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Parental Schooling And Child Health: Evidence From Medical Expenditure Panel Survey

Udbodha Ushakar Rijal
Wayne State University,

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UDBODHA USHAKAR RIJAL

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DEDICATION

I dedicate this piece of work to my loving parents.

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CHAPTER 1. INTRODUCTION

1.1 Background

Most would agree that parental schooling will play positive roles on the health of their children. The degree of these effects and the mechanisms by which the cause brings about these effects are not, however, very clear. An understanding of these effects and the underlying mechanism can be helpful in: (a) knowing whether the future "would-be parents" have schooling premium in the form of better health benefit to their "would-be children"; (b) identifying which demographic and socio-economic strata warrant more attention than the rest, and thereby providing an economic justification for differential supports, such as education subsidy, to the targeted strata; and (c) formulating more comprehensive and effective health and education policies, given the limited resources. Under the presumption that parental schooling (a) increases the household income; (b) helps the family obtain better health insurance; and (c) brings forth other intangible but important health benefits (called, here *non-monetary* benefits as opposed to the *monetary* benefits in the form of *income* and *insurance*), the objective of this study is to isolate the three channels, namely *income*, *insurance*, and the *non-monetary,* that may transmit the favorable health benefits of parental schooling to the children, and to examine the relative importance of these channels.

Income determines the ability of the parents to spend on medical goods[1] (e.g. doctor visit) and other goods (e.g. food) having health enhancing effects to the children. Health Insurance alters the effective price of medical goods, thereby determining the access to and quality of health care. In terms of choosing between the medical and

[1] While discussing the parental optimization problem in chapter 3, I use the term 'medical goods' to describe the health care inputs purchased exclusively for the children only. Similar goods if purchased for the adult members including the parents are put in the 'other goods' category.

other goods, the income and the insurance together determine the parental budget constraint (a change in the former shifts, and a change in the latter rotates the constraint). Hence for simplicity, I call the income and the insurance 'monetary' (or 'tangible') factors, while I call all other factors stemming from parental schooling and having health enhancing effects to the child *non-monetary* (or intangible) factors. As will be explained later, the non-monetary factors largely stem from parental access, analysis and implementation of relevant information attributable to their schooling, and having beneficial effects on child health. We can also understand these non-monetary effects as the increased productive (technical) and allocative[2] efficiencies resulting from higher level of knowledge.

Defining and measuring health is a complex job. The World Health Organization (WHO) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 2004). Physical and mental health are however strongly related, and they reinforce (or undermine when it works in the opposite direction) one another. Rather than one being the permanent cause or effect of the other, the causality between the physical and mental health may switch the direction any time. Also, although some factors are peculiar to physical health and others are to mental health, same set of many favorable (or adverse) factors may affect both physical and mental health favorably (or adversely) with varying degree. For instance, nutritious food; healthy lifestyle (physical activity, adequate sleep, healthy routine); absence of substance abuse; peaceful environment and mutual care (as opposed to abuses and

[2]*Productive efficiency* implies that a given level of output is produced at the lowest cost (or the largest amount of output is achieved given the inputs, also called technical efficiency). This occurs when the production takes place at a point on the production possibility frontier. *Allocative efficiency* implies the inputs are chosen such that the marginal benefit and marginal cost of the last unit of input used are equal. This occurs when the budget constraint is tangent to the indifference curve.

violence); and access to and timely utilization of health care services may have favorable effects on both measures of health. In the case of children, the parents have control over most of these factors, and many of them stem from parental schooling.

In this study, I use the Medical Expenditure Panel Survey (MEPS) data set, and consider two measures of health, namely (a) perceived physical health status and (b) perceived mental health status of the children 17 years or under, rated by the adult respondents, presumably the parents. Different opinions prevail as to the validity of such self-rated health measures. For instance, Miilunpalo et al (1997) claim that such measures are good and stable, whereas Zajacova and Dowd (2011) claim that they can be erroneous. Nonetheless, self-rating of health is among the most frequently used and widely considered as a valid measure, often more effective than clinical measures, and despite being subjective, may include aspects that are difficult to capture clinically [Statistics Canada (2010)][3]. I assume that the parents carefully observe their children's health, and their assessments as used in this study are reliable.

As the explanatory variables, I consider three categories of parental schooling, namely *No Degree* (without any formal degree); *HSD/GED* (a High School Diploma or a General Educational Development), and *College Degree* (Bachelor, Other, Masters or Doctorate degrees). Another option could be to use the years of schooling, a more continuous measure. Because most of the visible benefits of schooling such as employment prospects (which determines income and other benefits) are more likely to be determined by degree achieved rather than years spent in school, the three categorical measures as opposed to the number of years are more appropriate

[3]Statistics Canada, 2010 (http://www.statcan.gc.ca/pub/82-229-x/2009001/status/phx-eng.htm, accessed 07/14/2015)

measures of schooling, and are used in this study. I use maximum likelihood estimation (MLE) techniques, mainly the bivariate probit model using the physical and mental health of child simultaneously for the analysis. In particular, I justify why bivariate probit fits better than the individual probit models for the two health outcomes. For comparison, I also report the results from separate probit models as well as the ordered probit models.

Past literatures on parental schooling and child health relate mostly to developing countries [Cochrane (1982), Caldwell et al (1982), and Cleland et al (1988) study a number of developing countries; Thomas et al (1991) consider Brazil, Basu et al (2005) consider India; Aslam et al (2012) consider Pakistan], and there are very few studies that relate to the developed countries [Lindeboom (2009) and Chou et al (2010) study United Kingdom and Taiwan respectively using old data]. Similar studies that pertain to the US are somewhat rare and there are no recent studies, although there are some that look mostly at parental characteristics, such as parental behavior, maternal employment, parental job loss, and family income, which are all arguably influenced in some way by their schooling. This study attempts to address this vacuum in the US context, whereupon I explicitly look at the effects of parental schooling on both physical and mental health of child using the recent data (2001-2011) and try to explore the underlying mechanism.

1.2 Causality from Parental Schooling to Child Health

Grossman (1972) in his seminal work argues that education can improve the health production technology by enhancing the productive efficiency, whereas Rosenzweig and Schultz (1982) attribute allocative efficiency as the real factor for this

health benefit. Other literatures show that there are pervasive ethnic and racial disparities in education, and that these disparities mirror the disparities in socio-economic status (SES), as well as health outcomes and healthcare (APA-2012); that widening educational disparities have the strongest effects on mortality compared to other SES indicators (Miech et al, 2010); and that the association between SES and mortality has persisted despite radical changes in the diseases and risk factors that are presumed to explain it, mainly because of an array of resources, such as money, knowledge, prestige, power, and beneficial social connections embodied in SES that protect health (Phelan et al, 2010).

Researchers have made numerous efforts in the last four decades to estimate this causal effect from schooling to health of the individuals. As noted by Grossman (2004, 2008), there is compelling evidence of this causality, but establishing the causal link has always been a formidable task to the health economists because of two econometric issues. The first issue relates to the well-known reverse causality - that healthy people are more likely to acquire higher schooling [Edwards and Grossman (1979) and Case et al (2005)], and in turn would become healthier. The second issue, as argued by Fuchs (1982), relates to the omitted time preference, that people with modest discount rates (more future oriented) make larger investments in both health and schooling, the result being that the observed effects of schooling on health can be biased. It is reasonable to assume that the schooling premium on health may transcend well beyond the individuals and may accrue, even strongly, to their children. With child health as the dependent variable and parental schooling as the independent variable among others, the reverse causality (from child health to the parental schooling)

however seems unlikely in statistical sense, but there are other potential sources of biases to consider.

To start with, including only one parent's schooling as a predictor of child health can potentially give rise to biased estimates. This is because the effects might actually be arising from the schooling of the other parent who is missing in the equation, while at the same time their levels of schooling might be highly correlated[4]. This can be particularly problematic as (a) the labor market participation and reward (income and other benefits including health insurance) may depend largely on schooling, (b) some inputs such as income of father and mother are largely substitutes as regards their effects on child health, and health insurance of the children is usually tied with the employment of one of the parents, and (c) the couples after all do not just marry at random, but marry largely on the basis of schooling and work behavior [Pencavel (1998)]. Many earlier studies include the schooling of both parents in the child health equation, although some such as Cleland et al (1988), Bicego and Boerma (1993), and Basu and Stephenson (2005)] include only the mother's schooling. As the main sample in this study (called "*Sample 1*" henceforth), I analyze 31,756 children having both parents present at home, and I include both parents' schooling simultaneously as the regressors for this sample. This allows not only to compare the relative importance of the two parents' schooling, but also to address any bias that can result when only one parent is considered[5]. In addition to this sample, I also use another sample (called

[4] The correlation coefficient is about 0.65 in my sample.

[5] Another option would be to develop and use a common measure of the parental schooling, which would capture the relevant information of both parents' schooling in terms of their possible roles in determining child health. Measures such as the highest (Flores et al, 1999), lowest, or average level of parental schooling are easy to think of, but they work only under restricted assumptions-that only the highest level matters regardless of the lowest, or only the lowest level matters regardless of the highest, or the effects are same as long as the total level of schooling is same.

"*Sample 2*" henceforth) with 13,524 children with single mother. For this sample, I include only the mother's schooling, and this would clearly not cause any biasness issue.

Another important issue to consider is that healthy parents, both physically and mentally, are more able (and possibly willing) to take better care of their children, than unhealthy parents. For instance, healthy parents have more productive time (such as time not spent on bed) available for both labor market participation and for addressing the special needs of the children. At the same time, parental health and their schooling are likely to be associated positively. In such a case, the observed effects of parental schooling on child health might overestimate the true effects if parental health is missing in the child health equation. To address this issue, I include a summary health score of each of the parents available in the data source (MEPS). These scores were constructed by the MEPS based on the individuals' response to the twelve questions that pertain to their physical and mental health. Also, as discussed in the ensuing paragraphs, the inclusion of parental health in the child health equation can have other advantageous byproducts relevant for this study.

Many have documented that the parents and their offspring may share health determining genetic traits. For instance, obese parents are more likely to have obese children due to obesity-predisposing genotype present in them [Herbert et al, (2006)]. The genetic factors can have even stronger roles due to assortative mating among the parents [Hebebrand (2000)]. Inheritable conditions such as type-2 diabetes, hypertension, heart-diseases, breast cancers in women and many others largely do not appear during the childhood, but others such as hemophilia, sickle-cell disease, color

blindness, and neurofibromatosis can be observed among the children[6]. Unfortunately information about the genetic factors (and health endowment from the past) are not available in this data set. As Grossman (2008) has pointed out, uncoupling the causal links associated with genetic and behavioral factors is very difficult, and breaking into this complicated bundle is a challenge for future research. Given that genetic factors can simultaneously influence the parental health and child health, and that parental health and parental schooling are positively associated, including parental health in the child health equation becomes even more crucial. Fortunately, parental health is not a major explanatory variable in this study, but one should be cautious while interpreting the observed effects of parental health, as they may actually be capturing some of these genetic effects (rather than the effects of productive time available because of better parental health). Data permitting, use of an appropriate instrument or studying identical twins could be some options to segregate the genetic effects from the time effects[7], but this is beyond the scope of this study.

The unobserved 'innate ability' (which is usually conceived in terms of intelligence, smartness, or peoples' "better" production functions) might also make some people be simultaneously better at several things with least costs expended. For instance, innate ability may help them achieve higher level of schooling during their school age, and be good at raising the kids and achieving better child health later. Although 'innate ability' among individuals is widely regarded as a potential source of

[6] These inheritable conditions are broadly categorized into four groups-(1) Autosomal Recessive; (2) Autosomal Dominant; (3) X-linked Recessive; and (4) X-linked Dominant. The term "Recessive" refers to the case where both parents must carry the abnormal genes for the conditions to be present in a child, and "Dominant" refers to the case where only one parent's carrying the abnormal genes is sufficient to cause the condition. "X" refers to the X-chromosome (one of the two sex-chromosomes) and "Autosomal" refers to the other 22 pairs of human chromosomes.

[7] A panel data analysis can be another option, but is not applicable in this case as many variables including the major explanatory variable (parental schooling) are observed only once in the MEPS.

bias in the study of monetary returns to schooling, the importance of parental 'innate ability' in determining the child health is not very clear. But given that innate ability somehow matters, parental health variables should already capture some of these unobserved 'ability' traits (because those who can take better care of their children can also take better care of themselves). In any case, the inclusion of parental health in the child health equation is likely to account (at least partially) for this 'innate ability' bias.

Another key factor that may simultaneously influence the level of schooling of the individuals and the health of their children is their general preferences or attitudes towards life. Optimistic and prudent individuals are likely to be more future oriented (have modest time discount rates), and may strive for the best things in life. By nature, they may invest more resources for the acquisition of higher schooling, and later on the better health of their children, among others. If this is the case, then the observed positive effects of their schooling on their children's health may not be causal, and rather be a matter of their choice. In contrast, preferences and attitudes are not static, and are rather developed and polished in the course of and as a consequence of schooling and experience (due to change in their values, resulting optimism, better reasoning, or a sense of knowing what is expected of oneself in the home and society), then the observed effect of schooling on child health is largely causal. There is some evidence that preferences and attitudes are largely shaped by the level of schooling and experience[8]. The data set used in this study lacks suitable variables to control for the preferences or attitude, but along the same line of the argument made previously, it can be said that some of these unobserved factors will be captured by the parental health

[8] "….schools and individual teachers within schools are a major influence, alongside the family, the media and the peer group, on developing values of children and young people, and thus of society at large"- [Halstead et al (1996)].

variables themselves (those who value schooling and the health of their children highly, probably also value their own health highly). I presume that the resulting biases due to these unobserved factors, if any, are not too large.

Researchers also argue that family background might influence both the parental schooling and the child health. The notion of family background is not easy to put in words, but it may include place of origin, race and ethnicity, history and general practices (religious, occupational, financial, educational, clinical, criminal, marital, food, health care etc.), family structure (joint, nuclear, household size, fertility rate etc.), and essentially everything that pertains to the family. For instance, better schooling, and better nutritional and healthy practices may just be a matter of tradition for some families, in which case the observed effects of parental schooling on child health may not be purely causal. To explore this issue further, I conceive the family background in terms of an ever evolving continuum, rather than a static entity. For convenience, I split the family background into two compartments: (a) as what is inherited by the parents prior to their adulthood, over which they do not have any significant control or influence; and (b) as what is modified or acquired by themselves henceforth - such as in the latter stages of their schooling and after.

The various practices developed relatively recently, current associations with the people, current neighborhood characteristics, and even what is consciously carried over from the first compartment as being ‘worth retaining’ belong to the second compartment. Unlike the people in less developed countries, where the life style remains relatively static in terms of occupation, practices, values and even location throughout a longer period, the US societies are more dynamic and individuals are likely to make a lot of

changes over what they had inherited. Thus, after already accounting for some socio-demographic, geographic and parental behavioral (such as smoking) and health factors, I presume that little will be left in the former compartment of the background continuum to affect both the parental schooling and current child health significantly. This would mean that most of the working of the unobserved background on child health, if any, should be recent in origin, and should belong to the latter compartment of the background continuum. Clearly, if schooling has some influence over this part of background continuum, this will be captured by and reflected in the non-monetary effects of parental schooling. Under these scenarios, I presume that the unobserved family background would not significantly distort the observed effects of parental schooling on child health.

Lastly, it is reasonable to assume autocorrelation on the error terms as the siblings may share wide range of these family characteristics - demographic, economic, genetic (which may determine their initial health endowment), environment, family background, parental preferences, parental health, parental behavior, and most importantly the perception of their health status by the parents. To address this issue, I cluster the regressions at the household level. Also, the non-linear nature of the model specifications and the estimation technique (MLE) used in this study are inherently heteroskedastic, which I address by obtaining the robust standard errors.

1.3 Data, Estimation Techniques and Main Findings

The study uses ten panels (6-15) of the MEPS that cover the years 2001-2011, and employs maximum likelihood estimation technique under bivariate probit model (along with the estimation of probit and ordered probit models for comparison). The two

dependent variables used namely the 'perceived physical health status' and 'perceived mental health status' of the child are originally available in five categories, namely *Poor, Fair, Good, Very Good, and Excellent*. I merge these into two categories, namely *Very Good/Excellent* (very good or excellent) and *Poor/Fair/Good* (poor or fair or good) for the bivariate probit (and probit) specification[9]. For the ordered probit specification, I consider three categories of child health, namely *Very Good/Excellent*, *Good* and *Poor/Fair*.

The bivariate probit model, which uses both the physical and mental health status of child simultaneously, addresses a very crucial issue pertinent to this study. As discussed earlier, physical and mental health of a child are likely to be jointly determined by many common factors - both observed (parental schooling, child's age and gender, parental income, child's health insurance etc.), and unobserved (genes, family background, lifestyle, community characteristics, parental preferences and perceptions etc.). Technically, this means that the errors in the two child health equations (with the physical health status and the mental health status as the dependent variables) are likely to be correlated. In such a case, instead of estimating the two separate probit equations for the two dependent variables, estimating a bivariate probit model makes more efficient use of the available information - that a common set of observed factors and unobserved factors in the background play a role in influencing the two dependent variables. A bivariate normal distribution of the two error terms is assumed, which yields a more appropriate joint density. This allows to measure the joint and conditional probabilities pertaining to the different levels of the

[9] Flores et al (1999) use similar merging. Another option would be to merge 'Good' with 'excellent or very good', but doing so highly skews the distribution, with most of the observations in this category and less than 3% in the other category in the data used.

two dependent variables (such as probability that a given child has best physical health status, given that he/she has best mental health status), should such a correlation between the errors exist. The likelihood ratio or Wald or Lagrange multiplier statistic can test for the significance of this correlation. Failure to reject the null hypothesis (that the correlation in the error terms is statistically zero) would indicate no need for a joint bivariate model, and instead separate probit models would suffice. The estimated correlations in this study are very large (well above 0.8. in all the regressions involved), and highly significant, implying that bivariate probit model is more appropriate than estimating the two probit models separately.

Finally, I draw the conclusions about the relative importance of the monetary (income and insurance) and the non-monetary effects of parental schooling on child health by analyzing (a) the estimated magnitudes and significance of the parental income and child's health insurance type in the model equations, and (b) the changes in the marginal effects of parental schooling with the successive inclusion of these two monetary factors in the equations.

The results indicate significant positive effects of parental schooling on both measures of child health, and that the non-monetary effects of parental schooling are far more important (about four-fifths of the total effects) than the monetary effects. Furthermore, consistent with some earlier studies, maternal schooling plays a bigger role on child health than paternal schooling. For instance, relative to having *No Degree*, mother's having an *HSD/GED* (and a *College Degree*) increases the probability that the reported physical health status of her child is very good or excellent by about 5.2% (and 8.6%) respectively in terms of the non-monetary effects. Similar probabilities for the

father's schooling are about 3.6% (and 5.6%) respectively. For mental health, these probabilities are about 4.6% and 7.1% for mother's schooling, and 2.5% and 3.6% for father's schooling respectively. The total effects of parental schooling are about 2 percentage points higher than these non-monetary effects, implying that the combined monetary effects of income and insurance stemming from parental schooling are about 2% in terms of raising the probability that the child health is *Very Good/Excellent*. Also, the effects of parental schooling on child health are particularly highest for the *Hispanic*, followed by *Black*.

1.4 Study Limitations

This study has several limitations. First, it considers only the parents-rated child health outcomes as the dependent variables and ignores other possible measures such as outcomes measured clinically by the health care professionals. If possible, it would be a good idea to have measures that incorporate both the parental perceptions as well as clinical measures for more reliable results, both of which are beyond the scope of this study.

Second, I consider only formal schooling of the parents. This assumes that schooling is a homogeneous attribute in terms of their effects on child health, which is surely not the case. For instance, parents in health care professions would probably have greater impacts of their schooling on the health of their children than those in other professions. Even among the parents not in health care area, the impacts of their schooling would still be diverse based on their personal inclinations and skills.

Third, the study presumes that the more important non-monetary effects of parental schooling operate through better access to and use of relevant health care

information and the resulting efficiency in the allocation of health care inputs. Due to lack of relevant variables pertaining to the acquisition of information and the complexity involved in this process, the study is unable to delineate the exact mechanism by which this non-monetary channel operates.

Fourth, the data set lacks many relevant explanatory variables such as the health endowment of child, family background, and parental tastes and their innate ability. The presence of these variables could enhance the results.

Fifth, it is beyond the scope of this study to analyze the mechanisms of the observed effects of various other factors included in the equations. For instance, the racial and geographical differences on child health as well as the favorable effects of time (benefits of being in the recent panels) are not explored here.

Lastly, the magnitudes of the beneficial effects of parental schooling as observed in this study pertain only to this specific data set for U.S. population. It cannot be generalized for other societies and contexts.

CHAPTER 2. LITERATURE REVIEW

Most of the available literatures on the effects of parental schooling on child health are based on the developing countries, although two relatively recent works analyze old data from United Kingdom [Lindeboom et al (2009)] and Taiwan [Chou et al (2010)]. Studies based on the data from the United States are not available, although one [Flores et al (1999)] addresses it as a byproduct of a broader project analyzing ethnic disparities. Many do look at the effects of some parental or household characteristics, which are arguably closely influenced by parental schooling in one way or other.

