Adolescent Stress Induced by Family Structures and its Effect on Adult Health: A Longitudinal Assessment

by

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This study strives to explain the decrease in health among children and young adults in the United States in recent decades, by examining the relationship between adolescent family environments and health measures of the individuals as adults. The study utilizes the National Longitudinal Study of Adolescent Health (Add Health) dataset Waves I and IV to analyze health measures commonly used to rate the wear and tear on the body, such as high blood pressure, BMI (Body Mass Index), diabetes, high cholesterol, and poor purported health. Findings suggest that family structure during adolescence is an important predictor of adult health outcomes. Yet, it also underscores that family structure is complicated and cannot be simplified into a traditional versus nontraditional family dichotomy.

Results from Logistic Regression models indicate when disaggregating the many different forms of "alternative family forms" that the two biological parent home is not necessarily less stressful than all alternative family forms. Siblings also play a very integral part in the relationship between family structure and health as an adult. Multivariate models suggest that siblings have a positive effect in the family. In particular, being an only child is associated

with higher levels of obesity and high blood pressure. Finding presented here underscore the importance of siblings to long term health. Yet, they also provide some preliminary support for the perspective that different types of siblings may have different impacts. Indeed it appears that variations in sibling structure may explain some of the association between guardian structure and long term health. This study confirms the conclusions of other researchers that health among young people in this country is on the decline.

Adolescent Stress Induced by Family Structures and its Effect on Adult Health:

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DEDICATIONS

This paper is dedicated to my husband and children, and in memory of my father; because without them my life would not have led me to this point in time. Thank you for my life experiences, where my curiosities and passion for their answers all originate.

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CHAPTER 1: PROBLEM FORMATION

The United States is one of the most influential nations in the world. Yet individuals in the United States, young and old, have poorer health on average than other industrialized nations (Starfield 2004). The United States ranks 12th out of the top 13 developed countries when comparing health rates (Starfield 2004). Of particular concern is the decrease in health among children and young adults in the United States in recent decades.

For the past 30 years, adolescent and childhood obesity rates have doubled and the incidence of asthma, high blood pressure, childhood diabetes, anxiety, and depression have increased (Stein, Stanton, and Starfield 2005). Middle-aged men in the United States have rates of diabetes, C-reactive protein levels, and cholesterol levels that are higher than men of the same age living in England (Banks et al. 2006). It is argued that the differences in adult health between Britain and the United States are due to social determinates of health in childhood and adolescence (Banks et al. 2006; Barker 1997; Case, Lubotsky, and Paxson 2002; Marmot and Wilkinson 2005).

Recent thinking and research indicate that early life stressors affect childhood and adolescent development, ultimately leaving the body vulnerable to disease as an adult (Cicchetti and Toth 1991, 1997; Cohen and Park 1992; Compas 1987; Haggerty et al. 2004; Johnson 1986; Johnson and Bradlyn 1988; McEwen 2000; Rutter 1989). Because children living in families without both biological parents endure more stressors and have less ability to cope, these populations of children are more at risk of illness as adults.

This study strives to explain this phenomenon by examining the relationship between adolescent family structure and health measures of the individuals as adults. The study examines health measures commonly used to rate the wear and tear on the body, such as high blood pressure, BMI (Body Mass Index), diabetes, high cholesterol, and poor purported health. Thus I hypothesize that children who are at an increased risk of exposure to stress due to their family structure are more likely to suffer from disease in adulthood. I utilize the National Longitudinal Study of Adolescent Health (Add Health) dataset Waves I and IV. The data were collected in 1994/1995 when respondents were in grades 7-12 and again in 2008, when respondents ranged in age from 24-32. As much of the previous research analyzing the effects of stress has been cross-sectional or relied on retrospective recall of childhood conditions, the longitudinal data available through the Add Health program is ideal for testing the long-term impacts of family structure on young adult health.

CHAPTER 2: LITERATURE REVIEW

Human health has been defined by the World Health Organization (1948:100) as the "state of complete physical, mental, and social well-being; not just the absence of disease or infirmity." There are multiple dimensions that influence an individual's overall health: his or her physical ability to function properly; social relationships; interactions with social institutions; religiosity; beliefs; choices; societal mores; mental ability; emotional ability; self-esteem; external environmental factors and; genetics (World Health Organization 1948). In other words an individual's social and biological environment can place them at higher risks for chronic stress and disease.

Stress

In 1865, Claude Bernard identified the body's sympathetic nervous system's ability to regulate humans in their external environment. Cannon (1929a, 1929b, and 1939) extended Bernard's observations to include the regulation of emotional distress (Goldstein and Kopkin 2007). Cannon named this process of regulating the body from external and internal stressors "homeostasis". Conscious or unconscious disruption of homeostasis is known as stress, while causes of stress are called stressors (Cannon 1929b, 1939, Goldstein and Kopin 2007; Goldstein and McEwen 2002; and McEwen and Stellar 1993). Selye (1956) popularized the term stress as the body's response to any set of elements that place demands on the body. The concept of stress can be confusing. For example, Selye's concept includes all stressors such as exercise, chronic stressors, and emotional stress (Goldstein and Kopin 2007). Although exercise engages the same biological systems as does emotional stress and daily life stressors, exercising benefits

the body because the body returns to homeostasis, unlike chronic emotional and life stressors, which continue to negatively, impact the body overtime (Goldstein 2001; Goldstein and Kopin 2007; Goldstein and McEwen 2002; McEwen and Stellar 1993.)

Recently stress has been defined as "consciously or unconsciously sensed threat to homeostasis in which the response had a degree of specificity, depending, among other things, on the particular challenge to homeostasis, the organism's perception of the stressor and the perceived ability to cope with it" (Goldstein and Kopin 2007:111). Stress is sometimes used synonymously with the term stressor, as an event or ongoing events that challenge the body; stress can also be thought of as the body's response to the stressors (Goldstein and Kopin 2007, Goldstein and McEwen 2001; McEwen 2000). Responses to psychological stressors - such as fear, social defeat, disappointment, and anxiety - can be expressed physiologically, psychologically, and behaviorally by individuals (Goldstein and Kopkin 2007; Goldstein and McEwen 2002; McEwen 2000; and McEwen and Stellar 1993).

Homeostasis is an imperative function of the human body that permits individuals to deal with their physical and social environment, but these very biological responses to stress over time and over the life course, can cause damage, poor health, and physical weathering (Goldstein and Kopkin 2007; Goldstein and McEwen 2001; Mason 1959, 1975; McEwen 2000; McEwen and Stellar 1993; Perlin 1983, 1989). Physical weathering refers to accelerated aging; this characteristic includes achieving reproductive capabilities earlier, earlier onset of chronic disease, and earlier mortality due to stressors endured because of social disparities (Foster, Hagan, and Brooks-Gunn 2008; Geronimus 1996;

Geronimus 2001; Geronimus et al. 2001). Social activation of the stress response arises from chronic strains and life events (Cannon 1939; Mason 1959; Mason 1975; McEwen 2002; McEwen and Stellar 1993; Pearlin 1989; Unberson, Williams, and Anderson 2002).

Pearlin (1989:242) states, "many stressful experiences, it should be recognized, don't spring out of a vacuum but typically can be traced back to surrounding social structures and people's location within them." It is the very systems of society that cause stress to individuals and their living environment (Pearlin 1989). Roles within social institutions and social stratification within institutions, such as the family, create an environment of stress and when individuals cannot complete their roles without problems or conflict, the roles become a source of chronic strains (Pearlin 1983; Pearlin 1989). Therefore it is important and of interest to the study of Sociology to research the "Stress Process" by understanding stressors, mediators, and outcomes (Pearlin 1989).

Pearlin views "stressors as the experiential circumstances that give rise to stress" (Pearlin 1989:243). Life events and chronic strains are two ways of conceptualizing of social stressors. Life events are major life changes such as divorce, loss of a parent, addition of a stepparent to one's family, and birth of a child (Dohrenwend and Pearlin 1982; Thoits 1983). Chronic strains refer to the daily problems, threats, and conflicts that individuals endure as a result of role strain. (Pearlin 1989). It is important to take note, as Pearlin (1989) suggested in his writings; life events and chronic strains are not detached from one another. Life events can create chronic strains just as chronic strains can lead to life events (Pearlin 1989). Life events such as divorce and death of a spouse change the

family's lives and their quality of life (Pearlin and Johnson 1977; Pearlin and Lieberman 1978; Guidubaldi and Perry 1985; Hoffman 1977). Life events such as those above can create financial problems, turmoil within the family, and separation from social supports (Pearlin 1989). These same chronic strains of financial problems, family turmoil, and separation from social supports can cause life events such as divorce (Pearlin 1989). Life events and chronic strains are circular, life events and chronic strains feed off each other. Life events and chronic strains because of different role strains create an environment of chronic stress.

Individuals' responses to stress can differ. Individuals could potentially respond to negative stressors through harmful behaviors such as forms of substance abuse like, alcohol consumption, smoking, and overeating (Kushner, Sher, and Beitman1990; McEwen 2002; McEwen and Stellar 1993). A person's anxiety levels and depression typically increase with prolonged stress (Kessler 1997; McEwen 2000). Biological systems also respond to stress. Biological systems that react to stress are the brain, and the immune, metabolic and cardiovascular systems (Baker et al. 2000; McEwen 2002; McEwen and Stellar 1993; Seeman et al 2010). In addition to epinephrine and norepinephrine, cortisol is one of the hormones released during stress; cortisol has tremendous effects on the individual's metabolic and immune response (Cannon 1929; 1939; Miller et al. 2004). Individuals with high levels of cortisol have poorer antibody response (Miller et al. 2004). Miller and colleagues (2004) found healthy adults who underwent moderate intensities of stress had a weaker humoral immune response when controlling for alcohol consumption, activity level, and cigarette smoking.

Stress response can lead to other health problems and evidence indicates stress early in life can cause health problem in the future (Elkasabany et al. 1998; Geronimus 1992; Lowy, Wittenburg, and Yamamoto 1995; Lupien et al. 1994; Lupine et al. 1998; McEwen and Stellar 1993; Rowe and Kahn 1998; Seeman et al. 1997; Selye 1974; Slama, Susic, and Frohlich 2002; and Suter, Sierro, and Vetter 2002). A British birth cohort study of 17,414, found that poor self-rated health at age 33 was associated with factors during adolescence not only the result of recent stressful experiences (Power, Matthews, and Manor 1998). Other findings indicate hypertension in adulthood originated in childhood and in adolescence (Elasabany et al. 1998; Slama, Susic, and Frohlich 2002; and Suter, Sierro, and Vetter. 2002), which is especially troubling given that Brady and Matthews (2006) found adolescents who report having a greater number of chronic, negative, independent life events have a higher systolic blood pressure throughout the day. Allostatic load helps to explain the accumulation of wear and tear of the body or physical weathering due to constant or repetitive life stressors.

