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"It won't happen to me" VS "It could have been me"

Changes in health behavior initiated by a negative health shock to a peer

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Abstract: Despite being aware of the health risks associated with making "bad" health decisions, we seem to deny our personal vulnerability to the harmful effects of poor health behavior. Aiming to explore whether the harmful effects associated with poor health behavior are personalized once our peers suffer from them, reflected by improved health behavior and referred to as "peer effects", this study uses individual-level U.S. data from the National Longitudinal Surveys (NLS) on the health outcomes smoking behavior, BMI, (un)healthy food consumption, and exercise frequency. The predictor variable – a negative health shock to a peer – consists of the individual reporting that a biological parent and/or sibling has been diagnosed with asthma, diabetes, high blood pressure, high cholesterol, heart disease, or stroke. The empirical strategy consists of OLS regressions including time fixed effects, with a further specification including individual fixed effects. The results were mixed: suggestive evidence of peer effects was found for several diagnoses, while other regressions showed a significant yet contrary, or often statistically non-significant effect. We conclude that this study does overall not find consistent evidence of individuals improving health behavior once a peer suffers a negative health shock. Especially the small number of observations for which variation in time can be exploited has major drawbacks for the explanatory power of the study.

Key Words: Health behavior, peer effects, smoking, diet, exercise

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Contents

1. Introduction 3

2. Literature Review 5

3. Data 10

3.1 Outcome Variables 11

3.2 Predictor Variables 11

3.3 Control Variables 13

3.4 Sample Specifications 14

3.5 Summary Statistics 14

4. Methodology 17

5. Results 18

5.1 Sample A and B 18

5.2 Sample C 20

6. Discussion 24

7. Concluding Remarks 31

References 32

1. Introduction

It is health that is real wealth and not pieces of gold and silver – Mahatma Gandhi

The groundwork of all happiness is health – Leigh Hunt

Take care of your body. It's the only place you have to live - Jim Rohn

Health is the greatest gift – Buddha

We value health more than anything. While we were in utero, we heard our parents tell their friends that it did not matter to them whether we would be a boy or a girl, as long as we were healthy. On New Year's Eve, we wish each other a happy and healthy new year. And on birthdays, we sing about the many years that are yet to come. Yet, on those same birthdays, calories don't count. When work is demanding, we light a cigarette because a) stress is not healthy either and b) one more cigarette is not going to kill us anyway. When we're in a hurry (and we are reasonably sure there is no speedcam around) we hit the gas, because we are good, experienced, and safe drivers – unlike those others on the highway. On a night out we may have a couple of beers more than originally planned, but you only live once. And we really want to exercise more, starting tomorrow.

Although we undoubtedly truly value health, we seem to not always put our money where our mouth is. When it comes to our health, we tend to get creative, ignorant, or overly optimistic. We blame our genes, piles of work, the weather, friends, lack of time, government, or irresistible commercial for not making better health decisions. We're only human, right? Although these may not all qualify, we indeed do not have control over all factors that determine our health.

We can capture the determinants of health in a very simplistic production function of health, whereby $h = f(x, y, z)$. In this production function, x represents the factors that are outside of own control e.g. genetics, or stochastic events. Y refers to environmental exposure, which includes both the physical environment and our social environment. Finally, z holds the factors that are within our own control, which equals our health-related lifestyle. The latter is determined by choices we make, efforts preferences, but also social conditioning and cultural habits. The most obvious health-related lifestyle choices include smoking and drinking behaviors, and the combination of diet/exercise which determines body weight. However, one can also think of the use of drugs, driving behavior, and work-life balance.

It is reasonable to assume that the vast majority of the developed world is aware of the simple fact that not smoking is better for your health than smoking, alcoholic beverages are a less healthy choice than a glass of water, and that having excess weight is unlikely to benefit your overall health. However, we cannot translate people knowing these stylized facts into them acknowledging the (cumulative) health risks.

Taking smoking as an example, we tend to assume that smokers are sufficiently informed about the health risks of their tobacco consumption – a premise that even underlies a commonly used legal defense of the tobacco industry (Cummings, Morley, & Hyland, 2002). Nevertheless, a majority recognizing the major health risks tied to smoking does not mean that individuals believe they are personally at higher risk of severe illness due to their smoking behavior (Weinstein, 1982). In a study by Cummings et al. (2004), 60% of the smokers indicated that they would quit smoking before experiencing serious health issues, supporting the view that smokers tend to believe they are able to stop before health problems make their appearance. This results in misplaced optimism with regard to the personal risk of becoming ill (Ayanian & Cleary, 1999), thereby conveniently keeping one's behavior and one's vulnerability in separate mental compartments. Along the same lines, Slovic (2001) found that among the studied group of young smokers, 40% did not see harm in very next cigarette, and half of them were convinced that occurrence of harmful effects would require steady smoking for a period of many years. A study on a more wide range of risk factors (e.g. alcoholism, auto accident injury, heart attack, cancer) among college students by Weinstein (1984) shows that individuals tend to have distorted notions concerning their risk factors compared to the risk factors of their peers, whereby they credit their own risk-reducing factors disproportionately generous. As a result, most subjects have the perception that their level of risk was below the level faced by others – "it won't happen to me".

It is extremely difficult, if not impossible, to predict whether or when bad health-related lifestyle choices will lead to a health status that significantly decreases quality of life, or even results in death. Especially for individuals that do not have the ability, or the willingness, to foresee the future adverse effects on health, the level of personal concern with regard to current risky healthy behavior is low (Peretti-Watel, L'Haridon and Seror, 2013). As the English historian and churchman Thomas Fuller once said in the 17th century: "health is not valued until sickness comes". Although we clearly derive disutility from spending time in sickness (Grossman, 1999), we apparently do not allocate our resources (i.e. time, effort, money) in a manner that minimizes the risk to become ill. As discussed, denying of our personal vulnerability to harmful effects of e.g. smoking holds us from quitting. The question which then rises is: when *does* it hit (sufficiently) close to home?

Young et al. (2009) find that increasing motivational tension results in smoking cessation. Their findings show that smokers encountering a life-threatening event results in a

1 year quit rate of 50-60%. Obviously, in the latter case we are too late as well-being is harmed. From a prevention point of view, Young et al. (2009) find that personalization is a highly effective motivational tool, whereby tests of an individual's lung function achieve smoking 1 year cessation rates of 25%. Moreover, McGeary (2015) shows that women are more likely to quit smoking if their partner suffers a negative health shock. In line with these studies, this paper aims to explore whether a negative health shock happening to someone close to us is a sufficiently "personal" motivation to change our health behavior for the better. The strand of research that is closest related to such a question is the one studying peer effects.

2. Literature Review

In essence, peer effects exist if the output of individual *i* changes when the output of *j* is exogenously distorted and nothing else changes. Economists have among others explored the effects of peers on retirement savings behavior (e.g. Duflo and Saez, 2003), on productivity (e.g. Falk and Ichino, 2006), on school participation decisions (e.g. Bonobis and Finan, 2009), and on academic outcomes (e.g. Kang, 2007), whereby robust evidence of peer effects has been found. However, there seems to be a research gap with regard to peer effects on health, despite the large policy significance. The existence and magnitude of peer effects could namely lead to either positive or negative externalities, which have the potential to strongly affect a policy's cost-effectiveness. In addition, the existence of peer effects could imply that interventions at group-level may be both more successful and efficient than individual-level interventions. Along those lines, Salvy et al. (2012) argue that adolescent's peer networks may play a critical role in the promotion of long-term positive behavioral health trajectories and should therefore be involved in intervention efforts.

A simple reason why one may expect one's peers having an effect on his health is that "people are interconnected, and so their health is interconnected" (Fowler and Christakis, 2008: pp. 14). Canta and Dubois (2015) study spousal peer effects on smoking and find both a smoking-enhancing effect of smoking partners and a smoking-deterring effect of non-smoking partners, whereby individual utility from smoking is increased (reduced) when the partner is a smoker (non-smoker). Using several specifications, Fowler and Christakis (2008) find robust evidence that peer effects in body mass exist for both adults and adolescents, which they believe is suggestive of a causal effect; one's chances of becoming obese rose if his or her friend became obese in a given time period. Yuan et al. (2013) assess health behavior peer effects within university dormitory rooms and their findings too confirm the existence of health behavior peer effects concerning e.g. the use of a bicycle, frequency of sweet food intake, and moderate-intensity exercise. Therefore, they reckon that promotion efforts aimed at improving health outcomes must incorporate peers in the process (Yuan et al., 2013). However, as also noted by Fowler and Christakis (2008), inter-personal health effects may extend beyond the relatively well-studied behaviors concerning obesity and smoking. For example, peers may be (unconsciously) emulating each other with regard to symptoms. By exploiting variation in the prevalence of back pain in East and West Germany before and after the reunification, Raspe et al. (2008) highlight the importance of social influences (i.e. mass media and personal contacts) with regard to health-related perceptions and behaviors and raise the hypothesis that back pain may be a communicable disease. However, convincing empirical evidence has yet to be found.

A potential reason underlying the research gap on peer effects on health may be due to the fact that true peer effects are very difficult to measure. First of all, defining the peer group is a challenge in itself, as it is rather difficult for researchers to get a grasp on who exactly constitutes the peer network (Manski, 1993). Therefore, researchers have to impose their own ad hoc definition and as shown by Halliday and Kwak (2012), the estimated peer effects are significantly influenced by how the peer network is defined. While the most popular definitions hold school cohorts (e.g. Gaviria and Raphael, 2001), school-grade cohorts (e.g. Arcidiacono and Nicholson, 2005), classrooms (e.g. Burke and Sass, 2006), or roommates (e.g. Kremer and Levy, 2008)), there are a few studies that measure effects of friends and extended friends (e.g. Fowler and Christakis, 2008). Despite the large variety in peer (group) definitions, they all seem to aim to satisfy a certain degree of "closeness". With regard to closeness, two conceptual perspectives can been distinguished: closeness in quantitative terms, and in a qualitative matter (Collins and Repinski, 1994). While the first refers to e.g. frequency and length of interactions, the latter is involves subjective experiences including self-disclosure and non-ostensive communication. Obviously, these interactions and experiences are different for different individuals. Research by Claes (1997) on adolescents' closeness in Canada, Belgium, and Italy concludes that family clearly plays a more prominent role in Italians' relational world, while friends play a more central role in that of the Canadian youngsters – Belgians tend to take a position somewhere in between.

