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CHRONIC DISEASE MANAGEMENT & FITNESS TRACKERS THROUGH THE LENS OF THE HEALTH BELIEF MODEL & DIFFUSION OF INNOVATIONS THEORY

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LENS OF THE HEALTH BELIEF MODEL & DIFFUSION OF INNOVATIONS
THEORY

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Abstract

Chronic disease has become one of the leading causes of death in the United States. The purpose of this project is to understand the motivation behind health behaviors that individuals engage in to prevent, manage, or treat chronic diseases. By simultaneously examining chronic disease and fitness trackers through the Health Belief Model *and* The Diffusion of Innovations Theory, external factors are exposed that influence perceptions and lead to purchase decisions. Incorporating the cost-benefit analysis of the devices confirms that associated risks and questions of accuracy do not prevent product purchases or the belief that it can improve health. Moreover, the infiltration of technology into the health field is changing health communication. The use of social media proves to be the most influential tool in purchase decisions, which are now considered health behaviors. Thus, it is beneficial to apply this information to the development of future health products and to improve health education to mass audiences.

As healthcare costs burden the nation, it is unclear how Americans have lost control through the growth of consumerism in the health industry. Regardless of any "effort" to create a healthier country, America continues to struggle with obesity dominating among the population. As the richest country, with the most advanced technology, and 24/7, immediate access to personal data/numbers: how can this be true? Naturally, people are inclined to place the fault on the individual, considering they have control of personal health and food choices. However, many theories have been proposed over the years to explain the developmental changes that people undergo over the course of their lives. Since development is a life-long process (Baltes & Reese, 1984), the analysis is concerned with changes in the psychosocial functioning of adults as well as with those occurring in childhood (Bandura, 1989). Human expectations, beliefs, emotional bents and cognitive competencies are developed and modified by social influences that convey information and activate emotional reactions through modeling, instruction, and social persuasion (Bandura, 1986). Therefore, outside influences, including media, have significant impact in an individual's lifestyle choices, particularly in terms of health behavior.

In the 1950s, the Health Belief Model was developed as a way to explain why screening programs offered by the U.S. Public Health Service, particularly for tuberculosis, were not very successful. The underlying concept of the original model is that health behavior is determined by personal beliefs or perceptions about a disease and the strategies available to decrease its occurrence (Hochbaum, 1958). Furthermore, social and technological changes alter, often considerably, the kinds of life events that become customary in the society. Indeed, many of the major changes in social and economic life

are ushered in by innovations of technology (Bandura, 1989). Similarly, the Diffusion of

Innovations Theory can be applied to explain how, over time, an idea or product gains

momentum and diffuses (or spreads) through a specific population or social system

(Rogers, 1983). Therefore, the purpose of this project is to apply the Health Belief Model

to chronic disease in America by examining perceptions and behaviors based on health

communication through media, while applying the Diffusion of Innovations Theory to

fitness trackers (a proposed strategy to decrease chronic disease) to understand the

motivation towards purchasing these products in an effort to improve health.

Chronic Disease in America

An "epidemic" is defined as a widespread occurrence of an infectious disease in a

community at a particular time. Despite the fact that chronic disease is non-

communicable and has spread less rapidly than a communicable disease, it's impact is

just as devastating. In 1980, the number of adolescents with type 2 diabetes was zero. In

2010, only 20 years later, that number increased to 57,658 (*Fed Up*, 2014). Furthermore,

according to statistics from the World Health Organization (WHO), "non-communicable

diseases are responsible for 63% of deaths worldwide, double the number of deaths from

infectious diseases (including HIV/AIDS, tuberculosis, and malaria), maternal and

perinatal conditions, and nutritional deficiencies combined" (U.S. Department of State).

Government

The World Health Organization considers "unhealthy lifestyles" to be a common

misunderstanding in the chronic disease epidemic. The individual cannot be held solely

responsible for their health, considering the environment is a vital component. Therefore,

"governments have a crucial role to play in improving the health and well-being of

populations, and in providing special protection for vulnerable groups" (World Health

Organization, 2005, p. ix). Upon President Obama's inauguration, Michelle Obama

issued a call to action through a campaign called "Let's Move." Initially, this campaign

called to change products, cut child marketing, and improve nutrition. Coincidentally,

this terrified the food industry – so they volunteered to help. A "Healthy Weight

Committee," was implemented that consisted of Kelloggs, Coca-Cola, Pepsi, Mars, Kraft,

Hersheys, and Sara Lee. The companies made public announcements about the upcoming

changes/enhancements to food products and claimed they would be "removing 1.5 trillion

calories from the marketplace (*Fed Up*, 2014)," which breaks down to about 14 calories a

day per child. The initial focus quickly shifted from buying whole foods, shopping at

farmers markets, and making home cooked meals to reinventing processed foods and

encouraging more to exercise. The same companies reduced fat and increased sugar more

than the first time around, further proving that they are in the business of making money,

not food. Meanwhile, Michelle Obama's campaign shifted from a call to action on issues,

as she specifically stated "it is not about demonizing any industry," to an exercise

focused campaign. On the surface, the government is in full support of building a healthy

country. However, another perspective to consider is the government's position in public

health communication and disease management while maintaining a "healthy" economy.

Perhaps President Obama was making a true effort in 2010, when he signed the

Patient Protection and Affordable Care Act (ACA). Along with the Health Care and

Education Reconciliation Act of 2010, the law put in place comprehensive health

insurance reforms. The law makes preventive care—including family planning and

related care—more accessible and affordable for many Americans. However, the

continued increase in obesity rates, chronic disease and healthcare costs prove otherwise.