Allostasis and Stress Response

Allostasis is a term Sterling and Eyer (1988) coined to refer to the entire process the body goes through to maintain homeostasis (Goldstein and Kopin 2007; McEwen 1998, 2000, 2002; McEwen and Seeman 1999; Price, Lorenzon, and Handa 2000). Homeostasis is when there is a proper amount of stress hormones in the body, a normal state of the body (Cannon 1929a, 1939, McEwen 1998, 2002). Allostasis begins during the initial response to stress and concludes after normalizing the body's receptors back to their original sate (McEwen 1998, 2002; Sterling and Eyer 1988). Regulation of allostasis

involves the immune system, autonomic nervous system (ANS) and the hypothalamo-piyuitary-adrenal (HPA) axis (Goldstein and Kopkin 2007; McEwen 2002 Sterling; and Eyer 1988). When the body perceives constant threats or chronic stress, homeostasis cannot be maintained, thus inflicting damage to the very systems used to stabilize the body. Constant elevation of the stress hormones is referred to as an allostatic state (Koob and LeMoal 2001; McEwen 1998, 2002). Allostatic state profiles can be influenced by genetics, early developmental influences and environment (Koob and LeMoal 2001; McEwen 2002; McEwen and Stellar 1993). Over time chronic stress leads to allostatic load. Allostatic load (AL) is a concept coined by McEwen and Stellar (1993) to understand and quantify damage or wear and tear that the body endures from an accumulation of stress over a period of time (McEwen and Stellar 1993; McEwen 1998, 2002).

Repeated hits, lack of adaptation, prolonged response, and inadequate responses are four common allostatic state response patterns (McEwen 2002; McEwen and Stellar 1993). When an individual is constantly being bombarded by stressors over time this is known as an allostatic state of repeated hits (McEwen 2002). Those who lack self-esteem or self-confidence may have an excess of stress hormones and behavioral stress responses to everyday stress situations that do not bother the average individual (McEwen 2002; and McEwen and Stellar 1993). This allostatic pattern is known as lack of adaptation (McEwen 2002). An inadequate response to stress occurs when one of the many biological systems that respond to stress is not working properly, therefore other biological systems overcompensate and cause damage to the body (McEwen 2002). The prolonged response allostatic state is when the body never recovers and is in constant

state of stress; in other words the stress response fails to turn off. Lack of adequate sleep among other things can cause this state (McEwen 2002).

Allostatic Load

Allostatic load (AL) is a concept used to understand and quantify the damage - or wear and tear - that the body endures from an accumulation of stress over a period of time (McEwen 1998; McEwen and Stellar 1993). There are measures used to assess damage experienced by the immune system, autonomic nervous system (ANS), cardiovascular system, metabolic processes and (HPA) axis (McEwen 2000; Seeman et al. 1997). Common biological measures used to rate the wear and tear on the body are individuals' systolic and diastolic blood pressure, waist-hip ratio, serum HDL, and levels of glycosylated hemoglobin (Cohen, Janicki-Deverts, and Miller 2007; McEwen 2000).

Higher scores indicate a higher prediction for incidence of cardiovascular disease, syndrome X, cancer, mortality and a decline in physical and cognitive functioning (Cohen, Janici-Deverts, and Miller 2007; Seeman et al. 1997, 2001). Carrol and colleagues (2003) found that raised blood pressure due to psychological stress predicts an increase in resting blood pressure in the future.

Other health problems that have a positive correlation to psychological stress are: Th1-polarized inflammatory skin disease, early menarche in adolescent females, diabetes, inflammation, decrease in the immune systems function, fibromyalgia, chronic fatigue syndrome, and bowel disease (Chisholm et al. 2005; Cohen, Janicki-Deverts, and Miller 2007; Glaser et al. 1985, 1986; Kiecot-Glaser et al. 1987; Schmid-Ott et al. 2009; Seeman et al. 1997, 2001; Wellen and Hotamisligil 2005).

Early Stress and Long-Term Impacts on Health

Bruce McEwen (2002:929) states " the vulnerability of many systems of the body to stress is influenced by experiences early in life". McEwen (2002) also argues that the influences of early life stressors have not been investigated enough, and when they have been investigated, studies relied on the respondents' recall of their past stressors. As previous research has indicated certain family structures expose individuals to higher levels of stress, then it is to be expected that the family environment is related to allostatic load.

Stress, Family Structure, and Household Composition

Social environments, such as the family structure, harbor stress-induced situations, which interfere with the adolescent body's ability to achieve homoeostasis (Taylor, Repetti, and Seeman 1997). Adolescents are just as much at risk for the adverse effects of stress as adults, which can cause future life diseases. Adolescents living in negative social environments are more likely to have problems regulating their cardiovascular, sympathetic nervous system, and cortisol levels (Seeman et al. 2002). Brady and Matthews (2006) found among adolescents a positive relationship between a high number of reported family stressors and resting blood pressure reading throughout the day, independent of ethnicity, sex, and BMI among adolescents. An experiment conducted by Cohen and his colleagues (2004) indicated children with low socioeconomic status (SES) have a high risk of developing the common cold when exposed to the rhinovirus as an adult. Goodman and colleagues (2005) found a

relationship between lower parent education and insulin resistance in adolescents. Thus there is some evidence that stress in adolescence affects future health outcomes.

Guardianship Structure

Single Parent Homes

In the United States more than half of all children will live in a single-parent home at some time in their lives, with a large majority headed by their mother (Sweet and Bumpass 1987). Single-parent families are viewed as an at risk population for experiencing high numbers of stressors as a result of lower income, less social support, lower level of education, unemployment, poorer housing, lack of coping skills, poor diet, less time for their children, and fewer healthcare options (Acock and Kiecolt 1989; Amato and Booth 1997; McLanahan and Sandefur 1994; Duncan 1967; Duncan and Duncan 1969; Johner 2007; Weinraub and Wolf 1983). McLanahan (1983) found that single mothers experience more life events than married parents; they have fewer neighbors; are less likely to live near relatives; are less likely to think positively about themselves; and are less likely to think positively about their futures. Due to increased chronic strains and life events adolescents of single parents are more likely to smoke, less likely to exercise, have less supervision, are more delinquent, and have parents that are not as close to their children as teenagers of two-biological married parents (Demuth and Brown 2004; Hoffman et al. 1991).

Adolescents not living with both biological parents have fewer coping skills and endure more life strains and life event stressors, which causes chronic stress and poorer health (McLanahan 1983; Thompson et al. 2001). Coping skills are ways to reduce the

negative effects of transitions in adolescents; adolescents without the necessary coping skills may experience greater negative effects to the same transitions as adolescent with the coping skills (Pearlin et al. 1981; Hoffman et al. 1991).

Both single-father families and single-mother families have lower incomes than two-biological married and stepparent families; but single-father families have a higher income than single-mother families (Demuth and Brown 2004). Research has argued that the higher level of stress and poor health in single-mother homes is largely a result of living in lower SES environments (Johner 2007). But, interestingly research has also found when controlling for income, race, and sex adolescents in single-mother homes still fare worse in terms of health and higher amounts of stress than adolescents in homes with both biological parents and stepparents (Spruijt and de Goede 1997). Thus, while low income is an important factor, it is not the sole source of stress in single parent homes.

There are other differences between single-mother and single-father families. Male adolescents are more likely to live with their single father and daughters usually reside with their single mother (Demuth and Brown 2004). This may be due to the "same sex argument" that children are perceived to be better off with the parent of the same sex (Powell and Downey 1997). Use of the same sex argument has even guided courts and judges on where children of divorce should reside, even as far as to separate brothers and sisters (Chambers 1984). Powell and Downey found that there were no profound differences in single mothers and single fathers as the primary caregiver; in fact their study found that opposite sex parent relations are very important to the development of the child. Yet, other studies have found delinquency is higher in single-father homes than

in single-mother homes due to differences in parental involvement, supervision, monitoring, and closeness to the adolescent (Demuth and Brown 2004). To better understand the complexity of single-mother and single-father households and their long-term effects on an adolescent's health, further research is needed.

Divorce, remarriage, and death of parents are all life transition stressors (Brown 2006). The reorganization of the family structure and family roles can create disruptions in daily routines and inconsistent parenting, thus causing stress on the adolescent (Brown 2006). Transitions can change the relationships between the adolescent and parent as well as contribute to emotional insecurities (Brown 2006). Single parenting can result from unwed births, divorce, or death of a spouse. But, are the effects of divorce, death of a spouse, or unwed birthing the same? Classifying a household as a single parent is not as clear-cut as specifically addressing the reason for the absence of the parent. Does being a single parent from a divorce, death of a spouse, or never being married change the home atmosphere and thus change the amount of stressors in the home?

Referring back to Pearlin's (1989) argument that chronic strains and life events interact with each other one may postulate that divorce may be most detrimental to the long-term health of the adolescent, because of chronic strains before and after the divorce. Adolescents of divorce have feelings of rejection; while, when an adolescent loses a parent due to death, the adolescent may idolize that parent, only remembering the fond memories instead of the negative (Biblarz and Gottainer 2000). Adolescents who lose a parent because of death have a better ability to cope than adolescents from divorced families (Biblarz and Gottainer 2000). This ability to cope has been found in

other studies; finding that children from single-parent families due to death of spouse have higher well-being than those from divorces (Acock and Kiecolt 1989; Amato and Keith 1991a, 1991b). It is important to note that in both divorced and widowed families adolescents have higher delinquent behaviors and lower academic achievements than adolescents in two biological parent homes (Amato and Keith 1991a; Evans et al. 1995; Rankin 1983).

Studies of the long term impacts of divorce or death of a parent support the expectation of different effects. In a qualitative study of African American women with heart disease, of the women interviewed, a significant number of women reported the stress causing their "bad heart" was due to an early life stressor of the death of a parent (Warren-Findlow 2006). A different study found death of a parent in childhood didn't affect the respondents' happiness as adults (Glenn and Kramer 1985). Yet, the same study found when parents divorced in childhood happiness was affected negatively in adulthood (Glenn and Kramer 1985). Wallerstein (1984) found similar effects of divorce, and contends that after a divorce, although the biological father may not be present in the house the psychological presence lasts for longer than 10 years.

Hostility towards the parent who leaves is also often experienced after a divorce, whereas an adolescent who loses a parent to death builds positive memories to help with mourning (Biblarz and Gottainer 2000; Parsh and Kappes 1980; Rozendal 1983; Wallerstein and Kelly 1980). Biblarz and Gottainer (2000) found adolescents from widowed single mothers were more likely to graduate from high school and college, had more fulfilling occupations, and had a higher well-being than adolescents from divorced

parents. Of further interest are the economic differences between death of a parent and divorce.

Government benefits are greater for widows and widowers who have dependents; they are entitled to social security benefits, and the benefits are collected no matter what the spouse's future income may be or any combination of income such as life insurance, savings, or pension plans (McLanahan, Garfinkel, and Ooms 1987; Sugarman 1993, 1995). Divorced parents have to deplete their liquid assets and must be living below poverty level before they can receive government aid (Surgaman, 1993, 1995). Government support is lower for divorced mothers because it is assumed non-resident fathers will contribute funds, but only half of the divorced mothers will receive the full amount of child support and some receive none, or were never awarded support (Maccoby and Mnookin 1992; Sugarman 1995). Thus, widowed parents may have an economic advantage to divorced or unwed-single parents, buffering the impacts of single parenthood.

