of Measure	Data Analysis Method
Dependent Variable			
Healthy weight management (HWM)	Self-reports of intentional weight management, selection of vegetables for consumptions and exercise	Dichotomous	Reports of intentional weight management, selection of vegetables for consumptions and exercise will be transformed to: 1 = yes; 0 = no without regard for frequency of reported activities.
Non-violent accidental death prevention behavior (NVAIDP)	Self-report of seat-belt use	Dichotomous	Reports of seat-belt use will be transformed to: 1 = yes; 0 = no without regard for frequency of seat-belt use
Sexual health behaviors	Self-reports of both HIV testing and condom use	Dichotomous	Reports of HIV testing and condom use will be grouped to form a single nominal variable with: 1 = yes; 0 = no to HIV testing and/or condom use without regard to frequency of HIV testing and condom use.
Independent variable			
Screen time	Self-report of TV time and computer time.	Dichotomous	Reports of TV time and computer time in hours will be combined and transformed

Data Cleaning

The dataset was cleaned to identify and replace any missing values using frequencies and series means in the SPSS-27 software.

The Logistics Regression Model

The binomial logistic regression model was run in SPSS-27 software with stepwise bidirectional elimination to determine the odds ratio of a statistically significant association between of screen time and the independent variables representing selected health risk reduction behaviors among youth ages 13 to 17 years. The stepwise

bidirectional elimination was used identify any independent variables used in the regression model that did not contribute to the significance of the association. Chi-squared test of best fit provided assurance that differences in means have not been arrived at by chance.

Threats to Validity

Because this was a secondary data analysis, the validity of the study might have been threatened by errors in transforming and recoding variables, missing values, and reverse coding errors that went unseen. The primary dataset also used cluster sampling that may have presented variances. The YRBSS guide provides guidance for correctly using and analyzing the dataset so this threat should have been well mitigated. Additionally, data cleaning was ensured to mitigate data analysis errors presented from missing values.

Ethical Procedures

The 2019 YRBSS data are available to the public and have been de-identified prior to release. This study did not require reidentification of the participants. Participants provided consent to the original data collection and research by the CDC. Respondent consent was, therefore, presumed for this study. All other ethical conditions required for the research were presumed to be extended from the original data collection to this secondary analysis. The study design and methodology were vetted for ethical standards by the Institutional Review Board (IRB) and University Research Reviewer (URR) - approval number is 06-07-21-0672513.

Summary

There is growing availability and access to digital screens and devices that has fostered increased screen time trends among adolescents. Adolescents have been identified as digital natives, whose screen time trends have been, albeit unclearly, correlated to poor health outcomes. Further, youth inclination towards seeking formal healthcare with providers declines throughout the teen years. Historically, the focus of screen time related interventions has been to curtail time spent using screen-based activities rather than on providing content to promote health and well-being, specifically in youth. Laws and recommendation arising from the COVID-19 pandemic has prompted further access and a requirement for increasing screen time among youth. These current trends provide incentive for exploring the scope of screen-based engagement as a precursor for health seeking behaviors among youth. In this secondary analysis, I aimed to identify an association between voluntary health risk reduction behaviors and time spent engaged in screen-based activities among teens that could be built upon to promote enhanced youth health.

Section 3: Presentation of the Results and Findings

Introduction

The secondary data analysis was completed of the 2019 YRBSS cross-sectional study data to answer the following research questions and hypotheses for which covariates were modified based on limitations in the dataset:

RQ1: Is there an association between screen time and sexual health behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level?

$H_0$1: There is no association between screen time and sexual health behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

H_a1: There is an association between screen time and sexual health behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

RQ2: Is there an association between screen time and NVAIDP behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level?

$H_0$2: There is no association between screen time and NVAIDP behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

H_a2: There is a significant association between screen time and NVAIDP behaviors youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

RQ3: Is there an association between screen time and HWM behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level?

$H_0 3$: There is no association between screen time and HWM behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

$H_a 3$: There is a significant association between screen time and HWM behaviors among youth ages 13 to 17 years while controlling for age, race, sex, and grade level.

The analysis was completed using SPSS-27, which was the most recent version of the software available at the time of analysis. From the original sample of 13,677 respondents, cases were selected by filtering and selecting only those respondents who reported being 13 to 17 years old. Variables from the original dataset were combined, transformed, and recoded to new binomial variables to permit the secondary analysis. Frequency distributions were derived, which identified respondents' outcomes related to variables included in the research – screen time, age, race, gender, grade level, and reports of sexual health, NVAIDP, and HWM behaviors. Following this, binomial logistic regression models were used to analyze the likelihood of relationships between the independent variable screen time and the selected health behaviors. Following this,

the bidirectional elimination was completed to identify the impacts of each covariate on the regression models. The Omnibus Chi-squared test was analyzed for each regression set to determine whether variances in the results occurred by chance.

The Secondary Dataset

Case Selection

From the 2019 YRBSS, the following case selection was conducted of respondents reporting age 13 to 17 years. The total number of respondents (*n*) included in the secondary analyses was 11,929 students. There were no missing values.

Variables

Independent Variables

The independent variable screen time was recoded from Q79: "On an average school day, how many hours do you watch TV?", and Q80, "On an average school day, how many hours do you play video or computer games or use a computer for something that is not schoolwork? (Count time spent playing games, watching videos, texting, or using social media on your smartphone, computer, Xbox, PlayStation, iPad, or other tablet.)," as shown in Table 2.

Table 2

Independent Variable Screen Time

Original variables	Recode to binomial	New variable
Q79 – Television watching	< 2 hours = categories 1- 4	Screen time < 2 hours = 0
	> 2 hours = all else	Screen time > 2 hours = 1
Q80 - Computer use	< 2 hours = categories 1- 4	
	> 2 hours = all else	

Dependent Variables

The dependent variables were recoded to binomial variables to reflect whether respondents reported or did not report selected behaviors. To compute the variable NVAIDP behaviors, respondents' response to Q8, "How often do you wear a seatbelt when riding in a car driven by someone else?" All responses were categorized as either yes or no, where infrequent or grossly inconsistent behavior was counted as a report of no, as shown in Table 3.