As these results indicate, large heterogeneity exists with regard to whom an individual feels closest to, and whose health behavior is therefore likely to influence the individual's health behavior. This heterogeneity finds its roots in the existence of multi-level social complexity. While it is beyond the scope of this study to attempt to explain this complexity, the notion that the development of interpersonal relationships depends on both the characteristics of the individuals involved, but also the relationship in which it is embedded, the social nexus of other relationships in which it is embedded, and the sociocultural structure (Hinde and Stevenson-Hinde, 1987) again highlights the difficulty associated with defining one's peer group.

Moreover, peer effects are potentially even more difficult to measure when studied in relation to health or health behaviors. According to the existing literature, different health behaviors tend to have different main influencers. For example, a study by Pedersen, Grønhøj and Thøgersen (2015) finds that adolescents' consumption of fruit and vegetables is mostly influenced by parents' descriptive and injunctive norms, with friends playing a smaller role than commonly believed. However, when alcohol consumption is the variable of interest, drinking siblings and friends tend to be bigger risk factors for young adults' regular drinking than parents' drinking behavior (Scholte et al., 2008). This study stresses that not just the friend context should be considered when focusing on peer influences on young adults, as siblings play an important role too. A similar conclusion is drawn by Vink, Willemsen and Boomsma (2003), who find that the association between a young adults' smoking behavior and that of their siblings is comparable to the influence friends' smoking behavior has. When considering preventive health beliefs and behavior in a general sense, Lau, Quadrel and Hartman (1990) find that parents are more influential than roommates or best friends.

Based on the above, this paper argues that parents and siblings qualify as potential drivers of peer effects and therefore defines "peers" as the individual's biological parent(s) and/or biological sibling(s). More specifically, health shocks to a respondent's biological parent or sibling are used as an exogenous event to study (changes) in health behavior. Further elaboration on what constitutes a health shock will be provided in the data section. Unfortunately, limited data availability excludes the option of also exploring friendships.

It is no coincidence that the majority of health studies on peer effects focuses on adolescents and/or young adults, to which this study is no exception. Three main arguments can be made why especially young adulthood is a crucial period when it comes to health decisions, thereby backing this study's position that it of uttermost importance to study potential peer effects on young adults' health.

First of all, multiple researchers show the persistence throughout life of health decisions made as an adolescent/young adult. With regard to smoking, age at initiation has been found a predictor of smoking continuation, whereby starting before age 16 compared to starting at later age resulted in an odds ratio for continuation of 2.1 (Khuder, Dayal, and Mutgi, 1999).

Considering food habits, fast food consumption increases in young adulthood while eating breakfast becomes less common (Harris et al., 2006). Once these health-deteriorating behaviors lead to overweight or even obesity, it may be a lifelong struggle to lose weight and most importantly maintain weight loss; Wing and Hill (2001) report that approx. 20% of overweight/obese people who intended to lose at least 10% of their initial body weight managed to keep the weight off for at least a year. On a positive note, Liu et al. (2012) find that young adults who are able to maintain a healthy lifestyle throughout young adulthood tend to have a much lower cardiovascular disease risk profile when in middle age.

Secondly, five major role changes that take place during young adulthood can be distinguished: leaving the parental home, finishing school, entering the workforce, forming a romantic relationship, and transitioning into parenthood (Schulenberg and Schoon, 2012). Since young adults' health decisions are a reflection of the intertwining of general developmental processes and social roles (Johnson, Crosnoe, and Elder, 2011; Committee on Improving the Health, Safety, and Well-Being of Young Adults et al., 2015), this population makes an interesting case for studies with a social context, such as peer effects.

Lastly, young adults move into childbearing ages and start their own families. Scientific research shows that the mother's health decisions during pregnancy have a lasting effect on the child's health, with e.g. smoking having a significant negative effect on birth weight (Rosenzweig and Schultz, 1982), which may have far-fetched negative consequences for neurosensory, developmental, and health outcomes, but also clinical and educational outcomes (Hack, Klein, and Taylor, 1995; Case, Fertig, and Paxson, 2005). Once the child is born, the importance of the young adults' – now parents - health decisions does not diminish; what's learnt in the craddle, lasts till the tomb. The latter is confirmed by a study by Thompson, Humbert, and Mirwald (2003), who find that parental support for physical activity during childhood has a lasting positive impact on the both level of and attitude towards physical activity as an adult.

Concluding, health decisions and behaviors in young adulthood play a crucial role in people's lifelong health trajectory (Harris, 2010), which calls for a thorough understanding of potential peer effects on smoking, exercise, and diet decisions.

Now, we return to the question: why could one expect to see changes in health behavior once a peer experiences a negative health shock? As previously discussed, the intuition behind this hypothesis comes down to "seeing is believing". Hearing about and/or witnessing how the consequences of poor health behavior impact and most likely limit the peer in question in his or her daily activities, makes the risks of smoking or being (severely) overweight significantly less abstract. Especially when it concerns biological siblings and parents, the degree to which one is able to identify with the diagnosed peer and therefore the chance one will be affected by the negative health shock increases. This can be clarified when referring back to the health production function, h = f(x, y, z). Given that we share genes with our biological parents and siblings, "x" can be assumed have a similar contribution to our health as it has to theirs. Also the physical as well as the social environment, making up "y", can be expected to either be (partially) shared, or at least have been shared for a significant amount of years; think of having the same relatives and sharing a household for approx. two decades, thereby living in the same neighborhood. While "z" encompasses the factors supposedly within our own control, these decisions too are influenced by e.g. cultural habits which are again likely to be similar for parents and their children, thereby also among the children. All in all, our biological parents' and siblings' health production function entails many elements similar to ours, which would mean the outcome can also be expected to similar; unless we make significantly better health decisions, we are on the same health track. Therefore, our parents being diagnosed with e.g. diabetes or having a stroke could be our future scenario. When the negative health shock concerns our siblings, the same applies yet on a shorter term. In essence, we may therefore expect to see a shift in perception following the negative health shock to our peers: from "it won't happen to me" to "it could have been me". But this does not mean our future health should be considered a lost cause – it most definitely is not.

The tide can be turned for the largest part with regard to stroke; quitting smoking reduces the increased risk to which one was exposed as a smoker by more than half (Abbott et al., 1986). Similarly, a dramatic decrease in the risk of developing heart disease can be achieved by smoking cessation (Jeffrey and Lakier, 1992; NIH, 2016). Moreover, Pereira et al. (2005) find that changes in fast-food frequency were directly related to changes in bodyweight. With regard to high blood pressure, 30 minutes of physical activity a day can cause a decrease of 4 to 9 millimeters of mercury (mm Hg) (Mayo Clinic Staff, 2015). The latter also contributes to lowering or even reversing the risk of high cholesterol, with alternatives being quitting smoking, reducing the saturated fat to 5 to 6 percent daily, and minimizing trans fat intake (American Heart Association, 2017). Diabetes too is preventable; modest lifestyle changes can eliminate the threat that diabetes poses to both well-being and survival (Lindström et al., 2010). Again, this comes down to weight reduction, increased exercise, and dietary modifications including an increase in dietary fiber and reduction in (saturated) fats.

All in all, there is sufficient reason to change our health behavior for the better and consider the negative health shock to our peer as a very real warning or wake-up call. In addition, the guidelines on how to do so seem fairly straightforward. However, a precondition for people changing their health behavior is that they are aware of, and believe in, the fact that it is not too late to turn the tide.

It is important to note that this study should be interpreted as exploratory, and the research design and empirical strategy applied bring forth, at best, merely suggestive evidence. In that respect, this paper highlights the research gap with regard to peer effects on health, and contributes to the existing literature by taking a first step towards a greater understanding of the role of social networks in motivations to change health behavior (for the better).

In the next section, we will describe the data set that has been used to conduct this study, thereby providing the individual-level health behavior outcome variables, the exposure variables, and control variables. Also, the sample specifications will be explained and summary statistics will be provided. Then, the methodology will be explained. In the fifth section, results of the regressions are presented. Next, we elaborate on the results and this study's limitations in the discussion, eventually making a suggestion for future research. Finally, this research's conclusion is presented in section seven.

3. Data

The data used for this study stems from the National Longitudinal Surveys (NLS), which is a family of surveys sponsored by the U.S. Bureau of Labor Statistics with the main purpose of tracking American's labor market experiences. Throughout the years, the NLS have extended their focus, also covering e.g. childhood experiences, dating, attitudes towards peer pressure and self-perception, which makes it a comprehensive data source for a wide variety of studies. This study extracts data from two of the seven cohorts, thereby using the "NLSY79 Child/Young Adults 1986-2014" as the basis and main source of individual-level data and using the "NLSY79" to extend the data on the young adults' mothers. The former is a longitudinal study following the children born to women included in the latter cohort. Via the online search and extraction site "Investigator" a custom-made data set is created, thereby solely including NLS variables of interest.

3.1 Outcome Variables

The outcome variables selected in order to conduct the empirical analysis are: total smoking, BMI (which results from the synergy between diet/exercise), good nutrition intake, bad nutrition intake, and exercise habits. These reflect the most well-known health-related lifestyle choices.

Total Smoking refers to the number of cigarettes smoked per month. This variable has been created by multiplying the number filled in by the respondent to the question "When you smoked in the last 30 days, how many cigarettes did you smoke per day?" with the number of days a week indicated by the respondent when answering "During the last 30 days, how often (if ever) have you smoked cigarettes on average?". Then, the calculated number was multiplied by 4 in order to convert it into a monthly format, which is a simplification as a month consists of more than 4 weeks.

The variable *BMI* has been created for each year by applying the following formula: $BMI = \frac{(weight\ in\ pounds*703)}{height\ in\ inches^2}$. Diet and exercise together determine one's Body Mass Index, which is the commonly accepted measure of the health state of the human body. However, they present separate opportunities to change health behavior. For that reason, diet and exercise decisions are also studied separately.