Interestingly, Biblarz and Gottiner (2000) found that the advantages adolescents had from the death of a parent over the divorce of parents went away when the mothers remarried. Adolescents of both divorced and widowed parents who remarried were significantly less likely to graduate college, complete high school, and had a lower level of well-being (Biblarz and Gottiner 2000). Stepparent homes are, therefore, important to take into account when unraveling family structural stressors.

Stepparent Homes

In the United States one third of all children born will live in a stepparent family (Bumpass, Raley, and Sweet 1995, Seltzer 1994). Most people remarry three to four years following a divorce, most who remarry are white, and almost half of the children in the stepparent families are biologically the mothers' and are under the age of 18 (Kreider 2006). Up from 31% in 1970, 46% of couples that married in 1990 had at least one spouse who had been married previously (Kreider 2006:5).

Literature on stress in stepparent families and its relationship to adolescent health report contradictory results. Some findings indicate adolescents in stepparent homes have the same subjective health, as do adolescents with their biological parents (Bzostek 2008). These studies find caring stepfathers have a positive effect on their stepchildren and these adolescents have the same well-being as those with both biological parents (Amato 1994a; Amato and Rivera 1999; Hetherington 1993; White and Gilbreth 2001). Stepparent families help to alleviate some of the potential stressors associated with single parent families, leading to economic improvement, an additional adult to help supervise, and may help to emotionally support the once single parent (Cherlin and Furstenberg 1994; Holden and Smock 1991; McLanahan and Sandefur 1994; Peterson 1996). Yet, research concerning adolescent health and well-being in stepparent families is not all positive.

Much research shows that adolescents living with stepparents have lower well-being than adolescents who live with both biological parents. Stepchildren have lower educational attainment, poorer health, more incidents of stress, and poor socializing skills

(Amato 1994; Amato and Keith 1991a, 1991b; Astone and McLanahan 1991; Brown 2004; Cherlin and Furstenberg 1994; Coleman, Ganong, and Fine 2000; Coughlin and Vuchinich 1996; Hetherington, Bridges, and Insabella 1998; Hetherington 1993; Hetheringtion and Jodl 1994; Hofferth 2006; Manning and Lamb 2003; Thomson, Hanson, McLanahan1994; and Wojtkiewicz 1992). Studies also indicate adolescents living with stepparents have internalized emotional problems and more behavioral problems than those living with both biological families, and have lower well-being than those in single parent and divorced families (Cherlin and Furstenberg 1994; Dawson 1991; Furstenberg and Cherlin 1994; Hanson, McLananhan and Thomson 1996; McLanahan and Sandefur 1994; Vogt Yuan and Hamilton 2006).

Some of the differences in the literature may be due to the age at which the children's parent remarried. Bzostek (2008) found that among children ages 1-3 years who had an involved social father, their health was just as good as those having a relationship with their biological father. However, Bzostek's study might not have yielded the same results if adolescents had been analyzed. Age of the child or adolescent may be an important factor as to the discrepancies of the health of adolescents and stepparents.

Differences in findings may also be due to the adolescent's family history prior to the marriage. Sweeney (2007) found the effects of the adolescent's well-being in stepparent families depended on the marital context prior to the current marriage. Sweeny found adolescents in single-mother families due to divorce, experienced greater well-being than those from non-marital births. This may explain why she found adolescents

living in stepparent families after a previous divorce had better emotional well-being, higher income, greater parental involvement, and better educated mothers than those from a non-marital birth. The complexity of the history prior to the stepparent family and adolescent health outcomes is not limited to the stepparent family but also grandparent-headed families.

Grandparent Families

According to the 1990 Census there has been a 44% increase in grandparent headed families since 1980 (Saluter 1992). This increase may be because of federal and state laws that encourage or require next-of-kin to be given preferences over foster care (Fuller-Thomson and Minkler 2000). In one third of the grandparent households the grandchildren's parents were not living in the home (Saluter 1992). An increasing number of children have also gone to live with grandparents informally, where parents turn over their children to the grandparents without court involvement (Harden, Clark, and Maguire 1997; Minkler 1999). Many times grandparents are willing to take care of the children to prevent their grandchildren from being placed in foster care (Edwards 1998). When grandparents take over parental care it is due to a variety of parental problems: child abuse, neglect, abandonment, poverty, substance abuse, homelessness, incarceration, teen pregnancy, mental or physical illnesses, and HIV/AIDS (Burton 1992; Dressel and Barnhill 1994; Edwards 1998; Feig 1990; Kelley 1993; Kelley et al. 2001; Musil and Standing 2005; Racicot 2003; Whitley, Kelley, and Sipe 2001).

Children and adolescents who were given to their grandparents because of parental problems are at greater risk of developing emotional and behavioral problems

because of their prior exposure to their parents and their abandonment (Grinstead et al. 2003; Kelley 1993; Kelley et al. 2000; Musil and Standing 2005). Exposed children are more likely to encounter drugs, alcohol, and physical and sexual abuse (Grinstead et al. 2003; Kelley 1993; Kelly et al. 2000; Musil and Standing 2005). The likelihood of being raised by a grandparent is stratified by race, but not the negative effects experienced by the adolescents. Lower income, single, African American females have a disproportionately higher rate of children living with grandparents but the negative effects cross all races, gender, and socioeconomic groups (Caputo 2001; Jimenez 2002; Kelley et al. 2000; Sands and Goldberg-Glen 2000; Whitley, Kelley, Sipe 2001). Grandchildren are not the only people under tremendous life strains and life events; grandparents are also deeply affected by the responsibilities of childrearing.

Grandparents raising their grandchildren have reported numerous chronic stressors such as: conflicts between their adult children, lack of time to take care of themselves, depletion of family recourses including finances, lack of social support, anxiety, depression, loss of independence, and poor health, an overall change in quality of life (Kelch-Oliver 2010; Lender Grinstead, and Torres 2007). These stressors may spill over onto their grandchildren. Grandparents raising their grandchildren face many stressors, as do the children and adolescent who live with them. Analyzing the long-term health effects of a living in grandparent headed homes among adolescents is of great value.

Multigenerational Families

Adults in the home, other than the parents, are also addressed in the study. Is it true "that it takes a village to raise a child"? Is having an additional adult in the home, such as grandparents, more or less stressful for the adolescent? Multigenerational families are likely to increase due to the growing aging population (Beach 1993; Bailey and Bailey 1999). Another reason for rising multigenerational families is because grandparents, usually the grandmother, moves in to help with a single parent - most often a single mother (Deleire and Kalil 2002). Studies have varied on whether multigenerational families have positive or negative effects (Leadbeater and Bishop 1994; Pope et al. 1993; East and Felice 1996; Unger and Cooley 1992).

Variation in the findings may be due to the contextual reasons for living in a multigenerational home. As reported previously, adolescents of single parent and grandparent headed families are under more chronic strains, such as economic difficulty, and often lack of social support and the ability to properly supervise. Therefore I argue having a mother and grandmother together may provide more stability than if only the grandparent or mother were in the home. Studies do suggest this. Some have found that adolescents of single-mothers who have grandparents in the home have a higher educational attainment than those who did not have a grandparent in the home (Thompson et al. 1992; Aquilino 1996). Interestingly, Deleire and Kalil (2002) found that adolescents living with single-mothers in a multigenerational family had better outcomes than adolescents who lived only with married parents.

However, findings also suggest negative effects. McLanahan and Sandefur (1994) found that adolescents living in multigenerational residence with a single mother

had a higher risk of dropping out of high school. A study also found poorer parenting behaviors in homes with the mother and grandmother (Chase-Lansdale, Brooks-Gunn, and Zamskey 1994). However these studies fail to address whether the negative outcomes are due to the reasons of why the grandparents are in the home or because grandparents are in the home.

Another potential stressor for adolescents is that of caring for their grandparents in the home. With an aging population there are young and adolescent grandchildren helping to care for their grandparents who are living in their home. An exploratory study interviewed families taking care of their ill grandparents. The study found that grandchildren have feelings of anger, resentment, frustration, grief, and fear (Orel, Duput, and Wright 2004). Some of the anger came from having to give up their rooms for their grandparents to stay in. Grandchildren were also frustrated with the caring responsibilities and the change in their family routines. The relationship between the mother and child was taxed, with the mother taking her frustrations out on the children (Orel, Dupuy, and Wright 2004). Further research is needed to understand the multigenerational effects to adolescent stress. Yet, if multigenerational homes are associated with lower or higher levels of stress then they should also be associated with health outcomes.

Sibling Structure

Siblings have a large influence on adolescents' well-being, especially in regards to deviance and educational achievement (Blake 1985, 1989; Downey 1995; Duncan, Duncan, and Hops 1996; Powell and Steelman 1990; Rodgers and Rowe 1990).

Relationships between siblings change over time, relationships change as family members are born or die, and as the individual's role changes through life (Cicirelli 1985, 1988). Roles and relationships are different depending on how many siblings the individual has; therefore, knowing how many siblings are in the home is important, beyond simply knowing if there are siblings (Cicirelli 1985, 1988). Sibling size influences the amount of resources parents have for each child. This can lead to jealousy, conflict, and affect the ability to provide sufficiently for each child (Downey 1995; Vogt Yuan 2009). On the positive side, having a larger number of siblings may increase social support (Vogt Yuan 2009).

Biological relations among siblings may also affect the adolescent's well-being. Studies indicate that children raised in the same family do not always receive the same treatment from parents, and children are aware of these differences, which effects the child's well-being (Brody, Stoneman, and Burke 1987; Bryant and Crockenberg 1980; Daniels and Plomin 1985; and Dunn, Stocker, and Plomin 1990). Likelihood of depression and antisocial behaviors increase for children who receive less parenting than their siblings who receive more parenting (Reiss et al. 1995). Differential treatment of adolescents is greatest in stepparent families (Mekos, Hetherington and Reiss 1996). Stepfathers in particular tend to leave the parenting to the biological parents, and because they having less control over the parental decisions, they may be less involved in other aspects of the child's life (Brand, Clingempeel, and Bowen-Wooward 1988). This creates an environment of differential treatment.

Another important structural element of siblings is gender. Research indicates same-sex siblings better identify with one another; brothers especially have a strong

impact on each other's behavior, and sisters support each other socially (Bedford 1998; Hoffman, Kiecolt, and Edwards 2005; Rodgers and Rowe 1990; Weaver, Coleman, and Ganong 2003; Widmer 1997). Not everyone agrees. Vogt Yuan (2009) argued the only structural part of siblings that impacted mental health was the number of adolescents in the home; gender, age, and biology of the siblings had no significant differences in their mental health. Vogt Yuan found that the number of siblings in the home correlated with the feeling of being loved; adolescents with one sibling were less depressed than those with two or more.