Table 3

Dependent Variables NVAIDP Behaviors

Original variables	Recode to binomial	New variable
Q8 – Seat belt use	Most times, always = yes All else = no	Seat belt use, yes = 1 Seat belt use, no = 0

Responses to Q84, "Have you ever been tested for HIV, the virus that causes AIDS? (Do not count tests done if you donated blood.)," and Q63, "The last time you had sexual intercourse, did you or your partner use a condom?" were categorized as either yes or no then combined to create the new variable sexual health behaviors, as shown in Table 4. Responses to Q84 of "not sure" were categorized as no. Additionally, responses of "never had sex" to Q63 were categorized as abstinence and counted as yes to reporting a sexual health behavior in the analysis.

Table 4

Dependent Variable Sexual Health Behaviors

Original variables	Recode to binomial	New variable
	HIV tested = yes	
	HIV tested, no = no	
Q84 – HIV tested	Not sure = no	
	Condom use = yes	
	Never had sex = yes	No sexual health behavior = 0
Q63 – condom use	No condom use = no	Sexual health behavior, yes = 1

The responses to the following survey items were recoded and combined to derive a single binomial variable, HWM behaviors, indicating whether respondents reported frequent or consistent engagement with at a least one HWM behavior, as shown in Table 5.

- Q68: Which of the following are you trying to do about your weight?
- Q70: During the past 7 days, how many times did you eat fruit? (Do not count fruit juice.)
- Q71: During the past 7 days, how many times did you eat green salad?
- Q73: During the past 7 days, how many times did you eat carrots? This was not indicated in the original proposal.
- Q74: During the past 7 days, how many times did you eat other vegetables? (Do not count green salad, potatoes, or carrots.)

- Q75: During the past 7 days, how many times did you drink a can, bottle, or glass of soda or pop, such as Coke, Pepsi, or Sprite? (Do not count diet soda or diet pop.)
- Q78: During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time.)
- Q93: During the past 7 days, how many times did you drink a bottle or glass of plain water? (Count tap, bottled, and unflavored sparkling water.)

Table 5

Dependent Variable HWM behaviors

Original variables	Recode to binomial	New variable
	Lose, gain, stay = yes	
Q68 – Weight loss	Not trying to do anything = no	
	At least once/day = yes	
Q70 – Fruit eating	Less than once/day = no	
	At least once/day = yes	
Q71 – Green salad eating	Less than once/day = no	
	At least once/day = yes	
Q73 – Carrot eating	Less than once/day = no	
	At least once/day = yes	
Q74 – Other vegetable eating	Less than once/day = no	
	Did not drink = yes	
Q75 – No soda drinking	All else = no	
	3 days or more = yes	
Q78 – Physical activity >= 5 days	All else = no	
	>= 3 times/day = yes	No HWM behavior = 0
Q93 – Plain water	All else = no	At least 1 HWM behavior = 1

Covariates

The covariates included in the analysis were the categorical variables age (Q1), sex (Q2), race/ethnicity (Q4 & Q5), and grade level (Q3) as an indicator of attained education. Race and ethnicity were recoded to Black, White, Hispanic, and other for this analysis.

Distribution Tables

Table 6 shows that 51.2% reported being female, and 0.6 % did not respond regarding sex. The table indicates that respondents demonstrated similar male to female distribution provided by the U.S. Census Bureau 2019 population data.

Table 6

Distribution Covariate Sex

Sex	*N*	%
	72	0.6%
Female	6,104	51.2%
Male	5,753	48.2%

Table 7 shows 85.5% of respondents reported age of 15 years or older. More than 60% reported being in ninth or 10th grade (Table 8).

Table 7

Distribution Covariate Age

Age	*N*	%
13	27	0.2%
14	1,699	14.2%
15	3,473	29.1%
16	3,628	30.4%
17	3,102	26.0%

Table 8

Distribution Covariate Grade Level

Grade	*N*	%
	47	0.4%
9th	3,606	30.2%
10th	3,694	31.0%
11th	3,154	26.4%
12th	1,413	11.8%
Other	15	0.1%

In Table 9, the most frequently reported race/ethnicity was White (49.1%). Only 15% reported being Black or African American (AA), and 7.5% reported being Hispanic/Latino. Other respondents reported American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, or reported multiple races/ethnicities (approximately 25%).

Table 9

Distribution Covariate Race/Ethnicity

Race/Ethnicity	*N*	%
Black/AA	1,784	15.0%
White	5,854	49.1%
Hispanic/Latino	889	7.5%
Others	3,402	28.5%

Table 10 shows that more than half of respondents reported the independent variable of screen time more than 2 hours a day.

Table 10

Distribution Dependent Screen Time >2 Hours

Screen time > 2 hours	*N*	%
no	5088	42.7%
yes	6841	57.3%

More than 75% of respondents reported at least one behavior linked to sexual health and at least one behavior linked to NVAIDP – 9,396 and 9,004 respondents, respectively. Almost all 11,929 of respondents reported at least one behavior that was linked to HWM.

Table 11 shows the likelihood of each respondent from the selected covariate categories to report screen time > 2 hours. Overall, race was the most significant predictor of screen time > 2 hours ($p < 0.0005$). Respondents reporting Black/AA race were more likely ($p < 0.0005$) than those reporting White or Hispanic/Latino races to report screen time > 2 hours per day. White and Hispanic respondents were more likely to report screen time < 2 hours ($p = 0.005$ and $p = 0.549$ respectively). Further, female respondents had increased odds of reporting screen time > 2 hours than male respondents who showed increased likelihood of reporting screen time < 2 hours. Respondents from all grade levels had some odds of reporting screen time > 2 hours. However, respondents in Grade 9 showed the greatest odds ratio of reporting screen time > 2 hours, with a probability of approximately 59% (based on 1.414/2.414 = 0.5857). Based on age only, respondents were more likely to report screen time < 2 hours.