Michael Moore, CEO of PHAA and president of the World Federation of Public Health

Associations, says the government only invests 1.5% into prevention for chronic diseases.

Although it is true that individuals ultimately have to take responsibility for their own

health, it is obvious that valuable government oversight is also imperative.

Healthcare

The Patient Protection and Affordable Care Act (PPACA) stands as one of the

most significant reforms to the United States healthcare system. Signed into law by

President Obama in 2010, the Affordable Care Act (ACA) aimed to increase the quality

and affordability of healthcare, while reducing the number of uninsured Americans.

Consequently, the ACA led to increased healthcare costs for businesses, causing many

employers to search for cost-effective solutions. Legislators designed the ACA with the

goal to put consumers in charge of their health care by offering new benefits, rights and

protections. The law provides Americans with access to affordable health insurance by

creating the health insurance marketplace and aims to improve the quality of health care

while reducing costs by offering free preventive care, protection against health care fraud

and small business tax credits. Additionally, the ACA offers new consumer protections

for pre-existing conditions and consumer assistance. The ACA was intended to regulate

the health insurance industry by holding insurance companies accountable. Overall, it

helps 32 million Americans who are eligible for health care coverage, but could not

afford it before, and 95% of Americans will be insured under the plan (DeMichele, n.d.).

As the Affordable Care Act has developed over the last five years, there is one common

theme that individuals, businesses, and insurance companies cannot downplay – costs are

dramatically increasing. As costs increase, the new "wellness" world has developed with an emphasis on preventative care that has not only taken over in healthcare settings, but in businesses, schools, and even retail stores. Each of these entities has developed a new way of functioning when it comes to health that highly impacts the individual person.

Employer cost control. Defined by the Centers for Disease Control and Prevention (2015) as "a health promotion activity or organization-wide policy designed to support healthy behaviors and improve outcomes while at work," wellness programs present as an organizational solution to rising health-related costs. The variety of wellness programs and the different prevention levels they can target ensure that a wellness program can be customized to fit the specific health-related needs of an employee population. In addition, research has indicated that businesses with well executed wellness programs are likely to see a significant return on investment. Companies are also finding ways to utilize fitness trackers, devices, and even apps to hold employees accountable at all times for their health decisions. However, many companies have yet to see the return on investment from wellness programs. As employers invest more money into programs to try to keep employees engaged and numbers dropping, it is not always a win/win situation. More often than many would like to admit, money is lost to employee wellness programs. Admittedly, at the end of the day, businesses are in between a rock and a hard place. Healthcare costs could eventually become nearly impossible to afford. Yet, with no proven solution that decreases health costs, they are continuing to spend on standard healthcare costs and now top notch wellness programs to help draw in the best candidates to fill job openings.

Individual cost. The Kaiser Family Foundation's 2015 Employer Health Benefits Survey indicates the cost for health insurance and what employers pay. In 2015, the average premium costs were $6,251/year for single coverage or $17,545/year for family coverage. On average, employers paid $5,179 annually (83% of the premium) to cover a single employee or $12,591 annually (72% of the premium) to cover a family (Merhar, 2015). Costs are split between the employer and employee. Perhaps the largest penalty that employers face is the "Cadillac Tax" that will be in effect beginning in 2018. The government has set "max amounts" for plan costs in order to classify "high cost health plans." Therefore, any plan that exceeds $10,200 for single coverage and $27,500 for family coverage will be faced with a 40% excise tax penalty. Additionally, as the purpose of the ACA is to provide affordable health coverage to all individuals, any employee or citizen without health coverage will be responsible for paying a tax penalty for any month in which coverage was not elected. It is important for consumers to understand the penalties that they face as individuals, if they do not make any election under current law. Furthermore, it is critical to point out the increase in consumer spend as health declines across the nation. Considering over 75% of national health spending is attributed to chronic diseases that are mainly preventable, while less than 5% of national health spending is allocated to public health and prevention (Petersen, Rushing, Nelson, & Rhyne, 2016), it is clear that consumers are not driving healthcare to work to their benefit.

Disease Management: Eat Less, Exercise More

According to Boston Medical Center, "an estimated 45 million Americans diet and spend $33 billion annually on weight-loss products" (2017). However, 97% of dieters

regain their weight back within three years (Brown, 2015). Studies prove that weight-loss programs that include intervention are most effective, but interventions are not realistic for long-term, daily lifestyle health behavior. Considering "fad diets" and weight-loss plans have not been successful for people in the past, they seek other solutions that appear to be more obtainable without daily intervention and most importantly, are long-term. Moreover, the same individuals likely have lower self-efficacy, leading them to feel incapable of finding health through diet and exercise alone considering they have already tried and failed.