Cochrane et al (1982) extensively review earlier studies and data on 33 developing countries, and find that maternal education in those countries is closely related to child health, measured either by nutritional status or by infant and child mortality, and that the effect of father's education is about one half that of mother's. Using cross tabulation and stepwise regressions, they suggest that income differences among the educated parents cannot explain all the health effects to the children, or perhaps even as much as half of, and more of these effects are attributable to the increased in information through schooling.

Caldwell and McDonald (1982) use multiple classification analysis on the data from the World Fertility Survey in ten third world countries to test the conclusion based on a Nigerian study, that maternal education is important in reducing child mortality. They find that the impact of parental education in reducing the probability of dying by age 2 in those countries is greater than both income factors and access to health facilities combined, maternal education is more important than paternal

education, the step from primary to secondary schooling is more important than that from illiteracy to primary schooling, and rural/urban differentials are of small importance once parental schooling has been controlled. They further note that the age and sex differentiations in power, decision-making and benefits within the larger family are reduced when schooling brings about a new family system in which women and children are allocated higher priorities in terms of care and allocation of food and in which parents can make decisions about health and child care without reference to their elders.

Wolfe and Behrman (1987) use standard individual reduced-form estimates on a special adult sister sample to study the impact of mother's schooling on child health and nutrition in Nicaragua. In order to explore the question of whether the unobserved mother's childhood background related characteristics (such as motivation and ability) influence the estimated impacts of mother's schooling, they control for the characteristics shared by the adult sisters. For the child health outcome, they use the infant and child mortality rate; and three anthropometric measures, viz. height, weight, and upper arm circumference standardized for age and gender for a randomly-selected child five or younger. For the nutritional intake, they use the household intake of calories for the week preceding the survey, and the average number of months the woman had breastfed her children, standardized for age and gender composition. Their findings suggest that the mother's schooling does not improve substantially their children's health outcomes, though it does increase their nutrient intakes.

Cleland and Ginneken et al (1988) review the earlier studies and analyze the old and new data pertaining to a wide range of developing countries to assess the various

mechanisms which could explain how mother's education influences the health and survivorship of her children. Using the multiple classification analysis, they find that on average each one-year increment in mother's education corresponds with a 7-9% decline in under-5 mortality, and that education exercises a stronger influence in early and later childhood than in infancy. Two of the possible intervening variables, namely reproductive health patterns and more equitable treatment of sons and daughters play relatively minor roles, and economic advantages associated with education (income, water and latrine facilities, housing quality etc.) account for about one-half of the overall education-mortality relationship. They report that the influence of the use of preventive and curative health services as a group of intervening variables is complex and variable, and that there are countries whose primary health services are so weak that they have no effect on the health of mothers and children, and there are others whose health services may tend to accentuate educational disparities because of differential access.

Thomas et al (1991) use the data from the 1986 Brazilian Demographic and Health Survey to explore the mechanisms through which the maternal education affects child health conditional on age and sex. In particular, they use the reduced form regression of child health on the parents' educational level, and investigate three ways maternal education might affect child health: income augmenting effects, information processing effects, and interactive effects with community services. They find that almost all the impacts of maternal education on child height can be explained by indicators of access to information, namely reading papers, watching television, and listening to the radio. In urban areas, whether the mother is semi-literate accounts for some of the education effects, and there are significant interactions between maternal

education and the availability of community services, indicating that education and community health services are substitutes.

Using the survey data from seventeen developing countries, Bicego and Boerma (1993) examine the effects of mother's education on neonatal mortality, postneonatal mortality (l-23 months), stunting (3-23 months), underweight status (3-23 months), and non-use of selected health services namely non-use of tetanus toxoid during pregnancy and non-use of antenatal services. They employ Cox hazards regressions (for postneonatal mortality) and multivariate logistic regressions (for the rest of the dependent variables) as their estimation techniques. Consistent with earlier studies, they find that education advantage in survival is less pronounced during the neonatal period than after. They find strong but varying education effects on post-neonatal risk, undernutrition during the 3-23 month period, and non-use of health services, and that a large part of these associations are the result of education's strong link to household economics. Differential use of basic health services is closely tied to a mother's educational level, but does little to explain the education advantage in child health and survival.

Shariff and Ahn (1995) use two-stage ordinary least squares method to evaluate the effects of mother's education on long-term and short-term health measures (namely height-for-age and weight-for-height respectively) of the children less than five years of age in Uganda. They report significant positive effects of mother's schooling on long-term height-for-age measure, and that the effects are stronger in urban areas than in rural areas, and benefits are greater for sons than for daughters. However the effects are not significant with the short-term weight-for-height measure, although there are

positive effects of radio ownership on weight-for-height, which are much greater among the uneducated mothers.

Using the 1978 Intrafamily Food Distribution and Feeding Practices Survey dataset and the census data from Bangladesh, Bishai (1996) employs a two stage least squares fixed effects model to explore how parental schooling affects child health through its interactions with child care time. They use lagged childcare time, resource allocation and child health as the instruments for the first differences of these same endogenous variables. They report that the schooling of teenage brothers and fathers has the highest marginal productivity for child health, than that of mothers and grandmothers. If economic opportunity draws mothers away from childcare, the presence of other household members with higher schooling levels offers the potential for an improvement in the overall quality of childcare time. They further note that the households in their study failed to set the marginal labor product of child health for each of the caregivers equal, implying that the quality of childcare may not be the household's sole concern in determining time allocation.

Flores et al (1999) analyze the US data from National Health Interview Survey to explore whether the ethnic disparities for children in demographics, health status, and use of services are explained by differences in family income and the highest level of parental education at home. Using a sample of 99,268 children from 1989-91 NHIS surveys, they employ a logistic model for the health status, and ordinary least squares on the number of days on bed as the dependent variables. They report that non-white children average fewer doctor visits and more likely to have excessive intervals between visits, and that Native American, Black and Hispanic children are poorest, least healthy,

and have least well-educated parents. They find that a parent's having graduated from high school (as opposed to not graduated) is associated with an odds ratio of 0.89 (implying a probability of 0.47) for having a suboptimal health status, and is associated with an additional 0.018 days (about 26 minutes) in bed in the past 12 months. They conclude that major ethnic groups and subgroups differ strikingly in demographics, health and use of services, and that most disparities persist even after adjustment for family income, parental education, and other covariates.

Using the data from the 1992/93 Indian National Family Health Survey, Basu and Stephenson et al (2005) investigate twenty-two child health outcomes in India representing child mortality and morbidity, illness management, service utilization and health behaviors. They employ ordinary least squares for continuous outcomes and logistic regression for binary outcomes, and find that maternal education is a significant correlate of each of the outcomes, and even low levels of education increase child survival prospects and health-related behaviors, except for neonatal mortality and the effective management of diarrhea. Speculating on some of the possible mechanisms, they suggest that it may be the 'hidden curriculum' values of discipline and obedience of authority rather than female autonomy that account for these impressive findings.

Using the data from the National Child Development Study, which is a longitudinal study of 17,000 babies born in Great Britain in the week of 3–9 March 1958, Lindeboom et al (2009) explore the effects of parental schooling on child health at birth, namely the birth weight and an indicator for whether the child experienced an illness in the first week of life. They exclude twins from their sample since their birth weight is not comparable with singletons. To identify the causal impact of parental schooling on child

health, they use the regression-discontinuity techniques looking at the exogenous variation in parental education induced by the schooling reform in the UK in 1947, which raised the minimum school leaving age. The schooling reform provided a natural experiment to them, whereby the individuals close to the reform could be regarded as similar except for exposure to the reform. They find that increasing the school leaving age by 1 year in UK had little effect on the health of their offspring, although it did improve economic opportunities by reducing financial difficulties among households.

Chou et al (2010) use two-stage least squares method on the data from Taiwan to analyze the causal effects of parental schooling on child health. After Taiwan extended the policy of compulsory schooling from six years to nine years in 1968, many new junior high schools were opened at a differential rate among regions of the country in the period 1968-1973. The authors form the treatment and control groups of women or men who, in 1968, were age 12 or younger on the one hand and between the ages of 13 and 20 or 25 on the other hand. Within each region, they exploit variations across cohorts in new junior high school openings to construct an instrument for schooling, and use it to estimate the causal effects of mother's or father's schooling on the incidence of low birthweight and mortality of infants born to women in the treatment and control groups, or the wives of men in these groups in the period 1978-1999. They find that the parents' schooling caused favorable infant health outcomes, and that the increase in schooling associated with the new policy and opening of 150 new schools saved almost 1 infant life in 1,000 live births.

Aslam and Kingdon (2012) use ordinary least squares and instrumental variable techniques on the survey data from 2006 and 2007 in Pakistan to investigate the

relationship between parental schooling on the one hand, and child health outcomes (height and weight) and parental health-seeking behavior (immunization status of children), on the other. In particular, they use a set of "pathways" variables through which parental education impacts child health, such as whether the mother is a labor force participant, her family's per capita income, whether she has exposure to the media, and her extent of autonomy within the household as the proxy for the mother's unobserved traits such as the independence, attitudes, values, and preference. They find that father's education is positively associated with the immunization decision which works through the channel of increased health knowledge, and that mother's education and empowerment is more critically associated with longer term health outcomes such as child's height and weight.

As mentioned earlier, literatures that explicitly examine the effects of parental schooling on child health using the US data rare, but there are a few that look at parental or household characteristics, which are arguably closely influenced by parental schooling. For instance, Case et al (2002) finds that a broader set of policies, that target parents' health related behavior, are as important as health insurance coverage and advances in medical treatment. Dooley et al (2007) find that there is little evidence of an effect of income on behavioral–emotional scores of the children, but parenting style is found to have a consistent impact on child outcomes. Fairbrother et al (2010) finds that children with private health insurance are more than six and a half times as likely to lose coverage in the three months after one or both of their parents loses a job, compared to children whose parents remain employed. The likelihood of losing the coverage is particularly high for the poorest and Hispanics. Lindo (2011) finds that father's job

losses have significant negative effects on their infant children's health, and that they reduce birth weights by approximately four and a half percent. Some studies that particularly look at the work-time tradeoffs and the effect of mother's employment on child health have interesting findings. For instance, Anderson et al (2003) report that a child is more likely to be overweight if his/her mother worked more hours per week over the child's life, and the intensity is somewhat higher for family of higher socioeconomic status. Gennetian et al (2010) observes that maternal employment has a modest adverse effect on the health of low-income, elementary school-aged children. Morril (2011) shows that maternal employment increases the probability of adverse health events such as overnight hospitalizations, asthma episodes, and injuries/poisonings for children ages 7–17 by nearly 200 percent. It is noteworthy that all of these studies consider only maternal employment, not her education, and therefore do not rule out the net benefits of the maternal education arising from the additional monetary and non-monetary inputs, even after allowing for their work time.

CHAPTER 3. METHODOLOGY

3.1 Theoretical Framework

I propose that parental schooling can influence child health through three major channels, namely *Income*, *Insurance*, and *Non-monetary*, and the beneficial effects they carry are hence termed as *Income*, *Insurance*, and *Non-monetary* effects respectively. Income determines the ability of the parents to spend on medical goods (e.g. a doctor visit or a prescription medicine) and other goods (e.g. food or internet) having health enhancing effects to the children. Health insurance alters the effective price of the medical goods thereby determining the access to and quality of health care. Not to be confused with the error term in the regression model, all other factors stemming from parental schooling and having health enhancing effects to the children are collectively termed as non-monetary factors. Thus, non-monetary effects here are essentially the effects of parental schooling on child health when the parental income and health insurance type of child are already accounted for.

In terms of choosing between the medical and other goods, the income and the insurance together determine the parental budget constraint either by shifting or rotating it respectively. For this reason, I call the income and the insurance factors 'monetary' (or tangible). As I will explain, the non-monetary factors are largely intangible and are related to parental access, analysis and implementation of relevant information attributable to their schooling and having beneficial effects on child health. The ensuing sections elaborate these three factors and their effects, and possible interaction between them.

3.1.1 Income Effects

Empirical studies pioneered by Mincer (1974), and developed by countless others including Griliches (1977), Card (2001), Psacharopoulos (2004), and Carneiro et al (2011) all reaffirm the importance of human capital theory, and establish that schooling has positive monetary returns. An increase in parental income shifts the household budget constraint outward, so that more of all necessary resources can be purchased. Higher income can manifest as better child health in several ways. The households can consume nutritious, organic, and fresh foods, as opposed to relatively cheaper fast foods with little nutritional value, often high in fat, sugar, salt, and calories. The households can afford to pay for the health care inputs for prevention and treatment of diseases such as the prescriptions and over-the-counter medicines, first-aid kits, and various services of the health care providers (to be purchased either with co-pays and/or deductibles in the presence of health insurance, or out-of-pocket expenditure in the absence).

Higher income can make private health insurance affordable in the absence of other public or employer sponsored health insurance. Living in a healthy community, a clean home, and high quality schools for the healthy development of the kids may be affordable. Conceivably, parental income should have positive impacts on child health in general. It is also true that income above some threshold can make some marginal households ineligible for public health insurance, resulting into some negative effects. Higher income is nonetheless desirable as it opens up other avenues by making other resources accessible.

3.1.2 Insurance Effects

According to the US Census Bureau, about 55% of people had employment-based health insurance in 2012, while 9% had other private health insurance, 33% had public health insurance (mainly Medicaid and Medicare), and 15% were without any health insurance. The Kaiser Family Foundation reports that 57% of all firms, 99% of all large firms (with 200 or more workers), and 57% of all small firms (with 3-199 workers) offered health benefits in 2013. The share of employer sponsored health insurance in the total health insurance is thus substantial. According to College Board, 68% of four-year college graduates in 2008 working at least half-time in the private sector were covered by employer-provided health insurance, whereas only 50% of high school graduates had this benefit. *The Economist* (Sunday, April 15th 2012) reports that when the economic downturn hit the OECD countries in 2009, on average 84% of university graduates were in work, compared with 74% of those who did not go to university but studied beyond the minimum school-leaving age, and 56% of those who did neither[10]. Based on the US data from the CPS and the 1980 Census, Riddell and Xueda (2011) find that schooling significantly increases re-employment success for unemployed workers. Considerable such evidence indicates that schooling increases the job prospects, and consequently increases the probability of acquiring an employer sponsored health insurance. In many cases, the employer-sponsored plans cover for the spouse and the dependent children.[11]

[10] Retrieved from http://www.census.gov/hhes/www/hlthins/data/incpovhlth/2012/highlights.html; http://kaiserfamilyfoundation.files.wordpress.com/2013/08/8466-employer-health-benefits-2013_summary-of-findings2.pdf ; https://trends.collegeboard.org/education-pays/figures-tables/health-insurance-coverage-education-level-1979-2008; and http://www.economist.com/node/21529095

[11] The age of the dependent children covered under the parent's plan has increased from under 18 years to 26 years under the new Affordable Care Act.

Health insurance lowers the effective price of the medical goods such as office visits and tests, emergency visits, and prescription medicines for both prevention and treatment of conditions. The extent of the reduction in the price of these inputs is a function of many factors such as premium, copays, and deductibles. A lower (or even zero under some public coverage such as Medicaid and CHIP) price of the medical goods means a higher effective income that can be spent on both medical and other goods. Technically, the role of a health insurance is to rotate the household budget constraint outward in such a way that more of the medical and other goods (a) become affordable and (b) will be purchased, whenever needed. The consequence of such a price change in one good on the household's overall consumption bundle is usually illustrated by splitting the total effects of price change into the income and substitution effects.

3.1.3 Non-Monetary Effects

The non-monetary effects, by definition, are the beneficial impacts on child health of everything else directly attributable to the parental schooling, but other than the parental income and the child's health insurance type. As the results will show later, these effects are larger than the first two combined. I presume that the non-monetary effects, in one way or other, relate to parental information stemming from their schooling and its translation into better child health through three distinct processes - (a) parental access to relevant information, (b) their ability to analyze or process the information, and (c) their willingness to implement the information. Access to information in this regard is only a necessary but not a sufficient condition. For instance, many alcoholics presumably know the adverse effects of alcohol on their own health and the

psychological impacts to their children. However, only those who do not drink or have already quit drinking can gain effectively from this information. Similarly, merely the knowledge of the unhealthy effects of junk food does not yield any benefit to the children, unless it is practiced at home.

The purview of information is large. It may encompass the nutritional content in food, human physiology, prevalent and seasonal health conditions, preventive and curative cares available in the market, printed medicinal instructions, a television talk show and so forth. The mechanism of the acquisition and use of information is complex, and is beyond the scope of this study. Here I simply assume that formal schooling (through the course material as well as through the entire process and as a byproduct of schooling) is a major source of information that can be relevant to child health. Similarly, I assume that schooling enhances the ability of the individuals to analyze available information and state of affairs surrounding them, and thus prioritize the issues at hand.

Finally and most importantly, I assume that schooling brings about positive attitudes and tastes/preferences among the individuals in terms of developing healthy behaviors and willingness to implement the acquired information in day to day life in accordance with their priorities. For instance, the parents with higher levels of schooling may be better informed of the health care system; may know how to seek services when in need; may read, understand, and follow the instructions; may pick up relevant ideas from a casual television show; may explore necessary resources in the internet; may take appropriate preventive care and seek timely care for their children in the event of any health shocks; and may help their children develop healthy habits and eat healthy food.

Whereas parental income and health insurance type of child determine the parental budget constraint, the non-monetary factors influence the parental utility function[12] - either by influencing their tastes/preferences directly, or by affecting the child health production function (which yields utility to the parents). In other words, the non-monetary factors are responsible for determining the parental indifference curves and the corresponding effects reflect the increased productive (or technical) and allocative efficiencies that originate in the parental schooling and manifest into better child health. Here, productive (or technical) efficiency refers to a situation, whereby a given level of child health is produced at the lowest cost (or highest level of child health is achieved given these inputs are affordable and available to the parents). This occurs when the child health production takes place at a point on the production possibility frontier. Similarly allocative efficiency refers to a situation whereby the medical and other inputs (including time) are allocated by the parents in such a way that the marginal benefit (in parental utility) and marginal cost of the last unit used are equal. This occurs when the parental budget constraint is tangent to the indifference curve through the efficient allocation of all inputs. In other words, the parents with higher level of schooling are assumed to have better knowledge of the true nature of the child health production function, value child health highly, and are better at optimization.

3.1.4 Interplay between Income and Insurance Effects

It is crucial to understand that the income and insurance effects of parental schooling can overlap or interact in subtle ways. For instance, an increase in parental income (which shifts the budget constraint outward) can be spent on necessary items,

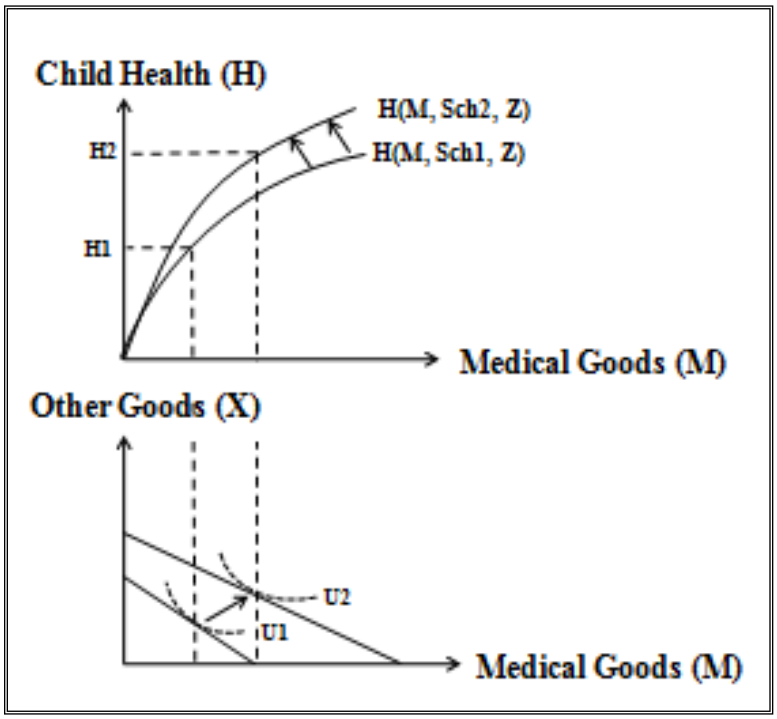
[12] For simplicity, the budget constraint and the utility function of both parents are combined into one. Furthermore, as explained in the next section, child health forms an input to the parental utility, and the parents aim at maximizing their own utility, rather than maximizing child health, given the constraints.

including possibly a private health insurance for the family members in the absence of other health insurance. The number of individuals without a health insurance has been declining, and it is mandatory to have health insurance under the current Affordable Care Act. But pertaining to the data set used in this study (2001-2011), choosing not to have a health insurance could sometimes be a matter of parental choice (decided possibly based on income and other factors), as they could still visit the emergency room, or just pay out-of-pocket when they faced serious medical issues. Given health insurance, a higher income on the other hand makes the co-pays, and the deductibles more affordable, so that more of the medical goods can be purchased when needed. Similarly, health insurance reduces the effective price of medical goods (which rotates the budget constraint outward and manifests into income and substitution effects), so that more of both medical and non-medical goods can be purchased. On the other hand, the public health insurances such as Medicaid and CHIP are typically available only to low income households. Thus marginal households with income just above some threshold may be ineligible for public health insurance and lack private health insurance simultaneously, and thus have decreased access to medical goods relative to their counterparts who have slightly low income and have public health insurance. Or they may face a severe tradeoff with other goods because of reduced purchasing power, should they decide to buy a private insurance. To put it simply, many attributes of income and health insurance tend to overlap and interact in terms of their effects to child health.