Table 11

All Covariate Odds Impacting the Study

							95% C.I.for EXP(B)	
Covariates	B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
RaceEth_BWHO			41.312	3	.000			
Black/AA	.233	.060	14.798	1	.000	1.262	1.121	1.421
White	-.122	.044	7.708	1	.005	.886	.813	.965
Hispanic/Latino	-.046	.076	.359	1	.549	.955	.823	1.109
Q1 Age			3.333	4	.504			
Q1 13 years	-.623	.400	2.422	1	.120	.536	.245	1.175
Q1 14 years	-.016	.103	.023	1	.880	.985	.805	1.205
Q1 15 years	-.064	.084	.579	1	.447	.938	.796	1.106
Q1 16 years	-.047	.064	.527	1	.468	.955	.842	1.082
Q2 Sex			1.420	2	.492			
Q2 Female	.028	.247	.013	1	.908	1.029	.635	1.668
Q2 Male	-.044	.037	1.377	1	.241	.957	.890	1.030
Q3 Grade Level			6.070	5	.300			
Q3 Grade 9	.346	.607	.325	1	.569	1.414	.430	4.647
Q3 Grade 10	.078	.533	.021	1	.884	1.081	.381	3.071
Q3 Grade 11	.138	.532	.067	1	.796	1.148	.404	3.256
Q3 Grade 12	.008	.533	.000	1	.987	1.008	.355	2.865
Q3 Other	.065	.536	.015	1	.904	1.067	.373	3.049
Constant	.307	.533	.331	1	.565	1.359		

a. Variable(s) entered on step 1: RaceEth_BWHO, Q1 Age, Q2 Sex, Q3 Grade Level.

The independent variable and covariates were further recoded to be dichotomous as seen in Table 12 for better ease of analysis and interpretation that is aligned with the existing screen time and health behavior trends among youth. This includes evidence suggesting that older age, and indirectly higher grade levels, non-White race, and being male has been linked to higher uptake of screen time and lower access or uptake of health-related activities.

Table 12

All Predictor Variables Coding

			Parameter coding
Covariates		Frequency	(1)
Higher Grade (>10th)	yes	4567	1.000
	no	7362	.000
Screen time >2hrs/day	yes	5088	1.000
	no	6841	.000
Older (than 15 years)	yes	6730	1.000
	no	5199	.000
Non-White	yes	6075	1.000
	no	5854	.000
Sex	Male	5753	.000
	Female	6176	1.000

Results

The binomial logistic regression with bidirectional stepwise regression was completed with inclusion of independent variable and covariates to identify any association between screen time > 2 hours and the selected health behaviors controlling for age, race, sex, and grade level. Omnibus test (Chi-squared test) was analyzed for significance of variances.

Research Question 1

Is there an association between screen time and sexual health behaviors among youth ages 13 – 17 years while controlling for age, race, sex, and grade level?

Logistic Regression With Forward Selection Stepwise Regression

In Table 13, the classification table from the logistic regression null model of reported sexual health behaviors step 0 shows the intercept only results of the model which demonstrates that the prediction of respondents reporting at least 1 sexual health behavior would be correct 79% of the time without any consideration for covariates.

Table 13

Null Model Predictions for Sexual Health Behaviors

			Predicted		
			Sexual Health behaviors		Percentage
	Observed		no	yes	Correct
Step 0	Sexual Health behaviors	no	0	2533	.0
		yes	0	9396	100.0
	Overall Percentage				78.8

a. Constant is included in the model.

b. The cut value is .500

The Chi-square test of good fit (Omnibus test) results displayed in Table 14 show that the fit of the model relative to the null model is statistically more significant ($p <$ 0.0005). This indicates that the regression model that includes screen time >2 hours (*step 1*) as a predictor of respondents reporting at least 1 sexual health behavior is more significantly matching the data than the null model where no predictors are included.

Therefore, there is an association between sexual health behaviors and screen time >2 hours according to the regression model.

Table 14

Omnibus Tests for Screen Time and Sexual Health Behaviors

		Chi-square	df	Sig.
Step 1	Step	17.216	1	.000
	Block	17.216	1	.000
	Model	17.216	1	.000

Table 15 shows the Chi-squared test of good fit for steps 1 - 3 of the forward regression model where the covariates have been included in the prediction of at least 1 sexual health behavior being reported among respondents. The variables included in each step of the model is clarified in Table 16. It is also noted that in the forward stepwise regression the variables selected as being the most significant predictors of sexual health behaviors among respondents were age, race, and screen time respectively.

Reporting older age and non-White race was resulted in negative odds scores (*B*) in the regression model (approximately -0.5 and -0.3 respectively). This indicates that there was a negative relationship between older age and the likelihood of reporting a sexual health behavior. As well, there was a negative relationship between reporting non-White race and the likelihood of reporting a sexual health behavior ($p < 0.0005$). Screen time >2 hours demonstrated a mildly positive odds score ($B = 0.178$ in *Step 3*) indicating that there is a positive relationship between screen time > 2 hours and the likelihood of reporting a sexual health behavior with $p < 0.0005$. Sex and grade level were not

automatically selected for inclusion in the forward model implying that they were not significant predictors of sexual health behaviors among respondents.

Table 15

Forward Selection Omnibus Tests for Sexual Health Behaviors

		Chi-square	df	Sig.
Step 1	Step	106.715	1	.000
	Block	106.715	1	.000
	Model	106.715	1	.000
Step 2	Step	50.815	1	.000
	Block	157.530	2	.000
	Model	157.530	2	.000
Step 3	Step	15.109	1	.000
	Block	172.640	3	.000
	Model	172.640	3	.000

Table 16

Sexual Health Behaviors Forward Regression - Variables in the Equation

							95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Older	-.475	.047	103.957	1	.000	.622	.567	.681
	Sexual Health behaviors	1.595	.037	1854.674	1	.000	4.928		
Step 2[b]	Older	-.473	.047	102.658	1	.000	.623	.568	.683
	Non-White	-.322	.045	50.432	1	.000	.725	.663	.792
	Sexual Health behaviors	1.765	.045	1549.433	1	.000	5.843		
Step 3[c]	Screen time >2hrs/day	.178	.046	15.006	1	.000	1.195	1.092	1.308
	Older	-.474	.047	103.034	1	.000	.622	.568	.682
	Non-White	-.315	.045	48.046	1	.000	.730	.668	.798
	Sexual Health behaviors	1.688	.049	1197.727	1	.000	5.411		

a. Variable(s) entered on step 1: Older.

b. Variable(s) entered on step 2: Non-White.

c. Variable(s) entered on step 3: Screen time >2hrs/day.