Good Nutrition indicates the number of times the respondent said to eat fruit in a typical week added up to the number of times the respondent indicated to eat vegetables in a typical week.

Next, *Bad Nutrition* refers the number of times the respondent said to have eaten fast food from a fast food restaurant in the past seven days, added up to the number of times in the past seven days that the respondent drank a soft drink or soda which contained sugar.

Finally, *Exercise* as an outcome variable indicates the times per week that a respondent said to do more than 15 minutes of exercise, thereby adding the numerical answers to the questions regarding strenuous exercise, moderate exercise, and mild exercise.

3.2 Predictor Variables

The independent variables, treated as "predictor variables", are dummies which indicate whether or not a respondent reported have a biological parent or sibling who received "bad news" from a doctor with regard to his/her health status. Six types of "bad news" a.k.a. diagnoses are considered: asthma, diabetes, high blood pressure, high cholesterol, heart disease, and stroke. In this sense, a negative health shock to a respondent's biological parent or sibling is used as an exogenous event to study health behavior.

For all these diagnoses, a strong relation to one or multiple health behaviors has been found. Therefore, an individual has (at least to a large extent) the power to prevent these quality-of-life-reducing symptoms/diseases/events from happening to him or her by making the right health decisions. With regard to the latter, a distinction is made between smoking decisions and diet/exercise decisions (which together determine BMI).

Starting with smoking, research finds a causal link between active tobacco smoking and asthma (ASH, 2015). In addition, an association between cigarette smoking and increased risk of coronary heart disease has been repeatedly found, whereby the magnitude of the increased risk may be two to fourfold (Jeffrey and Lakier, 1992). Finally, even after controlling for cardiovascular disease risk factors, previous literature argues that smoking contributes both significantly and independently to the risk of stroke (Wolf et al., 1988).

Diet and exercise decisions are to varying degrees reflected by the outcome variables BMI, Good Nutrition, Bad Nutrition, and Exercise. These health behaviors play a major role in a person's health status and thereby in one's chances to be diagnosed with either diabetes, high blood pressure, high cholesterol, heart disease, or stroke.

In theory, one could offset bad nutrition with exercise, resulting in a healthy BMI (18.5-25). Just as well, a high intake of good nutrition (especially fruits that are high in sugar) in combination with no physical activity could result in a BMI> 25 a.k.a. being overweight. In a third scenario, a lot of exercise can create a high muscle mass which may lead to a misclassification as being overweight. The latter is closely related to the main argument of those criticizing the use BMI as a measure of health: BMI poorly indicates the percentage of body fat (Nuttall, 2015).

However, research shows that the above are the exception rather than the rule. A significant positive association between fast food and sugary drinks has been repeatedly found, while fast food intake and consumption of fruit and vegetables are negatively related (Platat et al., 2006). Moreover, physical activity has been found to be positively related to fruit and vegetable consumption, while the latter is inversely correlated with sedentary behavior (Al-Hazzaa et al., 2011).

It is therefore reasonable to assume that someone with either a high bad nutrition intake, or low physical activity level, or both, is not making optimal health decisions. As a result, a higher BMI level can be expected with increased chances of being overweight (BMI>25) or even obese (BMI>30). On the contrary, those having high consumption levels of fruits and vegetables, or doing a lot of exercise, or both, are making better health decisions and can be expected to have a BMI within the "healthy weight" range. Compared to the latter group, overweight and obese adults have been found to be at significantly higher risk for diabetes, high blood pressure and high cholesterol (Mokdad, Ford and Bowman, 2001; Larson, 2015; Szer, Koyalskysa, and DeGregorio, 2010). In addition, excess weight is associated with an elevated incidence of both heart disease and stroke (Burton et al., 1985; Barbosa de Souza et al., 2010).

What is important to note, is that these predictor variables are based on self-reported data and concern information on a third party. Although our basic assumption holds that people attempt to give truthful answers – whether this is because of a dislike for telling lies, or stems from enjoyment from telling the truth (Sánchez-Pagés and Vorsatz, 2009) – one must keep in mind that saying to not have a parent or sibling that was diagnosed with one of the conditions studied is not per definition the same as not having a parent or sibling who was diagnosed. This may be a source of bias in several ways, which will be discussed in the discussion section. However, for sake of simplicity, we will use "reporting to (not) have a peer who was diagnosed", "saying to (not) have a peer who was diagnosed" and "(not) having a peer who was diagnosed" interchangeably throughout this paper.

3.3 Control Variables

In the analyses, age, education level, employment status, and residence type are being controlled for. In addition, self-reported health status, BMI (when BMI is not the outcome variable), aspirations with regard to body weight, the amount of 15+ workouts per week (when exercise is not the outcome variable), the number of times a week eating fruits, the frequency of consuming vegetables (when good nutrition is not the outcome variable), weekly fast food consumption, and the amount of times having a sugary drink or soda (when bad nutrition is not the outcome variable) are considered. Finally, when cigarettes smoked per month is not the outcome variable, a variable indicating the respondent's smoking status is included.

While these variables are likely to be related to the health behaviors chosen as dependent variables, we are not particularly interested in them and therefore wish to remove their effects from the equation.

3.4 Sample Specifications

When studying health behaviors, respondents aged younger than 18 were excluded under the assumption that youngsters under 18 are significantly less likely to independently make their diet and exercise decisions; being a teenager and often still part of the parental household, they presumably lack the e.g. interest, knowledge, money, and/or decisive power needed to consciously make their individual health decisions. After this first specification, thereby creating the largest study population used (Sample A), two further specifications have been made. The first one only considers smokers (Sample B), in order to study (changes in) the total amount of cigarettes smoked per month. Finally, a third sample (Sample C) has been created, in which only respondents are included on which data on the predictor variable has been collected for two years in order to exploit variation over time; either in 2010 and 2012, or 2010 and 2014, or 2012 and 2014. This results in a significantly smaller sample. Further implications and limitations arising as a result of this specification will be raised in the discussion section.

One should note that sample sizes are not entirely fixed in either case; they tend to vary depending on the outcome variable considered. This variation has not been eliminated in order to exploit as much data as possible, given that the data availability is already relatively limited. The ranges of numbers of observations per analysis is 1,716-1,799, 616-629, and 125-148 for the samples A, B, and C respectively.

To obtain an as accurate as possible picture of individual health behaviors, respondents that refused to answer the questions related to the outcome variables or demographic characteristics have been excluded from the sample.

3.5 Summary Statistics

Table 1 presents statistics on the set of demographics and health characteristics concerning the analysis samples. This gives us insight into who were presented the health module including questions on biological parents' and siblings' health, and subsequently whether it was a particular subset that answered the questions for more than one year.

Starting with a general overview that explores Sample A, we see that the majority of respondents indeed reported to have a parent and/or sibling that received one or more of the six types of diagnoses considered. This does not come as a surprise when considering the current average health status of Americans and the increased chance of a confirmative answer when considering both biological parents and siblings. It seems that individuals who have a peer that experienced a negative health shock are as a group slightly higher educated. Besides, this group is to a smaller degree represented by Hispanics and black people. Among those who do and who do not have a peer that experienced a negative health shock, no other clear patterns of economic or social outcome measures can be detected.

The more detailed specification of Sample C brings forward several more notable patterns. As expected, heart disease and stroke are more rare events than high cholesterol, high blood pressure or diabetes. In fact, the latter are risk factors and thereby potentially foretokens of heart disease and/or stroke (NIH, 2014). Mean age was notably higher for individuals who have a parent or sibling with heart disease, which may be expected as heart disease often develops at later age (Lerner and Kannel, 1985). When looking at gender, more men than women were part of Sample C, which was the other way around for Sample A. Surprisingly, men also seem to more often have a peer that experienced a negative health shock than women. Moreover, race seems to have predictive power for (not) having a peer who experienced a negative health shock. With regard to diabetes, relatively few black individuals have a sibling or parent with diabetes, while a relatively large share of the Hispanics from the study population has. What stands out when considering heart disease and stroke, is the large share of non-black, non-Hispanics among those who have a peer to which these diagnoses apply. Among the latter group, an extremely large share did not (yet) complete more education than high school. Besides, a noteworthy share of the individuals with a parent or sibling with high blood pressure, high cholesterol, or stroke is unemployed when comparing to the share of unemployed among those who do not have a peer that suffers from one of these health burdens. Next, individuals who have a peer with diabetes, high blood pressure, or high cholesterol tend to have ≥ 1.5 point higher BMI than those who do not. Continuing with health characteristics, we find that those with a peer diagnosed with heart disease have a significantly higher good nutrition intake than those who do not, yet the share of current smokers among them is larger. The latter also holds for the group with a peer diagnosed with diabetes. Finally, respondents with a parent or sibling with high cholesterol levels tend to consume less bad foods while exercising more than those without.

When comparing Sample A to Sample C, there seems to be an over-representation of black individuals in Sample C. Finally, BMI levels are generally higher among the ones who answered the question of interest in more than one survey round. These discoveries may be important when drawing conclusions from the empirical analyses using Sample C. However, as custom weights will be applied to Sample C in a second specification, over- or under-representation will no longer be an issue: the results will represent the US population.