3.1.5 Diagrammatic Illustrations

Omitting the details which I more fully discuss in section 3.2, Figure 1 below succinctly summarizes the mechanism just described above. The parents spend their budget on the medical goods ‘M’ and all other goods ‘X’. They get utility directly from ‘X’ but only indirectly from ‘M’ in the form of better child health ‘H’ resulting from these latter inputs. The child health is a function of medical goods ‘M’, parental schooling ‘Sch’, and other factors ‘Z’.

Figure 1: Effects of Higher Parental Schooling on Budget Constraint and Child Health

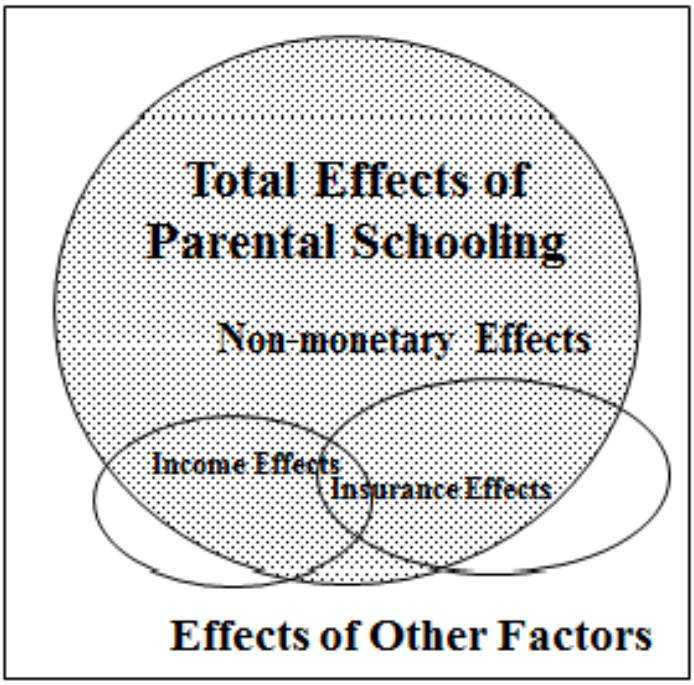


The parents with lower level of schooling 'Sch_1' are at equilibrium where the lower indifference curve 'U_1' is tangent to their budget constraint (lower panel), and end up with a lower level of child health H_1 (upper panel) as determined by their schooling and allocation of their available budget. Similar parents but with the higher level of schooling 'Sch_2' would have higher income, and would face lower effective price of the medical inputs 'M' (due to the access to health insurance), and thus would have a budget constraint shifted outward as shown (lower panel). This would not only allow them to buy more of both goods 'M' and 'X' as they attain equilibrium at the tangency of higher level indifference curve 'U_2' and the corresponding higher level (outer) budget constraint, but also their child health production curve would shift outward (upper panel) due to the non-monetary effects of schooling, and eventually they would attain a higher level of child health 'H_2'.

Figure 2 below (not drawn to the scale) illustrates the theoretical decomposition of the total effects of parental schooling on child health into the income, insurance, and non-monetary effects. The rectangle represents the effects of theoretically all possible factors responsible for child health, whereas the circle inside it represents the total effects of parental schooling only. The two overlapping ovals represent the role of income and health insurance, where the figure accounts for the fact that some of the factors contributing to income and insurance may actually originate outside the purview of parental schooling. For clarity, the terms income and insurance effects in this study refer to the effects of income and insurance attributable to the parental schooling only, represented by the parts of the two ovals lying inside the circle. Also, in line with the foregoing discussion, the overlapping of the two ovals reflects the fact that income and

insurance effects may actually overlap due to their interactive and substitutive nature in certain ways. Thus the measured income (or insurance) effects may actually capture a small portion of the insurance (or income) effects. In other words, the sum of the separate income effects and insurance effects may be greater than the total monetary (income and insurance) effects of parental schooling by the amount of the overlapping parts of the two ovals. Clearly, the non-monetary effects are represented by the portion of the circle not included in either oval. Therefore, the sum of the separate income, insurance, and non-monetary effects may be greater the total effects by the overlapping effects of income and insurance. However, the sum of the monetary and non-monetary effects is equal to the total effects of parental schooling.

Figure 2: Theoretical Decomposition of Total Effects into Income, Insurance, and Non-monetary Effects



All other factors not attributable to parental schooling (part of the rectangle not in the circle) may affect child health either through their impacts on the income or health insurance (parts of the ovals not in the circle) or on other factors (part of the rectangle not in the circle or the two ovals). Correspondingly, these other factors contribute partially either in the parental budget constraint or the parental indifference curves (by affecting parental utility). For instance, non-labor income, family inheritance, and prices of medical and other goods may affect the parental budget constraint. The time and geographical location may affect the budget constraint by affecting both income (via general labor market prospects) and the relative prices, whereas demographic characteristics (race and gender for instance) may affect both budget constraint (via income) and indifference curves (via preference/tradition and child health production). The behavioral factors of the parents and the community characteristics may largely affect the indifference curves (via child health production).

3.2 A Household's Optimization Problem

I use a variation of the conceptual model developed by Huffman et al (2006) to study the economics of obesity-related mortality among high income countries. Consider a hypothetical household which gets utilities from various sources, and has a utility function[13] -

$$U = U(N, S, L, H) \qquad (1)$$ where,

N = Aggregate health neutral goods, which comprises all goods consumed by the household that give utility to the parents, but are health neutral to the children, such as a movie show or an ipod. Neutrality in this context is used in a narrow and relative sense - for example, a good is health neutral if it does not directly affect the health of

[13] It is assumed that these factors are measured for a given period, such as in daily or weekly basis.

the children, although it may affect the health of other family members. For instance, purchased medical goods for the adult family members (over 17 years) such as a prescription for cholesterol consumed by the father, are also included in 'N'. Without the loss of generality, I assume that $U_N > 0$; and $U_{NN} < 0$.

S = Aggregate health sensitive goods, which comprises all goods consumed by the household other than the medical goods consumed by the children (described shortly), and which affect the health of the children favorably (e.g. food moderately eaten by a child or flu shot taken by her mother) or adversely (e.g. smoking by the parents). I assume that $U_S > 0$; and $U_{SS} < 0$.

L = Productive leisure times available to the two parents. 'L' includes the time that can be used to enhance the parental utility directly or indirectly through the enhancement of health of the children. It includes the time available for a normal sleep, rest, cooking, cleaning, social gatherings, groceries, regular health checkups and so on. It excludes the time that doesn't add to the parental utility, such as work time (t_w), time spent on taking care of a child less than 5 years of age (contrasted with the time spent with a child for pleasure), and the time they spend on bed due to illness. The idea is that it excludes all the times which are spent on the events which are undesirable by themselves, and do not add to the utility directly, but still committed merely because of necessity. I assume that $U_L > 0$; and $U_{LL} < 0$.

H = Overall health status of each of the children in the household measured in some continuous scale, where higher value represents higher level of child health. I assume that $U_H > 0$; $U_{HH} < 0$. It should be noted that the parental utility function is constructed in such a way that the utility coming directly from the consumption of any good/service, as

well as indirectly in the form of better health of the adult members (including the parents themselves) through these consumptions are already captured by either 'N' or 'S'.

The child health production function is given by-

$$H = H(S, M, L, Sch, \mu, Z_1) \qquad (2)$$ where,

S = Aggregate health sensitive goods as described above, which serve as either the inputs or dis-inputs. I assume that $H_S \neq 0$.

M = Aggregate medical goods consumed by one or more children in the household. As mentioned above, purchased health inputs for the adults are already included in S or N, depending on whether they affect the health of the children directly or not. I assume that $H_M > 0$ for appropriate/moderate use, and $H_M < 0$ for inappropriate/overuse; and $H_{MM} < 0$.

L = Productive parental leisure times as described above. More leisure would allow the parents to prepare fresh and nutritious food, maintain a sanitary environment, and provide home care and needed checkups for the children. I assume that $H_L > 0$; and $H_{LL} < 0$

Sch = Aggregate formal schooling acquired by the parents. I emphasize that schooling enters in the child health production function as an input in the form of technology (access to, analysis of and implementation of relevant information, and healthy preferences and behavior for instance), but not through its effects on income and child health insurance. The role of schooling through its effects on income and insurance enters in the budget constraint, by either affecting the income, or by reducing the effective price of the medical good (M), as shown in the equation (5) below.

μ = Aggregate health "endowment" of the child(ren). *μ* may capture the genetic pre-disposition for good health, health in womb, birth weight etc., largely unobservable and uninfluenced by parental behaviors once the child is born.

Z_1 = Other factors that may affect child health directly – age (via accumulation of external health shocks), gender (for biological reasons), demography (via various practices), and community (via sanitation and facilities) etc. Some of these factors are observed while others are unobserved.

Time Constraint: The time constraint faced by the parents is-

$$T(\mu, Z_2) = L + T_w \qquad (3)$$ where,

T = Potential time available to the parents, that can be allocated between work (T_W), and leisure (L). T has a maximum of 365 times 24 hours in a year, but can be less as determined by the factors such as health endowment of the children (μ), and other factors (Z_2) such as parents' general health status, presence of a child less than 5 years at home, commute time for work etc.

Budget Constraint: The budget constraint of the household is-

$$W(Sch, Z_3)T_W + V = P_N N + P_S S + P_M(Sch, Z_3, V, Z_4)M \qquad (4)$$ where,

W = Aggregate parental wages in the labor market, determined by Sch (formal schooling), and other factors (Z_3) such as area of focus in formal schooling, previous experience, age, sex, race, primary language, and time lived in the U.S. It is assumed that $W_E > 0$.

T_W = Time worked

V = Aggregate non-labor income and assets of the household.

P_N = Market Price of good 'N'

P_S = Market Price of good 'S'

P_M = Effective price of medical good 'M', largely determined by availability and nature of the health insurance, which itself is largely determined by the nature of job (determined by schooling 'Sch', job related characteristics 'Z_3'and non-labor income/assets 'V', and all other factors 'Z_4' such as location, time, technology and factors that may pertain to demand and supply in health insurance market. Thus parental schooling can influence the price of medical good 'M' in terms of increased access to employer sponsored and private health insurance (and sometimes reduced eligibility for public health insurance due to higher income).

It is important to note that the parents maximize their utility function U, and not the health production function *H*. That means, at an interior solution, the optimum value of *H** sought by the parents is less than the maximum *H* that can be acquired given the material resources including time.

The optimization problem of the parents can now be described by using the Lagrangian as-

$$F = U(N, S, L, H(S, M, L, Sch, \mu, Z_1)) + \lambda[W(Sch, Z_3)\{T(\mu, Z_2) - L\} + V - P_N N - P_S S - P_M(Sch, Z_3, V, Z_4)M] \quad (5)$$

The arguments are: N; S; M; L; and λ

The first order conditions give-

$$F_N = U_N - \lambda P_N = 0 \Rightarrow U_N = \lambda P_N \quad (6)$$

$$F_S = U_S + U_H H_S - \lambda P_S = 0 \Rightarrow U_S + U_H H_S = \lambda P_S \quad (7)$$

$$F_M = U_H H_M - \lambda P_M(Sch, Z_3, V, Z_4) = 0$$

$$\Rightarrow U_H H_M = \lambda P_M (Sch, Z_3, V, Z_4) \quad (8)$$

$$F_L = U_L + U_H H_L - \lambda W (Sch, Z_3) = 0$$

$$\Rightarrow U_L + U_H H_L = \lambda W (Sch, Z_3) \quad (9)$$

And finally, $F_\lambda = 0$

$$\Rightarrow W (Sch, Z_3)\{T (\mu, Z_2) - L\} + V$$

$$= P_N N + P_S S + P_M (Sch, Z_3, V, Z_4) M \quad (10)$$

The equations (6) – (10) can be solved for the five unknowns (N; S; M; L; and λ). Equation (6) shows that the health neutral good 'N' affects the parental utility directly, but has no indirect effect on utility via the children's health 'H'. Equation (7) shows that the health sensitive good 'S' affects the parental utility directly as well as indirectly through its effect on 'H'. Equation (8) shows that the medical good 'M' affects the utility indirectly by affecting 'H', but has no direct effect on utility. Equation (9) shows that leisure 'L' directly affects the utility, and also affects the utility indirectly through it's effects on 'H'.

Solving the equations (6) - (10) yield the reduced form household demand functions for the goods 'N', 'S', 'M', and the leisure time 'L' as,

$$\theta^* = D_\theta (P_N, P_S, Sch, V, \mu, Z_1, Z_2, Z_3, Z_4) \quad (11)$$

where $\theta = N, S, M,$ and L.

Thus the household demand for the child health determining resources (S, M, and L) that enter the children's health production function are determined by the market prices of the goods 'N' and 'S', level of parental schooling 'Sch', non-labor income 'V', health endowment 'μ', and other exogenous factors (Z_1, Z_2, Z_3, and Z_4) as defined above.

Furthermore, the optimum work time (T_W*) can be determined from equations (3) and (11) as-

$$T_W^* = T(\mu, Z_2) - L^*$$

$$= T(\mu, Z_2) - D_L(P_N, P_S, Sch, V, \mu, Z_1, Z_2, Z_3, Z_4) \quad (12)$$

With demand functions given by equations (6), and health production function as described in equation (2), we get the parental demand or supply function for child health as-

$$H^* = H(P_N, P_S, Sch, V, \mu, Z_1, Z_2, Z_3, Z_4) \quad (13)$$

3.3 The Model

In this section, I discuss the probit model followed by the bivariate probit model, and the econometric tests that can be used to infer whether the bivariate probit is a better fit than two separate probit models for our purpose[14]. The discussions and derivations are based on Greene (2003).

3.3.1 Probit Model

3.3.1.1 Defining the Model

In line with the reduced form equation (13) in section 3.2 describing the child health production function, consider the following standard model under probit specification-

$$H^* = \mathbf{X'\beta} + \varepsilon, \quad \text{where}$$

X is a vector that includes an intercept term and other variables of interest, as will be discussed shortly. **β** denotes the vector of the relevant coefficients on each of the

[14] The ordered probit model differs from probit model in having more than two (three in this study) categories of a given dependent variable instead of two, and is largely similar to probit, which I skip in this section.

regressors included in **X** and ε denotes the error terms, assumed to be normally distributed with mean zero and variance 1.

i.e. $\varepsilon \sim N(0, 1)$

H* is an unobserved latent variable between -∞ and +∞, capturing either the perceived physical health status or perceived mental health status of the child. *H* (without the star) represents the corresponding observed physical health status (HLTH) or observed mental health status (MLTH), each of which is a an indicator variable taking the values-

0 (*Poor/Fair/Good*); and

1 (*Very Good/Excellent*)

The observed value of H depends on where the unobserved value H* stands in the scale from -∞ and +∞, as marked by the cut point (0)[15]. Specifically, following rules apply as regards the observed values of H:

$H = 0$ if $H^* \leq 0$; and $H = 1$ if $H^* > 0$

Pertaining to the objective of exploring the channels that may transmit the beneficial effects of parental schooling on child health, X may represent one of the following four vectors, thereby giving rise to four different equations under this model-

Equation (I): X = (1 MoSch FaSch Z)

Equation (II): X = (1 MoSch FaSch Pinc Z)

Equation (III): X = (1 MoSch FaSch Insur Z)

Equation (IV): X = (1 MoSch FaSch Pinc Insur Z)

[15]Considering a non-zero cut-point (μ) is equally valid, but this can be normalized to make 0 as the cut point, if the model contains a constant term (Green, 2003, p. 669).

where *MoSch* and *FaSch* denote the mother's and father's schooling, each observed in three ordinal categories - 0 (*No Degree*); 1 (*HSD/GED*); and 2 (*College Degree*), as defined earlier. *Pinc* denotes total parental income (during their two years in MEPS, adjusted for inflation and expressed in log). *Insur* denotes the health insurance type of the child observed in three categories - 1 (*Any Private*); 2 (*Only Public*); and 3 (*None*). ***Z*** is the vector of other regressors (demographic, geographic and others including parental health). Inclusion of parental income and health insurance type of child successively in the regression equations inform us of the importance of income and insurance themselves, and to what extent the effects of income and insurance stem from parental schooling.

3.3.1.2 Response Probabilities

The estimated response probabilities are distributed as:

Prob (H = 0 | **X**)

= Prob (H* ≤ 0 | **X**)

= Prob (**X′β** + ε ≤ 0 | **X)**

= Prob (ε ≤ - **X′β** | **X)**

= $\int_{-\infty}^{-\mathbf{X}'\boldsymbol{\beta}} \boldsymbol{\varphi}(\boldsymbol{z})\boldsymbol{dz}$, which is denoted as Φ(-**X′β**) [or 1- Φ(**X′β**) because of the symmetry], where φ (z) is known as standard normal density, defined as-

φ (z) = $\exp(-0.5z^2) / (2\pi)^{0.5}$, and 'Φ' is the standard normal cumulative distribution.

Similarly,

Prob (H = 1 | **X**)

= Prob (H* > 0 | **X**)

= Prob (**X′β** + ε > 0 | **X)**

$= \text{Prob}\ (\varepsilon > -\ \mathbf{X'\beta}\ |\ \mathbf{X})$

$= \text{Prob}\ (\varepsilon < \mathbf{X'\beta}\ |\ \mathbf{X})$

$= \Phi(\mathbf{X'\beta})$

The model is then estimated by the method of maximum likelihood. For this, a joint probability (or likelihood) function is first defined using these response probabilities, and the values of the parameters that maximize this function are then obtained.

As discussed earlier, the siblings within the household share many common family characteristics - demographic, economic, genetic (which may determine their initial health endowment), environment, family background, parental preferences, parental health, parental behavior, and the perception of child health status by the parents. In order to address potential autocorrelation on the error terms arising from these sibling effects, all the regressions are clustered at the household level. Also, I obtain the robust standard errors instead of the regular ones to address the inherently heteroskedastic nature of the non-liner form of model specifications and the maximum likelihood estimation technique. Under the validity of the model assumptions, the estimates thus obtained are asymptotically efficient.

3.3.1.3 Marginal Effects

It is noteworthy that the parameter vector **β** in these models, unlike in the linear regression models, does not give the marginal effects of the predictors on the observed value of H, but merely gives the contributions of the predictors on the unobserved H*. More precisely, the estimated regression coefficients give the change in the z-score or probit index for a one unit change in a given predictor, other things same. Therefore, these parameters, at the time they are estimated, are less insightful and only indicative

of the direction of their contributions. However these estimated coefficients form the raw materials for the marginal effects of their respective regressors on the probability of observing a particular value of the dependent variable **H**. The expressions for the estimation of marginal effects are as below-

The marginal effects, which measures the ratio of the change in the probability of observing H = 1 to a small change in **X**, are generally computed using the following expression-

$$\frac{\partial Prob(H=1|\mathbf{X})}{\partial \boldsymbol{X}} = \varphi\,(\mathbf{X'\beta})\boldsymbol{\beta}$$

Clearly, the marginal effects are functions of **X**, and therefore their interpretations are not straightforward. This is made easier either by evaluating these expressions at sample means of the data (the method used in this study), or the marginal effects are evaluated at every observation and their sample average is computed. In large samples like the current one, both approaches will give similar results.

The above expression is typically appropriate for a continuous variable (say x), where a 'small change' in x is conceivable. But in many cases such as in this study, **X** may include dummy (or categorical) variables. The appropriate marginal effect associated to a dummy variable, say d, which now measures the change in the probability of observing H = 1 when d changes the values from 0 to 1, is expressed as-

Marginal effect = Δ Prob [H = 1| $\bar{\boldsymbol{X}}_{(d)}$] = Prob [H = 1| $\bar{\boldsymbol{X}}_{(d)}$, d = 1] - Prob [H = 1| $\bar{\boldsymbol{X}}_{(d)}$, d = 0],

where $\bar{\boldsymbol{X}}_{(d)}$ denotes the means of all the other variables except for d in the model.

Similar marginal effects for a variable, say MoSch in this study, which can take three values 0, 1 or 2, can be expressed as-

Marginal effect (1) = Prob [H = 1| $\bar{X}_{(MoSch)}$, MoSch = 1]

- Prob [H = 1| $\bar{X}_{(MoSch)}$, MoSch = 0], and

Marginal effect (2) = Prob [H = 1| $\bar{X}_{(MoSch)}$, MoSch = 2]

- Prob [H = 1| $\bar{X}_{(MoSch)}$, MoSch = 0],

where the first marginal effect (1) corresponds to the change in mother's schooling from level 0 to level 1, and the second corresponds to change in the schooling from level 0 to level 2.