Logistic Regression With Backward Stepwise Elimination Regression

The Omnibus test shown in Table 17 shows that the model is a good fit with $p < 0.0005$ that the model effectively accounts for variances in odds. The backward regression incorporates all predictors as seen in Table 18. The regression shows that the sex and grade level were not significant predictors of sexual health behaviors. Additionally, the model odds shows that there was a positive odd of respondents reporting screen time > 2 hours and at least 1 sexual health behavior with $p < 0.0005$. The null hypothesis has not been proven as the logistic regression models show evidence that

there is an association between screen time and sexual health behaviors. There is an association between screen time and sexual health behaviors among youth ages 13 – 17 years while controlling for age, race, sex, and grade level has not been proven.

Table 17

Backward Regression Omnibus Tests for Sexual Health Behaviors

		Chi-square	df	Sig.
Step 1	Step	175.617	5	.000
	Block	175.617	5	.000
	Model	175.617	5	.000
Step 2[a]	Step	-.060	1	.806
	Block	175.556	4	.000
	Model	175.556	4	.000

a. A negative Chi-squares value indicates that the Chi-squares value has decreased from the previous step.

Table 18

Backward Regression for Sexual Health Behaviors - Variables in the Equation

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Sex (Female)	-.077	.045	2.941	1	.086	.925	.847	1.011
	Screen time >2hrs/day	.178	.046	14.917	1	.000	1.195	1.092	1.308
	Older	-.463	.061	56.787	1	.000	.630	.558	.710
	Non-White	-.314	.045	47.911	1	.000	.730	.668	.798
	Higher Grade	-.015	.060	.060	1	.806	.985	.876	1.108
	Sexual Health behaviors	1.725	.053	1043.790	1	.000	5.613		
Step 2[a]	Sex (Female)	-.077	.045	2.917	1	.088	.926	.847	1.011
	Screen time >2hrs/day	.178	.046	14.889	1	.000	1.195	1.091	1.307
	Older	-.472	.047	102.061	1	.000	.624	.569	.683
	Non-White	-.314	.045	47.897	1	.000	.730	.668	.798
	Sexual Health behaviors	1.725	.053	1043.956	1	.000	5.612		

a. Variable(s) entered on step 1: Q2 Sex, Screen time >2hrs/day, Older, Non-White, Higher Grade.

Research Question 2

Is there an association between screen time and NVAIDP behaviors among youth ages 13 – 17 years while controlling for age, race, sex, and grade level?

The logistic regressions are completed with bidirectional selection and elimination and the results are shown below.

In Table 19, the classification table from the logistic regression null model of reported NVAIDP behaviors shows the intercept only results of the model which demonstrates that the prediction of respondents reporting NDVAIP behaviors would be correct 76% of the time without any consideration for covariates.

Table 19

Null Model Prediction for NDVAIP Behaviors[a,b]

			Predicted		
			NVAIDP		
	Observed		No	Yes	Percentage Correct
Step 0	NVAIDP	No	0	2925	.0
		Yes	0	9004	100.0
	Overall Percentage				75.5

a. Constant is included in the model.

b. The cut value is .500

The Chi-square test of good fit (Omnibus test) results displayed in Table 20 show that the fit of the model relative to the null model is statistically more significant ($p < 0.0005$). This indicates that the regression model that includes covariates influence on NAVIDP behaviors is significantly accounting for variances. The stepwise forward regression shows that there is a negative odds relationship between being non-White, reporting a higher grade level, screen time > 2 hours and reporting NVAIDP behaviors among recipients. There is, however, a positive odds relationship between older age and reporting NVAIDP behavior with $p < 0.0005$. Therefore, there is an association between NVAIDP behavior and screen time, non-White race, older age, and grade level according

to the regression model. Sex was not found to be a significant predictor of NVAIDP behaviors among respondents as seen in both the odds of the forward and backward regression models (Table 21and Table 22 respectively). The null hypothesis that there no association between screen time and NVAIDP behaviors among youth ages 13 – 17 years while controlling for age, race, sex, and grade level has not been proven.

Table 20

Omnibus Tests for NDVAIP Behaviors

		Chi-square	df	Sig.
Step 1	Step	175.989	1	.000
	Block	175.989	1	.000
	Model	175.989	1	.000
Step 2	Step	21.751	1	.000
	Block	197.739	2	.000
	Model	197.739	2	.000
Step 3	Step	47.805	1	.000
	Block	245.544	3	.000
	Model	245.544	3	.000
Step 4	Step	4.537	1	.033
	Block	250.082	4	.000
	Model	250.082	4	.000

Table 21

Forward Selection Regression for NDVAIP Behaviors - Variables in the Equation

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Non-White	-.571	.043	172.484	1	.000	.565	.519	.615
	Constant	1.436	.033	1873.855	1	.000	4.204		
Step 2[b]	Older	.201	.043	21.794	1	.000	1.223	1.124	1.330
	Non-White	-.574	.044	174.227	1	.000	.563	.517	.613
	Constant	1.327	.040	1088.009	1	.000	3.769		
Step 3[c]	Older	.500	.063	63.436	1	.000	1.648	1.458	1.864
	Non-White	-.577	.044	174.878	1	.000	.562	.516	.612
	Higher Grade	-.435	.064	46.152	1	.000	.647	.571	.734
	Constant	1.332	.040	1092.943	1	.000	3.789		
Step 4[d]	Screen time >2hrs/day	-.093	.043	4.545	1	.033	.912	.837	.993
	Older	.499	.063	63.160	1	.000	1.646	1.456	1.862
	Non-White	-.581	.044	177.049	1	.000	.559	.513	.609
	Higher Grade	-.433	.064	45.676	1	.000	.649	.572	.736
	Constant	1.374	.045	932.920	1	.000	3.952		

a. Variable(s) entered on step 1: Non-White.

b. Variable(s) entered on step 2: Older.

c. Variable(s) entered on step 3: Higher Grade.

d. Variable(s) entered on step 4: Screen time >2hrs/day.