TABLE 1 - Summary Statistics

	Sample A		Sample C									
	Any diagnosis		**Diabetes**		**High Blood Pressure**		**High Cholesterol**		**Heart Disease**		**Stroke**	
	YES	*NO*	*YES*	*NO*	*YES*	*NO*	*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
No. of observations	1117	682	60	88	70	50	36	89	10	117	13	114
Demographics												
Age (mean)	30.3	30.3	32.4	33.2	34.5	32.7	34.8	33.2	37.6	33.3	35.6	33.5
Male (%)	44.5	55.0	58.3	51.1	55.7	49.1	58.3	50.6	60.0	52.1	61.5	51.8
Female (%)	55.5	45.0	41.7	48.9	44.3	50.9	41.7	49.4	40.0	47.9	38.5	48.3
Hispanic (%)	24.1	25.6	28.3	12.5	15.7	15.8	22.2	13.5	10.0	16.2	15.4	15.8
Black (%)	30.0	33.2	35.0	62.5	55.7	52.6	41.7	59.6	30.0	56.4	30.8	57.0
Non-hispanic, non-black (%)	46.0	41.2	36.7	25.0	28.6	31.6	36.1	27.0	60.0	27.4	53.9	27.2
Less than high school (%)	17.5	19.1	21.7	30.7	24.3	29.8	25.0	28.1	20.0	27.4	15.4	28.1
High school (%)	51.1	52.2	60.0	42.1	54.3	42.1	47.2	49.4	70.0	47.0	69.2	46.5
College (%)	15.2	12.4	3.3	17.1	14.3	12.3	13.9	13.5	0.0	11.1	15.4	13.2
University (%)	16.2	16.3	15.0	10.2	7.2	15.9	13.9	9.0	10.0	14.5	0.0	12.3
Unemployed	39.4	40.3	41.7	38.6	45.7	35.1	47.2	38.2	40.0	41.1	61.5	38.6
Parttime job	6.6	5.3	6.7	6.8	4.3	10.5	2.8	9.0	0.0	7.7	0.0	7.9
Fulltime job	54.0	54.4	51.7	54.6	50.0	54.4	50.0	38.2	60.0	51.3	38.5	53.5
Own (shared) place	77.8	78.8	83.3	77.3	84.3	79.0	86.1	80.9	90.0	81.2	100.0	79.8
Living with parent(s)	17.6	15.4	13.3	14.8	14.3	10.5	13.9	11.2	10.0	12.8	0.0	14.0
Other living situation	4.6	5.8	3.3	8.0	1.4	10.5	0.0	7.9	0.0	6.0	0.0	6.1
Health characteristics												
BMI (mean)	29.6	28.3	32.2	29.5	31.9	29.5	31.8	30.3	31.5	30.8	30.5	30.9
Good nutrition intake (average per week)	13.2	13.1	11.0	13.3	11.5	13.2	10.7	10.6	16.6	11.9	11.9	11.8
Bad nutrition intake (average per week)	6.0	5.7	6.1	6.0	6.5	6.0	5.5	7.3	5.9	6.3	5.0	6.4
No. of workouts (average per week)	6.4	6.3	6.3	6.2	7.0	5.1	7.5	4.5	6.5	6.1	6.6	6.1
Current smoker (%)	37.5	34.7	45.0	33.0	34.3	36.8	36.1	34.8	50.0	34.2	30.8	36.0
Non-smoker (%)	62.5	65.3	55.0	67.0	65.7	63.2	63.9	65.2	50.0	65.8	69.2	64.0

4. Methodology

The estimations are obtained by OLS-regressions using STATA software, version 14.1 (StataCorp, College Station, Texas), thereby controlling for age, sex, race, education level, employment status, residence type, and several characteristics of one's health status respectively. As we wish to control for time trends, thereby holding constant the average effects of the study sample, time fixed effects are included. By including fixed effects, one can control for the average differences in observable or unobservable predictors. In other words, the threat of omitted variable bias is greatly reduced and what is left is the within-year action. Also, STATA allows us to immediately control for heteroscedasticity by using the "robust" option for all regressions. The baseline model for an individual's health behavior in calender year *t* in a fixed effects setup is:

$$HB_{it} = \alpha_t + x_{it}\beta + z_t\gamma + \varepsilon_{it} \quad (1)$$

In equation 1, HB_{it} is the health outcome variable for an individual *i* at time *t*. Hereby HB_i represents either a specific health behavior (smoking, consuming unhealthy foods, consuming healthy foods, exercising) or an encompassing health status (BMI). α_t equals a times specific effect, which is by assumption the same for all individuals at a specific point in time. Next, x_{it} represents a vector of observable individual characteristics and z_t is the exposure variable (predictor variable) at time *t*. Note that z_t is a dummy variable which takes the value of 1 when a peer (biological parent/sibling) suffers from a negative health shock. As previously indicated, models for five different health behavior outcome variables related to six different exposure variables will be tested. In this study, the health shock in the form of a diagnosis by a doctor has to be directly linked to the health behavior used as the outcome variable, as discussed in the data section. Throughout all analyses, γ is the coefficient of interest.

While one could argue that the decision to exercise more or eat healthier can be made overnight, losing weight (thereby lowering BMI) is a long-term process. Also in the case of a nicotine addiction, changing health behavior may take time as quitting smoking may be a struggle. Moreover, like tobacco or alcohol, sugar has been found to trigger our brain to encourage subsequent consumption and suggestive evidence concerning its dependence-producing properties (Garber and Lustig, 2011) would support the argument that abandoning an unhealthy diet is a process rather than an event. For the above reasons, one may wish to include lags of the exposure variables related to the driving health behaviors. However, as the

NLS interview is conducted every second year or at times every fourth, there is no need to create lags.

Next, Sample C is tested when also controlling for individual fixed effects μ_i. These analyses can easily be performed when using the data set's unique person IDs. The fixed effects model now controls for individual characteristics that are time-invariant; these are omitted and cannot bias the resulting estimated coefficients. This further reduces the threat of omitted variable bias and what is left is the within-individual variation. The model that applies is the following:

$$HB_{it} = \alpha_t + z_t\gamma + \mu_i + \varepsilon_{it} \qquad (2)$$

Finally, the customized longitudinal weights are applied to Sample C, in order to see whether making corrections to the raw data fundamentally alters the results.

5. Results

Firstly, OLS regressions for Sample A and B were performed for the varying outcome variables and related predictors, thereby including multiple controls and year fixed effects. The results of the year fixed effects regression are presented in Table 2 to 4. Thereafter, the results generated by performing individual fixed effects regressions for Sample C will be discussed. For this specification, only the coefficients of interest are presented in Table 5 and 6, albeit both for when not applying custom weights, and for when applying custom weights. Due to insufficient observations, taking smoking as the outcome variable yielded no results for the final analyses and was therefore not included.

5.1 Sample A and B

Starting with smoking behavior, we found that individuals who have a biological parent or sibling diagnosed with asthma tended to smoke significantly less. Having a peer diagnosed with heart disease seemed to have no implications for the amount of cigarettes smoked, neither did having a peer who has had a stroke. With regard to the control variables, a few statistically significant associations stand out. First of all, women tended to smoke less. Also, the results show rather large deviations among the different races; black people smoked 17-19 cigarettes per month more than Hispanics, yet individuals that fell into the category "non-black non-hispanic" were by far the biggest smokers. Having a University degree seemed to be negatively related to the monthly amount of cigarettes smoked, but this relation did not apply for higher education in general; while having finished college did not differ from having completed 8th grade or less, having some college education did. While the coefficients of self-reported health status have the expected sign at all times, a statistically significant effect was found for the "Very Good" status only. Finally, there seemed to be a positive association with the amount of times an individual consumes fast food and the amount of cigarettes smoked. With regard to working status, residence type, BMI, and the other health variables included, no effect on smoking behavior was found.

Next, looking at BMI as an outcome variable, we found positive and significant effects for having a peer diagnosed with either diabetes, high blood pressure, high cholesterol, or heart disease. However, the magnitude of the effect was rather small: approx. 1 BMI point. Individuals' BMI seemed to be unaffected by having a parent or sibling who suffered a stroke. Overall, BMI tended to increase with age and being black was associated with a higher BMI. Having a University degree tended to decrease BMI by 0.78-2.52 point, but for all other levels of education no effect was found. Unsurprisingly, individuals trying to lose weight tended to have a significantly higher BMI than those who were not attempting to do anything about their weight. In addition, every additional weekly occasion of 15+ minutes of exercise took down BMI by approx. -0.10 point. Although negligibly small, there seemed to be a positive effect of the frequency of consuming vegetables on BMI. Potentially even more surprising, a negative association was found between BMI and the times a week an individual ate food from a fast food restaurant. Finally, gender, working status, residence type, self-reported health status, fruit consumption, sugary drinks intake, and smoking status, did not seem to explain why individuals differed in BMI levels.

Next up is nutrition as the outcome variable, thereby distinguishing between bad nutrition and good nutrition. Concerning bad nutrition, having a peer who was diagnosed with high cholesterol seemed to be positively yet weakly associated with the frequency of fast food and/or sugary drinks consumption. Taking good nutrition as the outcome variable, a twice as large – yet still small – effect was found for having a sibling or parent with diabetes. The largest effect was found for having a peer with heart disease; those individuals said to have two more occasions of eating fruit and/or vegetables than individuals who did not have a peer diagnosed with heart disease. For the rest of the diagnoses, no evidence of an effect was found. Other factors that played a significant role were being female and having a master's degree (or more); both were associated with less frequent bad nutrition and more frequent good nutrition, though the effect of reaching a very high education level was (much) larger. Moreover, individuals working full time consumed slightly more fast food than those unemployed, and a similar but negative effect was found of living with (a) parent(s) compared to having moved out of the parental home. Surprisingly, individuals reporting a better than poor health status ate 1.43-2.26 times a week more fast food (or drank sugary drinks on an equivalent amount of occasions) than those who said their health status to be poor. In line with expectations, people trying to either stay the same or lose weight consumed bad foods or drinks less frequently than those not trying to do anything about weight. Also, frequency of physical activity and fruit consumption were negatively related to bad nutrition. On the contrary, the results show a positive association between exercise and eating fruits and/or vegetables. Finally, individuals who quit smoking over a year ago tended to eat slightly less fast food than non-smokers. For the rest of the control variables, no statistically significant effect was found.

Finally, Table 4 presents the regression results when studying exercise as the outcome variable. While having a peer who has been diagnosed with high blood pressure increased the amount of exercise by one workout per two weeks, being related to someone who suffered a stroke seemed to slightly decrease the amount of workouts. Neither for the other diagnoses, nor for age, gender, race, education, working status, self-reported health status, or smoking status significant effects on one's physical activity level were found. Individuals who lived in the parental home worked out almost once a week less than those who had moved out. As expected, BMI and the number of weekly workouts were negatively related. Also, those consciously trying to maintain or lower their weight tended to exercise more than those not trying to do anything about their weight. Although the effects were very small, a positive relation was found between good nutrition and exercise frequency. The opposite applied with regard to sugary drinks consumption.