3.3.2 Bivariate Probit Model

3.3.2.1 Defining the Model

Bivariate probit model estimates two equations involving the two dependent variables (perceived physical and mental health of child in this study) simultaneously. Under the assumption that same set of unobserved factors may affect the observed physical and mental health status of the children in the sample, consider the following bivariate probit model-

$$H_1^* = \mathbf{X_1'\beta_1} + \varepsilon_1$$

$$H_2^* = \mathbf{X_2'\beta_2} + \varepsilon_2$$

where the subscript 1 and 2 respectively refer to the physical health status equation and mental health status equation pertaining to the child. Also, the error terms (ε_1 and ε_2) are jointly normally distributed with mean 0, variance 1, and correlation ρ. Symbolically, it is written as-

$$\{\varepsilon_1, \varepsilon_2\} \sim \varphi_2 (0, 0, 1, 1, \rho)$$

where φ_2 denotes a bivariate standard normal distribution, distributed as-

$$\varphi_2 (u, v, \rho) = \exp\{-0.5(u^2+v^2-2\rho uv)/(1-\rho^2)\} / \{2\pi(1-\rho^2)^{0.5}\}$$

Both of the vectors $\boldsymbol{X_1}$ and $\boldsymbol{X_2}$ include an intercept term and other variables of interest, which can be same in both equations or can be different depending on the objective of the study and the nature of the variables. For simplicity, I use the same set of explanatory variables as in the probit (and ordered probit) models, and assume that these variables jointly affect the physical and mental health status of the child.

H_1* and H_2* are unobserved latent variables between -∞ and +∞, capturing respectively the perceived physical health status and perceived mental health status of the child. H_1 and H_2 (without the star) represent the corresponding observed physical health status (HLTH) or observed mental health status (MLTH), each of which is an indicator variable taking the values *0* (*Poor/Fair/Good*), and *1* (*Very Good/Excellent*).

The observed value of H_j (j = 1 or 2) depends on where the unobserved value H_j* stands in the scale from -∞ and +∞, as marked by the cut point *0* according to the following rule-

$$H_j = 0 \text{ if } H_j^* \leq 0; \quad \text{and} \quad H_j = 1 \text{ if } H_j^* > 0.$$

As in the case of probit model, X_j may represent one of the following four vectors, thereby giving rise to four different equations under this model-

Equation (I): X_j = (1 MoSch FaSch Z)

Equation (II): X_j = (1 MoSch FaSch Pinc Z)

Equation (III): X_j = (1 MoSch FaSch Insur Z)

Equation (IV): X_j = (1 MoSch FaSch Pinc Insur Z)

where *MoSch*, *FaSch*, *Pinc*, *Insur* and *Z* are defined as earlier.

3.3.2.2 Response Probabilities

The estimated response probabilities in the bivariate probit model are distributed as under-

Prob ($H_1 = 1$, $H_2 = 1$ | $\mathbf{X_1}$, $\mathbf{X_2}$)

= Prob ($H_1^* > 0$, $H_2^* > 0$ | $\mathbf{X_1}$, $\mathbf{X_2}$)

= Prob ($\mathbf{X_1'\beta_1} + \varepsilon_1 > 0$, $\mathbf{X_2'\beta_2} + \varepsilon_2 > 0$| $\mathbf{X_1}$, $\mathbf{X_2}$)

= Prob ($\varepsilon_1 > -\mathbf{X_1'\beta_1}$, $\varepsilon_2 > -\mathbf{X_2'\beta_2}$ | $\mathbf{X_1}$, $\mathbf{X_2}$)

= Prob ($\varepsilon_1 \leq \mathbf{X_1'\beta_1}$, $\varepsilon_2 \leq \mathbf{X_2'\beta_2}$ | $\mathbf{X_1}$, $\mathbf{X_2}$)

= $\iint_{-\infty,-\infty}^{X2'\beta2,X1'\beta1} \varphi_2(z_1, z_2, \rho)\, dz_1\, dz_2$, which is denoted as Φ_2 ($\mathbf{X_1'\beta_1}$, $\mathbf{X_2'\beta_2}$, ρ),

where Φ_2 denotes the bivariate standard normal CDF.

Similarly, the other joint probabilities can be expressed as-

Prob ($H_1 = 1$, $H_2 = 0$ | $\mathbf{X_1}$, $\mathbf{X_2}$)

= Φ_2 ($\mathbf{X_1'\beta_1}$, $-\mathbf{X_2'\beta_2}$, ρ) = Φ ($\mathbf{X_1'\beta_1}$) - Φ_2 ($\mathbf{X_1'\beta_1}$, $\mathbf{X_2'\beta_2}$, ρ);

Prob ($H_1 = 0$, $H_2 = 1$ | $\mathbf{X_1}$, $\mathbf{X_2}$)

= Φ_2 ($-\mathbf{X_1'\beta_1}$, $\mathbf{X_2'\beta_2}$, ρ)

= Φ ($\mathbf{X_2'\beta_2}$) - Φ_2 ($\mathbf{X_1'\beta_1}$, $\mathbf{X_2'\beta_2}$, ρ);

Prob ($H_1 = 0$, $H_2 = 0$ | $\mathbf{X_1}$, $\mathbf{X_2}$)

= Φ_2 ($-\mathbf{X_1'\beta_1}$, $-\mathbf{X_2'\beta_2}$, ρ)

= 1 - Φ ($\mathbf{X_1'\beta_1}$) - Φ ($\mathbf{X_2'\beta_2}$) - Φ_2 ($\mathbf{X_1'\beta_1}$, $\mathbf{X_2'\beta_2}$, ρ)

The marginal probabilities are expressed as,

Prob ($H_1 = 1$ | $\mathbf{X_1}$, $\mathbf{X_2}$) = Φ ($\mathbf{X_1'\beta_1}$)

Prob ($H_1 = 0$ | $\mathbf{X_1}$, $\mathbf{X_2}$) = Φ ($-\mathbf{X_1'\beta_1}$) = 1- Φ ($\mathbf{X_1'\beta_1}$);

Prob ($H_2 = 1$ | $\mathbf{X_1}$, $\mathbf{X_2}$) = Φ ($\mathbf{X_2'\beta_2}$);

Prob ($H_2 = 0 \mid \mathbf{X_1}, \mathbf{X_2}$) = Φ ($-\mathbf{X_2'\beta_2}$) = 1 - Φ ($\mathbf{X_2'\beta_2}$).

Similarly, the conditional probabilities are expressed as-

Prob ($H_1 = 1 \mid H_2 = 1, \mathbf{X_1}, \mathbf{X_2}$)

= Prob ($H_1 = 1, H_2 = 1 \mid \mathbf{X_1}, \mathbf{X_2}$) / Prob ($H_2 = 1 \mid \mathbf{X_1}, \mathbf{X_2}$)

= Φ_2 ($\mathbf{X_1'\beta_1}, \mathbf{X_2'\beta_2}, \rho$) / Φ ($\mathbf{X_2'\beta_2}$);

Prob ($H_1 = 1 \mid H_2 = 0, \mathbf{X_1}, \mathbf{X_2}$)

= Prob ($H_1 = 1, H_2 = 0 \mid \mathbf{X_1}, \mathbf{X_2}$) / Prob ($H_2 = 0 \mid \mathbf{X_1}, \mathbf{X_2}$)

= Φ_2 ($\mathbf{X_1'\beta_1}, -\mathbf{X_2'\beta_2}, \rho$) / Φ ($-\mathbf{X_2'\beta_2}$);

Prob ($H_2 = 1 \mid H_1 = 1, \mathbf{X_1}, \mathbf{X_2}$)

= Prob ($H_1 = 1, H_2 = 1 \mid \mathbf{X_1}, \mathbf{X_2}$) / Prob ($H_1 = 1 \mid \mathbf{X_1}, \mathbf{X_2}$)

= Φ_2 ($\mathbf{X_1'\beta_1}, \mathbf{X_2'\beta_2}, \rho$) / Φ ($\mathbf{X_1'\beta_1}$);

Prob ($H_2 = 1 \mid H_1 = 0, \mathbf{X_1}, \mathbf{X_2}$)

= Prob ($H_1 = 0, H_2 = 1 \mid \mathbf{X_1}, \mathbf{X_2}$) / Prob ($H_1 = 0 \mid \mathbf{X_1}, \mathbf{X_2}$)

= Φ_2 ($-\mathbf{X_1'\beta_1}, \mathbf{X_2'\beta_2}, \rho$) / Φ ($-\mathbf{X_1'\beta_1}$).

Other four conditional probabilities, namely Prob ($H_1 = 0 \mid H_2 = 1$), Prob ($H_1 = 0 \mid H_2 = 0$), Prob ($H_2 = 0 \mid H_1 = 1$), and Prob ($H_2 = 0 \mid H_1 = 0$) can be obtained by deducting their respective complements from 1. The model parameters are then estimated by the maximum likelihood method.

3.3.2.3 Implication of and Testing for Zero Correlation

The zero correlation ($\rho = 0$) between the error terms ε_1 and ε_2 implies that the two dependent variables (physical and mental health status of child) in the two equations are independent, and the function Φ_2 reduces to the simple product of the two respective standard normal CDF. For instance, if $\rho = 0$, then

$$\text{Prob}\,(H_1 = 1\,,\, H_2 = 1 \mid \mathbf{X_1}\,,\, \mathbf{X_2}) = \text{Prob}\,(H_1 = 1 \mid \mathbf{X_1}) \times \text{Prob}\,(H_2 = 1 \mid \mathbf{X_2})$$

i.e., $\Phi_2\,(\mathbf{X_1'\beta_1},\, \mathbf{X_2'\beta_2},\, \rho = \Phi\,(\mathbf{X_1'\beta_1}) \times \Phi\,(\mathbf{X_2'\beta_2})$,

and similarly for other joint probabilities. When the error terms ε_1 and ε_2 are plotted in a graph with their axes orthogonal to one another and their densities along the third axis, the hill formed by the density will look round and symmetrical in all directions when viewed from the density axis, as shown in Figure 3.

But, if the correlation between the two error terms is not zero ($\rho \neq 0$), then the two dependent variables in the two equations are not independent, and are simultaneously affected by some unobserved factors. In other words, the probability of observing a given level (0 or 1) of physical health status of the child will be dependent on what level of mental health status has been observed, and vice versa. In such a case, the joint probability of observing given levels of the two dependent variables can be computed only by using the respective Φ_2 function which is not a simple product of the separate marginal probabilities involved. For instance,

$$\text{Prob}\,(H_1 = 1\,,\, H_2 = 1 \mid \mathbf{X_1}\,,\, \mathbf{X_2}) \neq \text{Prob}\,(H_1 = 1 \mid \mathbf{X_1}) \times \text{Prob}\,(H_2 = 1 \mid \mathbf{X_2})$$

or $\Phi_2\,(\mathbf{X_1'\beta_1},\, \mathbf{X_2'\beta_2},\, \rho) \neq \Phi\,(\mathbf{X_1'\beta_1}) \times \Phi\,(\mathbf{X_2'\beta_2})$,

The similar hill formed by the density will look like a ridge, and not round or symmetrical when viewed from the density axis, and the intensity increases as ρ increases. Figures 4 portrays the situations when $\rho = 0.5$ and 0.9 respectively.

Figure 3: Bivariate Standard Normal CDF when ρ = 0

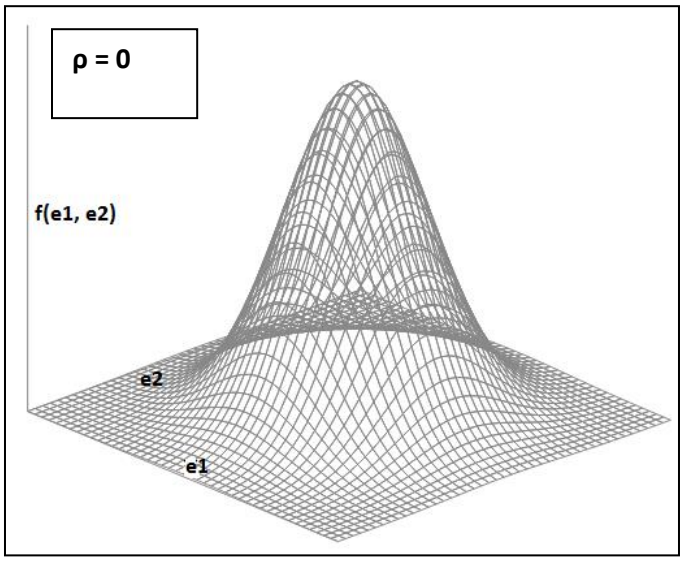
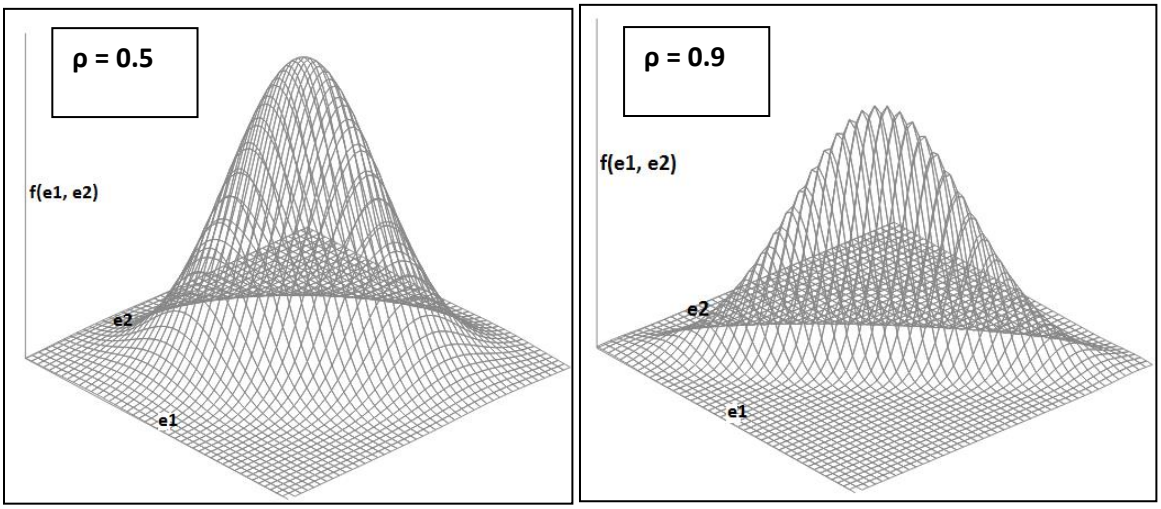


Figure 4: Bivariate Standard Normal CDF when ρ ≠ 0



3.3.2.4 Marginal Effects

As in the case of probit and ordered probit models, the estimated vector $\widehat{\boldsymbol{\beta_J}}$ (j = 1, 2) are not the marginal effects of the predictors on the observed values of H_j, but merely show the directions of influence of the respective predictors on observed H_j. These estimated coefficients are used to compute several marginal effects of interest, such as change in the joint, conditional, or marginal probabilities as a result of the change in a given regressor as under-

$\frac{\partial Prob(H1,\ H2\mid \mathbf{X})}{\partial \boldsymbol{X}} = \frac{\partial \Phi 2(.)}{\partial \boldsymbol{X}}$, where H_1 and H_2 can take the values 0 or 1.

$\frac{\partial Prob(H1\mid H2\mid \mathbf{X})}{\partial \boldsymbol{X}} = \frac{\partial\{\Phi 2(.)/\ \Phi(.)\}}{\partial \boldsymbol{X}}$,

$\frac{\partial Prob(Hj\mid \mathbf{X})}{\partial \boldsymbol{X}} = \frac{\partial \Phi(.)}{\partial \boldsymbol{X}}$, j = 1, 2

Further derivations for the computations of these marginal effects are cumbersome, yet are available. Also, for the ordinal categorical explanatory variables such as the schooling levels of the parents, marginal effects are derived not as partial derivatives, but as the difference in the predicted probabilities when value in the explanatory variable changes from one level to the next, other things same (computed at their means in general). I use the readily available commands in STATA for the computations of these marginal effects. In particular, I focus on the following two marginal effects-

$\frac{\partial Prob(H1=1\mid \mathbf{X})}{\partial \boldsymbol{X}}$; and $\frac{\partial Prob(H2=1\mid \mathbf{X})}{\partial \boldsymbol{X}}$

These marginal effects can be directly compared with those obtained from the probit (and ordered probit) models.

3.3.3 Assessing Income, Insurance, and Non-monetary Effects

The equations (I-IV) under all specifications contain parental schooling (*MoSch* and *FaSch*) as predictors of child health. The equation (I) excludes both the total parental income (*Pinc*) and the health insurance type of the child (*Insur*). The equation (II) includes the parental income, but does not include the health insurance, whereas equation (III) includes the health insurance but does not include income. Finally, the equation (IV) includes both the income and the health insurance. In light of this, the income, insurance, and the non-monetary effects of parental schooling on child health are then defined and discussed.

The coefficients on *MoSch* and *FaSch* in equation (I) measures the total contribution of respective parent's schooling on the unobserved latent child health (either physical or mental) measure, H^*, controlling for the variables described by X. The marginal effects on *MoSch* and *FaSch* therefore measure the total effects of parental schooling on child health, measured in terms of partial contribution of parental schooling in the probability that *Very Good/Excellent* child health status is observed as opposed to *Poor/Fair/Good* status, as the level of parental schooling changes.

The coefficients on *MoSch* and *FaSch* in equation (II) measures the contribution of respective parent's schooling on the unobserved H^*, controlling for the parental income and the other variables in X. Therefore, the marginal effects on parental schooling here measure the effects of parental schooling on child health transmitting through the channels other than income. This is essentially the sum of the insurance and non-monetary effects, less the joint effects of income and insurance (represented by the overlapping portion of the income and insurance ovals in Figure 2, section 3.1.5).

As a matter of fact, the contribution of income and insurance are found to be very small compared to the non-monetary factors. Therefore, I make it simple by defining the income effects as the difference in the marginal effects on the parental schooling variables between the equations (I) and (II), which by construction includes some contribution of insurance too (by the amount of the joint effects of income and insurance).

The coefficients on *MoSch* and *FaSch* in equation (III) measures the contribution of respective parent's schooling on the unobserved *H**, controlling for the health insurance type of child and the other variables in *X*. Therefore, the marginal effects on parental schooling here measure effects of parental schooling on child health transmitting through the channels other than health insurance. This is same as the sum of the income and non-monetary effects, less the joint effects of income and insurance. I then define the insurance effects as the difference in the marginal effects on the parental schooling variables between the equations (I) and (III), which clearly includes some contribution of income too.

Finally, the coefficients on *MoSch* and *FaSch* in equation (IV) measures the contribution of respective parent's schooling on the unobserved *H**, controlling for parental income, health insurance type of child, and other variables in X. Therefore, the marginal effects on parental schooling here measure effects of parental schooling transmitting through the channels other than the income and health insurance, which are the non-monetary effects of parental schooling on child health.

To summarize these effects vis a vis the nature of these factors (as discussed in chapter 3) and their relative importance, I further define the monetary effects of parental

schooling on child health as the effects of schooling transmitting through the channels of either the parental income or child's health insurance type. This is measured as the difference between the total effects and the non-monetary effects of parental schooling, which clearly is not equal to the sum of the separate income effects and insurance effects as defined above (by the amount of the joint effects of income and insurance).

CHAPTER 4. DATA AND VARIABLES

4.1 Description of the Data

I have used the Medical Expenditure Panel Survey (MEPS) data set, which is a set of large-scale surveys of families and individuals, their medical providers, and employers across the United States. The first panel of MEPS began in 1996, and every year it adds a new panel to its data set, where each panel is observed in five rounds of interviews during the span of two years. The analysis in the current study is based on a total of 45,280 children aged 1-17 years from 22,624 households observed by MEPS in the ten panels numbered from 6 to 15. Of this total, 31,756 children (70%) have both parents present, and make the major sample (*Sample 1*), while the remaining 13,524 children (30%) are brought up by single mother[16] and make the other sample (*Sample 2*). Also, to clarify, panels 6 (and 15) enter MEPS in 2001 (and 2010), and leave in 2002 (and 2011) respectively. The term 'panel' can give a misleading impression here, as this study in fact treats each observed child as a cross-sectional unit, rather than a panel unit. This is because many variables considered in the study are not observed in all five rounds by MEPS, and specifically, the major factor of inquiry (parental schooling) and other demographic and geographic characteristics, are observed only once (or do not change). Thus, this is in essence a cross sectional analysis of the pool of individuals observed by MEPS in different years from 2001-2011.

The relevant variables measured throughout the two years (or five rounds) for each child are either averaged or summed (adjusting for inflation by using the consumer price index wherever relevant), depending upon the nature of the variables, and the

[16] Another subsample with 1,182 children brought up by single father is not considered in this study because of small sample size.

purpose of the study. This in fact does not exacerbate the results, but rather enhances them, for the study of this kind. For instance, the outcome variables 'perceived physical or mental health status of each child' are rated by the parents in an ordinal scale of five categories and reported in each of the five rounds. For these two dependent variables, the medians are taken, which provide relatively better descriptions of child health during their two years in MEPS, as opposed to single snapshots observed at a particular round. Similarly, incomes of each parent are summed up (after adjusting for inflation) for the two years[17], which are used as the proxies to their permanent income, as opposed to using the snapshot hourly wages in the current main job in a single round.

4.2 Variable Definitions

The variables used in the analysis are:

HLTH: Perceived physical health status of child [0 (*Poor/Fair/Good*) and 1 (*Very Good/Excellent*) for probit and bivariate probit models; and 0 (*Poor/Fair*), 1 (*Good*) and 2 (*Very Good/Excellent*) for ordered probit model].