Likewise, statista.com explains, "the number of fitness center memberships in the United States has steadily increased over the last decade. By 2014, over 54 million people were members of one of the nearly 35 thousand health clubs in the United States. The total fitness center industry revenue in the U.S. amounted to 24 billion U.S. dollars in 2014, almost 90 percent of the region's total revenue" (2016). However, as gym memberships increase, obesity rates also continue to rise. As the obesity chart shows, percentages continue to be alarming (Centers for Disease Control, 2014).
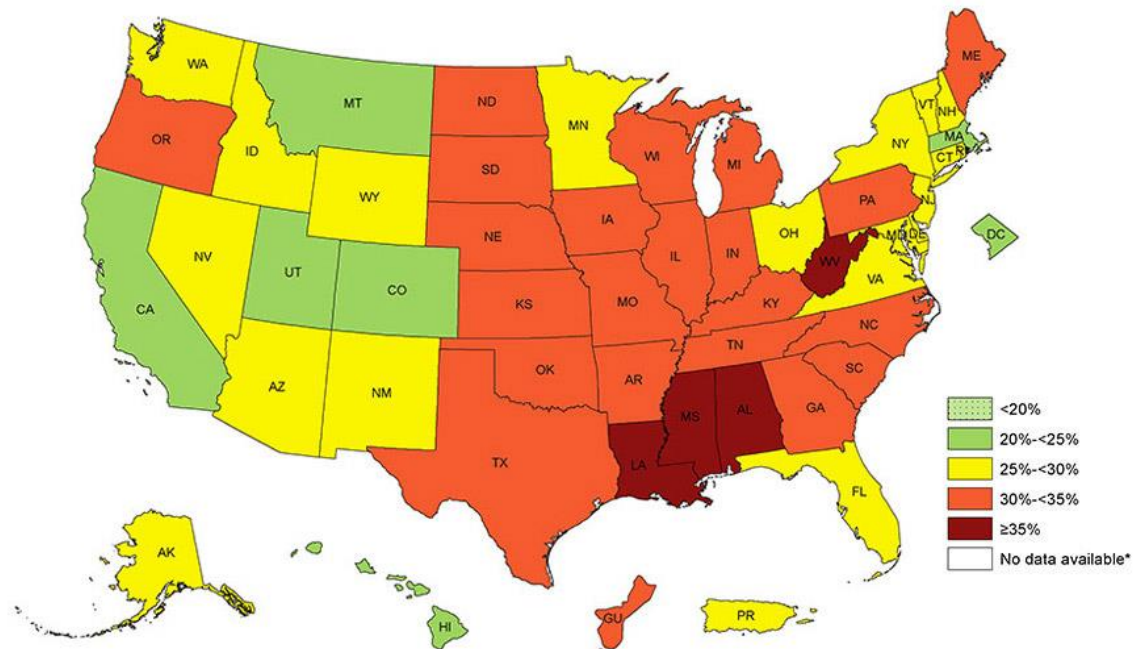
Figure 1. Prevalence of self-reported obesity among U.S. adults by state and territory, BRFSS, 2015. This figure illustrates the high obesity percentage rates across the U.S. Taken from: Centers for Disease Control and Prevention. (2015). Retrieved from https://www.cdc.gov/obesity/data/prevalence-maps.html

e-Health. During a "Health-literacy-sensitive diabetes self-management study" in 2016, written communication strategies were effective in improving some cognitive and psychological outcomes, but not self-care or health status (Kim & Lee). As consumerism advances, the internet is not always considered efficient enough for individuals to manage their health. It became essential to have on-the-spot data. Thus, the traditional wrist watch has been replaced in today's world. Telling time is nothing impressive as individuals reach for greater satisfaction through electronics, including the device they choose to wear on their wrist. By tracking steps, heart rate, sleep patterns, and calorie burn, people now rely on these electronic devices to determine their health status. Additionally, it is a great way for them to share in their achievements by instantly posting stats, goals met, miles ran, and more to Facebook, Instagram, and Twitter. Research finds that the use of mobile fitness apps and sharing of that data with social networks show

potential in technology changing the mindset of fitness and health (Vickey, Breslin, & Williams, 2012). Furthermore, considering the costs now range from $50-$500 for these devices, the appeal is to save on continuous and confusing health care costs with a one-time purchase for a product that allows them to self-manage.

Health Belief Model

The Health Belief Model (HBM) is a conceptual framework used to understand health behavior and possible reasons for non-compliance with recommended health action (Rosenstock, Stretcher, & Becker, 1988). It can provide guidelines for program development allowing planners to understand and address reasons for non-compliance. The HBM addresses four major components for compliance with recommended health action: perceived barriers of recommended health action, perceived benefits of recommended health action, perceived susceptibility of the disease, and perceived severity of the disease. In addition, there are modifying factors that can affect behavior compliance. Modifying factors would include media, health professionals, personal relationships, incentives, and self-efficacy of recommended health action (Turner, Hunt, DiBrezzo, & Jones, 2004).

The Health Belief Model
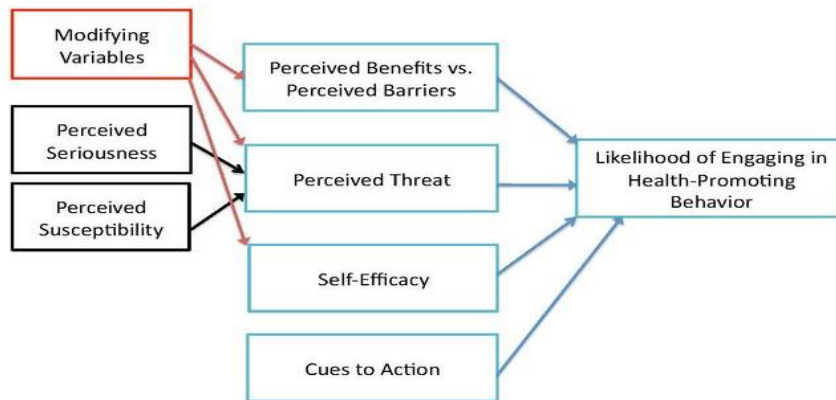
Figure 2. The Health Belief Model. This particular conceptual model best guides the purchasing decisions by including modifying variables in personal health care choices. Taken from: Kaewsutha, N., Intarakamhang, U., & Duangchan, P. (2014). *A causal relationship model of oral hygiene care behavior and the oral hygiene status of early adolescents* (PowerPoint Slides). https://www.slideshare.net/nathawutk/iprc2014-presentation-nathawut-12-aug-2014

According to Fishbein and Cappella (2006), "during the past decade, there has been a growing recognition of the usefulness of behavioral theory in the development of behavior-change interventions" (p. 5). Therefore, the health belief model, as shown above, can be applied to the current chronic disease epidemic to better understand how individuals' behavior alters standard health recommendations (eat healthy, exercise often, avoid tobacco) to prevent disease by purchasing and utilizing fitness trackers. The model will serve as a "roadmap" to further analyze the influence health communication has in the decisions people make and actions they take in terms of health on a daily basis.