5.2 Sample C

When including individual fixed effects, all of the previously found peer effects disappeared, yet two new ones made an appearance. Notable is the statistically significant negative coefficient with regard to exercise; individuals who have a peer that has been diagnosed with heart disease tended to exercise 3.5-5.2 times a week less than when they did not yet have a peer that received this tough diagnosis, depending on whether custom weights were applied. Secondly, yet only when not applying custom weights, we found a statistically significant positive effect of a peer experiencing a negative health shock in the form of heart disease on BMI. Under the same condition, a negative relation between having a peer who

Table 2 – Results time fixed effects regressions

	SMOKING BEHAVIOUR: No. of cigarettes per month			*BMI*				
	Asthma	**Stroke**	**Heart Disease**	**Diabetes**	**High Blood Pressure**	**High Cholesterol**	**Heart Disease**	**Stroke**
Bad News	-10.54**	1.41	0.93	1.42**	1.09*	0.83*	0.91***	-0.20
	(1.52)	(5.46)	(6.99)	(0.27)	(0.27)	(0.27)	(0.08)	(0.30)
Female	-10.70	-10.70*	-11.19*	-0.59	-0.74	-0.64	-0.70	-0.59
	(4.34)	(3.54)	(3.83)	(0.39)	(0.43)	(0.39)	(0.39)	(0.41)
Age	0.03	0.31	0.02	0.19**	0.14	0.16*	0.17*	0.18*
	(0.36)	(0.76)	(0.50)	(0.04)	(0.06)	(0.05)	(0.05)	(0.05)
Race								
Non-black, non-Hispanic	40.87***	41.63***	42.43***	-0.27	-0.37	-0.30	-0.30	-0.30
	(1.10)	(1.02)	(0.90)	(0.25)	(0.34)	(0.31)	(0.29)	(0.33)
Black	17.08***	17.34**	19.29***	1.39*	1.45*	1.53*	1.45*	1.39*
	(1.17)	(2.00)	(1.36)	(0.46)	(0.49)	(0.43)	(0.44)	(0.43)
Education								
Some high school	7.61	6.72	6.85	-0.15	-0.09	-0.37	-0.07	-0.21
	(7.41)	(7.42)	(6.53)	(0.20)	(0.32)	(0.20)	(0.18)	(0.10)
High school graduate	5.32	4.29	4.62	0.43	0.50	0.31	0.53	0.43
	(3.57)	(2.31)	(3.45)	(0.16)	(0.48)	(0.24)	(0.23)	(0.34)
Some college	-12.21*	-13.38*	-12.78*	0.04	0.07	-0.34	0.07	-0.15
	(4.06)	(3.63)	(3.37)	(0.35)	(0.11)	(0.27)	(0.22)	(0.20)
College graduate	-2.86	-2.63	-3.66	-0.15	-0.15	-0.42	-0.21	-0.29
	(19.26)	(18.86)	(19.45)	(0.27)	(0.54)	(0.41)	(0.32)	(0.39)
Bachelor's degree	-14.79**	-16.36**	-16.08*	-2.16***	-2.31*	-2.52**	-2.17**	-2.35**
	(3.36)	(3.82)	(3.42)	(0.15)	(0.64)	(0.33)	(0.35)	(0.42)
Master's degree or more	-19.63**	-17.20**	-18.15**	-0.78*	-1.02*	-1.27**	-0.92*	-1.07*
	(2.27)	(3.38)	(2.12)	(0.19)	(0.57)	(0.24)	(0.30)	(0.41)
Working status								
Working part time	1.36	4.64	2.65	0.05	0.30	0.33	0.20	0.15
	(1.64)	(2.69)	(1.22)	(0.62)	(0.61)	(0.58)	(0.61)	(0.81)
Working full time	-4.72	-3.37	-4.15	0.47	0.47	0.62	0.52	0.54
	(3.51)	(3.83)	(3.40)	(0.48)	(0.48)	(0.45)	(0.48)	(0.48)
Residence Type								
With parent(s)	3.72	4.10	2.95	-0.19	-0.20	-0.09	-0.14	-0.19
	(2.42)	(2.63)	(1.98)	(0.20)	(0.17)	(0.22)	(0.18)	(0.24)
Other	1.32	2.02	1.72	0.24	0.41	0.58	0.45	0.43
	(2.74)	(1.34)	(1.45)	(0.83)	(0.85)	(0.89)	(0.84)	(0.81)
Self-reported health status								
Fair	-33.94	-34.20	-32.46	-1.30	-1.62	-1.55	-1.46	-1.48
	(17.97)	(17.44)	(15.94)	(2.77)	(2.65)	(2.77)	(2.59)	(2.62)
Good	-37.18	-35.76	-35.11	-1.98	-2.29	-2.29	-2.28	-2.38
	(15.10)	(15.62)	(15.21)	(2.53)	(2.45)	(2.46)	(2.40)	(2.38)
Very good	-48.14*	-45.08*	-46.36*	-3.65	-4.02	-3.98	-4.04	-4.11
	(13.04)	(14.51)	(13.94)	(2.49)	(2.41)	(2.49)	(2.41)	(2.45)
Excellent	-53.71	-52.18	-51.66	-3.76	-4.08	-4.09	-4.09	-4.16
	(20.68)	(20.07)	(19.89)	(2.74)	(2.74)	(2.78)	(2.60)	(2.70)
BMI	0.01	0.02	-0.06					
	(0.12)	(0.07)	(0.12)					
Trying to do something about weight								
Stay the same weight	1.38	2.15	0.78	-0.80	-0.88	-0.84	-0.83	-0.74
	(2.46)	(2.04)	(3.14)	(0.39)	(0.34)	(0.36)	(0.37)	(0.34)
Lose weight	-7.16	-6.33	-7.26	4.93***	4.93***	5.00***	4.99***	5.13***
	(2.95)	(2.77)	(3.03)	(0.32)	(0.23)	(0.21)	(0.25)	(0.22)
Times per week 15+ min exercise	-0.10	-0.34	-0.25	-0.10**	-0.11**	-0.10*	-0.11**	-0.09**
	(0.57)	(0.55)	(0.65)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Times a week eating fruit	0.01	0.12	0.07	-0.03	-0.02	-0.03	-0.02	-0.02
	(0.45)	(0.39)	(0.42)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Times a week eating vegetables	-0.06	-0.19	-0.11	0.03***	0.03***	0.03**	0.03***	0.03***
	(0.52)	(0.43)	(0.48)	(0.001)	(0.001)	(0.01)	(0.002)	(0.001)
Times a week eating food from fast food restaurant	3.47***	3.52**	3.25**	-0.16**	-0.17***	-0.20***	-0.18***	-0.17**
	(0.25)	(0.48)	(0.41)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
Times a week drinking sugary soft drink/soda	0.40	0.33	0.33	0.04	0.04	0.04	0.04	0.04
	(0.23)	(0.32)	(0.29)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Smoking Status								
Quit more than a year ago				-0.17	-0.17	-0.22	-0.15	-0.20
				(0.49)	(0.57)	(0.58)	(0.60)	(0.59)
Quit less than a year ago				0.29	0.19	0.24	0.17	0.24
				(0.64)	(0.76)	(0.84)	(0.79)	(0.84)
Current smoker				-0.99	-1.09	-1.07	-1.08	-1.05
				(0.79)	(0.85)	(0.86)	(0.78)	(0.81)
No. of observations	616	629	626	1,799	1,735	1,716	1,768	1,771
R-squared	0.1994	0.1941	0.1984	0.2732	0.2681	0.2645	0.2633	0.2667

Notes: ***** p< 0.01, ** p<0.05, * p<0.1.**
Robust standard errors in parentheses
No biological parent or sibling received a diagnosis by a doctor = base level
Hispanic = base level race
Having completed 8th grade or less = base level education level
Own (shared) place = base level residence type
Not trying to do anything about weight = base level trying to do something about weight
Poor = base level self-reported health status
Never smoked = base level smoking status
Not working = base level working status