Table 22

Backward Regression for NDVAIP Behaviors - Variables in the Equation

							95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Q2 Sex (Female)	-.071	.043	2.691	1	.101	.932	.856	1.014
	Screen time >2hrs/day	-.093	.043	4.604	1	.032	.911	.837	.992
	Older	.503	.063	64.100	1	.000	1.653	1.462	1.870
	Non-White	-.581	.044	176.771	1	.000	.560	.514	.610
	Higher Grade	-.436	.064	46.304	1	.000	.647	.570	.733
	Constant	1.408	.049	809.914	1	.000	4.086		
Step 2[a]	Screen time >2hrs/day	-.093	.043	4.545	1	.033	.912	.837	.993
	Older	.499	.063	63.160	1	.000	1.646	1.456	1.862
	Non-White	-.581	.044	177.049	1	.000	.559	.513	.609
	Higher Grade	-.433	.064	45.676	1	.000	.649	.572	.736
	Constant	1.374	.045	932.920	1	.000	3.952		

a. Variable(s) entered on step 1: Q2 Sex, Screen time >2hrs/day, Older, Non-White, Higher Grade.

Research Question 3

Is there an association between screen time and healthy weight management HWM behaviors among youth ages 13 – 17 years while controlling for age, race, sex, and grade level?

The logistic regression is completed with bidirectional selection and elimination and the results are shown below.

In Table 23, the classification table from the logistic regression null model of reported HWM behaviors shows the intercept only results of the model which demonstrates that the prediction of respondents reporting at least 1 HWM behaviors would be correct 97% of the time without any consideration for covariates.

Table 23

Null Model Predictions for HWM Behaviors[a,b]

			Predicted		
			Healthy Weight Behaviors		Percentage
	Observed		no	yes	Correct
Step 0	Healthy Weight Behaviors	no	0	345	.0
		yes	0	11584	100.0
	Overall Percentage				97.1

a. Constant is included in the model.

b. The cut value is .500

The Chi-square test of good fit (Omnibus test) results displayed in Table 24 show that the fit of the model relative to the null model is statistically more significant ($p < 0.005$). This indicates that the regression model that includes covariates influence on HWM behaviors is significantly accounting for variances. The stepwise forward regression shows that there is a positive odds relationship between screen time > 2 hours and reporting at least 1 HWM behavior among recipients with $p = 0.006$. Therefore, there is an association between HWM behavior and screen time, non-White race, older age, and grade level according to the regression model. Sex was not found to be a significant predictor of HWM behaviors among respondents as seen in both the odds of the forward and backward regression models (Table 25 and Table 26 respectively). The null hypothesis that there no association between screen time and HWM behaviors among youth ages 13 – 17 years while controlling for age, race, sex, and grade level has not been proven.

Table 24

Omnibus Tests for HWM Behaviors

		Chi-square	df	Sig.
Step 1	Step	17.063	5	.004
	Block	17.063	5	.004
	Model	17.063	5	.004
Step 2[a]	Step	-.544	1	.461
	Block	16.520	4	.002
	Model	16.520	4	.002
Step 3[a]	Step	-2.483	1	.115
	Block	14.037	3	.003
	Model	14.037	3	.003
		Chi-square	df	Sig.
Step 4[a]	Step	-2.640	1	.104
	Block	11.397	2	.003
	Model	11.397	2	.003

a. A negative Chi-squares value indicates that the Chi-squares value has decreased from the previous step.

Table 25

Forward Regression for HWM Behaviors - Variables in the Equation

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Screen time >2hrs/day	.316	.114	7.660	1	.006	1.372	1.097	1.716
	Constant	3.390	.068	2479.750	1	.000	29.677		

a. Variable(s) entered on step 1: Screen time >2hrs/day.

Table 26

Backward Regression for HWM Behaviors - Variables in the Equation

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Q2 Sex (Female)	.171	.110	2.397	1	.122	1.186	.956	1.472
	Screen time >2hrs/day	.309	.114	7.319	1	.007	1.363	1.089	1.705
	Older	.253	.156	2.644	1	.104	1.288	.949	1.748
	Non-White	-.210	.110	3.616	1	.057	.811	.653	1.006
	Higher Grade	-.118	.161	.537	1	.464	.889	.648	1.219
	Constant	3.333	.119	787.276	1	.000	28.025		
Step 2[a]	Q2 Sex (Female)	.173	.110	2.470	1	.116	1.189	.958	1.475
	Screen time >2hrs/day	.308	.114	7.258	1	.007	1.361	1.088	1.702
	Older	.173	.110	2.509	1	.113	1.189	.960	1.474
	Non-White	-.210	.110	3.620	1	.057	.811	.653	1.006
	Constant	3.331	.119	787.384	1	.000	27.980		
Step 3[a]	Screen time >2hrs/day	.306	.114	7.174	1	.007	1.358	1.086	1.699
	Older	.178	.109	2.650	1	.104	1.195	.964	1.481
	Non-White	-.209	.110	3.583	1	.058	.812	.654	1.007
	Constant	3.409	.109	979.460	1	.000	30.236		
Step 4[a]	Screen time >2hrs/day	.307	.114	7.201	1	.007	1.359	1.086	1.700
	Non-White	-.207	.110	3.514	1	.061	.813	.655	1.009
	Constant	3.505	.093	1415.755	1	.000	33.268		

a. Variable(s) entered on step 1: Q2 Sex, Screen time >2hrs/day, Older, Non-White, Higher Grade.