Summary

In sum, significant research demonstrates that family environment is related to stress. Some research finds that family environment is also related to health, although this research is largely cross-sectional and therefore a causal link can only be inferred. The general link between stress and health is well established in previous research, although again much of this research is cross-sectional or relies on subjective assessments of health provided by the individual. Given the documented patterns of increased stressors by family structure, it stands to reason, therefore, that adolescents' family environments should be associated with long term health. Furthermore as variations in income are a significant outcome of family structure, I test whether differences in family income explain these associations.

Longitudinal data from the Add Health survey creates a unique combination of social measures and biological measures that can be used to understand the impact of family structure, in all its complexity, on health over time. The panel nature of the study allows me to examine overtime affects. The rich biological measures of physical health

collected in Wave IV and described below provide more precise measures of health than subjective health measures used in past research. In addition to providing a more objective measure of health in young adulthood, the biological data may uncover a disease at the preclinical stage, when the respondent does not know a disease exists.

CHAPTER 3: RESEARCH DESIGN AND METHODS

Data and Sample

This study uses data from the National Longitudinal Study of Adolescent Health (Add Health) Waves I and IV. Wave I includes data collected in 1994-1995 from a random sample of adolescents living in the United States, grades 7-12. Wave I data collected through in-school surveys and in-home interviews. Wave II, Wave III, and Wave IV are follow-ups by way of in-home interviews between, 1996 and 2008. Wave IV data were collected in 2008 when respondents were the ages of 24-32. What is intriguing about the Add Health dataset is the inclusion of the respondents' social, economic and psychological characteristics; data on their neighborhood, community, and school; and their peer groups, and romantic relationships. Then in Wave IV new questions were asked about respondents medical information as well as collecting biological measurements, such as: blood pressure, BMI, and diagnosis of diabetes, high cholesterol, and blood pressure (Add Health 2011).

Wave I

Wave I data were collected between 1994 and 1995. The sample included 132 high schools sampled systematically and stratified to represent a representation of by region of the country, urban area, size, and race of students. If a school declined to take part in the study then another from the same stratum replaced it. Over 90,000 students were selected to complete a self-administered in-school questionnaire between September 1994 and April 1995 in a 45-60 minute class period. Topics of the questionnaires include social and demographic characteristics of respondents, education and occupation of

parents, household structure, risk behaviors, expectations for the future, self-esteem, health status, friendships, and school year extracurricular activities. If students were absent they did not complete the questionnaire (UNC Carolina Population Center 2011).

In-home surveys were given to adolescents, randomly selected to form the core sample to be interviewed. Their resident parents or guardians were also surveyed. The sample was racially and ethnically diverse, including 1,038 well-educated black families, 334 Chinese, 450 Cuban, 437 Puerto Rican, 1,500 Mexican Americans and a significant number of Nicaraguans, Japanese, South Koreans, Filipinos, and Vietnamese families. 589 of the students in the sample have physical disabilities. Interviews lasting around one to two hours were recorded on laptops in the homes in 1995 (UNC Carolina Population Center 2011). Total weighted sample size in Wave I restricted-use data set included 20,745 individuals.

Wave IV

Respondents were re-interviewed in Wave IV conducted in 2007 and 2008. The sample ranged from 24 to 32 years in age at that time. Data contained include the individuals' social, economic, psychological, geographic, health circumstances and anthropometric measures, cardiovascular measures and chronic disease diagnosis. Biological measurements were collected twice to insure reliability of the data (UNC Carolina Population Center 2011).

Anthropometric measures include the respondents' weight, height, and waist circumference, measured by the interviewers. Interviewers also collected the cardiovascular measurements, including the respondent's systolic blood pressure,

diastolic blood pressure, and pulse. Respondents were also asked if they have ever been diagnosed with a number of chronic diseases (UNC Carolina Population Center 2011).

In this study only respondents who were in both Wave I and Wave IV were included in the sample size. The sample size is 15,701 individuals.

Measures

Dependent Variables

In this analysis, there are six dependent variables used to understand the long-term health impact of an adolescents' family structure. Variables used are from Wave IV interviews and include: Poor Perceived Health, High Blood Pressure, Obesity, Diabetes, and High Cholesterol. While some of these variables were initially measured as Likert scales which are summarized in the univariate results section, sensitivity analyses indicate that family structure is most strongly associated with poor health outcomes, rather than gradations in health.

Poor Perceived Health. The variable Poor Perceived Health is constructed using variable S3Q1 in Wave IV. Respondents were asked, "In general, how is your health?" Respondents' were given the following categories for their answers: (1) *excellent,* (2) *very good,* (3) *good,* (4) *fair, and (5) poor.* Poor Perceived Health is recoded into a dummy variable, using the categories as follows: (1) *Poor and fair health,* (0) *excellent, very good, and good health.*

High Blood Pressure. During Wave IV, respondents' blood pressure were recorded in four different categories: (1) *Normal,* with a measure of systolic less than 120

and a diastolic 80 or lower;(2) *Prehypertension,* with a measure of systolic between 120 and 139 or a diastolic between 80 and 89*;* (3) *Hypertension I,* with a measure of a systolic between 140 and 159 or higher and a diastolic between 90 and 99*; and* (4) *Hypertension II,* with a measure of a systolic 160 and higher or a diastolic 100 or higher. In addition, Variable H4ID5C asks respondents, "Has a doctor, nurse, or other health care provider ever told you that you have or had: high blood pressure or hypertension {if female not when pregnant}?" (0)= *No,* (1)= *yes.* The study's variable *High Blood Pressure* is constructed as follows: (1)= if, respondents answered, "*yes*" to having a diagnosis of high blood pressure, or measured in the *Hypertension I or Hypertension II class* during the survey, (0)= if, respondents answered "*no*" to having a diagnosis of high blood pressure, and measured in the *normal or prehypertension* class during the study.

Obesity. During wave IV, respondents' weight, height, and waist circumference were used to construct variable S27, BMI Class. Respondents were characterized as follows: (1)= *Underweight,* having a BMI less than18.5; (2)= *Normal,* a BMI between 18.5 and 24; (3)= *Overweight,* a BMI between 25 and 29; (4)= *Obese I;* a BMI between 30 and 34; (5)= *Obese II,* a BMI between 35 and 39; and (6)= *Obese III,* respondents with a BMI of 40 or higher. . *The* variable *Obesity* recodes variable S27 into a dummy variable. *Obesity* is coded as follows: (1)= if, respondent is coded as *Obese I;* a BMI between 30 and 34; *Obese II,* a BMI between 35 and 39; or *Obese III,* respondents with a BMI of 40 or higher; and (0)= if, respondents are coded as *Underweight,* having a BMI less than18.5, *Normal,* a BMI between 18.5 and 24, or *Overweight,* a BMI between 25 and 29.

High cholesterol. To measure cholesterol, triglycerides and lipid levels, the pre-constructed dummy variable C4VAR047 from Wave IV is utilized. Respondents were asked if a "doctor, nurse, or other health provider had ever told you that you had or have high blood cholesterol or triglycerides, or lipids": (1)=*Yes*, (0)=*No*.

Diabetes. Diabetes is measured using the dummy variable H4ID5D from Wave IV. Respondents were asked, "has a doctor or nurse told you that you have ever had high blood sugar or diabetes (when not pregnant)", (1)= *yes*, (0)= *No*.

Independent Variables

The Household Roster, section 11, of the Add Health questionnaire is utilized to construct the study's independent variables. In this study Family Structure is divided into two different sections, guardian and sibling structure. To obtain a family roster, respondents were asked the following question, "Please tell me the first names of all the people, other than you yourself, who live in your household. If someone usually lives with you, but is away for a short time, include him or her." Additional questions were then asked for each household member to identify the relationship of household members to the respondent. Variables H1HR3A-H1HR3J, H1HR5A-H1HR5J, and H1HR6A-H1HR6J were used to construct variables used of guardian and sibling structure.

Guardian Structure

Guardian structure is constructed using questions 3 and 6, variables H1HR3A-H1HR3J and H1HR6A-H1HR6J. Question 3, asks respondents, "What is {Name}'s relationship to you?" Respondents were given 29 categories to choose from, which

included: wife or husband, partner, son, daughter, brother, brother's wife, brother's partner, sister, sister's husband, sister's partner, father, father's wife, father's partner, mother, mother's husband, mother's partner, father-in-law, mother-in-law, grandfather, grandmother, great-grandfather, great-grandmother, uncle, aunt, cousin, nephew, niece, other relative, and other non-relative.

Question 6 further disaggregates respondents' response when identifying a parent. Question 6 asks respondents: "Which description best fits {Name}'s to you?" Respondents could answer: *biological father, stepfather, adoptive father, step/adoptive father, foster father, other (father), biological mother, stepmother, adoptive mother, step/adoptive mother, foster mother, and other (mother).*

Biological parents. Living with two biological parents is constructed using variables H1HR3A-H1HR3J and H1HR6A-H1HR6J. Using "*If then* statements", a dummy variable is constructed from the respondents' answers, coded (1) when respondents indicated they had both a biological mother and a biological father in the household with no other adult household members identified, and (0) if not.

Biological parents and grandparent. Respondents with both biological parents and at least one grandparent in the home are coded as (1), all others are coded as (0).

Single father. Single father home is coded as (1) when the respondent indicates that they have a biological father in the household and all other adult, family member categories=0. All other households are coded (0).

Single mother father living. Single mother home is coded (1) if the respondent indicated that there is only a biological mother in the household, and if in variable H1NF2 respondents answer "yes" to having a living biological father who is not living in the home, and if there are no other adults living in the home. All other households are coded (0).

Single mother father died. Single mother homes, due to the death of a biological father are coded as (1) if the household is a single mother household (see above) and the respondent indicates in variable H1NF2 that their biological father is not still living. All others are coded (0).

Single mother living with a grandparent. Single mother living with a grandparent households are coded (1) if the respondent is living with a biological mother and a *grandfather or grandmother, or great-grandmother,* or *great-grandfather* and (0) for all other guardian types.

Single grandparent. Single grandparent home is coded (1) is the respondent lives with a single grandmother or a single grandfather, with no other adult in the home. All other guardianship types are coded 0.

Stepmother families. Stepmother household is coded 1 if the respondent reports living with his/her biological father and their father's wife or partner or a stepmother. All other guardian types are coded (0).

Stepfather families. Stepfather household is coded (1) if the respondent living with a biological mother and their mother's husband or partner or a stepfather. All other guardian types are coded 0.

Both grandparents. Two grandparent home, is coded (1) if the respondent lives with a grandfather and a grandmother, and if, all other adult, family member categories equal 0. All other guardianship types are coded 0.

Other adults in the home. Households that have two biological parents in the home in addition to other adults who are not the grandparents are represented by this variable. The variable other adults in the home is coded (1) if respondent lives in a home with a biological mother, and a biological father, and at least one other adult such as an uncle, aunt, brother-in-law, or sister-in-law (with the exception of a grandparent(s)). All other guardian types are coded 0.

Foster or adopted guardians. Foster and adopted household is coded (1) if the respondent reported living with a foster or adoptive mother or father. All other guardian types are coded 0.