TABLE 3 – Results time fixed effects regressions

	BAD NUTRITION: ***No. of times p/w fast food and/or sugary drinks/soda***					***GOOD NUTRITION:*** ***No. of times p/w eating fruit and/or vegetables***				
	Diabetes	**High Blood Pressure**	**High Cholesterol**	**Heart Disease**	**Stroke**	**Diabetes**	**High Blood Pressure**	**High Cholesterol**	**Heart Disease**	**Stroke**
Bad News	0.41	0.48	0.35**	0.40	1.10	0.76**	-0.02	0.57	1.99*	0.80
	(0.46)	(0.18)	(0.08)	(0.56)	(0.69)	(0.13)	(0.74)	(0.71)	(0.66)	(0.82)
Female	-1.14*	-1.20*	-1.14*	-1.17*	-1.11*	2.27**	2.37**	2.37**	2.32**	2.23**
	(0.29)	(0.31)	(0.32)	(0.28)	(0.34)	(0.45)	(0.51)	(0.48)	(0.38)	(0.45)
Age	-0.10	-0.11	-0.10	-0.08	-0.07	0.07*	0.08	0.08	0.08	0.09
	(0.07)	(0.08)	(0.08)	(0.07)	(0.08)	(0.02)	(0.07)	(0.05)	(0.05)	(0.04)
Race										
Non-black, non-Hispanic	0.12	0.15	0.27	0.13	0.20	1.28	1.30	1.25	1.22	1.31
	(0.21)	(0.11)	(0.12)	(0.16)	(0.12)	(0.52)	(0.66)	(0.60)	(0.53)	(0.59)
Black	0.14	0.12	0.25	0.16	0.05	0.78	0.85	0.96	0.87	0.76
	(0.20)	(0.20)	(0.17)	(0.20)	(0.22)	(0.63)	(0.68)	(0.63)	(0.78)	(0.70)
Education										
Some high school	-0.49	-0.74	-0.66	-0.64	-0.59	-0.14	-1.05	-0.30	-0.82	-0.80
	(0.84)	(0.79)	(0.80)	(0.76)	(0.80)	(1.90)	(2.06)	(1.73)	(1.66)	(1.77)
High school graduate	-0.45	-0.81	-0.74	-0.65	-0.59	1.40	0.36	1.02	0.57	0.69
	(1.30)	(1.10)	(1.16)	(1.15)	(1.09)	(1.34)	(1.40)	(1.16)	(1.21)	(1.23)
Some college	-1.77	-2.17	-2.16	-1.93	-1.98	1.29	0.24	0.80	0.42	0.66
	(1.24)	(1.17)	(1.17)	(1.24)	(1.09)	(1.37)	(1.40)	(1.01)	(0.96)	(1.02)
College graduate	-2.06	-2.38	-2.50	-2.20	-2.26	1.37	0.58	1.17	0.76	0.87
	(1.87)	(1.71)	(1.83)	(1.79)	(1.67)	(1.23)	(1.38)	(1.26)	(1.15)	(1.18)
Bachelor's degree	-2.82	-3.21	-3.15	-2.92	-3.00	2.91	2.14	2.76	2.18	2.45
	(1.57)	(1.49)	(1.52)	(1.62)	(1.43)	(1.34)	(1.63)	(1.16)	(0.91)	(1.23)
Master's degree or more	-4.83	-5.32*	-5.29*	-5.02*	-5.07*	4.00**	2.83**	3.42*	3.17**	3.34**
	(1.74)	(1.66)	(1.65)	(1.71)	(1.54)	(0.61)	(0.43)	(0.94)	(0.48)	(0.49)
Working status										
Working part time	0.81	0.89	0.97	0.81	0.87	-0.36	-0.43	-0.33	-0.56	-0.56
	(0.76)	(0.97)	(1.01)	(0.98)	(0.95)	(1.03)	(0.84)	(0.85)	(0.98)	(0.80)
Working full time	0.48**	0.44***	0.50**	0.46**	0.49***	-1.16	-1.20	-1.16	-1.19	-1.25
	(0.08)	(0.04)	(0.06)	(0.06)	(0.04)	(0.82)	(0.85)	(0.81)	(0.80)	(0.89)
Residence Type										
With parent(s)	-0.62*	-0.60**	-0.54**	-0.61**	-0.52**	0.01	-0.14	-0.02	-0.10	0.02
	(0.18)	(0.11)	(0.08)	(0.06)	(0.09)	(0.30)	(0.38)	(0.31)	(0.16)	(0.28)
Other	-1.09	-0.87	-0.85	-0.90	-1.09	2.60**	2.21	2.43	1.91	1.87
	(0.69)	(0.87)	(0.78)	(0.70)	(0.60)	(0.51)	(0.95)	(1.02)	(0.82)	(1.06)
Self-reported health status										
Fair	2.16*	2.17	2.21	2.14	2.0*	2.55	2.46	2.32	2.58	2.27
	(0.70)	(0.83)	(0.83)	(0.74)	(0.73)	(1.47)	(1.57)	(1.68)	(1.45)	(1.42)
Good	2.13*	2.26	2.26*	2.20	2.19	1.99	2.05	2.06	2.21	1.96
	(0.70)	(0.90)	(0.88)	(0.79)	(0.87)	(2.24)	(2.31)	(2.36)	(2.06)	(2.30)
Very good	1.51*	1.55	1.50*	1.43*	1.46	3.37	3.13	3.18	3.40	3.16
	(0.37)	(0.56)	(0.51)	(0.46)	(0.57)	(2.12)	(2.24)	(2.25)	(1.94)	(2.15)
Excellent	1.71*	1.88*	1.85*	1.69*	1.76*	4.99	4.90	4.80	5.12*	4.76
	(0.43)	(0.58)	(0.57)	(0.52)	(0.54)	(1.97)	(2.05)	(2.11)	(1.67)	(1.97)
BMI	0.02	0.02	0.03	0.02	0.02	0.01	0.02	0.01	0.01	0.01
	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
Trying to do something about weight										
Stay the same weight	-1.22	-1.39*	-1.48*	-1.34*	-1.40*	0.76	0.92	0.78	0.92	0.89
	(0.45)	(0.45)	(0.49)	(0.45)	(0.39)	(0.85)	(0.77)	(0.83)	(0.71)	(0.71)
Lose weight	-1.05*	-1.09*	-1.14*	-1.05*	-1.11**	-0.71	-0.73	-0.82	-0.69	-0.66
	(0.26)	(0.37)	(0.40)	(0.36)	(0.25)	(0.83)	(0.82)	(0.89)	(0.81)	(0.81)
Times per week 15+ min exercise	-0.13***	-0.13***	-0.13***	-0.13***	-0.13***	0.36***	0.37***	0.37***	0.35***	0.37***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.003)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Times a week eating fruit	-0.04**	-0.04**	-0.05**	-0.04**	-0.04**					
	(0.01)	(0.01)	(0.01)	(0.01)	(0.006)					
Times a week eating vegetables	-0.01	-0.01	-0.01	-0.01*	-0.01**					
	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)					
Times a week eating food from fast food restaurant						-0.23	-0.31	-0.34	-0.26	-0.28
						(0.20)	(0.24)	(0.22)	(0.23)	(0.21)
Times a week drinking sugary soft drink/soda						-0.04	-0.04	-0.04	-0.05	-0.05
						(0.03)	(0.03)	(0.03)	(0.04)	(0.03)
Smoking Status										
Quit more than a year ago	-0.52*	-0.58*	-0.52*	-0.55*	-0.50*	0.87	0.85	0.90	0.87	0.78
	(0.15)	(0.14)	(0.16)	(0.15)	(0.16)	(0.33)	(0.30)	(0.28)	(0.33)	(0.30)
Quit less than a year ago	0.02	0.05	0.01	0.08	0.03	0.29	0.33	0.41	0.39	0.25
	(0.68)	(0.63)	(0.65)	(0.61)	(0.65)	(1.02)	(0.91)	(0.94)	(0.99)	(0.93)
Current smoker	1.32	1.29	1.30	1.30	1.23	-1.00	-0.96	-0.93	-0.98	-1.05
	(0.66)	(0.62)	(0.62)	(0.58)	(0.66)	(0.54)	(0.38)	(0.39)	(0.52)	(0.43)
No. of observations	1,799	1,735	1,716	1,768	1,771	1,799	1,735	1,716	1,768	1,771
R-squared	0.1035	0.1058	0.1054	0.1047	0.1061	0.0990	0.1013	0.1012	0.1024	0.1004

Notes: ***** p< 0.01, ** p<0.05, * p<0.1.**
Robust standard errors in parentheses
No biological parent or sibling received a diagnosis by a doctor = base level
Hispanic = base level race
Having completed 8th grade or less = base level education level
Own (shared) place = base level residence type
Not trying to do anything about weight = base level trying to do something about weight
Poor = base level self-reported health status
Never smoked = base level smoking status
Not working = base level working status

TABLE 4 – Results time fixed effects regressions

	EXERCISE: No. of 15+ min workouts per week				
	Diabetes	**High Blood Pressure**	**High Cholesterol**	**Heart Disease**	**Stroke**
Bad News	0.53	0.47**	0.13	0.90	-0.12**
	(0.36)	(0.08)	(0.10)	(0.54)	(0.02)
Female	-0.73	-0.85	-0.77	-0.83	-0.82
	(0.37)	(0.40)	(0.41)	(0.33)	(0.35)
Age	-0.08*	-0.07	-0.07	-0.06	-0.06
	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)
Race					
Non-black, non-Hispanic	-0.28	-0.31	-0.25	-0.36	-0.30
	(0.22)	(0.20)	(0.22)	(0.22)	(0.23)
Black	-0.59	-0.58	-0.63	-0.62	-0.61
	(0.52)	(0.53)	(0.51)	(0.49)	(0.49)
Education					
Some high school	0.14	0.36	0.02	0.15	0.05
	(0.69)	(0.36)	(0.72)	(0.74)	(1.46)
High school graduate	0.003	0.23	-0.08	0.08	-0.06
	(0.63)	(0.22)	(0.59)	(0.60)	(0.51)
Some college	-0.10	0.16	-0.14	-0.003	-0.04
	(0.22)	(0.28)	(0.15)	(0.16)	(0.16)
College graduate	0.20	0.46	0.11	0.28**	0.19
	(0.15)	(0.46)	(0.08)	(0.06)	(0.14)
Bachelor's degree	-0.29	-0.15	-0.50	-0.17	-0.33
	(0.50)	(0.38)	(0.58)	(0.57)	(0.51)
Master's degree or more	0.62	0.72	0.43	0.61	0.49
	(0.63)	(0.32)	(0.56)	(0.58)	(0.50)
Working status					
Working part time	0.91	1.06	1.02	0.93	0.95
	(0.49)	(0.51)	(0.38)	(0.51)	(0.50)
Working full time	0.19	0.22	0.22	0.22	0.25
	(0.34)	(0.33)	(0.35)	(0.39)	(0.36)
Residence Type					
With parent(s)	-0.91*	-0.88*	-0.88*	-0.93*	-0.91*
	(0.30)	(0.27)	(0.30)	(0.26)	(0.29)
Other	0.43	0.37	0.34	0.33	0.24
	(0.78)	(0.75)	(0.69)	(0.79)	(0.79)
Self-reported health status					
Fair	0.30	0.14	0.22	0.28	0.17
	(1.31)	(1.20)	(1.25)	(1.31)	(1.23)
Good	0.84	0.66	0.71	0.74	0.61
	(1.52)	(1.38)	(1.42)	(1.48)	(1.45)
Very good	1.16	1.09	1.12	1.13	1.00
	(1.41)	(1.24)	(1.29)	(1.34)	(1.30)
Excellent	2.35	2.16	2.19	2.38	2.22
	(1.46)	(1.24)	(1.36)	(1.37)	(1.35)
BMI	-0.07**	-0.07**	-0.06*	-0.07**	-0.06*
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Trying to do something about weight					
Stay the same weight	0.79*	0.73*	0.77*	0.76*	0.75**
	(0.26)	(0.22)	(0.20)	(0.18)	(0.16)
Lose weight	1.46**	1.46**	1.47**	1.54**	1.47**
	(0.27)	(0.26)	(0.28)	(0.21)	(0.22)
Times a week eating fruit	0.08**	0.09**	0.09**	0.09**	0.09**
	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)
Times a week eating vegetables	0.07**	0.08***	0.08**	0.07**	0.08**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Times a week eating food from fast food restaurant	-0.16 (0.09)	-0.15 (0.09)	-0.14 (0.09)	-0.17 (0.09)	-0.17 (0.08)
Times a week drinking sugary soft drink/soda	-0.07* (0.02)	-0.07* (0.02)	-0.07* (0.02)	-0.07* (0.02)	-0.07* (0.02)
Smoking Status					
Quit more than a year ago	0.15	0.09	0.14	0.08	0.06
	(0.16)	(0.14)	(0.09	(0.15)	(0.15)
Quit less than a year ago	0.09	0.10	0.11	0.09	0.06
	(0.17)	(0.21)	(0.19)	(0.15)	(0.17)
Current smoker	0.36	0.27	0.44	0.41	0.40
	(0.36)	(0.32)	(0.35)	(0.38)	(0.39)
No. of observations	1,799	1,735	1,716	1,768	1,771
R-squared	0.1026	0.1032	0.0992	0.1066	0.1025