Summary

The findings from the data analyses indicate that there is association between selected health behaviors and screen time among the youth ages 13-17 years while controlling for age, sex, race, and grade levels ($p < 0.05$). The analysis showed that screen time > 2 hours was positively associated with sexual health behaviors and HWM behaviors while being negatively associated with NVAIDP behaviors among youth 13-17 years. Overall, the least significant predictor of healthy behaviors was sex. Older age and non-White race were negatively associated with healthy sexual behaviors while being positively associated with NVAIDP behaviors. Of note is that screen time > 2 hours was the only predictor in the analyses to have a significant influence on the odds of HWM ($p = 0.006$). Therefore, the results of the analyses indicate that the alternative hypotheses are true as follows:

H_{a1}: There is significant association between screen time and sexual health behaviors among youth ages 13 – 17 years while controlling for age, race, sex, and grade level.

H_{a2}: There is significant association between screen time and non-violent accidental injury death prevention (NVAIDP) behaviors youth ages 13 – 17 years while controlling for age, race, sex, and grade level.

H_{a3}: There is a significant association between screen time and healthy weight management (HWM) behaviors among youth ages 13 – 17 years while controlling for age, race, sex, and grade level.

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The data frequency reports also showed that almost 50% of respondents reported screen time > 2 hours. While the predictions for sexual health, HWM, and NVAIDP behaviors among respondents were above 50% and accurate more than 50% of the time in all cases. The results of this study demonstrate that youth environment and personal determinants of health are effectually influencing their health behaviors but also that youth behaviors are similarly predicting and perhaps originating changes in the environment. The Bandura's triadic reciprocal argument allows for appropriate reflection on the results of this study and the interrelationship between youth uptake of screen time and the likelihood to engage in healthy behaviors even as personal factors vary.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The noticeable disparity in how and when youth will access preventive healthcare and their tendency towards excessive screen time prompted the study, which was designed to identify whether it might prove more prudent to harness screen time tendencies in promoting health among youth rather than to suppress these tendencies. The study highlighted the question of whether there is significant value to dedicating efforts to promote healthcare access to this unique population by harnessing the clearly inherent inclination towards technology and screen-based activities rather than to primarily focus efforts on screen time reduction among youth. Additionally, there is an obvious increase in the development and availability of screen-based interventions for promoting health in this digital age, and the literature has suggested that health practitioners have focused on the nuances and needs of adult consumers while youth are secondary candidates and consumers. The SCT provided a context for triadic reciprocity between youth personal factors, environmental factors, and behaviors, while recognizing youth as a unique public health audience. Overall, the study had three overarching purposes: identifying associations between screen time and select health behaviors, identifying target sociocultural and personal determinants of youth health, and providing evidence to prompt practitioner innovation in promoting youth health through screen-based strategies.

The quantitative secondary analysis was completed using SPSS-27 statistical software to identify whether there was an association between the nonacademic use of digital screen-based activities for more than 2 hours a day among youth and their self-

reports of select health behaviors that are not otherwise required for school attendance. The CDC 2019 YRBSS data were used in the binomial logistic regressions with bidirectional stepwise elimination and Chi-squared test for fit. The independent variable was screen time, and the dependent variables were sexual health, NVAIDP, and HWM. Covariates included in the analysis were race, sex, age, and grade level. The study sample *n* consisted of 11,929 respondents from schools across the United States, ages 13 to 17 years old.

The study results showed that youth had almost equal odds (58%: 42%) of reporting screen time > 2 hours as they did screen time < 2 hours. The outcomes of the logistic regression models showed that there are significant associations between screen time and the selected health behaviors. Screen time > 2 hours was significantly associated with sexual health behaviors and HWM behaviors. In fact, of all predictors included in the study, screen time > 2 hours was the only significant predictor of HWM behaviors. However, screen time > 2 hours was negatively associated with NVAIDP behaviors. Generally being non-White and older (over 15 years old) was associated with significant odds of not engaging in health behaviors except for HWM behaviors. Overall, sex and grade level had little to no influence on reports of health behaviors among youth.

Interpretation of the Findings

The findings of the study reiterated that youth remain a vulnerable public health demographic. The findings highlighted two specific areas of concern among public health practitioners: Youth increased tendency towards screen time > 2 hours/day and the related health risk, and youth continue to engage in further behaviors that have been

linked to the leading causes of death and disability in adults. The dependent variables included in the study, sexual health, HWM, and NVAIDP behaviors, were identified as risk reduction behaviors for the leading causes of death and disability among youth – HIV testing, abstinence and condom use, exercise and healthy dietary choices, and seatbelt use. The converse to these behaviors once established in youth have been linked to the leading causes of death and disability in adults. The covariates included in the study, age, race, sex, and education, operationalized in the study as grade level, have been identified in previous research as personal determinants of health and health behaviors among youth.

The digital media environment is developing and expanding in reach quite rapidly and at a rate exceeding the related research on its effects (Canadian Pediatric Society DHTFOO, 2017; Domingues-Montanari, 2017). This digital era has encouraged increased availability and access to screen time among youth (Rostad et al., 2018). Currently, the 2020 COVID-19 pandemic has presented an environmental change for youth that has prompted and essentially normalized high uptake of screen time among youth even outside of the academic realm (Nagata et al., 2020; Robbins et al., 2020). The triadic reciprocal that youth environment is continuously affected by youth behaviors and vice versa in the presence of their personal determinants was emphasized in the study and its results. To keep up with youth health, practitioners must be prepared to specifically address the environment that is affecting youth health and behaviors and remain fluid to the changes that originate in either the environment or the behaviors. The study results showed that sex was not a significant predictor of screen time and healthy behaviors

overall although existing literature has recognized disparities among males regarding health risk behaviors and screen time uptake. Grade level was also not a prevalent predictor of health behaviors. However, grade levels did not necessarily provide significant distinctions for acquired education in its most objective sense. Bandura's (1986) arguments of triadic reciprocity contextualized the findings and support the implications of the study results.