Sibling Structure

Sibling structure variables are constructed using variables H1H53A-J and H1Hr5A-J. Question 5 (variables H1HR5A-J), asks respondents who listed having a brother a sister in question 3, "*Which description best fits {Name} to you?"* Using question 3 and 5, variables are used to construct variables for full, half, step and foster/adopted siblings; as well as a variable for having other children in the family other

than a sibling. Together full sister and full brother constitute the comparison group for all other sibling structures.

Full sister. Full sister is constructed using variables H1HR5A-J. Using "*If Then"* statements, full sister is coded 1 if the respondent reported living with at least 1 full sister, 0 if not.

Full brother. Full brother is constructed using variables H1HR5A-J. Full brother is coded 1 if the respondent reported living with at least 1 full brother, 0 if not.

Half-sister. Half-sister is constructed using variables H1HR5A-J. Half-sister is coded 1 if the respondent reported living with at least 1 half-sister, 0 if not.

Half-brother. Half-brother is constructed using variables H1HR5A-J. Half-brother is coded 1 if the respondent reported living with at least 1 half-brother, 0 if not.

Stepsister. Stepsister is constructed using variables H1HR5A-J. Stepsister is coded 1 if the respondent reported living with at least 1 stepsister, 0 if not.

Stepbrother. Stepbrother is constructed using variables H2HR3A-J and H1HR5A-J. Stepbrother is coded 1 if the respondent reported living with at least 1 stepbrother, 0 if not.

Adopted and foster sibling. Having an adopted or foster sibling in the household is constructed using variables H1HR5A-J. Adopted/foster is

constructed as a dummy variable, as follows: (1)= if, foster brother=1, or foster sister=1 or adopted brother=1 or adopted sister=1 in variables in variables H1HR5A-J.

Other children. Having other children in the home is constructed using variables H2HR3A-J and H1HR5A-J. Other children is constructed as a dummy variable, as follows: (1) if, cousin=1, nephew=1, niece=1 in variables H2HR3A-J, and if other sibling=1 in variables H1HR5A-J.

Income

Total household income, variable PA55, is used to measure income. To account for any missing data pertaining to income, predicted income is imputed based on parental marital status and parental education in Wave I. The unstandardized coefficients for parental education and marital status are both used to calculate the average predicted income which then replaced any missing values for household income in Wave I. Predicted income in this study is a continuous variable in thousands of dollars.

Control Variables

Female. Respondents were asked, "What sex are you?". For this study, all female respondents are coded as (1), and males are coded as (0).

Minority. Respondents' race and ethnicity are combined as minority status in this study. Respondents were asked, "What is your Race?" Respondents were to answer *White* (H1GI6A), Black or African American (H1GI6B), American Indian or Native American (H1GI6C), Asian or Pacific Islander (H1GI6D), or Other (H1GI6E). Hispanic was asked

in a separate question, "Are you of Hispanic or Latino origin?" For this study all respondents who answers White are coded (0), all other answers are coded as (1).

Dropout. Dropout is a constructed variable which measures the likelihood that an individual would have dropped out of the sample prior to Wave IV, based on known demographic characteristics and perceived health in Wave I. The inclusion of this variable in the multivariate analyses helps to insure that the results are not the results of a spurious association due to differential attrition from the study (Heckman 1979).

Analytical Technique

This study investigates long-term health effects, based on an individual's family structure as an adolescent. To unravel the answers, family structure is divided into two conceptual groups, *parental/guardian structure* and *sibling structure*. By splitting the two structures, the study can investigate how each structure affects future health separately and together. Previous research has examined some of these structural differences, but no study has systematically assessed the impact of all of these family structures on health over-time.

The study begins with descriptive statistics to give a better understanding of the variation in health and in family structure. Then the study moves to bivariate analysis using correlational analysis, to identify associations between the health measures and independent variables. Logistic regression models are then developed to further disaggregate these associations and rule out spurious relationships between adolescent family structures and future adult health. I also test whether variations in income help to

explain any associations between guardian structure and health outcomes in young adulthood.

This study has five logistic regression models*: poor health*, *obesity*, *high blood pressure*, *diabetes*, and *high cholesterol*. All regression models include five steps: Step1 includes control variables *female*, *minority*, and *age*; Step2 includes *guardian structures*; Step3 includes *sibling structures*; Step4 includes the explanatory variable, *income*; and Step5 includes *dropouts*.

CHAPTER 4: RESULTS

Descriptive Statistics

Dependent Variables

Table1 reports either the variable's mean or percent, and the standard deviation where appropriate. The total sample size is 15,701 respondents. All dependent variables used in this study are from Wave IV.

(Insert Table 1 About Here)

Of the adult respondents, 1.1% perceived themselves to be in poor health. 8.6% of respondents report having fair general health, 33.2% report having good health, 37.9% report having very good health, and 19.2% report having excellent health. It is noteworthy that in this sample of young adults there is considerable variation in perceived health. Thus for the variable poor health, 9.7% are coded (1) as they perceive themselves to be in fair or poor health.

The notable variation in perceived health is borne out by the other more objective measures of physical health. Respondents who have been diagnosed with high blood pressure or were identified during the survey with blood pressures in the Hypertension I and II categories are coded as having High Blood Pressure. These individuals make up 25% of the sample. This is a very large percent of the sample, representing 3,928 individuals.

5,964 individuals, or 38% of the sample, are obese based on their BMI scores of 30 or more. Respondents diagnosed with diabetes represent 2.8% of the sample, and

8.1% of the sample represent those that have been diagnosed with high cholesterol. Thus there is considerable variation in health outcomes among this group of young adults, including early signs of significant disease.

Independent Variables

Table 2 gives either the variable's mean or percent, and the standard deviation where appropriate. Every independent variable used in this study is from Wave I.

(Insert Table 2 About Here)

There is considerable variation in guardianship structures. Adolescents who live with both biological parents only are much more numerous than any other structure (46.2%). Single mother homes with a biological father still living is the second largest structure (16.6%), and stepfather homes are not far behind at third (12.2%). Those living with both grandparents (1%) and single grandparent homes (1.4%) represent the least common parental structure. Single father (2.4%), stepmother (2.7%), widowed single mothers (2.1%), and single mothers with a grandparent (2.2%), represent about the same number of families in the sample. Yet, given the large sample size, these still represent between 372 and 427 households each. Two biological parents and grandparent homes represent 4.7% of the sample, two biological parents and other adults in the home represent 3.6%, and adopted or foster households represent 3.6% of the sample, between 575 and 700 households for each.

20.6% of adolescents are only children with no sibling. Most adolescents have 1 sibling (47.9%), 2 siblings (31.9%), or 3 siblings (13.3%) living with them. Of the

respondents who have siblings living in their home, 42.6% have a full sister and 44.9% have a full brother (44.9%). The most full sisters any one adolescent has living with them are 7 and the most of any full-brothers are 8.

The impact of the increased number of blended families in the United States on sibling structure is quite evident in this sample. The number of adolescents who have at least one half-brother or half-sister is about equal; 8.5% of adolescents in the sample have a half-brother and 8.1% have a half-sister in their household. The most half-brothers any one adolescent has in the home are 6 and the most half-sisters in a home are 5. There are fewer stepsiblings than there are half or full siblings, but the gender ratio between stepsiblings is also fairly equal. There are 248 (1.6%) adolescents who have a stepsister, and 299 (1.9%) adolescents with a stepbrother. The most stepsisters or stepbrothers that any adolescent has living in the home with them are 5.

Siblings that have been adopted or fostered makeup 2.8% of the sibling sample, 433 adolescents have a foster or adopted sibling living in their home. Surprisingly, just over 10% of adolescents have a child that lives in their home that is not a sibling. These could be their cousin, nephew, niece, or their own child.

In this sample there are slightly more females than males. Females make up 53.2% of the sample, and males 46.8%. Race was divided into two groups for the purpose of this study - white and minority. Over half of the sample is white, including 9,947 individuals (63.4%). Minorities represent 36.6% of the sample, or 5,742 individuals. In Wave I, the average age of the respondents is 16.09 (SD=1.7). The youngest respondent

was 12 and the oldest was 21 (.1%). The average predicted household income amounts to around $43,900 a year (SD=17.2). Income ranges between $0 and $73,000.00 a year.

Respondents' perceptions of their general health decreases over time. Respondents who report their health as poor doubled from Wave I to Wave 4 (.5% vs. 1.1%). Those who said their health was fair also increase with time (6.7% vs. 8.6%). Respondents who report good health increased from 25.3% in Wave I to 33.2% in Wave IV, but that may be because respondents' reported health decreased in the categories of very good and excellent. In Wave IV, 37.9% respondents claimed to have very good health, down from 39.4% at Wave I. Those who purported to have excellent health at Wave IV are 19.2% of the sample and 28% of the sample during Wave I (Wave I mean 3.8, Wave IV mean 3.6 SD .9).

Bivariate Analyses

Household structure is an important predictor of poor health outcomes in young adulthood. Household structures that have an association with reported poor health at Wave IV include living with two biological parents, single mother, single grandparent, living with your biological parents and grandparent, having other adults in the home in addition to both biological parents, having a half-brother or half-sister, and having other children in the home.

(Insert Table 3 About Here)

Living with two biological parents as an adolescent has a beneficial association with how young adults feel about their overall general health ($r= -.065$, $p<.001$).

However, having grandparents or other adults in the home with the biological parents *is* associated with higher levels of poor health ($r = .024$, $p<.01$ and $r = .023$, $p<.01$ respectively). As expected single mother households have a harmful association with poor health as an adult ($r = .020$, $p<.01$), as does living with single grandparents during one's teenage years ($r = .042$, $p<.001$).

Sibling structure during adolescence is also a predictor of perceived health. Having a half-brother or half-sister in the home as an adolescent also has an positive association with reported poor general health as adults ($r=.020$ and $r = .017$, $p<.05$). Other children living in the household was also associated with reporting poor health as an adult ($r = .051$, $p<.001$).

Most of the different guardian structures have an association with obesity. Living with two parents - either two biological parents ($r = -.039$, $p<.001$), or a stepmother ($r = -.017$, $p<.05$) or stepfather family ($r = -.016$, $p<.001$) - had a negative association with being obese as an adult. Whereas, single mother ($r= .024$, $p<.05$), single mother father died ($r-.034$, $p<.001$), single mother with a grandparent ($r= .020$, $p<.05$), being raised by both grandparents, ($r= .017$, $p<.05$) and having grandparents ($r=.026$, $p<.001$) or other adults in the home ($r=.019$, $p<.05$) with biological parents have a positive association with obesity. Interestingly, living with a single father as an adolescent is associated with a decreased likelihood of obesity ($r = -.016$, $p<.05$).

Sibling structure has several associations with obesity. Adolescents living with a full-sister or a full-brother have a lower likelihood of being obese as an adult ($r = - .021$, $p<.01$ and $r = -.032$, $p<.001$ respectively). Adolescents who have no siblings in the home

have a higher likelihood of to being obese as an adult ($r = .029$, $p<.001$). While some might speculate that these patterns are the result of increased physical play among those with other children to play with in the household, it should be noted that half- and step-siblings have no association with obesity in young adulthood and that adolescents living with children with other types of relationships have a higher likelihood of being obese as an adult ($r=.050$, $p<.001$). These are associations of obesity, not just being overweight; the respondents coded as obese have a BMI of at least 30.