Notes: ***** p< 0.01, ** p<0.05, * p<0.1.**
Robust standard errors in parentheses
No biological parent or sibling received a diagnosis by a doctor = base level Hispanic = base level race
Having completed 8th grade or less = base level education level
Own (shared) place = base level residence type
Not trying to do anything about weight = base level trying to do something about weight
Poor = base level self-reported health status
Never smoked = base level smoking status
Not working = base level working status

TABLE 5 – Results individual fixed effects regressions

	EXERCISE					BMI				
	Diabetes	High Blood Pressure	High Cholesterol	Heart Disease	Stroke	Diabetes	High Blood Pressure	High Cholesterol	Heart Disease	Stroke
Bad News *Not Using Custom Weights*	0.23 (1.21)	0.62 (1.09)	0.18 (2.12)	-3.5** (1.71)	0.17 (1.94)	-1.21 (0.88)	-0.41 (0.74)	1.47 (1.66)	4.80* (2.74)	2.14 (2.26)
Bad News *Using Custom Weights*	-0.07 (1.56)	0.35 (1.07)	-1.11 (1.74)	-5.22*** (1.32)	-1.02 (2.25)	-1.11 (0.97)	-0.36 (0.66)	3.61 (2.32)	4.49 (4.33)	3.31 (2.57)
No. of obs	148	127	125	127	127	148	127	125	127	127

Notes: ***** p< 0.01, ** p<0.05, * p<0.1.**
Robust standard errors in parentheses

TABLE 6 – Results individual fixed effects regressions

	BAD NUTRITION					GOOD NUTRITION				
	Diabetes	High Blood Pressure	High Cholesterol	Heart Disease	Stroke	Diabetes	High Blood Pressure	High Cholesterol	Heart Disease	Stroke
Bad News *Not Using Custom Weights*	-2.27* (1.29)	0.71 (1.69)	-3.45 (2.33)	3.00 (6.26)	-0.33 (2.84)	2.91 (2.11)	-2.35 (2.28)	0.63 (3.82)	3.50 (3.06)	3.50* (2.02)
Bad News *Using Custom Weights*	-1.67 (1.08)	1.20 (1.24)	-4.72 (2.95)	-2.92 (5.67)	-1.80 (3.95)	4.54 (2.81)	-3.01* (1.75)	3.15 (3.66)	5.52 (4.17)	4.81* (2.74)
No. of obs	148	127	125	127	127	148	127	125	127	127

Notes: ***** p< 0.01, ** p<0.05, * p<0.1.**
Robust standard errors in parentheses

received a diagnosis of diabetes and bad nutrition was found. Only when using custom weights, we detected a surprising negative relation between having a biological parent/sibling who was diagnosed with high blood pressure and the intake of fruits and/or vegetables. Finally, regardless of whether or not custom weights are applied, a potential peer effect was found with regard to having a peer who suffered a stroke and the individual's consumption of healthy foods.

With regard to the other bad news – health behavior relations, what stands out are the large standard deviations, pointing towards data points being spread out over a relatively wide range of values. Thus, there seems to be large variation among the respondents' within-individual variation.

6. Discussion

In this section, we will provide more specific insights into the (lack of) evidence of peer effects found by this study. In the latter part of this section, the limitations of the study's research design will be discussed and suggestions for future research will be made. Throughout all findings, there were three possible outcomes: 1) we found no significant effect, 2) suggestive evidence of peer effects was found, or 3) we found an effect contrary to what one would expect if peer effects would predominate. We primarily ascribe the latter to being a relative of the one who experienced a negative health shock, therefore having many similar inputs into the health production function. Yet, more extensive and diverging explanations will be provided below.

Starting with the OLS year-fixed effects regressions, we believe that one explanation for the relatively large effect for a peer having asthma on smoking behavior, compared to no effect for a peer being diagnosed with heart disease or stroke, is the more tangible link between asthma and smoking as a trigger. Witnessing a parent or sibling wheeze, cough, having chest tightness, and struggling with shortness of breath will undoubtedly make one aware of the burden asthma puts on the respiratory system. Subsequently, we expect that the perception of smoking as a trigger for asthma is rather straightforward. In that case, it is likely that at least some more thought will be put into lighting that next cigarette, eventually leading to a decrease in the amount of cigarettes smoked and/or quitting. With regard to heart disease or stroke, the risk factors are less easy to wrap your mind around. Mosca et al. (2000) find that the major risk factors are not known among the majority of US women aged 25 to 44. In addition, the role of smoking as a cause is less recognized than being overweight or lack of exercise. Especially concerning stroke, people seem do not seem to acknowledge the role their individual health behaviors play in the development of a stroke; a majority of stroke survivors think there was nothing they could have done in order to avoid the stroke (Wellwood, 1994). The lack of perceived control and thereby responsibility likely indicates low personal vulnerability. This also decreases chances that one is willing to make an effort to change health behaviors in order to prevent a stroke from happening. This is worrisome, as previous research established that the vast majority of coronary events can be prevented via lifestyle practices (Stampfer et al., 2000; Chiuve et al., 2006).

Another potential explanation is the significant genetic contribution concerning asthma; heritability estimates range from 35% to 95% (Ober and Yao, 2011). Under the assumption that individuals are at least to some extent aware of the important role of genetics with regard to asthma, a peer's diagnosis may cause the individual to acknowledge its personal vulnerability and therefore smoke less. Family history was mentioned as a cause of heart disease too, yet only after being overweight, not exercising, smoking, high cholesterol, and stress (Wellwood, Dennis, and Warlow, 1994). The various contributing factors offer an individual whose biological parent or sibling has been diagnosed with heart disease multiple (valid) arguments based on which he/she can, and likely will, deny personal vulnerability.

Our results also indicate that health and health behaviors have clear cultural underpinnings, which become particularly evident in diverging smoking behaviors among different races. Although certainly an interesting topic for research, it is beyond the scope of this paper to dig into the historical, economic, and social factors that underlie these differences between cultures.

The positive relationship between having a peer who received a diagnosis of high blood pressure or high cholesterol - both proven to be (directly) related to being overweight/obese - and BMI seems to indicate that the effect of sharing genes, having the same cultural context, and a past or present of sharing a similar physical and social environment outweighs a potential peer effect. The intuition behind the latter is that the individual is on a health track comparable to the peer who is now experiencing the negative consequences of poor health behavior. Therefore, his/her BMI is higher than that of an individual whose parent nor sibling experienced a negative health shock, reflecting the latter family's more desirable inputs into the health production function. However, the finding that individuals who indicated wanting to lose weight have higher BMI could suggest the start of a downward trend in BMI; more research is needed to establish whether intentions generate actual results, and whether this applies to individuals with a peer that experienced a negative health shock in particular.

The marginal positive effect of having a peer with high cholesterol and fast food intake could be explained along the same lines. Having a peer with diabetes seemed to result in a slightly more frequent consumption of fruit and/or vegetables, but this effect was clearly outweighed by other health-deteriorating factors as results also show a positive effect of having a peer with diabetes on BMI. The contribution of having a peer with heart disease on good nutrition was significantly larger, which could point towards the existence of peer effects. With regard to both bad and good nutrition, women seemed to make more health-enhancing decisions then men. This supports conclusions from the previous literature, which suggest that food decisions are of greater personal importance and relevance to women than to men (Levi, Chan, and Pence, 2006). The latter coincides with the notion that women have higher levels of nutrition knowledge than their male counterparts (Gracia, Loureiro, and Nayga, 2007).

The negative relations between bad nutrition and intentions of either staying the same weight or trying to lose weight indicate that people are well aware of the tendency of fast food and sugary drinks to increase weight. Also, the notion that exercise helps with losing weight seems to be well established, shown by the increased frequency of weekly exercise among those aspiring to lose weight.

With regard to exercise, the inconsistency among the diagnoses and either lack, or diminutive magnitude of the effects (max. one additional 15+ min exercise per two weeks), lead us to conclude that a negative shock to a peer does not incentivize the individual to boost physical activity levels.

Despite clearly observing multiple effects when performing OLS regressions, thereby controlling for a significant amount of factors as well as including year fixed effects, the majority of conclusions changes notably once introducing individual fixed effects. While doing so provides us with the "cleanest" empirical analyses possible with the data at hand, it is important to note here that the study population was reduced to Sample C in order to exploit variation over time. This not only vastly deteriorated explanatory power of the results, but also precluded the option of studying smoking behavior. The latter is particularly unfortunate given that smoking behavior initially showed the largest potential for exposing peer effects.

When controlling for individual fixed effects, the one effect that remains significant, yet now multiplied by factor 5, is the positive effect of a peer receiving a diagnosis of heart disease on BMI. While this does not support the hypothesis of individuals improving health behavior once witnessing the consequences of poor health behavior from up close, there are several plausible arguments one could think of when attempting to explain this finding.