Youth Health Risk

Freeman et al. (2018) posited that a healthy transition period is a significant determinant of a healthy adulthood experiences. Youth health risk is further compounded by screen time tendencies all while youth have continued to demonstrate reduced rates of uptake of primary wellness visits (Freeman et al., 2018). Black et al. (2016) acknowledged that the adolescent years are a critical point for establishing health habits for adulthood and overall public health direction. The researchers have recognized the declining with age rate of uptake of traditional/formal regular primary and preventative health interventions among this group and have shed light on the importance of opportunities for identifying and embracing strategies that may prove feasible for promoting youth health. Harris et al. (2017) found that system-level and provider visit-level interventions and strategies to enhance clinical prevention among youth were lacking in quality and outcomes despite evidence-based consensus, enhanced recommendations, and improved financial access through the Affordable Care Act. The study findings highlight opportunities for social change by utilizing youth screen time tendencies as a key complementary component of health promotion tactics for youth.

There is prospect for harnessing the screen time tendencies of youth in health promotion efforts with enough understanding of the full potential of screen time impacts on youth health risk and risk reduction behaviors.

Screen Time and Sexual Health Behaviors

The study results indicated that there is a positive association between screen time > 2 hours/day and both sexual health behaviors. Age greater than 15 years old and non-White race revealed a negative association with sexual health behaviors. This is important to note as these determinants are associated with disparities in HIV/AIDS prevention, diagnosis, and care. In the absence of longitudinal studies to confirm long term negative health impacts of screen time (Kaye et al., 2020), recognizing the current positive health associations of screen time excess offers an opportunity to harness the benefits to mitigating potential long term negative health outcomes. There was limited evidence of direct connection found within the literature between screen time and sexual health among youth. However, there was an indication in the existing literature that young adults tend to gravitate to mobile apps and websites for sexual health education and information. Kim et al. (2019) identified that HIV testing was most prevalent among teens who had been exposed to school-based educational interventions, which may be limited during the COVID-19 pandemic and its sequelae, as well as in schools where there is insufficient funding and resources. As screen-based activities of teens continue to be on the rise, research such as that conducted by Macapagal et al. (2018) highlighted the importance of screen-based content in influencing teen health and health practices. Macapagal et al. found that adolescent men having sex with men often used a screen

based “hook-up” app to meet and engage in sex with other men. Self-report from app users revealed significantly high rates of app use with low rate of condom use. This study has identified excess screen time as a significant predictor of sexual health behaviors and reiterated groups identified in previous literature as having more significant risk for poor sexual health outcomes.

Screen Time and Nonviolent Accidental Injury Death Prevention

The results of the study also showed a negative association between screen time > 2 hours and NVAIDP behaviors. However, youth older than 15 years old were found to have increased odds of using a seatbelt when riding in a motor vehicle driven by someone else than youth under 15 years of age who are typically nondrivers by legal standards. Drake et al. (2017) asserted that deaths from MVA were the most common cause of death among youth. The researchers also found that a social media-based intervention for promoting seatbelt among teens was met with positive evaluation and garnered significant attention and “likes” from teens (Drake et al., 2017). It is possible that the youth under 15 years are less likely to gravitate to such an app until they are at a legal age to drive. There is an opportunity then to address nondriving youth or passengers and not just driving teens. Additionally, Shults et al. (2016) recognized that primary and secondary enforcement laws have increased seat belt use among teens and that the typical precursors to seat belt use were race, socioeconomics, and substance use. The researchers did not explore substance use but did show results to suggest a negative association between non-White race and seatbelt use (Shults et al., 2016). The results of this secondary analysis of the YRBSS reiterated this recognized disparity identified by Shults

et al. (2016). The findings are significant to public health efforts, as youth health risk has generally been compounded by decreasing-with-age rates of uptake of primary wellness visits with low socioeconomics, parental education, and non-White race being additional predictors of this disparity. This is noteworthy in the context that for youth, a healthy transition period is a significant determinant of healthy adulthood experiences (Black et al., 2016; Freeman et al., 2018).

Screen Time and Healthy Weight Management Behaviors

A positive association was found from the study results between screen time > 2 hours/day and HWM behaviors among youth. In fact, of all health determinants included in the study, screen time > 2 hours was the only factor to display a significant and positive association with HWM behaviors. The arguments posed by Whitlock et al. (2019) and Spengler et al. (2015) that screen time was linked to increased family cohesion and did not specifically eliminate engagement in physical activity, positive social interactions, and outdoor physical activities among youth. These studies focused on the unhealthy outcomes while this study addressed the prevalence of the healthy preventive behaviors. Al-Khudairy et al. (2017) attested that obesity among youth is in fact a condition of concern that has been on the rise globally. The researchers posited that modification of risk will occur through behavior change interventions aimed at dietary and weight management activities (Al-Khudairy et al., 2017).

The study findings appear to challenge the findings of Keel et al. (2020) while simultaneously aligning with Sultana et al. (2020). Keel et al. and Sultana et al. found that screen time was positively associated with measured or perceived unhealthy weights.

However, Sultana et al. acknowledged that the positive relationship between screen time and unhealthy weight was most prevalent among individuals with sedentary lifestyles and other unhealthy behaviors. Further to this point made by Sultana et al., Marker et al. (2019) found that the association between screen-based gaming and body mass was small and more prevalent among adults than youth.

Mutz et al. (2019) argued that a focus on strategies to reduce screen time can be best operationalized in the presence of structured outdoor activities to represent a valid solution for mitigating the negative health impacts of screen time. Arguments related to the negative impacts of excessive screen time are derived from weak and to some degree unconvincing literature with significant limitations (Stiglic & Viner, 2019). The strongest of evidence is linked to obesity, depression symptoms, and quality of life. With that said, active versus passive screen time engagement speaks to the importance of messaging and enforcements through repetitive physical behaviors and cognitive efforts and reinforcement. This should not be overlooked when considering screen time as causation of negative health risk or outcomes.