Guardian structure has few associations with high blood pressure in young adulthood, while some sibling structures do seem to matter. Only adolescents who lived with a single mother because their father died have a higher likelihood of having high blood pressure as an adult ($r = .016$, $p<.05$). Interestingly, living with a single mother while their father is living or with a single mother who also has a grandparent in the home, have no association to high blood pressure. Adolescents who do not have a sibling in their home have a higher likelihood of having high blood pressure as an adult ($r = .029$, $p<.001$). Sisters appear to be beneficial while brothers have no impact on blood pressure as an adult. Full-sisters ($r= -.023$, $p<.003$) and stepsisters ($r= -.017$, $p<.05$) have a beneficial association with blood pressure as an adult ($r = -.023$, $p<.01$ and $r = -.017$, $p<.05$, respectively).

There are two parental structures that have an association with diabetes as an adult, biological parents and biological parents with a grandparent. Living with both of your biological parents as an adolescent decreases your likelihood of being diagnosed

with diabetes as an adult ($r = -.024$, $p<.05$), whereas having lived with grandparents in the home is not beneficial in terms of diabetes ($r=.017$, $p<.05$).

Sisters may be beneficial to blood pressure, but brothers may be more helpful in the fight against diabetes. Adolescents who live with a full-brother have a lower likelihood of being diagnosed with diabetes as an adult ($r = -.018$, $p<.05$). Adolescents who have other children in the home are also more likely to have diabetes as an adult ($r = .021$, $p<.05$). Step- and half-siblings appear to have no relationship with diabetes.

There are two household structure variables that have an association to cholesterol - single mothers with a grandparent and full sisters. Adolescents who live with a single mother and a grandparent have a lower likelihood of having high cholesterol as an adult ($r = -.021$, $p<.01$). Growing up with a full-sister in the home also has a beneficial association with high cholesterol as an adult ($r = -.017$, $p<.05$).

Thus bivariate associations indicate that both guardian structure and sibling structure have associations with health outcomes in young adulthood. It is important, however, to investigate whether it is indeed these structures that are generating these relationships and not simply the uneven patterns of household structure by sex, race, and income. As previous research has indicated and my correlations suggest, the guardian structures of male and female teens are not the same. Males are more likely to live with their fathers, in two biological parent households, single father households, and in stepmother households than are females. Females are more likely to live with their mothers, in single mother father living and single mother with grandparent households. White adolescents are more likely than minority adolescents to live in two parent

households - two biological parent households, stepmother households, stepfather households, and in foster or adopted families.

(Insert Table 4 About Here)

Finally, income is higher in most two-parent households, and lower in single parent households of all types and in grandparent households. Sex, minority status, and income are also all associated with health outcomes. This may lead to spurious relationships between household structure and health outcomes, making multivariate analyses essential.

Multivariate Statistics

Poor General Health

Single Father and Single Mother

As seen in Table 5 adolescents living with a single father are 45% more likely to perceive themselves to be in poor health as an adult than those who lived with two biological parents ($p<.05$). The relationship holds up even when controlling for gender, minority status, and age of the adolescent. When sibling structure is added to the model single father is still significant. However, when income is added to the model the relationship becomes insignificant, suggesting that the relationship is likely the result of the fact that single father households have lower incomes than do two biological parent households. The same is true for single mother father living households, suggesting that lower household income during adolescence is a significant component in determining

health outcomes in young adulthood. Every one dollar decrease in household income during adolescence increases the likelihood of perceiving one's self to be in poor health as a young adult by 1.2% ($p<.001$).

(Insert Table 5 About Here)

Stepfather and Stepmother

Controlling for sex, minority status, and age, stepfather homes are 25% more likely to raise adults who feel poorly about their health than are two biological parent homes ($p<.01$). The pattern is even stronger in stepmother homes, from which adolescents are 39% more likely to report poor health as an adult ($p<.05$). Yet, when sibling structure was added into the model, both the stepmother and stepfather homes disappeared, indicating that siblings have a buffering effect on stepmother and stepfather household structures. Stepfather families are strongly correlated with the presence of half-brothers and half-sisters ($r=.231$ and $r=.226$, $p<.001$ respectively), and not surprisingly are likely to include stepsiblings as well. By contrast, stepmother families have the strongest association with the presence of stepsisters and stepbrothers ($r=.305$ and $r=.255$, $p<.001$ respectively), but also have an association with half-siblings.

Single Grandparent

Adults who lived in single grandparent households as an adolescent are 76% more likely to rate their health as poor, than those raised by two biological parents ($p<.01$). Income does explain some of why adults from single grandparents rate their health as poor; before income was added to the model adults were 119% more likely to rate their

health as poor ($p<.001$). These results indicate lower income is a factor for grandparent homes and future adult health, but is not the entire explanation for the ill effects of growing up in a single grandparent home.

Multigenerational Households

Adolescents who live with both biological parents and a grandparent are 41% more likely to rate their health poor as an adult, than those who only lived with their parents ($p<.01$). Also tested is whether having additional adults in the home (eg. uncles, family friends, etc) impact adult health. Indeed the presence of other types of adults in the household during adolescence also increases the odds of an adult purporting poor health by 38% ($p<.05$). Having other types of children in the home (eg. cousins) was significant ($p<.01$), until income was added to the model. Low income households may be more likely to have to take in adults and children of friends and relations in times of trouble, leading to overcrowding, conflict, and/or stress.

Obesity

Single Father and Single Mother.

After controlling for sex, race and income, adolescents who live with a single father are 24% less likely to be obese as adults ($p<.05$). Sibling structure is a mediating factor for obese adults raised by single mothers. Before siblings were added into the model, adults raised in single mother father living homes are 14% more likely to be obese than adolescents who lived with two biological parents ($p<.01$). Bivariate analyses indicate that adolescents who grow up in single mother homes are more likely to have

half siblings, no siblings, and/or have other types of children in the home, all of which are associated with the likelihood of being obese as a young adult.

(Insert Table 6 About Here)

Siblings may help adolescents cope with the transitions of single mother homes when the biological father is still living, but the same findings are not seen when the father has died. Adolescents who lived in a single mother home because of a father's death are 35% more likely to be obese as adults, than adolescents who lived with both parents ($p<.01$). This relationship is explained only modestly by sibling structure and income.

Multigenerational Households

The relationship between respondents' obesity and living with their parents and a grandparent(s) is masked by differential attrition, or respondent dropout. Once differential attrition is controlled for, we see that adolescents who live with their biological parents and at least one grandparent are 21% more likely to be obese as adults ($p<.05$). Differential attrition also affected households with other adults in the home. When controlling for dropouts adolescent who lived with other adults in the home are 24% more likely to be obese than those who only lived with their biological parents ($p<.05$). It is likely that these adolescents from these types of households were less likely to be found at the fourth wave of data collection.

Sibling Structure

When analyzing sibling structure, households with children other than the respondent's siblings increase the adult's odds of obesity by 23%, as compared to adolescents who have just a full-brother and/or full-sister in their household ($p < .001$). Yet, not having siblings has negative effects on future BMI of individuals. Adolescent households without a full brother or sister increase the adult's odds of obesity by 20% ($p < .001$). The types of children present in the home – not simply having playmates - does seem to matter in terms of obesity in young adulthood.

(Insert Table 7 About Here)

High Blood Pressure

Guardian Structure

Adolescents from homes of a widowed single mother are 34% more likely to have high blood pressure as an adult, when compared to those who lived with two biological parents ($p < .05$). Having lived in a family with additional adults becomes significant when differential attrition is controlled. Adolescents who live with additional adults are 29% more likely to have high blood pressure as an adult than those who only live with their biological parents ($p < .01$). Single father homes and stepmother homes appear to be significant predictors of high blood pressure, but the significance is due to respondent dropouts.

(Insert Table 7 About Here)

Sibling Structure

Siblings are also important to adolescents' future blood pressure. Adolescents who do not have a full-brother or full-sister are 18% more likely to have high blood pressure than those who do ($p<.01$). Surprisingly, household income was not a significant predictor of the adolescent's future high blood pressure once other variables were taken into account.

Diabetes

Family and Sibling Structure

The significant family structures for diagnosis of diabetes are living with their biological parents and a grandparent, and having a sibling. Adolescents who live with their biological parents and at least one grandparent are 60% more likely to be diagnosed with diabetes ($p<.05$).

(Insert Table 8 About Here)

Income and Minority Status

Income is a mediating variable for adolescents who do not have a sibling. Before income is introduced into the model, adolescents without a sibling are 28% more likely to have diabetes ($p<.05$), but the significance is explained by income. Income has an inverse relationship with diabetes as an adult. As an adolescent's household income goes down they are .7% more likely to be diagnosed with diabetes as an adult ($p<.05$). Families who do not have siblings have significant lower income than do those who have more than

one child (r = -.065, p<.001). Interestingly, as also indicated in the correlation analysis, minority status is not a factor for diabetes as a young adult in this model.

High Cholesterol

Guardian and Sibling Structure

Single fathers have the spotlight with the health condition of cholesterol. Adolescents who live with a single father are 39% less likely to have high cholesterol than those who have two biological parents. Siblings are a mediating factor for adolescents who live with a single mother and a grandparent. Single mothers with grandparent households have a positive association with half siblings (p<.001). Once sibling structure is controlled, the odds of a 43% reduction in having high cholesterol in single mother grandparent homes are no longer significant.

(Insert Table 9 About Here)

CHAPTER 5: DISCUSSION

Recently public attention has been drawn to what has been called the "epidemic of obesity" among America's children (Ebbeling, Pawlack, and Ludwig 2002). Research focusing on related health conditions has also documented an alarming increase in these conditions among children (Stein, Stanton, and Starfield 2005). It is perhaps not surprising then that this study finds a high level of poor perceived health and negative health conditions among young adults in the United States. While just under ten percent of the sample perceive themselves to be in poor health, more than a third meet accepted standards for obesity, a quarter have been diagnosed or presented with high blood pressure, a little under ten percent have high cholesterol, and about three percent are diabetic. Notably this is a sample of individuals ages 24-33 at the time of the fourth wave of data collection when these health assessments were made. Comparisons of first and fourth wave assessments of perceived health indicate that respondents perceive their own health to be in decline. It is critical that we understand what is contributing to these patterns.

Guardian Structure

Previous research summarized above has provided solid evidence that family structure is associated with stress for both parents and children. The findings of my study support the argument that these differential patterns of stress during adolescence are associated with health outcomes in young adulthood. Family structure in adolescence is associated with future perceived health as an adult. Disaggregating the many different forms of "alternative family forms" indicates, however, that the two biological parent

home is not necessarily less stressful than all alternative family forms. Indeed even the ubiquitously scrutinized single mother household is not negatively associated with poor perceived health when the household is the result of widowhood. Furthermore, while overall multigenerational homes decrease many health outcomes, living with both grandparents has no low term negative effects on poor perceived health. However, poor perceived health is more common among those raised in single father, single mother, single grandparent, and stepparent families, once controlling for age, minority status, and gender. While most research has focused on negative impacts of single parent homes, this study finds that single grandparent homes are associated with the highest likelihood of poor health in young adulthood, even after controlling for income.