First of all, having a biological parent and/or sibling with heart disease may lead to the individual (in)voluntarily becoming a caregiver. This poses a physical and emotional burden on the individual, thereby causing stress (Okoye and Asa, 2011). Previous literature states that stress and weight gain may be casually linked, primarily via stress-induced eating (Torres and Nowson, 2007). In addition, taking care of a relative means having less time for e.g. exercise and home cooking healthy meals. Furthermore, a peer receiving life-threatening news with regard to his or her health may in itself be enough for the individual to feel anxious or depressed (Fumis and Deheinzelin, 2009), especially when being close to the parent/sibling. Inadequate coping with these negative emotions has been found to be associated with emotional eating and loss of control over eating (Goossens et al., 2008), which eventually leads to an increased BMI. However, increasing one's BMI by several points requires a large and long-term positive energy-balance (calorie surplus), which means that (a combination of) the above effects must be substantial.

Moreover, several new findings made an appearance. That individuals with a peer who got diagnosed with heart disease tended to exercise significantly less speaks against potential operating of peer effects. Strangely, not exercising was most reported as a cause of heart disease in a study by Wellwood (1994). This creates the expectation that those with a parent or sibling who lives with the daily burden of heart disease and the very real threat to life it poses will be incentivized to exercise more. Moreover, the predictive strength of family history should enhance this incentive (Barrett-Connor and Khaw, 1984). Nevertheless, we suspect that being the child or sibling of the person experiencing the negative health shock implicated the development of similar health behaviors. Consequently, under the assumption that insufficient physical activity contributed to the development of heart disease, a positive relationship between the individual's and the peer's exercise level could explain the negative effect on exercise frequency. Besides, referring to the previously discussed caregiver argument, the care for a peer with heart disease may be at the expense of time previously spend on physical activity. When correcting for oversampling by using the longitudinal weights created by the NLS Custom Weighting program, thereby reducing bias, the negative effect is reinforced.

On the condition that custom weights are not used, therefore not being representative for the US population as a whole, we found suggestive evidence of a peer effect on health; individuals whose biological parent or sibling was diagnosed with diabetes consumed more than two times a week less fast food or sugary drinks than those who did not have a peer that experienced this negative health shock. Given that modest weight loss significantly reduces the risk of developing diabetes, even when having a family history of diabetes (Wing et al., 1998), a lower intake of bad nutrition is a step into the right direction.

Further suggestive evidence of peer effects that benefit health behavior was found with regard to the consumption of fruits and vegetables; good nutritional intake tended to increase when a peer suffered a stroke, regardless of whether custom weights were used. Building upon previous literature stating that fruit and vegetable intake is predicted by the belief in the importance of disease prevention (Gibson, Wardle, and Watts, 1998), this finding could reflect increased awareness or even awakening of the individual with regard to his/her individual power to make better health decisions and thereby prevent harmful consequences of poor health behavior, like a stroke.

Finally, when using custom weights, individuals whose peer experienced a negative health shock in the form of a diagnosis of high blood pressure were found to decrease fruit and/or vegetable intake by three times a week. This is a rather unexpected finding that challenges intuition. Since a diet rich in fruit and vegetables has been found to reduce blood pressure (Alonso et al., 2004), such an effect could harm one's health. Future research may be able to shed a light on this aberrant finding.

The disappearance of the other effects found in the initial round of OLS regressions implies that correlations between previously unobserved individual characteristics and the regressors caused the former effects, instead of being true peer effects.

All in all, this study does not provide consistent evidence of the operating of peer effects; a negative health shock to a peer seems to – more often than not – be unable to (sufficiently) motivate the individual to change health behavior for the better. We expect the inherently high degree of complexity concerning health behaviors to be a major jammer in the detection and probable reveal of peer effects.

As health and health behaviors are a component of daily living, they are subject to social, structural and cultural expectations (Backett and Davidson, 1992). Due to the multitude of underlying mechanisms, the detected effects potentially operate in both directions. For example, completing a higher level of education is generally associated with better health behavior (Mirowsky and Ross, 2003). With the exception of exercise, this is confirmed by the results and particularly once a University level degree has been achieved. A common argument is that higher educated individuals are better informed about the health risks than those with lower levels of education, which enables them to make better health decisions. However, causality could also run the other way around: those with better health invest more in education. For example, obese children may perform worse in (or drop out of) school due to e.g. being bullied, having lower self-esteem, or suffering from musculoskeletal discomfort (Beck, 2016; Pollock, 2015). Consequently, they do not get a University degree. Another example of the complexity concerning health behavior and outcomes: diabetes prevalence is likely to be associated with the food marketing and distribution processes that prevail in the region, which are expected to influence the individual's diet, presumably in the same direction as it influences diabetes prevalence. The same goes for aspects of the physical environment e.g. whether or not there are bike paths.

It is beyond the scope of this paper to set out all - sometimes contradicting - lines of reasoning that could explain health behavior; we therefore confined ourselves to the explanations we considered most feasible.

A major limitation of this study is the small number of observations, especially with regard to the regressions performed with Sample C. The large amount of missing values for the questions representing the predictor variables significantly restricts the analysis possibilities and undermines the explanatory power. In addition, as the health module was only started in 2010, the time span that could be studied was very limited. This poses a serious limitation, as health behavior change is a long term process which unfolds over time. Hereby, one must go through a sequence of stages: precontemplation, contemplation, preparation, action, maintenance and termination (Prochaska and Velicer, 1997). On the basis of this transtheoretical model, a negative health shock to a peer may push people out of the contemplation stage and into the preparation stage, or cause them to progress to the action stage. Notwithstanding, individuals often linger in the preparation and thereafter the action stage for months, sometimes years, which means it could take a long time before measurable results of health behavior change become apparent. Given this paper's relatively short study period, we may not yet observe the results of the (progression in the) process that has been initiated by a negative health shock to peer.

Besides, a subtle sampling bias may be caused by choosing telephone interviews as the means of data collection; telephone interview respondents tend to be have slightly higher education levels compared to respondents from face-to-face interviews or mail questionnaires (Groves and Kahn, 1979). Utilizing sampling weights, when available, can solve this issue.

Also, there will always be a risk of bias when using self-reported data, especially in a health context. As mentioned before, we tend to credit our risk-reducing health decisions disproportionately generous (Weinstein, 1984). This could then result in an upward bias with regard to e.g. the amount of physical activity, or the amount of fruits and vegetables consumed. Moreover, women and heavier men (>100 kg) have a tendency to under-report their weight (Lakdawalla and Philipson, 2009). Hence, BMI levels may be biased downwards. Accounting for this bias would further increase the validity of the results.

In addition, the predictor variables being based on self-reported data on a third party gives rise to potential bias in three ways. First of all, a factor that may influence the findings is the simply not knowing whether or not the condition applies; especially parents may want to withhold the truth about their health in an attempt to spare their children from the potentially painful experience of hearing the facts (Braddock, 1998). Secondly, they may not remember whether or not one of the conditions applies to their parent(s) and/or sibling(s). Both these explanations are likely to be related to the degree of closeness between the respondent and his/her relatives. Finally, the respondent may have blocked the existence of a diagnosis out, known as information avoiding (Brashers, Goldsmith, and Hsieh, 2002). Reasons behind the latter could be that this information is distressing (Brashers et al., 2000; Leydon et al., 2000), especially when he/she believes to be at risk for the same condition, or that it conflicts with current beliefs with which the individual is comfortable (Babrow, 2001). Although unable to determine which argument holds most explanatory power, the bias seems to be even stronger for black respondents. While previous research shows that the incidence of heart disease and stroke was significantly more common among blacks than non-blacks (Bahrami et al., 2008; Bibbins et al., 2008), a different conclusion derives from the summary statistics. In addition to the ones mentioned above, a potential explanation underlying the underrepresentation of blacks in the group that reported to have a peer with a diagnosed health condition could be the absence of a doctor diagnosis altogether; black Americans have been found to underutilize health care, reflected by lower rates of physician visits (Bazargan, Bazargan, and Baker, 1998; Escarce and Puffer, 1997). Whether this is due to lack of (perceived) accessibility or availability, not visiting a physician obviously obstructs being diagnosed. Consequently, the results may falsely indicate that black respondents are more likely to not have a peer who experienced a negative health shock.

Finally, future research could make use of the Add Health Parent Study (AHPS), from which the data is expected to be available in the fall of 2018. One of the unique aspects of this study is that it will provide intergenerational data about health behavior, as they are collecting extensive information about parents' health behavior and health conditions. This also includes the parent's family health history. Given that Add Health has a rich 20-year longitudinal data on health behavior for the children, adding information on parent's health behavior will provide a rich and unprecedented resource to conduct intergenerational health behavior and outcome analysis. Such a data set may better enable researchers to study the effect of a "shock"ing event in an individual's peer network. While some circularity and effects in both directions (discussion) would still apply, doing a differences-in-differences analysis with a richer and larger data set could overcome many of this study's limitations.

7. Concluding Remarks

Ultimately, us as individuals and society as a whole would benefit from making better health decisions. In order to do so, we need to have a thorough understanding of the factors triggering us to change our health behavior. Once we understand what underlies and influences our decision-making process, we can design more effective policy.

While this study did not find consistent evidence of the existence of peer effects, it neither excludes the possibility that peer effects indeed operate in a set-up similar to the one used in this study. However, as policy (advice) must be based on reliable evidence in order to A) get support and B) achieve the desired effect, it all starts with researchers gathering cohesive data. In particular data on cohorts that have been followed for years already should be considered highly valuable, and its respondents should be encouraged to continue taking part in the surveys. Building such a data set from the ground up will require significant investments in the form of money, effort, and time. Especially the latter is a luxury we can no longer afford; worldwide health care expenditures are going through the roof, while well-being is taking a dive due to mainly preventable diseases and the limitations on daily activities posed by them. The message is simple: effective policy is needed, time is limited, and thorough research holds the key.

So what are we waiting for? Let's get to work, starting today.

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