MLTH: Perceived mental health status of child [0 (*Poor/Fair/Good*) and 1 (*Very Good/Excellent*) for probit and bivariate probit models; and 0 (*Poor/Fair*), 1 (*Good*) and 2 (*Very Good/Excellent*) for ordered probit model].

MoSch: Mother's schooling [0 (*No Degree*); 1 (*HSD/GED*); 2 (*College Degree*, meaning Bachelor, Other, Masters, or Doctorate)]

FaSch: Father's schooling [0 (*No Degree*); 1 (*HSD/GED*); 2 (*College Degree*, meaning Bachelor, Other, Masters, or Doctorate)]

Age: Age of child (in years)

Female: Gender of child [0 (*Male*); 1 (*Female*)]

[17] Incomes in MEPS for each person are measured only two times, in annual basis.

Brthrd: Child's birth order [1 (*First born*); 0 (*Otherwise*)]

Chldrn: Number of children less than 17 years in the house

Child_5: Presence of a child below 5 years of age at home [1 (*Present*); 0 (*Absence*)

MSA: Location variable [0 (*non-MSA*[18]); 1 (*MSA*)]

Region: Location variable [0 (*NE*); 1 (*MW*); 2 (*S*); 3 (*W*)][19]

Race: Race of the child [0 (*White*); 1 (*Black*); 2 (*Hispanic*); 3 (*Other*)]

MoHlth: Mother's health index (Range: 4-75)

FaHlth: Father's health index (Range: 7-72)

Pinc: Log of parental total income during their two years in MEPS, adjusted for inflation

Minc: Log of mother's total income during the two years in MEPS, adjusted for inflation

EcoSt: Economic status of household [0 (*Low*) meaning Poor/Near Poor/Low Income; 1 (*High*) meaning Middle/High Income]

Insur: Health insurance type of the child [0 (*Any Private*); 1 (*Only Public*); 2 (*None*)

Msmok: Smoking habit of mother [1 (*Smokes*)); 0 (*Otherwise*)

Fsmok: Smoking habit of father [1 (*Smokes*)); 0 (*Otherwise*)

Panel: Panel number (6 to 15)

[18] MSA stands for Metropolitan Statistical Area
[19] NE, MW, S, and W stand for North-East, Mid-West, South, and West respectively.

CHAPTER 5. EMPIRICAL ANALYSES AND MAIN FINDINGS

5.1 Summary Statistics

Table 1 below shows the summary of the variables used in this study for the two samples. *Sample 1* includes children with both parents. *Sample 2* designates children with a single mother. Average age of the children is 8 years, and number of male and female children are almost symmetrically distributed in both samples. Number of children in the household are practically equal (about 2.7), and over half of the households have at least one child below five years of age in both samples.

Whites are a majority followed by Hispanics in the first sample, and these two races together represent about four-fifths of the observations. In contrast to this, Blacks are the majority, followed by Hispanics in the second sample, and these two races represent about seven-tenths of the observations. Over four-fifths of the children live in MSA in both samples, and the largest portion (around two-fifths) are from South, followed by West, Midwest, and Northeast.

In *Sample 1*, while mother's schooling is somewhat better than father's, about two-thirds of the fathers and mothers have an *HSD/GED* or are without any formal degree, and only one-third has a *College Degree*. In contrast to this, mother's schooling is significantly lower in *Sample 2*, where more than four-fifths are without degree or have an *HSD/GED*, and only 15% (half as much as in *Sample 1*) with *College Degree*. Incomes of mothers and fathers are highly skewed and vary greatly both within and between the groups. Average income of fathers is about 80% higher than the mothers in *Sample 1*, and the average income of mothers in *Sample 2* is still 10% lower than in

Sample 1. Over half of the households (56%) in *Sample 1* are in middle or high income category, as opposed to less than one fourth in *Sample 2*.

More than four-fifths of the children have '*Very Good*' or '*Excellent*' physical and mental health status in *Sample 1*, and these percentages are lower by about 6 percentage points in *Sample 2*. The remaining are mostly in '*Good*' status in both samples. Majority (57%) of the children have some form of private health insurance, one-third have only public health insurance, and the remaining 9% are without any health insurance in *Sample 1*. In contrast to this, about two-thirds of the children in *Sample 2* have only public health insurance, little over one-fourth (27%) have any private, and remaining 7% are without any health insurance. Fathers' health index is slightly higher than mothers' in *Sample 1*, and mothers' health are slightly lower in *Sample 2* than in *Sample 1*. Fathers smoke more than mothers; about one-fourth of the children have at least one smoker parent; and almost three-fourths of the parents are non-smoking in *Sample 1*. Percentage of smoking mothers is more than double in *Sample 2* relative to *Sample 1*.

Table 1: Summary Statistics

(Numbers inside the parentheses are the standard deviations)

Variables	Summary	
	Sample 1 (N = 31,756)	**Sample 2 (N = 13,524)**
Demographic Variables		
Child's Age, Years	8.01 (5.24)	8.57 (5.27)
Child's Gender, %	Male (0): 51.07; Female (1): 48.93	Male (0): 50.43; Female (1): (49.57)
Child's Race, %	White (0): 44.43; Black (1): 10.0; Hispanic (2): 37.22; Other (3): 8.35	White (0): 24.03; Black (1): 39.04; Hispanic (2): 31.66; Other (3): 5.21
Number of Children in the Household	2.76 (1.37)	2.65 (1.42)
Any Child below 5, % of Households	59.8	54.7
Geographic Variables		
MSA/Non-MSA, %	Non-MSA (0): 16.2; MSA (1): 83.8;	Non-MSA (0): 15.5; MSA (1): 84.5;
Region, %	NE (0): 13.2; MW (1): 19.3; S (2): 36.2; W (3): 31.2	NE (0): 16.6; MW (1): 19.0; S (2): 41.5; W (3): 22.9
Parental Schooling, %		
Mother's Schooling	No Deg. (0): 25.0; HSD/GED (1): 43.4; College Deg. (2): 31.6	No Deg. (0): 28.2; HSD/GED (1): 56.7; College Deg. (2): 15.1
Father's Schooling	No Deg. (0): 27.0; HSD/GED (1): 44.0; College Deg. (2): 29.0	
Income & Economic Status		
Parental Income, 2011 Dollars	Mother- 48932 (58322); Father- 87915 (75560); Total Parental-136790 (108088)	Mother- 43876 (43871)
Household's Economic Status	Poor/Near Poor/Low Income-43.6; Middle/High Income- 56.4	Poor/Near Poor/Low Income-76.8; Middle/High Income- 23.2
Health Status of Child		
Physical Health, %	Poor/Fair (0): 1.2; Good (1): 15.0; Very Good/Excellent (2): 83.8	Poor/Fair (0): 2.4; Good (1): 19.7; Very Good/Excellent (2): 77.9
Mental Health, %	Poor/Fair (0): 1.1; Good (1): 12.9; Very Good/Excellent (2): 86.0	Poor/Fair (0): 2.8; Good (1): 17.4; Very Good/Excellent (2): 80.0
Health Insurance Type of Child, %	Any Private (0): -57.4; Public Only (1): 33.5; None (2): 9.1	Any Private (0): 26.6; Public Only (1): 66.0; None (2): 7.4
Parental Health Index	Mother: 49.9 (8.5); Father: 52.1 (7.8)	Mother: 47.4 (10.1)
Parental Smoking, %		
Mother Smokes	13.6	28.6
Father Smokes	22.0	
Only Mother Smokes	4.7	
Only Father Smokes	13.0	
Both Smoke	8.9	
At Least One Parent Smokes	26.7	
No Parent Smokes	73.3	

Appendices 1 and 2 report the Pearson's correlation matrices of the variables used in the study for both samples. Most of the correlation coefficients are statistically significant, although the coefficients themselves are small. In spite of the fact that most of the variables are categorical or dummies and very few are continuous, the correlation coefficients can still provide useful information about the degree and direction of linear relationship between the variables, given they are measured in some ordinal scale. For instance, the physical and mental health of child are positively related with a correlation coefficient of 0.64 and 0.58 in the two samples respectively. Also, they are positively related to parental schooling, parental income and economic status, and negatively with insurance type (where 0 implies availability of a private insurance) in both samples, although relatively weakly in the second sample.

5.2 Regression Results

5.2.1 Regression Results for Sample 1 with Both Parents

5.2.1.1 Comparison of the Results in the Three Models

Sample 1 includes 31,756 children in the households with both parents. As explained earlier, the dependent variables can be physical and/or mental health status of child measured in two categories under probit and bivariate probit models (and in three categories under ordered probit). Along with other factors, the equation (I) under each model includes parental schooling without parental income and health insurance type of child; equation (II) includes parental schooling and parental income but does not include child's health insurance; equation (III) includes parental schooling and child's health insurance but does not include parental income; and equation (IV) includes parental schooling, parental income, and child's health insurance. The other regressors

are age, sex and birth order of child; number of children and presence of any child less than 5 years of age in the household; child's race, MSA/non-MSA, and region; father's and mother's health indices and smoking habits; and the panel in which the child is observed.

Appendix 3 reports the coefficients associated with the bivariate probit, probit, and ordered probit models for *Sample 1*. Appendix 4 (a portion of which will be reproduced shortly as Table 3 for discussion) reports the corresponding marginal effects computed from the estimated coefficients.

Each of the three models in all four equations and for both dependent variables (physical health and mental health) are highly significant with large Wald Chi-squared statistics. Most of the coefficients and the marginal effects have expected signs and are statistically significant. The overall results (coefficients, marginal effects and the standard errors) are essentially identical for the sample under all three specifications. This is not surprising for a large sample such as this where countless factors simultaneously determine the dependent variables and partial contribution of a particular factor is relatively small. Nonetheless, the standard errors are marginally smaller in general under bivariate probit and ordered probit than under probit specifications as expected.

The smaller standard errors in ordered probit than in probit are plausible as the former makes use of relatively more information in terms of having three categories of dependent variables than in the latter which has only two. However, as very few children (about 1%) are in the same (*Poor/Fair*) category while almost 99% belong to

the remaining two (*Good* or *Very Good/Excellent*) categories, the resulting gain in efficiency relative to probit in terms of the size of the standard errors is small.

Similarly, smaller standard errors in general in the bivariate probit than in probit model are also expected as the former uses additional information – that same set of parameters are being estimated for the physical and mental health status of child, and that some common unobserved factors may be influencing both measures of dependent variables. Technically, if some unobserved background factors are truly common in the physical and mental health equations, their error terms are likely to be correlated, which can be tested. The following hypothesis test provides the evidence that the two error terms are indeed correlated, implying that bivariate probit model is a better fit than separate probit models for the two dependent variables. The null and alternative hypotheses for the test are stated as-

H_0: $\rho = 0$ (the two error terms are not correlated)

H_a: $\rho \neq 0$ (the two error terms are correlated)

As shown in Appendix 3, the estimated $\boldsymbol{\rho}$ is very high at 0.89 with the standard error of 0.005 in all four equations (I-IV). The positive sign on the correlation coefficients indicate that the unobserved common factors influence the two dependent variables in the same direction, as expected. The Wald Chi-squared statistics for these tests in the four equations reported by STATA are-

Wald – χ^2 (1) = 4016.02 (I); 3998.19 (II); 3987.31 (III); and 3978.05 (IV).

With the large test statistics and correspondingly small p-values of 0.00, the null hypothesis is rejected in support of the alternative hypothesis. In other words, the evidence suggests that the two error terms are correlated.

[Alternatively, the likelihood ratio statistics can also be computed from the estimated log-likelihoods as LR – $\chi^2(1) = -2\ (LL_r - LL_{ur})$, where the subscripts *r* and *ur* attached to the log-likelihoods (*LL*) refer to the restricted (**ρ = 0**) and unrestricted (**ρ ≠ 0**) models. The computed LR-statistics and p-values (not reported here) also support the same conclusion that the error terms are correlated.]

In addition to utilizing the additional information about the unobserved error terms in the physical and mental health equations, the bivariate probit model allows us to compute other probabilities of interest, given that the correlation coefficient **ρ** is significantly different from zero**.** For instance, for the full equation (IV) that includes parental income and child's health insurance, following Table 2 presents the marginal, joint and conditional probabilities that pertain to a typical child having a very good or excellent health status for each measure of health (physical or mental)[20].

Table 2: Marginal, Joint and Conditional Probabilities Pertaining to Child Health in Sample 1

	Bivariate Probit Results
P (HLTH =1)	0.837
P (MLTH = 1)	0.861
P (HLTH = 1, MLTH = 1)	0.807
P (HLTH =1 | MLTH =1)	0.938
P (MLTH = 1 | HLTH =1)	0.964

A typical child has a probability of about 83.7% to have *Very Good/Excellent* physical health status as opposed to *Poor/Fair/Good* category. The probability is slightly

[20] Similar probabilities for the other three equations (I-III) are similar, and are not reported here.

higher, about 86.1% for mental health status. There is about an 80.7% chance that the child has *Very Good/Excellent* physical and mental health. Given that a child has *Very Good/Excellent* mental health, there is about 93.8% chance that he/she has *Very Good/Excellent* physical health. On the other hand, given that a child has *Very Good/Excellent* physical health, there is 96.4% chance that he/she has *Very Good/Excellent* mental health. The result supports the evidence that both physical and mental health interact closely and reinforce one another. Also, it indicates that the contribution of physical health on mental health is slightly greater than that of mental health on physical health by about 2.6 percentage points of probability.

5.2.1.2 Analysis of the Effects of Parental Schooling

The marginal effects in the Appendix 4 measure the change in the probability that the health status of a typical child will move from *Poor/Fair/Good* to the *Very Good/Excellent* level, when the value of the corresponding regressor changes by a unit or from the base level to another level, other things equal. To discuss the marginal effects of parental schooling on child health and the importance of the monetary (income and insurance) and non-monetary channels, I reproduce a portion of the Appendix 4 as Table 3 below. The effects of other regressors in both samples (1 and 2) as well as some selected subgroups of *Sample 1* will be discussed together in section 5.2.4.

Table 3: Selected Estimated Marginal Effects in Sample 1

(percentage point probabilities, N = 31,756)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	Biprob	6.403*** (0.900)	5.683*** (0.889)	5.588*** (0.884)	5.210*** (0.877)	5.602*** (0.859)	4.971*** (0.843)	4.907*** (0.844)	4.577*** (0.834)
	Prob	6.490*** (0.909)	5.759*** (0.898)	5.658*** (0.893)	5.270*** (0.886)	5.855*** (0.882)	5.218*** (0.865)	5.151*** (0.865)	4.814*** (0.855)
	Oprob	6.251*** (0.868)	5.513*** (0.855)	5.384*** (0.850)	4.993*** (0.842)	5.617*** (0.844)	5.001*** (0.825)	4.887*** (0.826)	4.565*** (0.815)
College Degree	Biprob	10.560*** (0.996)	9.389*** (1.009)	9.214*** (1.000)	8.582*** (1.006)	8.777*** (0.939)	7.753*** (0.943)	7.631*** (0.945)	7.077*** (0.946)
	Prob	10.787*** (1.003)	9.632*** (1.014)	9.446*** (1.007)	8.819*** (1.012)	9.152*** (0.962)	8.156*** (0.964)	8.027*** (0.967)	7.483*** (0.967)
	Oprob	10.508*** (0.974)	9.346*** (0.982)	9.102*** (0.976)	8.476*** (0.979)	8.869*** (0.938)	7.906*** (0.936)	7.698*** (0.940)	7.181*** (0.938)
FaSch (Base: No Degree)									
HSD/GED	Biprob	4.517*** (0.850)	4.049*** (0.837)	3.794*** (0.839)	3.586*** (0.831)	3.289*** (0.795)	2.889*** (0.781)	2.687*** (0.785)	2.508*** (0.776)
	Prob	4.566*** (0.857)	4.115*** (0.843)	3.856*** (0.845)	3.656*** (0.836)	3.344*** (0.809)	2.972*** (0.794)	2.764*** (0.796)	2.598*** (0.786)
	Oprob	4.208*** (0.833)	3.782*** (0.818)	3.484*** (0.818)	3.302*** (0.809)	2.820*** (0.784)	2.481*** (0.768)	2.239*** (0.770)	2.094*** (0.760)
College Degree	Biprob	7.438*** (0.992)	6.417*** (1.000)	6.181*** (1.003)	5.640*** (1.006)	5.114*** (0.939)	4.223*** (0.944)	4.039*** (0.953)	3.566*** (0.954)
	Prob	7.600*** (0.996)	6.609*** (1.003)	6.368*** (1.006)	5.841*** (1.009)	5.302*** (0.948)	4.468*** (0.951)	4.290*** (0.959)	3.841*** (0.959)
	Oprob	7.210*** (0.983)	6.234*** (0.988)	5.932*** (0.989)	5.420*** (0.991)	4.648*** (0.940)	3.857*** (0.944)	3.611*** (0.952)	3.194*** (0.953)
Pinc	Biprob		1.770*** (0.298)		1.393*** (0.287)		1.546*** (0.253)		1.213*** (0.249)
	Prob		1.759*** (0.294)		1.397*** (0.283)		1.465*** (0.241)		1.167*** (0.236)
	Oprob		1.761*** (0.272)		1.387*** (0.259)		1.409*** (0.224)		1.101*** (0.220)
Insur (Base: Any Private)									
Only Public	Biprob			-4.944*** (0.710)	-3.939*** (0.733)			-4.316*** (0.670)	-3.441*** (0.685)
	Prob			-4.879*** (0.715)	-3.866*** (0.736)			-4.117*** (0.682)	-3.269*** (0.694)
	Oprob			-5.081*** (0.689)	-4.072*** (0.707)			-4.244*** (0.661)	-3.443*** (0.671)
None	Biprob			-1.237 (0.926)	-0.696 (0.929)			-0.703 (0.863)	-0.234 (0.863)
	Prob			-1.331 (0.923)	-0.785 (0.925)			-0.590 (0.860)	-0.142 (0.859)
	Oprob			-1.608* (0.905)	-1.064 (0.906)			-0.759 (0.840)	-0.339 (0.839)

Note: One, two and three stars imply the statistical significance at 0.10, 0.05, and 0.01 levels respectively.

The general hypotheses that pertain to the four equations (I-IV) under each of the three models can be stated simply as-

H_0: Controlling for other factors in the equations, parental schooling has no significant effects on child health

H_1: Controlling for other factors in the equations, parental schooling has significant positive effects on child health

The positive marginal effects associated to the mother's and father's schooling (where parental schooling are measured in an increasing level of ordinal categories), and their being statistically highly significant (at 0.01 significance level) suggest that the variation in parental schooling pertaining to each equation explains the variation in child health (physical or mental) in support of the alternative hypothesis. In the following paragraphs I discuss the interpretations of these marginal effects in each of the four equations. I keep the analysis simple by referring to the bivariate probit results, which provide a better fit and are more flexible than probit (although the results in all three models are essentially identical).

I. Interpretations of the Marginal Effects in Equation (I)

In equation (I), as parental income and health insurance type of child are not held constant, any observed beneficial effects of the parental schooling are the total effects as defined earlier, inclusive of all income, insurance and non-monetary effects. The results suggest that (a) benefits of parental schooling increases with levels of schooling; (b) mother's schooling has greater impacts than father's; and (c) the impacts of parental schooling on physical health of child is slightly larger than on mental health. For instance, relative to having *No Degree*, mother's having an *HSD/GED* increases the

probability that the reported physical health status of her child is *Very Good/Excellent* by about 6.4%. With mother's having a *College Degree*, this probability increases to about 10.6%. Similar probabilities for the father's schooling are somewhat smaller, about 4.5% and 7.4% respectively. The gain in these probabilities on child's mental health are 5.6% and 8.8% respectively for *HSD/GED* and *College Degree* for mother's schooling, as opposed to 3.3% and 5.1% respectively for father's schooling, which all are slightly smaller than in the case of physical health. These gains might seem small but in the case where both parents have a *College Degree* (as opposed to *No Degree*), the gain is substantial, about 18% and 14% respectively on physical and mental health of child.

II. Interpretations of the Marginal Effects in Equation (II)

Equation (II) controls for the parental income while the health insurance type of child varies. The importance of parental income as such on child health is explained by the magnitudes and significance of the marginal effects on parental income. The results show that parental income has small but significant positive effects on child health, and the effects are practically similar for both physical and mental health (with marginally smaller magnitude for the latter). Also, the increase in the model fit with the inclusion of parental income in the equation can be statistically tested by using likelihood ratio, Wald or Score tests. For instance, I report below the results of Wald test under bivariate probit specification-

H_0: Inclusion of parental income in both physical and mental health equations does not significantly increase the model fit.

H_1: Inclusion of parental income in both physical and mental health equations significantly increases the model fit.

Wald – χ^2 (2)[21] of 39.38 and the corresponding p-value of 0.00 suggests that the null hypothesis is rejected in support of the alternative hypothesis. In other words, there is significant gain in the model fit with the inclusion of parental income in equation (II) relative to equation (I).

The results show that a one hundred percentage increase in (or doubling) the total parental income (before taking their logarithms) increases the probability that the reported physical health status of the child is *Very Good/Excellent* by about 1.8%, as opposed to about 1.5% for mental health. It should be noted that, the contribution of parental income here is not attributable to any factor included in the equation. As insurance is not included, it may however include some effects of insurance through their interaction as explained in chapter 3. For instance, low income households tend to have public health insurance and high income households tend to have private health insurance for the children. In such a case, the observed importance of parental income might include the unobserved effects of health insurance.