Many have argued that the negative impacts of living in households other than the traditional two biological parent home may be largely the result of differences in household income across different family form. These studies have focused primarily on single parent homes, if not single mother homes exclusively (Heath 1999; Ziol-Guest 2009. This study finds that income does explain the relationship between single parent homes – father or mother - and perceived poor health, and some of the relationship between single grandparent homes and perceived health. It is also important to note that the relationship between household income and family structure can go either way, it cannot be determined whether low income is due to family structure or that family structure creates lower income.

Moving from perceived health to other measures of health in young adulthood, the patterns are less clear. Adolescents from single mother households are more likely to

be obese than those from two parent homes, while those from single father households are less likely to be obese, after income is controlled. Multigenerational homes including both biological parents are associated with obesity and diabetes, while other multigenerational homes are not. Adults other than parents (biological or step) and grandparents tend to be associated with worse health outcomes. We do see in these results some initial evidence that family structures matter in the diagnosis of health conditions, but these impacts may also take longer to take effect. It may also be that the stressful life conditions that tend to follow with certain family structures affect people's perceptions of life – including their health status – while not affecting their actual physical health. This is less likely as previous research has documented that perceived health is related to actual health outcomes (Kaplan et al. 1995). Continued follow up with this cohort through middle age would help to disentangle these opposing explanations.

Literature varies on the benefits of multigenerational families (Leadbeater and Bishop 1994; Pope et al. 1993; East and Felice 1996; Unger and Cooley 1992). This study found that when grandparents are in the home with two biological parents there are negative effects, such as 60% increase likely hood of diabetes ($p<.05$). And, having additional adults other than two biological parents and grandparents increased the adult's chances of high blood pressure ($p<.05$).

Sibling Structure

Contradictions in the literature pertaining to the impact of single parent and stepparent families may be due in part to siblings. Siblings play a very integral part in the relationship between family structure and health as an adult. Multivariate models suggest

that siblings have a positive effect in the family. In particular, being an only child is associated with higher levels of obesity and high blood pressure. This may be an indication of a lack of physical activity in childhood in the absence of childhood playmates in the home. However, the presence of children other than full-, step-, or half-brothers and –sisters is also associated with higher levels of obesity in young adulthood. It may be that these other children are less likely to have spent long periods of time in the household - coming into the home in times of need, and thus may contribute less to physical activity levels among children in the house.

Siblings may also help each other cope. The relationship between both stepparent household types and perceived poor health are explained by variations in sibling structure, in particular the presence of half- or step-siblings.

Sibling structure also explains the higher levels of obesity in single mother homes and high cholesterol in single mother homes with grandparents. As literature has indicated, siblings do have a large influence on the well-being of the adolescent (Blake 1985, 1989; Downey 1995; Duncan, Duncan, and Hops 1996; Powell and Steelman 1990; Rodgers and Rowe 1990). This study finds that siblings also benefit individual long-term health, not only health during adolescence.

Literature also suggests roles and relationships were different among siblings (Cicirelli 1985, 1988). This study did find this to be true; for example, sisters were beneficial for cholesterol and blood pressure, whereas brothers were beneficial to diabetes. Half-siblings and stepsiblings also have different associations with health in adulthood. In an interaction effect individuals who lived in stepfather homes with half-

brothers had a 68% lower likelihood of being diagnosed with diabetes than those without half-brothers in the home. Yet, adolescents in households with stepfathers and a stepsister were more likely to perceive their health to be poor. Other interaction effects indicate those who grow up in grandparent families with siblings are less likely to perceive themselves to be in poor health ($p<.05$), and are 30% less likely to have diabetes ($p<.05$).

Literature has also found that the more siblings in the home the more stressors in the home due to limited resources, leading to jealousy and conflict (Downey 1995). Others argue that having more siblings in the home may lead to more social support. (Vogt Yuan 2009). In an additional analysis with number of siblings replacing sibling structure in the model, this study finds that adults are 5% more likely to perceive themselves to be in poor health with each additional sibling in the household. This relationship is explained when income is controlled, supporting the limited resources argument. But, as siblings increase blood pressure decreases by 4% ($p<.01$), and the likelihood of obesity decreases by 4% ($p<.01$). Thus there is also support for the alternative perspective that number of siblings may be positively related to health.

Differential Patterns in Family Structure

As others have noted (Caputo 2001; Jimenez 2002; Demuth and Brown 2004; Kelley et al. 2000; Sands and Goldberg-Glen 2000; Whitley, Kelly, Sipe 2001), experience in different types of family structures is not randomly distributed across different groups of adolescents. As a result, some groups of teens are more likely than are others, to live in family structures that are associated with poor health outcomes. Controlling for gender, minority status, and age in the multivariate analyses has insured

that any observed effect of family structure is not the result of a spurious relationship between individual and family characteristics. Indeed there is no evidence of spuriousness. In contrast, there is some evidence that group patterns in guardian structure might be suppressing some of the effects of guardian structure on health. For example, the effects of single father and stepparent households on perceived poor health are not apparent until age, minority, status, and gender are taken into account. What is clear is that females, minority group members, older students, and low income students are more likely to live in alternative family forms, which are often associated with poor health outcomes in young adulthood. This may compound other disadvantages, which these adolescents experience with respect to health.

CHAPTER 6: CONCLUSION

This research finds that family structure during adolescence is an important predictor of adult health outcomes. Yet, it also underscores that family structure is complicated and cannot be simplified into a traditional versus nontraditional family dichotomy. Indeed alternative family forms have been demonstrated to have both positive and negative impacts on health. Little attention has been paid in previous research to single father households and to grandparent households. Both of these family structures have been found to have mixed impacts on health overtime in this study. Explanations for these differential patterns are worthy of more research.

Sibling structure has also received little attention in stress and health research. Findings presented here underscore the importance of siblings to long-term health. Yet, they also provide some preliminary support for the perspective that different types of siblings may have different impacts. Indeed it appears that variations in sibling structure may explain some of the association between guardian structure and long-term health.

This study confirms the conclusions of other researchers that health among young people in this country is on the decline. Given the apparent downward trajectory of this cohort, the long-term impacts of this trend are sobering. By understanding that particular household structures are associated with long-term health problems doctors, other health professionals, and educators can target interventions to those at greatest risk.

TABLES

Table 1. Descriptive Statistics: Dependent Variables.

	Total *N*= 15,701	
	% or *M*	*SD*
Dependent Variables		
Wave IV		
General Health	3.6 (*M*)	.9
Poor	1.1	
Fair	8.6	
Good	33.2	
Very Good	37.9	
Excellent	19.2	
Poor Health	9.7	0.3
Blood Pressure Class	2 (*M*)	0.8
Normal systolic <120, diastolic <80	34.0	
Prehypertension: systolic 120-239 or diastolic 90-99	46.0	
Hypertension I: systolic	16.3	

140-159 or diastolic 90-99		
Hypertension II: systolic	3.7	
160+ or diastolic 100+		
High Blood Pressure		
Diagnosed with Hypertension		
or/Hypertension I/II at interview	25.0	0.4
BMI Class		
Underweight: <18.5	1.4	
Normal: 18.5-<25	31.5	
Overweight: 25-<30	30.1	
Obese I: 30-<35	18.5	
Obese II: 35-<40	9.4	
Obese III: 40+	9.1	
Obesity	38.0	
Diabetes	2.8	
High Cholesterol	8.1	

Table 2. Descriptive Statistics: Independent Variables

	Total *N*= 15,701	
	% or *M*	*SD*
Independent Variables		
Guardian Structure		
Biological Parents	46.2	
Single Father	2.4	
Single Mom/Father Living	16.6	
Single Mom/Father Dead	2.1	
Single Mom/Grand Parent	2.2	
Single Grandparent	1.4	
Stepmother	2.7	
Stepfather	12.2	
Grandparents	1.0	
Biol Parents/Grand Parent	4.7	
Biol Parents/Other Adult	3.6	
Foster/Adopt Parents	3.7	
Sibling Structure		
Full Sister	42.6	
Full Brother	44.9	
No Siblings	20.6	
Half Brother	8.5	

Half Sister	8.1		
Stepsister	1.6		
Stepbrother	1.9		
Other	10.4		
Foster/Adopt	2.8		
Control Variables			
Female	53.2		
Minority	36.6		
Age Wave I	16.09	(M)	1.7
Income (In Thousands) WI	43.9	(M)	17.2
Perceived Health Wave I	3.1	(M)	.9

Table 3. Correlation Coefficients: Associations Between Independent and Dependent Variables

	PH WIV	Obesity	High BP	Diabetes	High Chol
Bio. Parents	-.065***	-.039***	-.006	-.020*	.010
S. Father	.014	-.016*	-.009	.001	-.016
S. Mom/F.L.	.020*	.024**	.009	.014	.002
S. Mom/F.D.	.012	.034***	.016*	.002	-.008
S. Mom/GP	.005	.020*	-.009	-.002	-0.021**
Grandparent	.042***	.013	.001	.006	-.007
Stepmother	.003	-.017*	-.013	.000	.003
Stepfather	.007	-.016*	-.003	-.005	-.003
Grandparents	.011	.017*	-.002	.009	.000
Bio. P./GP	.024**	.026**	.010	.017*	-.012
Bio. P./Other	.023**	.019*	.015	.007	.010
Foster/Adopt	.004	-.008	.001	.007	.010
Full Sister	-.011	-.021**	-.023**	-.002	-.017*
Full Brother	.001	-.032***	-.003	-.018*	.003
No Siblings	.000	.029***	.023**	.015	.001
Half Brother	.020*	.014	-.002	-.008	-.003
Half Sister	.017*	.007	-.006	.006	-.015
Stepsister	.000	-.011	-.017*	-.003	-.002
Stepbrother	.008	-.009	.000	-.007	.001
Other	.051***	.050***	.012	.021**	.002

Foster/Adopt	-.004	-.008	.000	-.001	.011

***p<.001; **p<.01; *p<.05

Table 4. Correlation Coefficients: Association Between Control Variables and Independent/Dependent Variables

	Female	Minority	Age	Income
Bio. Parents	-.027**	-.151***	-.046***	.382***
S. Father	-.031***	-.014	.024**	-.102***
S. Mom/ F.L	.031***	.117***	-.024**	-.336***
S. Mom/F.D	.011	.053***	.014	-.134***
S. Mom/ GP	.018*	.092***	-.020*	-.134***
Grandparent	.011	.080***	.016*	-.115***
Stepmother	-.038***	-.049***	.004	.050***
Stepfather	.006	-.045***	-.021**	.003
Grandparents	.014	.027**	.000	-.034***
Bio. P/ GP	.009	.077***	-.005	-.034***
Bio. P/Other	.006	.041***	.037***	.006
Foster/Adopt	.004	-.029***	-.001	.060***
PH WIV	.025**	.064***	.015	-.083***
Obesity	.020*	.060***	.041***	-.088***
High BP	-.191***	.037***	.052***	-.018*
Diabetes	.036***	.015	.025**	-.029***
High Chol	-.026**	-.018*	.063***	.010