Diffusion of Innovations Theory

As this essay analyzes the chronic disease epidemic with the Health Belief Model, it will integrate the Diffusion of Innovations Theory (DOI) to further explain how the proposed strategy for solving the disease, fitness trackers, have become necessary to health management in society, making many people feel the need to purchase these

products. Considering the questionable accuracy and effectiveness of fitness trackers, it

is a wonder how they have such a substantial presence in living a healthy lifestyle. There

is no doubt that the media have a part in this through product promotion. The mass

media's most powerful effect on diffusion is that it spreads knowledge of innovations to a

large audience rapidly. However, each member of the social system faces his/her own

innovation decision that follows a 5-step process: 1.) Knowledge, 2.) Persuasion, 3.)

Decision, 4.) Implementation, and 5.) Confirmation. The innovation-decision is made

through a cost-benefit analysis where the major obstacle is uncertainty. People will adapt

to an innovation if they believe that it will, all things considered, enhance their utility

(Rogers, 1985). It is essential to understand how and why media influences people's

ability to overcome that uncertainty with the purchase of health and wellness products,

such as fitness trackers. However, to effectively do so, the model will not solely focus on

the product. Rather, it is necessary to consider and incorporate the health risk directly into

the overall decision-making process.

DOI: Knowledge & HBM: Perceived Susceptibility, Severity, and Threat

      Knowledge. According to the Diffusion of Innovation Theory, knowledge is the

first step in a person's own innovation-decision making process. At this point, a person

becomes aware of an innovation and has an idea of how it functions (Rogers, 1995).

      In any case, knowledge of the health risk should be present prior to the product

knowledge. The chronic disease epidemic and potential wellness solutions have become a

major topic for daily news. Thus, awareness of the health decline across the nation is not

an issue that is unknown to the population. However, as individuals seek solutions for

personal health or for those around them, it is important to examine how they choose to

gain knowledge on the topic considering this ultimately impacts their actions, health behavior, and purchases.

Perceived susceptibility. According to the HBM, perceived susceptibility is one's opinion of chances of getting a condition. The World Health Organization has identified common misunderstandings with chronic disease that seem to directly impact one's perceived susceptibility to the epidemic. First is the idea that chronic diseases mainly affect high income countries. The reality is that four out of five chronic disease deaths are in low and middle income countries. Likewise, "low and middle income countries are at the centre of both old and new public health challenges" (World Health Organization, 2005, p. 9). Similar to the global issue, the disease does not discriminate based on wealth, location, age, or sex in the United States. "During 2009-2010, more than one-third of adults, or about 78 million people were obese. Nearly one out of five youth aged 2-19 years was obese" (Centers for Disease Control).

Health literacy. The development of chronic conditions such as cardiovascular disease and diabetes is largely associated with lifestyle behaviors (Mackey, Doody, Werner, & Fullen, 2016). This means that self-management is required, which assumes that individuals have a strong level of health literacy in their everyday life. Health literacy is "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (CDC, 2016). Health literacy can be a barrier or a facilitator to chronic disease management, but current studies mainly focus on the weaknesses it provides for consumers as they do not understand the extent of damage the disease can do to their body. It is important to note that individuals are not only on different pages with the

privacy issue, but also conflicting levels of understanding (health literacy). In 2010, a study found that perceived health information sensitivity has an influence on privacy concern, which is impacted by health status and personality traits. Personality traits influenced perception of health information sensitivity with emotional instability increasing the sensitivity. Poor health status also increases information sensitivity and therefore also influences privacy concern (Bansal, Zahedi, & Gefen, 2010).

Perceived severity. Although many people are aware of the chronic disease issue in America, many continue to neglect the best prevention tactics in their daily life. For example, according to the CDC, "86 million American adults – more than 1 out of 3 – have pre-diabetes. What's more, 90% of people with pre-diabetes don't know they have it" (2017). Additionally, the World Health Organization identifies the three common, modifiable risk factors for chronic disease: unhealthy diet, physical inactivity, and tobacco use. Each year, "4.9 million people will die as a result of tobacco use, 2.6 million from being overweight or obese, 4.4 due to raised total cholesterol levels, and 7.1 million people will die as a result of raised blood pressure" (World Health Organization, 2005, p.6).

Self-management. With the infiltration of technology into society, self-management dominates health care today. "Patients must become responsible for daily management of their chronic diseases; this includes behavior changes, emotional adjustments, and accurate reporting of disease trends and changes. Health professionals must turn into teachers and advisors, helping patients develop disease management skills, and partnering with patients in the medical management of their conditions. The healthcare system must become the organizer and financial supporter of these new roles"

(Linnell, 2005, p. 189). Self-management is defined as the ability of an individual, in conjunction with family, community, and health care professionals to manage symptoms, treatments, and lifestyle changes. This is the epitome of health care today. The irony in this concept is that "self-management" (as described) has little to do with the individual person's healthy lifestyle and prevention of chronic disease. Instead, it includes assistance or *influence* from family, community, professionals and drives the focus on symptoms, treatments and lifestyle changes. Allowing outside influences to encourage behaviors one way or another is common, but it is not always good. This ultimately leads to the sharing of personal information, releasing privacy rights, and sharing consumer insight for more effective target marketing to sell products, rather than health promotion and disease prevention.