After settling that income is an important factor - however small, any observed benefits of parental schooling on child health here are the effects of factors other than their income attributable to their schooling. In other words, the observed marginal effects associated to the parental schooling measure the combined non-monetary and 'some' insurance effects (it would be the sum of the non-monetary and insurance effects, had the income and insurance effects been disjoint). The decline in the marginal effects on parental schooling in equation (II) relative to (I) captures the 'overall' income effects of parental schooling, which may include some effects of income via its influence

[21] The degrees of freedom are two for one variable (parental income) and two equations (physical and mental health).

in insurance as discussed. The general conclusions, that positive impact on child health increases with levels of schooling; that mother's schooling has greater impacts than father's; and that the impacts on physical health of child is slightly larger than on mental health hold just as before, when parental income is controlled for. Now, relative to having *No Degree*, mother's having an *HSD/GED* increases the probability that the reported physical health status of her child is *Very Good/Excellent* by about 5.7%. With mother's having a *College Degree*, this probability is about 9.4%. Similar probabilities for the father's schooling are about 4.0% and 6.4% respectively. For mental health, these probabilities are about 5.0%, 7.8%, 2.9%, and 4.2% respectively, which all are slightly smaller (by up to 1.2 percentage points probabilities) than from equation (I). The conclusion is - out of the total effects of parental schooling on child health, very little is attributable to increased income due to higher level of parental schooling.

III. Interpretations of the Marginal Effects in Equation (III)

Equation (III) controls for the health insurance type of child, while the parental income varies. The importance of health insurance on child health is explained by the magnitudes and significance of the marginal effects on health insurance. The results show that *Only Public* as opposed to *Any Private* health insurance is statistically significant for both the physical and mental health of child. Also, the results of Wald test reported below shows that there is significant increase in the model fit with the inclusion of health insurance in equation (III) relative to equation (I) without it-

H_0: Inclusion of health insurance in the equations does not significantly increase the model fit.

H_1: Inclusion of health insurance in the equations significantly increases the model fit.

Wald – χ^2 (4)[22] is 57.55, and the corresponding p-value is 0.00, which implies that there is significant gain in the fit of the model with the inclusion of health insurance in equation (III) relative to (I). The results show that having only public health insurance as opposed to having a private health insurance significantly lowers the probability that *Very Good/Excellent* child health status is observed, by about 4.9% and 4.3% for the physical and mental health respectively. Having *No Insurance* has no significant effects and the signs are negative.

Following the earlier argument, the observed contribution of health insurance on child health in equation (III) should be understood in light of income not being controlled for, which may in fact capture some role of parental income too. For instance, because the children with private health insurance are likely to have parents with better jobs and higher incomes (and children with public only health insurance tend to have parents with low income jobs), some of the observed importance of private health insurance may in fact be the effects of parental income that can be spent on health enhancing goods such as nutritious food.

After establishing that health insurance is an important factor, any observed benefits of parental schooling on child health then are the effects other than due to differences in health insurance type among the children. In other words, the observed

[22] The degree of freedom is four for the two categories of health insurance (only public and no insurance) and the two equations.

marginal effect associated with the parental schooling now measure the combined non-monetary and some income effects. The decline in the marginal effects on parental schooling in equations (III) relative to (I) captures the overall insurance effects of parental schooling, which may include some effects of income due to the interchangeability of the roles of income and insurance as discussed earlier. The three general conclusions about the effects mother's and father's schooling on the physical and mental health of child still hold as before. Relative to having *No Degree*, mother's having an HSD/GED increases the probability that the reported physical health status of her child is *Very Good/Excellent* by about 5.6%. With mother's having a *College Degree*, this probability is about 9.2%. Similar probabilities for the father's schooling are about 3.8% and 6.2% respectively. For mental health, these probabilities are about 4.9%, 7.6%, 2.7%, and 4.0% respectively, which all are slightly smaller (by 1.4 percentage points or less) than in equation (I). Thus, out of the total effects of parental schooling on child health, very little is attributable to health insurance type, although health insurance in itself, particularly private as opposed to only public, seems to be an important factor.

IV. Interpretations of the Marginal Effects in Equation (IV)

Equation (IV) controls for both the parental income and the health insurance type of child, among others. The importance of income and health insurance on child health is explained by the magnitudes and significance of the marginal effects on these two variables. The results show that parental income and *Only Public* as opposed to *Any Private* health insurance are statistically significant. Also, the results of Wald test

reported below shows that there is significant increase in the model fit with the inclusion of parental income and child's health insurance type in the equations-

H_0: Inclusion of parental income and child's health insurance type in the equations does not significantly increase the model fit.

H_1: Inclusion of parental income and child's health insurance type in the equations significantly increases the model fit.

Wald – χ^2 (6)[23] is 83.71, and the corresponding p-value is 0.00, which implies that there is significant gain in the model fit with the inclusion of these two variables in equation (IV) relative to (I). Furthermore, inclusion of parental income in equation (III) or health insurance in (II) results into Wald – χ^2 (2) = 26.11 with a p-value of 0.00, and Wald – χ^2 (4) = 35.90 with a p-value of 0.00 respectively, implying that the equation (IV) fits better than equations (II) or (III) and justifies the role of these two factors in the equation in explaining child health.

It can be observed that the magnitudes of the effects of income and insurance in equation (IV) are only marginally smaller relative to (II) or (III). The results show that when health *insurance* is controlled for, a one hundred percentage increase in the total parental income increases the probability that the reported physical health status of the child is *Very Good/Excellent* by about 1.4% for physical health, and 1.2% for mental health (as opposed to 1.8% and 1.5% when insurance is not controlled for), and these are the 'pure' contributions of parental income as distinguished from the latter which includes some effects of insurance as explained earlier. Similarly, when parental income is controlled for, having only public health insurance as opposed to having a private

[23] The degree of freedom is six for the two categories of health insurance (only public and no insurance), and parental income in the two equations.

health insurance significantly lowers the probability that *Very Good/Excellent* child health status is observed by about 3.9% for physical health and 3.4% for mental health (about a percentage point lower than when parental income is not controlled for). Thus these are the pure contributions of health insurance as distinguished from what is observed in equation (III) which includes some contributions of income. As before, having *No Insurance* has no significant effects and the signs are negative.

After establishing that parental income and child's health insurance type are jointly significant, any observed benefits of parental schooling on child health in equation (IV) are now the effects other than due to differences in parental income or health insurance type among the children. In other words, the observed marginal effects on the parental schooling are the non-monetary effects of parental schooling. The three general conclusions about the effects of mother's and father's schooling on the physical and mental health of child still hold as before. Relative to having *No Degree*, mother's having an *HSD/GED* increases the probability that the reported physical health status of her child is *Very Good/Excellent* by about 5.2%. With mother's having a *College Degree*, this probability is about 8.6%. Similar probabilities for the father's schooling are about 3.6% and 5.6% respectively. For mental health, these probabilities are about 4.6% and 7.1% for mother's, and 2.5% and 3.6% for father's schooling respectively, which all are slightly smaller (by 2 percentage points or less) than in equation (I). These declines in the marginal effects on parental schooling in equation (IV) relative to equation (I) capture the combined income and insurance effects of parental schooling (or the monetary effects), which are relatively much smaller compared to the non-monetary effects.

5.2.1.3 Decomposition of Total Effects of Parental Schooling

The Table 4 below presents the decomposition of the total effects of parental schooling into overall income, insurance, monetary, and non-monetary effects using the results of the bivariate probit model.

Table 4: Decomposing Total Effects of Parental Schooling on Child Health in Sample 1

Child Health	Parental Schooling (Base: No Degree)	Total [%] (a) = (d) + (e)	Income [%] (b)	Insurance [%] (c)	Monetary [%] (d)	Non-monetary [%] (e)
Physical	Mother					
	HSD/GED	6.4 [100]	0.7 [11]	0.8 [13]	1.2 [19]	5.2 [81]
	College Degree	10.6 [100]	1.2 [11]	1.3 [13]	2.0 [19]	8.6 [81]
	Father					
	HSD/GED	4.5 [100]	0.5 [10]	0.7 [16]	0.9 [21]	3.6 [79]
	College Degree	7.4 [100]	1.0 [14]	1.3 [17]	1.8 [24]	5.6 [76]
Mental	Mother					
	HSD/GED	5.6 [100]	0.6 [11]	0.7 [12]	1.0 [18]	4.6 [82]
	College Degree	8.8 [100]	1.0 [12]	1.1 [13]	1.7 [19]	7.1 [81]
	Father					
	HSD/GED	3.3 [100]	0.4 [12]	0.6 [18]	0.8 [24]	2.5 [76]
	College Degree	5.1 [100]	0.9 [17]	1.1 [21]	1.5 [30]	3.6 [70]

The numbers without the brackets are the effects of parental schooling on child health, measured as the marginal impacts, namely the increase in the probability that the reported health status of the child is *Very Good/Excellent* as opposed to *Poor/Fair/Good* category. It should be noted that the income effects of parental schooling in the table show the 'overall' effects of income, implying that insurance is not controlled for while these effects are being measured, and same is true with the

insurance effects, where income is not controlled for[24]. The sum of the separate income and insurance effects (columns 'b' plus 'c') measured this way is technically greater than the overall monetary effects (column 'd') by the contribution of the overlapped portion of income and insurance effects (which is very small, less than 0.5 percentage points in probabilities) and is not shown in the table. Clearly, the sum of the overall monetary and the non-monetary effects (columns 'd' and 'e') equals the total effects (column 'a'). Also, the numbers inside the square brackets represent the relative importance of each component effect as a share of the total effects (normalized at 100) in each row.

All five measures of the effects of parental schooling increase with the levels of schooling with mother's schooling having greater impacts than father's and the impacts on physical health of child being slightly larger than on mental health. Both income and insurance effects are much smaller than the non-monetary effects, and are almost equal for both physical and mental health of child for a particular level of parental schooling, and marginally increase with the level of schooling. Most of the beneficial effects of parental schooling on child health are the non-monetary effects, and these are about four-fifths of the total effects for mother's schooling and slightly less for father's schooling. Accordingly, the overall monetary effects accounts for about one-fifth of the total effects for mother's schooling and slightly more for father's schooling.

[24] These income and insurance effects could also be measured by controlling the other each time one is measured, but the general conclusions would not be significantly different, as the effects of income and insurance themselves, as well as their joint contributions are very small.

Figure 5: Decomposing Total Effects of Parental Schooling into Monetary and Non-monetary Effects in Sample 1

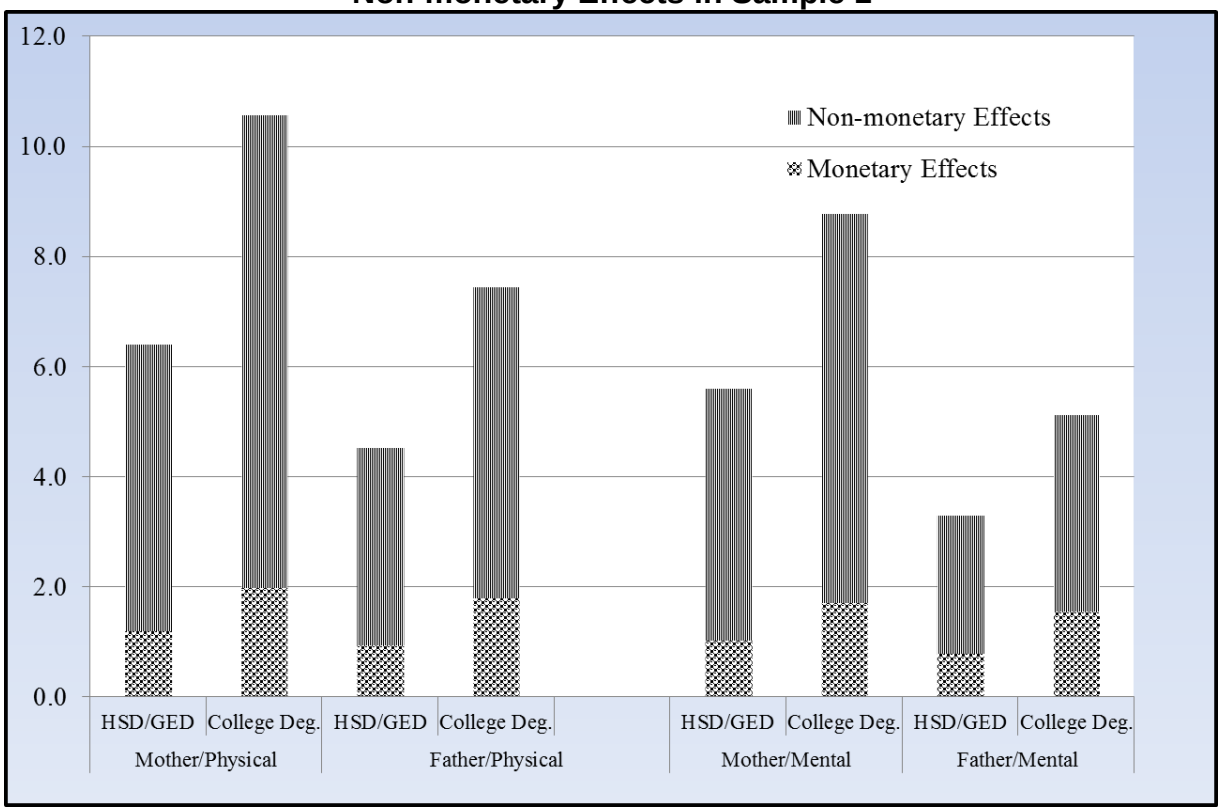


Figure 5 pictorially illustrates the decomposition of total effects of parental schooling into the overall monetary and non-monetary effects. The monetary or income equivalents of the non-monetary effects of parental schooling on child health are difficult to estimate. One reason is that the health benefits of a given increase in income may vary widely depending on several factors including the initial level of income that together determine the expenditure patterns of the households. But more importantly, the parents can spend a given endowment of income only once (and it depletes after every spending), whereas the knowledge and information acquired through higher schooling for example can be used multiple times (and may become even more effective after every use). So the computed income equivalents of the non-monetary effects are likely to be underestimated. Nonetheless, just to get a rough idea, the non-monetary effects of a mother's having a *College Degree* (as opposed to having *No Degree*) is at least as effectual as an increase of income by 6.1 folds (which is 8.6 divided by 1.4, where the former is the estimate for the corresponding non-monetary effects, and the latter is the estimate for the marginal effects on parental income) in terms of lifting the child's physical health from the lower to the upper category. Similar equivalent of the non-monetary effects of father's having a *College Degree* can be estimated as an income transfer by 4.0 folds. Similar estimates for mental health are slightly small, about 5.9 and 6.0 folds respectively for mother's and father's schooling.

In summary, parental schooling plays an important role in determining child health, and the smaller monetary effects and relatively larger non-monetary effects imply that most of the effects of parental schooling on child health transmit through the channel other than the income and insurance, possibly in the form of better access to

relevant health care information, ability to process these information, and increased willingness to implement on these information. I presume that better schooling helps the parents bring about healthy attitudes, tastes and behaviors within the family, prioritize and allocate the resources better, provide timely care of the health related issues, and eventually increase efficiency and child health productivity.

Also, controlling for parental schooling, parental income and insurance type of child can both explain the variation in child health to some degree, where the insurance seems to be more important factor than income. For instance, having any private insurance as opposed to only public health insurance increases the probability of reporting *Very Good/Excellent* child health status by about 3.9% and 3.4% for physical and mental health of child, while doubling of the income increases these probabilities only by 1.4% and 1.2% respectively (or income needs to be increased by roughly 2.8 folds to achieve similar effects as the private insurance). This should not be interpreted too rigidly however, as various factors including the parental schooling together determine the income and health insurance. Nonetheless, this might suggest that higher parental income is associated with better (private) health insurance of the child, and better child health. Also, almost equal (although small) income and insurance effects of parental schooling, while insurance being relatively more important factor than income, might suggest that parental income in itself is relatively less important than health insurance for child health, but is more closely attributable to parental schooling, and vice versa.

5.2.2 Regression Results for Sample 2 with Single Mothers

Sample 2 includes the 13,524 children in the households with single mother. Hence the parental characteristics pertaining to father, namely father's schooling (FaSch), father's health (FaHlth), and father's smoking habit (Fsmok) are missing in the equations, and the total parental income (Pinc) is replaced by mother's total income (Minc). All other explanatory variables are same as in *Sample 1*. Along with mother's schooling and other factors, the equation (I) in each model excludes both mother's income and child's health insurance; equation (II) includes mother's income but does not include health insurance; equation (III) includes health insurance but does not include mother's income; and equation (IV) includes both mother's income and child's health insurance.

Appendix 5 reports the coefficients associated with the bivariate probit, probit and ordered probit models for *Sample 2*, and Appendix 6 reports the corresponding marginal effects computed from the estimated model coefficients (a portion of which will be reproduced shortly as Table 6 for discussion). Each of the three models in all four equations and for both dependent variables is overall highly significant with large Wald Chi-squared statistics, and most of the coefficients and the marginal effects have expected signs and are statistically significant. The overall results (coefficients, marginal effects and the standard errors) are largely similar to *Sample 1*, and the standard errors are marginally smaller in general under bivariate probit and ordered probit than under probit specifications. The conclusion that bivariate probit fits better than the probit holds as in *Sample 1* with marginally smaller value of the estimated correlation coefficient ($\hat{\rho}$ =

0.853 as opposed to 0.895 in *Sample 1*) between the error terms in the physical and mental health equations.

For the full equation (IV), the Table 5 below presents the marginal, joint and conditional probabilities that pertain to a typical child having *Very Good/Excellent* health status for each measure of health (physical or mental) for both samples 1 and 2 for comparison.

Table 5: Marginal, Joint and Conditional Probabilities Pertaining to Child Health In *Sample 2*

	Bivariate Probit Results (*Sample 2*)	**Bivariate Probit Results (*Sample 1*)**
P (HLTH =1)	0.779	0.837
P (MLTH = 1)	0.799	0.861
P (HLTH = 1, MLTH = 1)	0.725	0.807
P (HLTH =1 | MLTH =1)	0.908	0.938
P (MLTH = 1 | HLTH =1)	0.931	0.964

A typical child has a probability of about 77.9% to have *Very Good/Excellent* physical health status as opposed to the lower categories. Similar probability for mental health is about 79.9%. These are about 6% point smaller than in *Sample 1*. There is about 72.5% chance that the child has *Very Good/Excellent* physical and mental health, which is about 8% point lower than in *Sample 1*. Given that a child has *Very Good/Excellent* mental health, there is about 90.8% chance that he/she has *Very Good/Excellent* physical health, and given that a child has *Very Good/Excellent* physical health, there is about 93.1% chance that he/she has *Very Good/Excellent* mental health, both of which are about three percentage points lower than in *Sample 1*. The result supports the evidence that both physical and mental health reinforce one another,

and that the contribution of physical health on mental health is slightly greater than of mental health on physical health. To discuss the marginal effects of mother's schooling on the physical and mental health of child and the three channels, I present below a portion of Appendix 6 as Table 6.

Table 6: Selected Estimated Marginal Effects in Sample 2

(N = 13,524)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	Biprob	5.396*** (1.180)	4.961*** (1.196)	4.682*** (1.174)	4.445*** (1.187)	6.622*** (1.190)	6.110*** (1.205)	6.127*** (1.187)	5.778*** (1.199)
	Prob	5.609*** (1.202)	5.171*** (1.219)	4.856*** (1.196)	4.623*** (1.211)	6.976*** (1.236)	6.432*** (1.252)	6.441*** (1.233)	6.073*** (1.246)
	Oprob	5.649*** (1.144)	5.139*** (1.160)	4.893*** (1.136)	4.598*** (1.149)	6.806*** (1.169)	6.277*** (1.182)	6.186*** (1.164)	5.849*** (1.174)
College Degree	Biprob	9.195*** (1.446)	8.467*** (1.497)	7.235*** (1.525)	6.863*** (1.557)	9.582*** (1.432)	8.722*** (1.483)	8.218*** (1.508)	7.669*** (1.540)
	Prob	9.713*** (1.478)	8.992*** (1.529)	7.686*** (1.561)	7.326*** (1.593)	10.371*** (1.479)	9.485*** (1.534)	8.952*** (1.559)	8.387*** (1.594)
	Oprob	9.190*** (1.447)	8.337*** (1.494)	7.098*** (1.516)	6.634*** (1.546)	9.624*** (1.438)	8.741*** (1.486)	7.963*** (1.516)	7.431*** (1.546)
Minc	Biprob		0.414** (0.182)		0.265 (0.186)		0.487*** (0.178)		0.394** (0.181)
	Prob		0.418** (0.185)		0.262 (0.188)		0.509*** (0.183)		0.407** (0.187)
	Oprob		0.495*** (0.183)		0.339* (0.187)		0.509*** (0.173)		0.386** (0.176)
Insur (Base: Any Private)									
Only Public	Biprob			-5.588*** (1.037)	-5.324*** (1.055)			-3.949*** (1.027)	-3.541*** (1.048)
	Prob			-5.889*** (1.062)	-5.631*** (1.079)			-4.271*** (1.072)	-3.860*** (1.094)
	Oprob			6.042*** (1.018)	-5.706*** (1.036)			-4.934*** (1.015)	-4.546*** (1.034)
None	Biprob			-1.885 (1.718)	-1.640 (1.730)			0.917 (1.617)	1.274 (1.634)
	Prob			-2.217 (1.754)	-1.976 (1.767)			0.492 (1.654)	0.850 (1.672)
	Oprob			-2.302 (1.719)	-1.990 (1.735)			-0.056 (1.608)	0.274 (1.626)

Note: One, two and three stars imply the statistical significance at 0.10, 0.05, and 0.01 levels respectively.