****p*<.001; ***p*<.01; **p*<.05*

Table 5. Logistic Regression Perceived Poor Health on Family Structure as an Adolescent, Household Income, and Control Variables

	Guardians		Siblings		Income		Dropout	
	eB	SE	eB	SE	eB	SE	eB	SE
Guardians								
S. Father	1.453*	.166	1.462*	.166	1.217	.169	1.219	.170
S. Mom/F.L.	1.226*	.076	1.196*	.078	0.987	.083	0.988	.086
S. Mom/F.D.	1.390	.175	1.347	.176	1.083	.179	1.085	.181
S. Mom/GP	1.014	.189	0.965	.190	0.783	.192	0.784	.193
Grandparent	2.317***	.181	2.193***	.183	1.760**	.186	1.763**	.187
Stepmother	1.392*	.166	1.314	.180	1.327	.181	1.329	.182
Stepfather	1.253**	.086	1.203	.094	1.142	.094	1.144	.097
Grandparents	1.084	.274	1.033	.275	0.922	.275	0.922	.275
Bio. P/GP	1.386*	.138	1.387*	.138	1.307*	.137	1.410*	.139
Bio. P/Other	1.489***	.072	1.416**	.075	1.373*	.076	1.376*	.077
Foster/Adopt	1.201	.144	1.270	.166	1.307	.167	1.309	.168
Siblings								
No Sibling			0.996	.075	0.962	.075	0.980	.075
Half Brother			1.090	.100	1.074	.100	1.074	.100
Half Sister			1.052	.104	1.027	.104	1.032	.104
Stepsister			0.996	.241	0.978	.242	0.970	.242
Stepbrother			1.194	.206	1.189	.206	1.194	.206
Other			1.247**	.088	1.135	.088	1.179	.088

Foster/Adopt			0.873	.200	0.885	.201	0.891	.201
Control								
PH WI	3.593***	.075	3.548***	.075	3.435***	.076	3.431***	.076
Female	1.133*	.056	1.399*	.056	1.116*	.056	1.110	.056
Minority	1.433***	.057	1.016***	.057	1.349***	.058	1.353***	.058
Age	1.018	.016	1.016	.016	1.008	.056	1.008	.016
Income					.988***	.002	.988***	.002
Dropouts							.963	.580
Constant	.036***	.304	.036***	.306	.038***	.307	.038***	.307

***$p<.001$; **$p<.01$; *$p<.05$

Table 6. Logistic Regression Results: Longitudinal Prediction of Obese Adults Due to their Family Structure as an Adolescent, Household Income, and Control Variables

	Guardians		Siblings		Income		Dropout	
	eB	SE	eB	SE	eB	SE	eB	SE
Guardians								
S. Father	.842	.113	.816	.113	.704**	.115	.759**	.116
S. Mom/F.L.	1.135**	.046	1.069	.048	.933	.051	1.002	.054
S. Mom/F.D.	1.560***	.113	1.525***	.113	1.259*	.115	1.353**	.116
S. Mom/ GP	1.223	.116	1.173	.116	.959	.118	.947	.119
Grandparent	1.196	.143	1.151	.144	.905	.145	.969	.146
Stepmother	.868	.106	.826	.114	.828	.115	.894	.116
Stepfather	.971	.053	.922	.058	.885*	.058	.951	.060
Grandparents	1.247	.182	1.189	.182	1.036	.183	.804	.183
Bio. P./GP	1.142	.190	1.135	.090	1.141	.091	1.209*	.092
Bio. P/Other	1.215*	.088	1.226*	.089	1.139	.089	1.235*	.051
Foster/Adopt	.938	.090	.899	.104	.915	.105	.968	.105
Siblings								
No Siblings			1.168***	.044	1.183***	.044	1.203***	.044
Half Brother			1.082	.064	1.062	.064	1.058	.064
Half Sister			1.069	.067	1.051	.067	1.060	.067
Stepsister			1.006	.151	1.007	.151	1.010	.151
Stepbrother			1.046	.135	1.044	.136	1.056	.136
Other			1.271***	.058	1.194**	.059	1.227***	.059

Foster/Adopt			1.034	.119	1.058	.120	1.079	.120
Control								
Female	1.075*	.073	1.079*	.033	1.065	.033	.885*	.056
Minority	1.223***	.035	1.241***	.035	1.177***	.035	1.337***	.047
Age	1.048***	.010	1.048***	.010	1.037***	.010	1.066***	.012
Income					.991***	.001	.991***	.001
Dropouts							.224***	.358
Constant	.246***	.159	.293***	.164	.524***	.179	.393***	.191

***$p<.001$; **$p<.01$; *$p<.05$

Table 7. Logistic Regression of High Blood Pressure on Family Structure as an Adolescent, Household Income, and Control Variables

	Guardians		Siblings		Income		Dropout	
	eB	SE	eB	SE	eB	SE	eB	SE
Guardians								
S. Father	.799	.129	.764*	.129	.755*	.131	.833	.132
S. Mom/F.L.	1.074	.053	1.053	.054	1.025	.058	1.123	.062
S. Mom/F.D.	1.290*	.126	1.261	.126	1.222	.129	1.336*	.130
S. Mo./GP	.899	.139	.862	.140	.838	.142	.439	.142
Grandparent	1.015	.165	.948	.166	.920	.168	1.004	.168
Stepmother	.761*	.122	.760*	.132	.760*	.132	.839	.134
Stepfather	1.012	.060	.996	.065	.989	.066	1.066	.069
Grandparents	1.065	.215	.994	.215	.980	.216	.993	.215
Bio. P./GP	.936	.106	.933	.106	.934	.106	1.006	.107
Bio. P./Other	1.186	.054	1.161	.100	1.162	.057	1.285**	.058
Foster/Adopt	1.002	.101	.958	.118	.962	.118	1.034	.119
Siblings								
No Siblings			1.170**	.050	1.167**	.050	1.181**	.050
Half Brother			.988	.073	.984	.073	.983	.073
Half Sister			1.021	.077	1.019	.077	1.027	.077
Stepsister			.777	.182	.776	.182	.782	.182
Stepbrother			1.215	.152	1.213	.152	1.228	.152
Other			1.133	.067	1.124	.067	1.140	.067

Foster/Adopt			1.052	.134	1.055	.135	1.076	.134
Control								
Female	.406***	.038	.405***	.038	.404***	.038	.328***	.038
Minority	1.190***	.040	1.186***	.040	1.1820**	.041	1.383***	.040
Age	1.058***	.011	1.054***	.011	1.052***	.011	1.089***	.011
Income					.998	.001	.998	.001
Dropouts							.194***	.400
Constant	.193***	.181	.198***	.181	.219***	.191	.151***	.222

***$p<.001$; **$p<.01$; *$p<.05$

Table 8: Logistic Regression of Diabetes on Family Structure as an Adolescent, Household Income, and Control Variables

	Guardians		Siblings		Income		Dropout	
	eB	SE	eB	SE	eB	SE	eB	SE
Guardians								
S. Father	1.181	.314	1.135	.315	1.012	.319	1.005	.321
S. Mom/F.L.	1.290	.129	1.264	.133	1.121	.142	1.113	.148
S. Mom/ F.D.	1.097	.328	1.061	.330	.927	.335	.921	.337
S. Mom/ GP	.796	.359	.746	.360	.657	.364	.655	.364
Grandparent	1.271	.372	1.104	.374	.964	.378	.957	.379
Stepmother	1.172	.301	1.230	.325	1.233	.325	1.224	.328
Stepfather	1.034	.159	1.055	.171	1.022	.171	1.015	.177
Grandparents	1.008	.446	.892	.448	.834	.449	.834	.449
Bio P. GP	1.614*	.226	1.611*	.227	1.613*	.227	1.604*	.230
Bio P./Other	1.292	.133	1.244	.138	1.218	.241	1.208	.141
Foster/Adopt	1.307	.235	1.310	.272	1.335	.272	1.328	.274
Siblings								
No Siblings			1.282*	.124	1.266	.124	1.265	.124
Half Brother			.733	.198	.725	.198	.725	.198
Half Sister			1.218	.186	1.203	.186	1.202	.186
Stepsister			.996	.459	.993	.459	.993	.459
Stepbrother			.773	.449	.773	.449	.772	.449
Other			1.318	.155	1.267	.156	1.266	.156

Foster/Adopt			.939	.344	.951	.345	.949	.345
Control								
Female	1.564***	.100	1.550***	.100	1.542***	.100	1.576**	.173
Minority	1.125	.101	1.108	.103	1.084	.103	1.070	.133
Age	1.096**	.028	1.086**	.028	1.079**	.028	1.076*	.034
Income					.993*	.003	.993*	.003
Dropouts							1.441	1.037
Constant	.004***	.476	.005***	.477	.005***	.518	.008***	.546

***$p<.001$; **$p<.01$; *$p<.05$

Table 9. Logistic Regression of High Cholesterol on Family Structure as an Adolescent, Household Income, and Control Variables

	Guardians		Siblings		Income		Dropout	
	eB	SE	eB	SE	eB	SE	eB	SE
Guardians								
S. Father	.592*	.234	.601*	.234	.615*	.236	.615*	.238
S. Mom/F.L.	1.009	.082	1.031	.085	1.056	.091	1.056	.096
S. Mom/F.D.	.797	.225	.804	.225	.826	.229	.826	.230
S. Mom/GP	.573*	.273	.585	.274	.600	.277	.600	.277
Grandparent	.801	.283	.810	.284	.832	.286	.832	.287
Stepmother	1.003	.177	1.050	.193	1.050	.193	1.050	.196
Stepfather	.945	.094	.979	.102	.985	.103	.985	.107
Grandparents	1.170	.340	1.178	.342	1.193	.342	1.193	.342
Bio. P./GP	.839	.181	.844	.181	.843	.181	.844	.183
Bio. P/Other	.978	.158	.808	.090	.966	.090	.966	.164
Foster/Adopt	1.171	.147	1.112	.175	1.108	.175	1.108	.177
Siblings								
No Siblings			.947	.079	.949	.079	.950	.079
Half Brother			1.072	.116	1.074	.116	1.074	.116
Half Sister			.818	.127	.820	.128	.820	.128
Stepsister			.888	.268	.889	.268	.889	.268
Stepbrother			1.064	.233	1.066	.233	1.066	.233

Other			1.051	.101	1.060	.105	1.060	.105
Foster/Adopt			1.152	.197	1.150	.197	1.149	.197
Controls								
Female	.850**	.059	.851**	.059	.851**	.059	.851	.098
Minority	.871*	.064	.856*	.065	.869*	.065	.869	.087
Age	1.145***	.017	1.145***	.018	1.147***	.018	1.147***	.021
Income					1.001	.002	1.001	.002
Dropouts							.994	1.037
Constant	.011***	.292	.011***	.293	.011***	.321	.010***	.346

***$p<.001$; **$p<.01$; *$p<.05$

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Appendix IRB Documentation