Perceived threat. Despite numerous obesity studies and news reports on how unhealthy eating and inactivity are recipes for chronic disease or worse, a new survey finds Americans aren't getting the entire message. The survey found that many Americans know about heart disease and diabetes as major health risks from obesity, but few realize other conditions including cancer, arthritis, sleep apnea and infertility are tied to having excess weight (Harvard School of Public Health, 2013). With data directly linking obesity to cancer, it is obvious that connection is not prominent enough in people's perception of the severity of chronic disease, causing them to believe that it is not an immediate concern. Until the disease reaches the level of cancer, it is perceived as curable and people have hope for a healthy future…starting Monday. Therefore, as individuals weigh the options of recommended health behaviors to prevent, manage or

treat chronic disease, it is important to consider the risk associated with non-compliance despite the efforts people appear to make towards improving health.

DOI: Persuasion & HBM: Cues to Action

Persuasion. According to the Diffusion of Innovations Theory, this is the point where a person forms a favorable or unfavorable attitude toward the innovation (Rogers, 1995).

Knowledge and concern for chronic disease has been exposed to the general public and hopefully explained through physician or public health efforts. At the same time, diet and fitness industries gear up for advertising and marketing efforts to promote their product and it's assistance in daily health behaviors. This leaves the individual to consider the options towards maintaining a healthy lifestyle.

Cues to action. As individuals become more aware of the chronic disease issue, they seek viable strategies to manage health, avoid disease, and keep healthcare costs down by eating healthy, avoiding tobacco use, and exercising regularly. Generally, patients spend 99.98% of their life outside of the Doctor's office, where they make their own decisions (Petersen et al., 2016). In an effort to make the best decision, people today are careful to do research prior to taking action.

The internet. In 2014, 78.8% of U.S. citizens reported having searched for health information on the internet (National Cancer Institute). The internet may pose a formidable communication channel for helping advance health literacy in the United States. During the past decade, "the internet has become an important medium in terms of population health, with its strengths well documented, including availability of a wide range of information, reduced cost, increased access, ability to overcome time and space,

real-time interaction, tailoring of content and anonymity" (Jiang & Beaudoin, 2016, p. 240). Additionally, the internet "can spur improvements in their medical knowledge, sense of patient empowerment, self-presentation during medical encounters, and self-management skills" (Jiang & Beaudoin, 2016, p. 240).

As chronic disease has rapidly spread, health has become a main focus of research on the national and individual level. However, health information is not always sought out from a provider. In 2016, health related studies had more reach on social media and other online platforms than other scientific studies. Additionally, the fifth "most-discussed" article was an analysis claiming the sugar industry has downplayed the links between sucrose and coronary heart disease (Pew Research Center). On the individual level, a 2014 national survey found that "seven-in-ten (72%) adult internet users say they have searched online for information about a range of health issues, the most popular being specific diseases and treatments" (Pew Research Center).

Health topics

The % of internet users in each group who have looked online for this type of information in the past 12 months

Have you looked online for information about …	No Chronic Conditions n=1,325 (a)	1 Chronic Condition n=630 (b)	2+ Chronic Conditions n=437 (c)
A specific disease or medical problem	52	59[a]	62[a]
A certain medical treatment or procedure	41	42	53[ab]
How to lose weight or how to control your weight	27	25	27
Health insurance (private, Medicare or Medicaid)	24	25	29
Food safety or recalls	18	22	21
Drug safety or recalls	15	17	21[a]
Caring for an aging relative or friend	14	15	14
A drug you saw advertised	13	19[a]	20[a]
Medical test results	13	17	18
Pregnancy and childbirth	13[c]	12[c]	6
How to reduce your health care costs	10	13	12
Any other health issue	18	23[a]	26[a]
Yes to any of the above topics	71	73	76

Source: Pew Internet Health Tracking Survey, August 07 – September 06, 2012. N=3,014 adults ages 18+. Interviews were conducted in English and Spanish and on landline and cell phones. Margin of error is +/- 3 percentage points for results based on all internet users.
Note: Percentages marked with a superscript letter (e.g., [a]) indicate a statistically significant difference between that column and the column designated by that superscript letter, among categories of each demographic characteristic (e.g. age).

Figure 3. Pew Internet Health Tracking Survey. This table shows that people with more than one chronic condition are more likely to search online for information regarding a disease and/or treatment. Taken from: Fox, S., & Duggan, M. (2013). Part two: Sources of health information. *Pew Research Center.* Retrieved from http://www.pewinternet.org/2013/11/26/part-two-sources-of-health-information/

Contrastingly, it is too often that Americans rely on the internet or technology as a solution for health. Meaningful use is not about technology. Technology is the tool, but meaningful use is about improving health and transforming healthcare (Institute of Medicine, 2011). Moreover, studies show that people often do not question online health information (OHI) quality and use incorrect criteria to evaluate it (Divianni, van den Putte, Meppelink, & van Weert, 2016). In other words, the availability of information is convenient, but the lack of education prior to applying the information can be dangerous. The internet is a valuable source of information, but such use requires some sort of rating
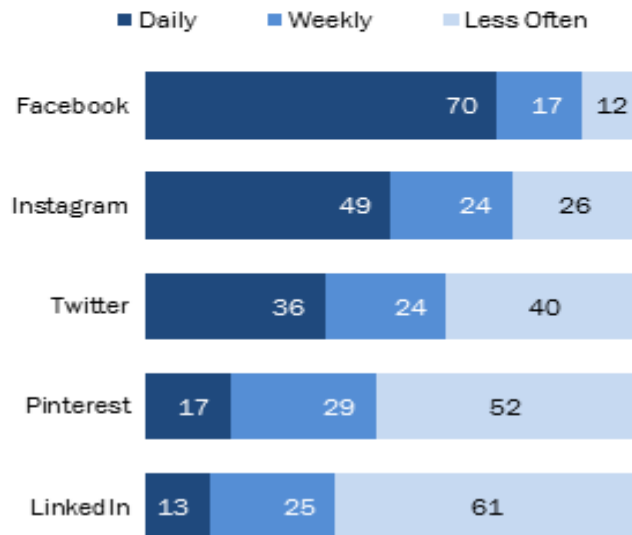
for people to know which health information is accurate and easy to understand (CDC, 2016). The quality of the information should not be left up to the consumer to decipher between good and bad. Considering the inability for individuals to decipher between good or bad health information, how reliable is a person for determining their health status based on the results given through a fitness tracker? Furthermore, it is questionable as to whether these devices are actually being used to improve health or to "fit in" with society and having some data to post on their personal Facebook or Instagram account.