The contributions of income are even smaller than in *Sample 1*. The probability of observing *Very Good/Excellent* physical or mental health when income doubles is less than 1% when health insurance is not controlled for, and they are statistically insignificant for physical health when the health insurance is controlled for. In the full equation (IV) where income is controlled for, having *Only Public* health insurance as opposed to having *Any Private* health insurance significantly lowers the probability that *Very Good/Excellent* child health status is observed by about 5.3% for physical health (about 1 percentage point higher than in *Sample 1*) and 3.5% for mental health (similar to *Sample 1*). Having *No Insurance* has no significant effects as in *Sample 1*.

The general hypotheses that mother's schooling has significant positive effects on child health hold true for all four equations (I-IV) under each of the three models and the essential results are identical with marginally different magnitudes. The Table 7 below presents the decomposition of the total effects of mother's schooling into overall income, insurance, monetary and non-monetary effects using the results of the bivariate probit model.

Table 7: Various Components of the Total Effects of Mother's Schooling on Child Health in Sample 2

Child Health	Mother's Schooling (Base: No Degree)	Total [%] (a) = (d) + (e)	Income [%] (b)	Insurance [%] (c)	Monetary [%] (d)	Non-monetary [%] (e)
Physical	**HSD/GED**	5.4 [100] *6.4 [100]*	0.4 [8] *0.7 [11]*	0.7 [13] *0.8 [13]*	1.0 [18] *1.2 [19]*	4.4 [82] *5.2 [81]*
	College Degree	9.2 [100] *10.6 [100]*	0.7 [8] *1.2 [11]*	2.0 [21] *1.3 [13]*	2.3 [25] *2.0 [19]*	6.9 [75] *8.6 [81]*
Mental	**HSD/GED**	6.6 [100] *5.6 [100]*	0.5 [8] *0.6 [11]*	0.5 [7] *0.7 [12]*	0.8 [13] *1.0 [18]*	5.8 [87] *4.6 [82]*
	College Degree	9.6 [100] *8.8 [100]*	0.9 [9] *1.0 [12]*	1.4 [14] *1.1 [13]*	1.9 [20] *1.7 [19]*	7.7 [80] *7.1 [81]*

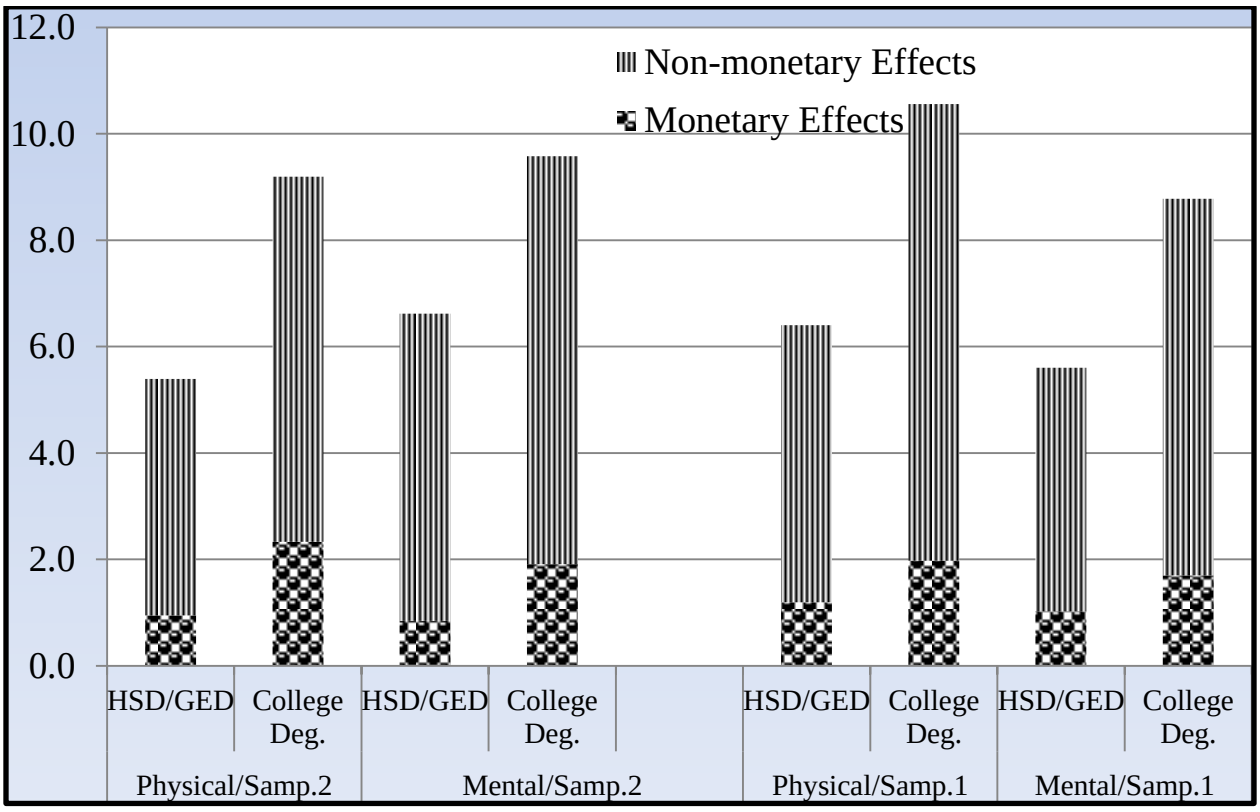
The numbers without the brackets are the effects of parental schooling on child health, measured as the increase in the probability that the reported health status of the child is *Very Good/Excellent* as opposed to *Poor/Fair/Good*. For instance, relative to having *No Degree*, mother's having an HSD/GED increases the probability that the reported physical health status of her child is *Very Good/Excellent* by about 5.4% as total effects, by 0.4% as income effects, by 0.7% as insurance effects, by 1.0% as combined monetary effects, and by 4.4% as non-monetary effects. Corresponding probabilities associated to mother's having a *College Degree* are 9.2%, 0.7%, 2.0%, 2.3%, and 6.9% respectively. The numbers inside the square brackets represent the relative importance of each component effect as a share of the total effects (normalized at 100) in each row. The bottom values in italics in each cell are the corresponding effects of mother's schooling in *Sample 1* for comparison.

The effects of mother's schooling are slightly smaller on physical health and slightly larger on mental health of child in this sample than in *Sample 1*. Also, contrary to *Sample 1*, the impacts on mental health are slightly greater than on physical health in this sample in terms of total, income, and non-monetary effects, and that the insurance

effects are somewhat larger than the income effects. Except for these marginal differences, the results are not substantially different in the two samples in terms of the increasing effects of the levels of mother's schooling, overall size of the total effects, the largest share of non-monetary effects (from three-fourths to seven-eighths compared to four-fifths in *Sample 1*), and the smallest share of income and insurance effects (one-fourth or less share of monetary effects compared to one-fifth in *Sample 1*). Figure 6 below pictorially illustrates the decomposition of total effects of mother's schooling on physical and mental health of child into the overall monetary and non-monetary effects for both samples for comparison.

Figure 6: Decomposing Total Effects of Mother's Schooling into Monetary and Non-monetary Effects

(Samples 1 & 2)



5.2.3 Subgroup Analysis in Sample 1

In this section, I briefly compare the results of the bivariate probit model across selected subgroups of the main *Sample 1* with both parents present - namely by age-group, sex, race and economic status. For this, the sample is grouped into three age-groups, namely the *bottom* age-group of infants, toddlers and preschoolers between the ages 0-5 years; the *middle* age-group of middle childhood between the ages 6-11 years; and the *top* age-group of young teens and teenagers between the ages 12-17 years. Similarly the sample is grouped into *Male* and *Female*; into *White*, *Black*, *Hispanic* and *Other* races; and into *Low* and *High* economic status, where the former includes the poor, near poor and low income households, and the latter includes the middle and high income households.

The following Table 8 reports the various marginal, joint and conditional probabilities pertaining to the physical and mental health status of the children across different subgroups as estimated from the full equation (IV) that includes both parental income and child's health insurance.

Table 8: Marginal, Joint and Conditional Probabilities Pertaining to Child Health Across Subgroups

	Sub Groups	N	ρ (s.e.)	P(H =1)	P(M = 1)	P(H = 1, M = 1)	P(H =1 | M =1)	P(M = 1 | H =1)
Total		31756	0.894 (0.005)	0.837	0.861	0.807	0.938	0.964
Sex	**Male**	16217	0.879 (0.006)	0.833	0.852	0.797	0.935	0.956
	Female	15539	0.910 (0.006)	0.842	0.870	0.818	0.940	0.971
Age Group	**0-5**	11717	0.911 (0.007)	0.850	0.901	0.838	0.930	0.986
	6-11	10385	0.901 (0.007)	0.841	0.855	0.808	0.946	0.961
	12-17	9654	0.875 (0.008)	0.819	0.819	0.768	0.938	0.939
Race	**White**	14108	0.836 (0.010)	0.895	0.901	0.859	0.953	0.959
	Black	3177	0.908 (0.013)	0.847	0.864	0.815	0.943	0.962
	Hispanic	11819	0.925 (0.005)	0.758	0.804	0.734	0.912	0.968
	Other	2652	0.923 (0.014)	0.880	0.897	0.856	0.955	0.973
Econ. Status	**Low**	13857	0.912 (0.005)	0.759	0.798	0.727	0.912	0.958
	High	17899	0.866 (0.008)	0.899	0.910	0.869	0.956	0.968

Note: 'H' and 'M' refer to physical and mental health status of child.

The high correlation coefficients (from 0.84 to 0.93) between the error terms in the physical and mental health equations and their statistical significance show that the bivariate probit model is a better fit than the isolated probit models in each subgroup. The higher conditional probabilities in the last two columns relative to the smaller marginal and joint probabilities imply that both physical and mental health of child reinforce one-another in each subgroup, where contributions of physical health on mental health are slightly higher than the contributions of mental health on physical health. The male and female children have practically similar (with the females having slightly higher) probabilities of having the best physical and mental health in terms of all marginal, joint and conditional sense. The bottom, followed by the middle age-groups, has by and large better physical and mental health than the top age-group. Conditional upon *Very Good/Excellent* mental health, the probabilities of having *Very Good/Excellent* physical health are similar (around 94%) in all age-groups. However the probability of having *Very Good/Excellent* mental health conditional upon *Very Good/Excellent* physical health is highest (99%) for the bottom age-group, followed by middle (96%) and top (94%) age-groups. *White* has the best physical and mental health outcomes followed by the *Other* race and *Black*; and *Hispanic* has the worst outcomes. But the differences narrow down for the conditional probabilities. The high income group clearly has better child health outcomes in all measures, but the differences on the conditional probabilities are smaller.

Appendices 7-10 report the marginal effects obtained from the bivariate probit regressions on each of these subgroups. The Table 9 below reports the marginal effects of parental income and the health insurance type of child across the subgroups

corresponding to the full equation (IV). Parental income has small but significant positive effects on both physical and mental health of child across all subgroups except *Black* and *Other* race (mainly due to large standard errors possibly from small sample size). These effects are marginally smaller for mental health, and relatively greater for Hispanic and high[25] income groups. Similarly, health insurance by and large seems to be an important factor too. In particular, the health reducing effects of *Public Only* as opposed to *Any Private* health insurance are mostly prominent in *Hispanic* than in other subgroups.

[25] The apparently greater effects on high income groups are not surprising as these measured effects in fact correspond to doubling of parental income rather than a unit change in income.

Table 9: Marginal Effects of Parental Income and Child's Health Insurance Type Across Subgroups

	Sub Groups	N	Physical Health			Mental Health		
			Pinc	Insur		Pinc	Insur	
				Only Public	None		Only Public	None
Total		31756	1.393*** (0.287)	-3.939*** (0.733)	-0.696 (0.929)	1.213*** (0.249)	-3.441*** (0.685)	-0.234 (0.863)
Sex	**Male**	16217	1.252*** (0.353)	-4.329*** (0.912)	0.411 (1.112)	1.173*** (0.323)	-4.066*** (0.875)	-0.031 (1.067)
	Female	15539	1.559*** (0.359)	-3.540*** (0.928)	-1.864 (1.204)	1.291*** (0.313)	-2.839*** (0.839)	-0.442 (1.066)
Age Group	**0-5**	11717	0.800*** (0.339)	-3.308*** (0.960)	-1.769 (1.380)	0.922*** (0.263)	-2.155*** (0.771)	-1.720 (1.148)
	6-11	10385	1.507*** (0.509)	-4.150*** (1.115)	0.441 (1.385)	1.566*** (0.464)	-3.503*** (1.057)	0.390 (1.369)
	12-17	9654	1.935*** (0.486)	-4.222*** (1.238)	-1.147 (1.440)	1.195*** (0.480)	-4.041*** (1.277)	-0.147 (1.428)
Race	**White**	14108	1.329*** (0.351)	-3.163*** (0.919)	0.467 (1.362)	0.900*** (0.337)	-3.025*** (0.882)	0.721 (1.301)
	Black	3177	1.222 (0.948)	-1.676 (2.038)	-0.549 (3.271)	0.871 (0.891)	-1.887 (1.887)	0.625 (3.115)
	Hispanic	11819	2.246*** (0.595)	-6.431*** (1.369)	-2.692 (1.729)	2.099*** (0.459)	-5.309*** (1.248)	-1.598 (1.615)
	Other	2652	0.237 (0.584)	-2.516 (2.151)	-0.342 (3.402)	0.410 (0.503)	-0.530 (2.139)	-1.676 (2.987)
Economic Status	**Low**	13857	0.945*** (0.403)	-2.952*** (1.258)	0.895 (1.701)	0.924*** (0.358)	-2.626** (1.188)	1.876 (1.574)
	High	17899	2.281*** (0.603)	-2.750*** (1.001)	-0.266 (1.043)	1.668*** (0.531)	-2.288** (0.962)	-0.947 (1.003)

Note: *, **, and *** imply the statistical significance at 0.10, 0.05, and 0.01 levels respectively.

Table 10 below highlights the total (denoted 'T') and non-monetary (denoted 'NM') effects of parental schooling on child health reproduced from the appendices 7-10 for the purpose of comparing across these subgroups. In particular, the numbers in the table measure the increase in the probability that the reported health (physical or mental) of the child is *Very Good/Excellent* as opposed to *Poor/Fair/Good* category as parental schooling increases to the given level with *No Degree* as the reference point in each of the equations (I), where parental income and child's health insurance type vary, and (IV), where these two variables are controlled for. Also, the difference in the total and non-monetary effects represent the share of monetary (combined income and insurance) effects of parental schooling, and are not shown in the table.

The three general conclusions for the whole sample indicate: (1) that parental schooling has health enhancing effects on child; (2) that mother's schooling has greater effects than father's; and (3) that effects on mental health are slightly smaller than on physical health. These conclusions largely hold across the subgroups. Also, as seen earlier for the entire sample, most of the effects of parental schooling (more than three-fourth in most of the subgroups) transmit through the non-monetary channel so that the share of the monetary effects shrinks to less than one-fourth in general.

Mothers' effects seem to be somewhat larger on male child than on female by about 1-2 percentage points in terms of both physical and mental health, whereas father's effects are practically similar on both male and female. Both mother's and father's effects are clearly largest for the top age-group, by up to 5 percentage points increase in the probabilities that the health outcome is *Very Good/Excellent*. The effects on the other two age-groups are essentially alike. Also, the effects of father's schooling

on the top age-group is particularly larger, and more so for *College Degree* by about 3-5 percentage points increase in the probabilities compared with the other two age-groups. Across the race, the effects are largely statistically insignificant for the *Other* race, followed by *Black* and *White*, and more so in the non-monetary effects than in the total effects. These insignificances are the result of large standard errors relative to the small effects (see Appendix 9), likely exacerbated by the small number of observations in the case of these two races. However, the effects on *Hispanic* are highly significant and particularly higher than in any other racial groups, mostly by up to 5-6 percentage points increase in probability than the *White* counterparts, and by slightly smaller difference with *Black*. Across the economic status, the effects on the low income group are generally larger by up to 5 percentage points probabilities. Particularly father's having a *College Degree* results into greater effects on both physical and mental health of child, and mother's having a *College Degree* results into greater effects on mental health for the low income groups.

Table 10: Total and Non-monetary Effects of Parental Schooling on Child Health Across Selected Subgroups

Child Health	Parent	Parental Schooling (Base: No Degree)	Effect Type	All	Sex		Age-Group			Race				Economic Status	
					M	F	0-5	6-11	12-17	W	B	H	O	L	H
Physical	Mother	HSD/GED	T	6.4	7.0	5.8	6.4	6.3	6.7	3.2	5.2	7.9	*4.7*	6.1	5.6
			NM	5.2	5.9	4.6	5.5	5.2	5.2	*2.0*	*4.4*	6.5	*4.5*	5.7	4.6
		College Degree	T	10.6	10.5	10.7	10.8	10.6	10.6	6.8	8.9	12.8	10.3	8.1	9.0
			NM	8.6	8.6	8.6	9.2	8.6	8.4	4.8	7.3	9.9	9.8	7.6	7.4
	Father	HSD/GED	T	4.5	4.6	4.4	3.7	4.0	6.1	*1.8*	2.0	6.9	0.1	3.9	3.6
			NM	3.6	3.7	3.4	3.1	3.2	4.7	0.9	1.4	5.9	-0.6	3.7	2.8
		College Degree	T	7.4	7.5	7.4	5.7	6.5	10.4	3.9	7.0	10.1	2.3	8.8	4.7
			NM	5.6	5.6	5.6	4.3	4.6	8.3	*2.3*	*5.7*	7.3	1.0	7.9	3.4
Mental	Mother	HSD/GED	T	5.6	6.7	4.6	4.9	5.8	6.7	3.1	*4.0*	6.8	3.0	5.2	5.0
			NM	4.6	5.6	3.6	4.1	4.7	5.6	2.1	3.3	5.6	2.7	4.9	4.2
		College Degree	T	8.8	9.4	8.2	8.2	9.4	9.1	5.8	5.9	11.5	6.0	9.0	6.7
			NM	7.1	7.6	6.6	6.9	7.6	7.5	4.2	4.6	8.9	5.6	8.6	5.5
	Father	HSD/GED	T	3.3	3.1	3.4	3.1	2.4	4.4	0.5	3.1	5.3	1.6	3.1	2.1
			NM	2.5	2.2	2.7	2.6	1.6	3.4	-0.3	2.5	4.4	1.4	2.8	1.5
		College Degree	T	5.1	5.0	5.1	3.7	4.3	7.5	*2.0*	7.4	5.4	3.8	5.6	2.8
			NM	3.6	3.3	3.7	2.5	2.5	5.9	0.8	6.3	3.0	3.4	4.7	1.8

Note: The numbers in italics are statistically significant at 0.1 level, and the numbers highlighted in gray represent statistically insignificance. All other numbers represent significant at .05 or .01 levels.

5.2.4 Effects of Other Factors on Child Health

In this section I assess the effects of other factors included in the regression models on the physical and mental health of child. For this, I reproduce the marginal effects of these factors in the bivariate probit results for *Sample 1* (with both parents present) from Appendix 4 as Table 11 below, and briefly highlight how these impacts compare across *Sample 2* (with single mother) and the selected subgroups of *Sample 1*. To keep it simple yet informative, I resort mainly to the qualitative analysis referring to appendices 6-10 without re-reporting the actual figures for *Sample 2* and the selected subgroups. Mostly the results in the four equations (I-IV) differ only marginally, and I shall mainly refer only to the full equation (IV) that includes both the parental income and child's health insurance type.