Limitations of the Study

Although the primary data were not collected with the purpose of the secondary analysis in mind, they provided the appropriate data from a large representative population and contained variables that aligned with the secondary analysis variables and definitions. The greatest potential limitation of the study was the potential threats to the external validity that might have been present if there had been unseen errors in case selection, definition, coding, and operationalization of the most relevant variables for

analysis. Additionally, only health behaviors that could be deemed voluntary and not otherwise required for school attendance were included in the analysis.

The results of the study have been mostly consistent with existing evidence and addressed a research gap related to youth positive health behaviors in relation to screen time, while adding to the body of knowledge related to youth health outcomes. In this secondary analysis study, I used data from YRBSS 2019 data. The YRBSS data collection and analysis efforts have been executed every 2 years for 3 decades, and the data collection tool and strategies have been revised to meet the data needs as dictated by the social environment and dynamic public health needs of youth. The data were also collected at the national level, which afforded a large sample for analysis. The internal validity of this secondary analysis was bolstered by the strength of the primary data collection instrument and dataset. The primary dataset variables were operationalized to provide dichotomous variables for the secondary analysis using binomial logistic regression models.

Recommendations

The results of the study present several opportunities for further research. First, there is an opportunity for further research into social media and mhealth apps, which have the potential to play significant roles in the uptake of health strategies that can provide behavior change among youth who are most receptive to high impact media messaging. Further study of behavior changes among youth who engage with these platforms is recommended. The importance of the electronic media environment on youth health behavior and outcomes has also been reiterated. The assumption that screen time

among youth has both direct and indirect, positive, negative, and reciprocal influence on their behaviors provides an indication that alteration in messaging at the screen-level has the potential to influence behaviors such as voluntary HIV testing, condom use, seatbelt use, dietary consumption of vegetables, and weight management overall. Among youth, health information is triangulated, and searching digital media has been identified as the most common initial step to identifying a personal health problem and its solution. The triadic reciprocal of youth health noted from the study results has indicated the need for further research, policy, and practice that can intentionally develop and make readily available content and resources that can promote and support behavior change, specifically in youth where they go seeking health information and care.

Implications for Professional Practice and Social Change

The study results have shown clear evidence that youth will actively and voluntarily engage in health behaviors related to risk reduction for leading causes of death and disability. The study further shows that there is significant association between screen time and likelihood of engaging in health behaviors all while screen time continues to be trending up among youth. Therefore scholars, policy makers, and practitioners, now have further evidence to support lending direct efforts to bolstering the availability and of screen-based health content that has been tailored for youth specifically. Web-based strategies have been successfully employed across at-risk adult and pediatric groups to assess and promote mental and physical health. Yet, there is limited evidence to support the deliberate and specific application of internet-based tools to address youth risk despite clear evidence of engagement, to the degree of excess. As

teens are increasingly less likely to present to health and wellness visits (Daley et al., 2017; Larson et al., 2015) excessive screen time presents an essential point of access for health promotion and disease prevention interventions. One key finding expressed by Daley et al. (2017) is that there are too few health strategies specifically designed with an aim to screen and intervene for youth health despite the rate of mortality and morbidity associated with preventable conditions. Teen health and intentions towards personal health rely on a quality relationship with care providers. This echoes the importance of care practitioners' investment in reaching teens where they are regarding health promotion and digital landscape.

It may be time to shift the conversation of the association between youth health behaviors and screen time from being focused on youth with existing poor health outcomes to focusing instead on the relatively healthy youth at risk within the context of the existing environmental factors as a more proactive approach to youth health than the reduction of screen time to < 2 hours/day. This is especially important with youth observed gradual failure to uptake formal sources of preventative care. School health program efforts have been invaluable in this regard, but the value of effectively designed screen-based interventions in this digital era and with the challenges and changes stemming from the COVID-19 pandemic, cannot be overlooked within the youth population.

Beyond this, the influence and subsequent need for support of socio-political agents involved in health and technology advancements must be implemented with realistic expectations of outcomes from digitally driven health promotion strategies. This

is the undercurrent of this study. While the evidence of negative outcomes and associations between screen time use and health among youth from previous research is vital the results of the study implore practitioners and policymakers to act beyond reducing screen time trends but instead to recognize benefits to be derived from this trend if harnessed strategically at the appropriate levels.

Supporting the uptake of screen time especially among disparate youth groups may present a feasible strategy for reducing the global burden of health, as behaviors linked to health are developed in the teenage years (Keselman et al., 2019). However, Twenge and Farley (2021) recognized that different screen-based media activities will affect different youth in different ways. This highlights the need for further research and effort into providing screen-based content that youth might utilize especially as the COVID-19 pandemic has created an environment where screen time needs has increased. TIGER Initiative continues to push health practitioners towards competence and comfort with electronic resources that support safe and good quality healthcare. The study results strengthen the potential benefits to public health that relies on policy makers and practitioner commitment to harnessing screen-based interventions for youth health.

Conclusion

The study results have effectively identified associations between screen time and the selected health behaviors. They have allowed identification of some target sociocultural and personal determinants of youth health such as age and race. The results emphasize that black/AA youth are most likely to engage in screen time > 2 hours while having the least likelihood of engaging in voluntary health behaviors linked to leading

causes of death and disability among youth and young adults. Further, the study has provided additional evidence to prompt practitioner innovation in promoting youth health through screen-based strategies. The associations were generally positive for screen time > 2 hours and the selected voluntary health behaviors. With screen time > 2 hours being the only significant predictor of HWM behaviors. Although NVAIDP behaviors was negatively associated with screen time > 2 hours there remains opportunity for further research, policy and practice change to harness screen time trends in promoting youth health. As public health demographic youth present a unique audience with unique sociocultural and personal determinants of health. Applying the SCT as a framework for triadic reciprocity allowed appropriate reflection and interpretation of the findings that support the value of actively harnessing youth screen time trends as a primary health promotion strategy rather than condemning screen time for its negative impacts. Further research into youth screen time content and association with health behaviors is recommended. As well, policy, research, development, and accessibility of content specifically tailored to promote health behaviors and healthcare access among youth should be a primary focus of screen time debates.

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