      Social media. Similarly, social media and social interaction has the potential to empower people by knowing more about their health condition (Fatima et al., 2015). According to Pew Research Center (2015), Facebook is the most popular social media outlet with 72% of adult internet users, followed by Pintrest at 31%, Instagram at 28% and Twitter at 21%. Another study exemplified the frequency of exposure through social media:

Frequency of social media site use

% of social media site users who use a particular site with the following frequencies (% is reported among each specific site's user groups, e.g., 70% of Facebook users use the site on a daily basis)

■ Daily ■ Weekly ▢ Less Often

	Daily	Weekly	Less Often
Facebook	70	17	12
Instagram	49	24	26
Twitter	36	24	40
Pinterest	17	29	52
LinkedIn	13	25	61

Figure 4. Frequency of social media site use. This displays the most influential social media channels for health information. Taken from: Duggan, M., Ellison, N., Lampe, C., Lenhart, A., Madden, M. (2015). Social media update 2014. *Pew Research Center*. Retrieved from http://www.pewinternet.org/2015/01/09/social-media-update-2014/

Additionally, the most common uses for social media in health communication is

increasing interaction with others, and facilitating, sharing and obtaining health messages

(Moorhead et al., 2013). Considering the expanded outreach social media has across

various demographics and populations, it is no surprise that this has become a prime

channel in health communication and influence towards health behavior.

> ***Wearable Technology.*** In 2014, wearable technology was a $700 million industry

(Abramovich, 2014). As of September, 2016, wearable devices grew by 26.1%

(International Data Corporation). It is clear that technology is the best way to connect,

inform, and influence individuals toward a product. Therefore, it should come as no

surprise that fitness wearable companies utilize social media and online advertising as the

primary method of advertising and marketing. Fitbit spent the most on advertising, investing $26.1 million, followed by Garmin at $18.7 million and Samsung at $11.6 million (Pai, 2014). More specifically, "Fitbit dominated social media mentions; the company had a 79 percent 'share of voice,' while Nike+ Fuelband had 9 percent share of voice, and Jawbone had 4 percent, according to Kantar Media" (Pai, 2014). Consequently, Fitbit significantly surpasses the other wearable devices at this time in terms of unit shipments, market share, and growth proving that its investment in advertising was worth the cost. This information is significant as people search for solutions to gain control of their health in a "DIY" way. Wearable fitness trackers are one of the most prominent solutions presented through the various search engines and media outlets where individuals seek most of their information to prevent, manage, or treat chronic disease.

DOI: Decision & HBM: Self-Efficacy

  Decision. The third step in the innovation-decision process is the decision. The person engages in activities that lead to a choice to adopt or reject the innovation (Rogers, 1995).

  After initial research and consideration of methods to control health in their daily lifestyle, a person must make a decision towards the actions they will take to improve health behaviors. The decision that the person makes is impacted significantly by self-efficacy. As one considers options for a new diet plan, fitness regimen, or lifestyle change, such as quitting smoking, it is common to question the ability to carry-out the proposed change, especially when considering it long-term.

Self-efficacy. Counting calories, interpreting food labels, walking 10,000 steps, and burning 'x' amount of calories are common recommended behaviors to achieve health. Prior to fitness trackers, none of these were maintainable goals. Therefore, fitness trackers have given people an opportunity to better understand their daily activity and where they might fall short. Additionally, it allows them to have a concrete goal and know instantly whether they met it or not. "Bandura argues that self-efficacy information derives from four sources: enactive, or performance attainments; vicarious experience; verbal persuasion; and physiological state. Furthermore, performance accomplishments are the most influential sources of efficacy information because they are based on personal mastery experience" (Rosenstock, Strecher, & Becker, 1988, p. 180). Fitness trackers offer a sense of hope as they give individuals a measurable solution to weight-loss or healthy lifestyle habits, ultimately increasing their self-efficacy.

Fitness trackers. There are many potential applications through health information gathered by fitness trackers. A study led by Lockhart, Pulickal, and Weiss (2012) identified possible uses depending on the status of the user. For end users, fitness trackers could be used for fitness tracking, health monitoring, fall detection, context-aware behavior, home and work automation and self-managing systems. For third parties, fitness trackers could be used for targeted advertising, research platforms for data collection, and corporate management and accounting. For crowds and groups, fitness trackers could be used for traditional social networking, activity-based social networking, and activity-based crowd sourcing.

According to a national United States (US) survey completed in 2012, 69 % of adults tracked at least one health indicator for themselves, a family member, or friend

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using a tracking device (such as an activity tracker), paper tracking, or another method. From this survey, 60 % of adults reported tracking weight, diet, or exercise. In addition, 21% shared that they used some form of fitness device to measure this information, and 46% shared that tracking this information motivated them to improve their lifestyle in terms of health (Evenson, Goto, & Furberg, 2015).

DOI: Implementation & HBM: Perceived Benefits and Barriers

      Implementation. According to the Diffusion of Innovations Theory, implementation involves putting the innovation to use (Rogers, 1995).

      After researching the product and making the decision to purchase the most suitable fitness tracker in an effort to improve health, the individual will begin to understand the ways to use the product for their own needs and preferences. Furthermore, as they implement the device into their daily routine, the individual will re-evaluate the product from a personal and exploratory standpoint, rather than as an abstract product.

      Perceived benefit: Health information sharing. People constantly share their health information via Facebook, Twitter, and/or Instagram. Similarly, they have the opportunity to join on line support groups and share experiences or their fitness journey through support groups. One study found that social media such as Facebook already plays a large role in patients' lives as it helps patients to understand their health conditions and gain support from other people who suffer from the same condition. However, there are major concerns for those patients as their privacy and confidentiality can be harmed by improper use of their posted sensitive health information by governments, hospitals or individuals (Asiri, E., Asiri, H., & Househ, 2014). Health and fitness information retrieved from devices can be shared with employers to serve a

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purpose. It is interesting to examine how this information fits into the role of businesses and health insurance. In an article provided by the *Australian Financial Review*, it suggests that employers can use the data retrieved from Fitbits to analyze whether employees are stressed to try and prevent future issues. Additionally, they noted a positive difference in employees who were already wearing fitness trackers (Nickless, 2015). Thus, employers can improve employee wellness by utilizing that data retrieved from fitness devices and trackers. The data can also be used as incentives to lower employee health premiums or additional rewards for reaching health goals.

Perceived benefit: Self-management. Similarly, a positive perspective in sharing this information is the ability to be proactive in healthcare and disease prevention, while delivering more accurate information straight to one's physician. Incorporating electronic fitness trackers into the primary care setting is beneficial and should be implemented in order to improve health through diet and exercise. Moving forward, patient-generated health data and patient self-management will only become more prominent. By integrating that data into their electronic patient portal with a primary care physician it is not just the patient's word anymore – it is more accurate and allow the provider to intervene more effectively (Stukenberg & Fries, 2015). Therefore, those with devices prove to care about personal health and fitness by delivering more accurate results to their providers.

Perceived benefit : Engagement. Fitness trackers allow for individuals to find ways to enjoy healthy activities. In a 2015 article, Dr. Klein discusses his personal experience with using fitness trackers in both his patients, and his family. He notices a difference between adults using fitness trackers, and children or teens using fitness

trackers. Additionally, using the fitness trackers are a great way of promoting communication and encouragement throughout individuals of different generations. It gives people a common denominator to talk about and many of the models can set up groups or challenges that can bring families or groups of friends together (Klein, 2015). Ashley Ross of Time Magazine also examines the game-like world of fitness trackers and the increase of competitiveness for users of health applications and wearable wristbands. She specifically cited Flywheel's CEO, Ed Kinally, who explained that individuals are focused on not only beating their own personal record, but also the records of others as well (2015). Thus, in a world where video games have replaced outdoor activities, fitness trackers offer a game-like competition that could increase movement among children, teens, and adults. Furthermore, trackers might people feel like they are part of a virtual health community.

Perceived barrier: Privacy. Traditionally, health information that should be protected embodies any sort of information pertaining to an individual's health. However, with technology and trackers today, a door has been opened through *fitness* that encourages people to actually share *health* information, potentially relinquishing protected rights to that information. In a study with 256 participants, most were interested in protecting their health data but many would be willing to exchange privacy or security if there were certain perceived benefits to either themselves or others (Atienza et al., 2015).

Despite benefits and willingness to share health information, it is still important that the patient or person whose information it is has control over it and any sort of distribution that goes along with it. In *Findings from a Mixed-Methods Study*, participants

indicated a high desire to control who accessed their data as well as when and where. Participants were generally uncomfortable with the idea of transmitting health information via mobile devices to insurance companies, Internet companies or other businesses while some were more willing to send information to doctors that they trust or have a relationship with (Atienza et al., 2015). However, through the use of fitness trackers, electronic devices, and social media – that control is not guaranteed. In an article, Kat Austen identifies two problems that must be solved before wearable devices develop any further – 1. Finding improved ways to transmit data to and from wearables and 2. Keeping all of that information safe. Users worry about inputting vulnerable information into these devices and uploaded to a company that could change terms of service, be bought out, or go out of business – no longer protecting their personal information. Ironically, these were many of the same concerns people had when the internet first came about. Despite the fact that many companies claim to be safe or private, an information-management company (Symantec) revealed that many health monitors can be easily tracked. Likewise, encrypting data is not necessarily as secure as it sounds (Austen, 2015). A study by Peter Sayer (2016) went behind the scenes to purposefully breach privacy and view people's private information via these apps and trackers to prove that the individual is not the only one tracking their fitness – developers and other users have that access as well.

Another consideration is what exactly is being shared about the individual, to whom and for what purpose. As fitness trackers advance in capabilities, the extent of what they are able to track and be privy to is of concern. In a cross-sectional web survey conducted on patients 18 years or older or parents of patients, majority of repeat PCHR

users are willing to share personal health data to other providers to support patient care and with public health authorities to support health management and research. While many respondents were willing to share their information for some perceived benefit, worry over who will receive the information and what they will do with it is still prevalent. In addition, many were less willing to share sensitive information (substance use, STDs, genetic information). In the same sense, individuals would hesitate to share certain health information freely if fitness trackers were able to allude to that health issue in any way (Weitzman, Kelemen, Kaci, & Mandl, 2012). More importantly, users are hesitant to share this information with their own doctor's to assist in monitoring their health. In a study conducted on individuals within a patient portal, only about 500 out of about 80,000 were willing to share the information pulled from trackers with their provider (Pevnick, Fuller, Duncan, & Spiegel, 2016). Ironically, those patients with the highest risk were the most hesitant to share the information.

Perceived barrier: Health literacy. It is important to remember that individuals are not only on different pages with the privacy issue, but also conflicting levels of understanding (health literacy). In 2010, a study found that perceived health information sensitivity has an influence on privacy concern, which is impacted by health status and personality traits. Personality traits influenced perception of health information sensitivity with emotional instability increasing the sensitivity. Poor health status also increases information sensitivity and therefore also influences privacy concern (Bansal, Zahedi, & Gefen, 2010). A healthy person or someone who is engaging in healthy habits is more likely to utilize trackers and worry less about privacy (less sensitive) than someone whose health is at risk or inferior that would be more sensitive to health information

becoming public or unknown entities having access. In an extensive study conducted by Linda Ackerman (2013), she examined the technical analyst and the user. It was concluded that privacy is not necessarily a priority for application developers and users often look beyond the importance of privacy and security when purchasing such devices. Furthermore, as fitness trackers are used today to determine health, it is questionable how many of the users understand the information derived from these devices in terms of their health and making improvements in lifestyle choices.

      Perceived barrier: Accuracy. Ironically, many fitness trackers out on the market have not yet been tested for accuracy and even those that have might only measure larger more exerting movements, not giving a true reading on results and numbers (Kolterjahn, 2015). In a study with 20 participants (10 male, 10 female), each wore a Fitbit classic on their hip, only to discover that the device was significantly off (Sasaki et al., 2015). Depending on what these devices measure, inaccuracies could be detrimental in people's health and fitness progress and development. As they become more prominent in individual's long, healthy life – it is pertinent that they are accurate. The proposed standard-based model for automated collection of patient data and communication with health providers would rely on the accuracy of this information in the patient's health record (Sujansky & Kunz, 2014). If accuracy is not guaranteed, the purpose of a fitness tracker is null and void.

DOI: Confirmation & HBM: Engaging in Health Promoting Behavior

      Confirmation. After using the innovation, the person evaluates the results of an innovation-decision already made (Rogers, 1995).

Once the fitness tracker has been a part of someone's life for a substantial period of time, they understand the uses, benefits, and flaws from a personal standpoint and can make a decision on the action that they have taken. Additionally, this is the point where an individual may re-consider the type of fitness tracker that they bought, the decision to purchase a tracker all together, or how valuable the information the device provides is. Ultimately, a person will determine whether the product is improving their daily health behaviors or if they feel it is another electronic that has disappointed them with the results as they set it in the junk drawer beside their dead 1998 pedometer. Furthermore, is the behavior of purchasing and implementing a fitness tracker enough?

Engaging in health promoting behavior. At this point in the process, continued use of the fitness tracker is dependent on its impact on health behavior and most likely, visible results. Therefore, if someone has seen an improvement in motivation, weight loss, diet choices, and general health management, they will continue to use the tracker as a health-promoting behavior. However, as studies continue to be conducted to determine the validity and effectiveness of these trackers, each individual must determine whether it impacts their long-term health. A recent study involved interventions as participants were placed on low-calorie diets and prescribed physical activity, along with counseling sessions, text message prompts, and study materials. As the study transitioned to more self-management through online resources, random participants were given fitness trackers to supplement their behavior. The results found that the addition of the device resulted in *less* weight loss over 24 months (Jakicic et al., 2016). More importantly, doctors are still struggling to find the value in the product and usefulness of their information in patient care and disease management (Rosenblum, 2015). Consequently,

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the performance achievement factor and increased self-efficacy become the key

indicators of success or failure for these products with each person.

Chronic Disease Management in America & Fitness Trackers

As entities and individuals try to control health costs and minimize risk for

disease, they seek answers via technology. Currently, perceived susceptibility, severity,

and threat continue to be low for individuals regarding chronic disease due to factors

including health literacy and self-management. Therefore, as they seek new information

via the internet and social media, rather than their doctor's office, the cost-effective

fitness tracker is most prominent and appealing. People feel hope towards the product as

it is not another diet or gym membership that they have previously tried and failed.

Moreover, the ability to have immediate results on the number of steps they have taken

and calories burned is gratifying enough to boost self-efficacy and purchase the device.

Despite the question of risk, accuracy, or health benefits from the product, the

technological factor drives its appeal and each person determines the value or lack-there-

of that it holds to their health. However, as purchases become health behavior, this leads

to the question of whether or not this will help keep costs down or actually increase (with

the influx of new products that also have questionable accuracy) costs across the nation?

The information gathered through this analysis utilizing both the Health Belief

Model and Diffusion of Innovations Theory presents helpful guidance towards reaching a

mass audience in preventing chronic disease. Health professionals should utilize social

media more to communicate valuable health information to the masses. Additionally, by

examining the disease and product in conjunction, it presented insight toward health

behaviors. The cost-benefit analysis of the wearable device proves that regardless of

questions of accuracy or usefulness, the individual will buy into the potential of a healthier lifestyle. These products are only becoming more popular and available. Therefore, rather than analyzing the current model, it may be more beneficial to utilize this information to create a similar product that is helpful for physicians to use the data from. Moreover, considering interventions are the most effective weight-loss programs, it would be most beneficial for a fitness tracker to serve as the intervention on a daily basis, while information is fed to the physician for monitoring or follow-up. It is clear that these products alone do not derive health. However, people are drawn to them as they seek valuable health information through technology. Therefore, products should be redesigned to better serve the chronic disease epidemic in the U.S.

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