Table 11: Marginal Effects of Other Factors in Sample 1

Variables	Physical Health				Mental Health			
	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Age	-0.304*** (0.064)	-0.320*** (0.064)	-0.359*** (0.065)	-0.363*** (0.064)	-0.635*** (0.060)	-0.647*** (0.060)	-0.685*** (0.061)	-0.686*** (0.060)
Female	1.001*** (0.398)	0.961** (0.398)	1.040*** (0.397)	1.003*** (0.397)	2.016*** (0.369)	1.978*** (0.368)	2.047*** (0.368)	2.013*** (0.368)
Brthrd	1.758*** (0.454)	1.914*** (0.455)	1.827*** (0.454)	1.937*** (0.454)	1.290*** (0.419)	1.426*** (0.419)	1.352*** (0.418)	1.447*** (0.418)
Chldrn	0.218 (0.259)	0.258 (0.258)	0.352 (0.260)	0.356 (0.259)	-0.411* (0.244)	-0.376 (0.243)	-0.293 (0.244)	-0.289 (0.243)
Child_5	-0.140 (0.743)	0.050 (0.743)	0.028 (0.741)	0.143 (0.742)	1.055 (0.703)	1.220* (0.702)	1.199* (0.702)	1.300* (0.702)
Race (Base: White)								
Black	-3.544*** (0.965)	-3.151*** (0.963)	-3.052*** (0.968)	-2.828*** (0.966)	-3.088*** (0.912)	-2.734*** (0.910)	-2.641*** (0.916)	-2.438*** (0.913)
Hispanic	-6.389*** (0.748)	-5.899*** (0.746)	-5.551*** (0.753)	-5.350*** (0.752)	-4.199*** (0.708)	-3.779*** (0.709)	-3.517*** (0.715)	-3.344*** (0.715)
Other	-2.437** (1.046)	-2.046** (1.046)	-2.196** (1.055)	-1.939* (1.053)	-1.281 (1.001)	-0.933 (0.998)	-1.069 (1.013)	-0.842 (1.009)
MSA	2.176*** (0.769)	1.926*** (0.764)	1.946*** (0.765)	1.788** (0.761)	2.699*** (0.750)	2.478*** (0.745)	2.488*** (0.747)	2.349*** (0.744)
Region (Base: NE)								
MW	-1.860** (0.955)	-1.956** (0.957)	-2.112** (0.956)	-2.140** (0.957)	-2.525*** (0.894)	-2.595*** (0.895)	-2.749*** (0.896)	-2.765*** (0.897)
S	-1.854** (0.857)	-1.747** (0.857)	-1.792** (0.854)	-1.735** (0.854)	0.874 (0.786)	-0.765 (0.784)	-0.838 (0.783)	-0.777 (0.782)
W	0.181 (0.887)	-0.008 (0.890)	0.095 (0.885)	-0.036 (0.888)	0.836 (0.831)	-0.990 (0.834)	-0.903 (0.830)	-1.011 (0.832)
MoHlth	0.367*** (0.032)	0.360*** (0.032)	0.354*** (0.032)	0.351*** (0.032)	0.391*** (0.029)	0.385*** (0.029)	0.379*** (0.029)	0.376*** (0.029)
FaHlth	0.247*** (0.035)	0.227*** (0.035)	0.232*** (0.035)	0.219*** (0.035)	0.274*** (0.032)	0.256*** (0.033)	0.260*** (0.032)	0.248*** (0.032)
Msmok	0.357 (0.814)	0.616 (0.807)	0.590 (0.810)	0.749 (0.805)	-0.825 (0.792)	-0.589 (0.785)	-0.615 (0.788)	-0.471 (0.783)
Fsmok	-0.933 (0.721)	-0.764 (0.715)	-0.602 (0.716)	-0.531 (0.712)	-0.759 (0.688)	-0.615 (0.683)	-0.475 (0.685)	-0.416 (0.682)
Panel (Base: 6)								
7	-1.149 (1.159)	-0.981 (1.164)	-0.798 (1.169)	-0.728 (1.171)	-1.323 (1.111)	-1.187 (1.119)	-1.009 (1.125)	-0.955 (1.129)
8	0.373 (1.140)	0.599 (1.145)	0.870 (1.148)	0.959 (1.151)	-0.321 (1.101)	-0.131 (1.105)	0.123 (1.111)	0.197 (1.113)
9	-1.004 (1.151)	-0.788 (1.154)	-0.451 (1.159)	-0.379 (1.160)	-1.669 (1.100)	-1.482 (1.104)	-1.174 (1.110)	-1.112 (1.111)
10	-0.572 (1.137)	-0.277 (1.139)	0.081 (1.145)	0.200 (1.146)	0.606 (1.080)	-0.350 (1.082)	-0.025 (1.090)	0.081 (1.091)
11	1.168 (1.147)	1.484 (1.151)	1.834* (1.150)	1.965* (1.153)	1.177 (1.078)	1.443 (1.081)	1.773* (1.087)	1.881* (1.088)
12	4.981*** (1.119)	5.453*** (1.121)	5.667*** (1.126)	5.909*** (1.127)	3.101*** (1.080)	3.512*** (1.081)	3.722*** (1.087)	3.930*** (1.087)

Variables	Physical Health				Mental Health			
	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
13	2.764*** (1.074)	3.243*** (1.078)	3.466*** (1.083)	3.716*** (1.085)	1.675* (1.027)	2.090** (1.029)	2.298** (1.038)	2.515** (1.038)
14	2.894*** (1.118)	3.533*** (1.117)	3.545*** (1.125)	3.937*** (1.122)	2.549** (1.060)	3.094*** (1.056)	3.142*** (1.066)	3.473*** (1.062)
15	1.932* (1.227)	2.527** (1.217)	2.949** (1.218)	3.230*** (1.212)	1.316 (1.137)	1.834* (1.132)	2.224** (1.135)	2.469** (1.132)

- Age (Age): Age has very small negative effects on the reported physical and mental health of child, the effect being almost double for the latter. Other things same, a child one year elder to similar other children is likely to have about 0.4% (and 0.7%) less chance of having very good or excellent physical (and mental) health respectively. To put it differently, a 13 year old child is likely to have 4% (and 7%) less chance of having the *Very Good/Excellent* physical (and mental) health status than a 3 year old child. The negative effect of age might suggest that the child is exposed to more health shocks as he or she ages. Also, the negative age effects are relatively larger for female, *Black* and low income groups for both physical and mental health and for *Sample 2* for mental health.
- Sex (Female): Relative to a male child, a female child is likely to have slightly higher - 1% (and 2%) greater chance of having very good or excellent physical (and mental) health status. The relatively higher positive impacts on mental health than on physical health holds across *Sample 2* and all subgroups, and are strongest for *Sample 2*, the upper two age-groups, *Black* and low income groups. Understanding gender differential in health is complex as it is determined by several factors – biological (evolutionary and genetic included), behavioral, cultural, nutritional and others. For instance, many cultures (such as in South Asia) attribute higher values to boys, and discriminate against girls. On the other hand, some believe that girls are genetically superior to boys in certain ways. Buckberry et al (2014) argue that boys and girls differ in terms of growth and development in utero which places males at increased risk when in suboptimal

conditions. Also, some surveys reveal that boys are less likely to eat healthy food than girls[26].

- Birth Order (Brthrd): A first-born child is likely to have 2% greater chance of having the *Very Good/Excellent* physical health. The effect is slightly smaller (1.4%) for mental health. The benefits of having first born on both physical and mental health are relatively greater on female, the bottom age-group, *Black*, *Hispanic* and low income groups. Although the exact reason for this variation is not fully known, a number of theories exist explaining why the first born children tend to be healthier (and smarter, or at least test better) than the latter born. For instance, Behram (1988) believes that parental preferences have productivity-equity tradeoffs and favor their first born children, particularly in hard times. Horton (1988) on the other hand believes that parents do not discriminate among children of different birth orders when deciding on the allocation of current resources, but they are unable to allocate resources over time in such a way as to offset the inevitable advantages accruing to children in earlier birth orders who are born when per capita resources (both financial and parental attention) are greater. However, the possibility that parents may have more resources and acquire more effective childrearing and parenting skills with more children cannot be ignored.
- Number of Children (Chldrn): Number of children in the household is largely an insignificant factor in *Sample 1* and its subgroups. However in *Sample 2* with single mother, this factor is highly significant in the mental health equations, and indicates that every additional child in the household results into about 1.3%

[26] http://news.bbc.co.uk/2/hi/health/4606393.stm

decline in the probability that the mental health of the child is *Very Good/Excellent*. The insignificance of this variable in the main *Sample 1* (and the subgroups) may be due to simultaneous contributions of some positive factors (such as increased parental experience and possibility of sharing of some inputs among the children), and some negative factors (reduced share of necessary inputs available to each child and exposure to more health shocks such as due to some contagious diseases) as the number of children increases. If this is the case, the negative effects may have overshadowed the positive effects in *Sample 2*.

- Child Less Than 5 Years at Home (Child_5): Presence of a child less than 5 years at home is insignificant for physical health, but is marginally significant for mental health at 0.1 level in the main *Sample 1*, and results into about 1.3% greater chance that a child has *Very Good/Excellent* health. These effects on mental health are significant and slightly larger for male, middle age-group and *White*. The marginal contribution of this factor may be due to the increased likelihood of more parental time and care at home in the families with a child less than 5 years of age.
- Child's Race (Race): In *Sample 1*, *Hispanic* children are likely to have about 5% (and 3%) less chance of having *Very Good/Excellent* physical (and mental) health than the *White* counterparts; whereas *Blacks* have about 3% (and 2%) lower chances than *Whites*. The effects on *Other* race are slightly smaller, about 2% lower than *White* for physical health, and insignificant for mental health. The effects on *Hispanic* are slightly smaller for physical health in *Sample 2*, whereas

effects on *Other* race are insignificant. The racial effects are slightly stronger in equation (I), where income and insurance are not held constant, than in the full equation (IV), which may be due to the fact that *Hispanic* followed by *Black* has somewhat inferior income and insurance status compared to *White* in the sample. Also, the negative effects of *Black* are largest for the top age-group and the high income groups, whereas the negative effects of *Hispanic* are largest for the lowest two age-groups and the low income groups.

- Living in MSA (MSA): Relative to living in non-MSA, living in MSA is associated to about additional 1.8% (and 2.3%) chance of having *Very Good/Excellent* physical (and mental) health status. The MSA effects are slightly higher for *Sample 2*. Also, the marginally stronger effects in equation (I) than in equation (IV) might imply that there are some positive benefits of living in MSAs in terms of higher income and better health insurance through job. The positive MSA effects are somewhat greater for the male and the upper two age-groups, and particularly high for *Black* and low income groups.
- Region of Residence (Region): The regional effects on child health are mixed. In the main *Sample 1*, compared to living in North-East region, living in Mid-West and South are associated to about 2% lower probability of having *Very Good/Excellent* physical health of child. For mental health, the effects are about 3% lower in Mid-West but insignificant in the South. Living in the West does not seem to have statistically significant effects on child health. Across the subgroups of *Sample 1*, MW has very strong negative effects on Hispanic, followed by low income groups and upper two age-groups. South has stronger

negative impacts on male and low income groups on the physical health and on *Hispanic* on both physical and mental health. West has some negative impacts on the top age-group on mental health but has some positive effects on 'Other' race on physical health. The picture in *Sample 2* is somewhat different, where West and South have some (2% - 4%) greater probabilities relative to North-East, and Mid-West effects are insignificant. Exploring the cause for these small regional impacts is beyond the scope of this study. However these findings are partly consistent with the findings of Shea et al (2008), which note that there is wide variation in children's access to care and health care quality across the United States, and the states in the South by and large have inferior outcomes than the states in the North-East.

- Parental Health (MoHlth and FaHlth): Both mother's and father's health have some positive effects on child's physical and mental health. Mothers have slightly greater effects than fathers, and the effects are almost identical for both physical and mental health. For instance, a 10 points increase in the health index of mother results into about 4% higher probability that the child is in best physical and mental health status, and similar effects of father is about 2%. The effects of mother's health in *Sample 2* are marginally higher, about 5-6%. Across the subgroups, the positive impacts of both mother's and father's health are by and large stronger for the top followed by the middle age-groups, *Hispanic*, and low income groups.
- Parental Smoking (Msmok and Fsmok): Parental smoking does not seem to have a significant effect on child health in both *Sample 1* and *Sample 2*. Across the

subgroups of *Sample 1*, father's smoking has about 1-2% negative effects on both physical and mental health of child in the high income group; mother's smoking seems to have some small (1.5% lower probability) and marginally significant negative effects on the mental health of *White*; and father's smoking seems to have similar negative effects on physical health of *White* and *Other* races. Also, it should be noted that the inclusion of parental smoking habits in the equations informs us that any observed non-monetary effects of parental schooling on child health may include factors such as healthy habits, but not related to smoking, that the parents may exercise at home.

- Panel Number (Panel): Relative to panel 6, children in the last five panels (11-15) have higher chance of reporting *Very Good/Excellent* physical and mental health than the earlier panels. The effects are highest (6% and 4% in physical and mental health) for panel 12. To understand the real cause for this time effect is beyond the scope of this study. I suspect that some of these effects in the latter years can be attributed to increased access to and use of health care resources including shots and vaccines, better technology, increased information, and more time spent at home by many parents who lost jobs (or work hours) during the last recession. More interestingly, the health enhancing effects associated to a given panel gets stronger with successive inclusion of parental income and child's health insurance. This may mean that passage of time has positive effects on health; but that negative effects of lower income and lower share of private health insurance creep in as time passes (which is consistent with the correlation table in Appendix 1). In other words, the suppressed negative effects of lower income

and lower share of private health insurance may have released when these are included in the equations. Also, these time effects are typically greater for *Blacks* and *Hispanics*, but are largely mixed for other subgroups.

CHAPTER 6. CONCLUSION

6.1 General Findings and Implications

This study applies bivariate probit models to the Medical Expenditure Panel Survey data set to explore the effects of parental schooling on the physical and mental health of child and the underlying mechanism of the transmission of these beneficial effects. The major sample (*Sample 1*) includes 31,756 children with both parents present and the second sample (*Sample 2*) includes 13,524 children with single mothers. A typical child in the first sample has about 84% (and 86%) probability to have *Very Good/Excellent* physical (and mental) health. Similar probabilities in the second sample are about 6 percentage point less. Across the subgroups of *Sample 1*, the top followed by the middle age-group children, *Hispanics* followed by *Blacks*, and the children from lower income families have greater probabilities of having *Poor/Fair/Good* physical or mental health.

Using the perceived physical and mental health status of child as the outcome variable, the results in the *Sample 1* indicate that (a) benefits of parental schooling increases with levels of parental schooling; (b) mother's schooling has greater impacts than father's; and (c) the impacts of parental schooling on physical health of child is slightly larger than on mental health. For instance, relative to having *No Degree* at all, mother's having an *HSD/GED* (and *College Degree*) increases the probability that the reported physical health status of her child is *Very Good/Excellent* as opposed to *Poor/Fair/Good* by about 5.2% (and 8.6%) in terms of non-monetary effects where parental income and child's health insurance type are already controlled for. Similar probabilities for father's schooling are about 3.6% (and 5.6%) respectively. For mental

health, these probabilities are about 4.6% and 7.1% for mother's schooling, and 2.5% and 3.6% for father's schooling respectively. The total effects of parental schooling are about 2 percentage points higher than these non-monetary effects, implying that the combined contribution of the monetary-effects of income and health insurance attributable to parental schooling in raising the probability that the child health is *Very Good/Excellent* as opposed to *Poor/Fair/Good* is about 2%.

About one-fifth of the total effects of parental schooling are thus monetary in origin, and transmit through the channels of increased parental income and access to better health insurance attributable to higher level of parental schooling. Most of the effects (about four-fifths) are non-monetary in nature and stem from the higher level of parental schooling, possibly working through better access to and use of relevant health care information, better allocation of health care inputs, and thereby increased efficiency and health productivity.

The results in *Sample 2* also suggest similar beneficial effects of mother's schooling, with marginally greater impacts on mental health than on physical health. Similar beneficial effects of parental schooling can be observed across most of the subgroups with varying degree. For instance, mother's effects seem to be somewhat larger on male child than on female. Both mother's and father's effects are largest for the top age-group children. The effects of parental schooling on child health are particularly highest for the *Hispanic*, followed by *Black* and *White* (the effects on the *Other* race are largely insignificant). Similarly, the effects on the low income families are larger than on high income families. These all indicate that the subgroups with relatively

inferior health of child (and thus warrant greater support in relative sense) have by and large greater potential to benefit from parental schooling in the long run.

Controlling for parental schooling and other factors, the contributions of parental income on child health is negligible, whereas having a private health insurance as opposed to having only a public health insurance seems clearly favorable. Among other regressors, being a young child; being a female; being a first-born; living in MSA; having healthier parents (particularly mother); and belonging to the more recent panels have some contributing effects on both physical and mental health of child.

Despite substantial differences in the methodology and contexts, the findings of this study are somewhat similar to comparable studies. For instance, the findings that non-monetary factors attributable to the parental schooling play a bigger role than the monetary factors and that the mother's effects are bigger than the father's are largely consistent with the findings of Caldwell et al (1982), Thomas et al (1991), Basu et al (2005), and Aslam et al (2012) in the context of the developing countries.

To my knowledge, this study is unique in that it analyzes the possible mechanisms by which parental schooling may bring about beneficial effects on overall child health – both physical and mental, using the recent data in the U.S. context. Also, the use of a bivariate probit model as opposed to separate probit models to account for the likely correlation between the background factors influencing the two dependent variables, and the inclusion of parental health to address potential econometric issues are some strengths of this study. Understanding of the beneficial effects of parental schooling and the underlying mechanisms can be useful to the policy makers in formulating more comprehensive and effective health and education policies for the

future, given the limited resources. In particular, the findings that the non-monetary (intangible) effects of parental schooling are even more important than the monetary effects, and that mother's effects are greater than father's, can have significant efficiency implications. Also, the observations that *Hispanic* followed by *Black* children have relatively inferior health, but have greater potential to benefit from parental schooling in the same order, can be useful information to be incorporated in the future policies. For instance, differential supports such as education subsidies to the needed social strata can thus be justified on economic grounds. It should not be ignored however that the beneficial effects in the form of better child health are only a part of the total benefits of parental schooling (there are health and other benefits that accrue to the parents themselves and the society as a whole in the form of positive externalities), which makes the investment in education even more important.

6.2 Limitations and Moving Ahead

This study has several limitations. First, it considers only the parents-rated child health outcomes as the dependent variables and ignores other possible measures such as outcomes measured clinically by the health care professionals. If possible, it would be a good idea to have measures that incorporate both the parental perceptions as well as clinical measures for more reliable results, both of which are beyond the scope of this study.

Second, I consider only formal schooling of the parents. This assumes that schooling is a homogeneous attribute in terms their effects on child health, which is surely not the case. For instance, parents in health care professions would probably have greater impacts of their schooling on the health of their children than those in other

professions. Even among the parents not in health care area, the impacts of their schooling would still be diverse based on their personal inclinations and skills.

Third, the study presumes that the more important non-monetary effects of parental schooling operate through better access to and use of relevant health care information and the resulting efficiency in the allocation of health care inputs. Due to lack of relevant variables pertaining to the acquisition of information and the complexity involved in this process, the study is unable to delineate the exact mechanism by which this non-monetary channel operates.

Fourth, the data set lacks many relevant explanatory variables such as the health endowment of child, family background, and parental tastes and their innate ability. The presence of these variables could enhance the results.

Fifth, it is beyond the scope of this study to analyze the mechanisms of the observed effects of various other factors included in the equations. For instance, the racial and geographical differences on child health as well as the favorable effects of time (benefits of being in the recent panels) are not explored here.

Lastly, the magnitudes of the beneficial effects of parental schooling as observed in this study pertain only to this specific data set for U.S. population. Clearly it cannot be generalized verbatim for other societies and contexts.

It might be useful to extend this analysis further by addressing some key limitations of this study. If possible, using a combined measure of child health for the dependent variable that incorporates both parental perceptions as well as clinical outcomes would be a good idea. If the factors related to the acquisition of relevant information (such as parental response to whether they are aware of a given set of child

health related information, and the different sources they would attribute to those information) are available, it would be possible to explore the mechanism of the working of the more important non-monetary channel. This might be useful to develop a simple and effective health care package which can be incorporated in the formal schooling as well as the general dissemination of information through popular media. Similarly, having information on health endowment of child (such as birth weight and general health at birth) and various exogenous health shocks experienced by the child after his/her birth could enhance the results. Data permitting, use of an appropriate instrument or studying identical twins could be another option to deal with the issue of health endowment as well as potential endogeneity caused by the genetic effects as discussed earlier. Lastly, extending this study further to other settings such as in other developing and developed countries would shed more light on these findings.

APPENDIX[27]

A.1: Correlation Coefficients Between the Variables Used in Sample 1 (Children with Both Parents)

	HLTH	MLTH	MoSch	FaSch	Pinc	EcoSt	Insur	Age	Female	Brthrd	Chldrn	Child_5
MLTH	0.64 (0.00)	1.00										
MoSch	0.21 (0.00)	0.17 (0.00)	1.00									
FaSch	0.20 (0.00)	0.16 (0.00)	0.65 (0.00)	1.00								
Pinc	0.16 (0.00)	0.14 (0.00)	0.41 (0.00)	0.41 (0.00)	1.00							
EcoSt	0.18 (0.00)	0.15 (0.00)	0.49 (0.00)	0.47 (0.00)	0.57 (0.00)	1.00						
Insur	-0.14 (0.00)	-0.11 (0.00)	-0.43 (0.00)	-0.42 (0.00)	-0.39 (0.00)	-0.48 (0.00)	1.00					
Age	-0.03 (0.00)	-0.11 (0.00)	-0.04 (0.00)	-0.02 (0.00)	0.05 (0.00)	0.08 (0.00)	-0.03 (0.00)	1.00				
Female	0.01 (0.05)	0.03 (0.00)	0.00 (0.49)	0.00 (0.74)	0.01 (0.08)	0.00 (0.86)	0.00 (0.76)	0.00 (0.98)	1.00			
Brthrd	0.03 (0.00)	-0.01 (0.31)	0.07 (0.00)	0.06 (0.00)	0.03 (0.00)	0.12 (0.00)	-0.07 (0.00)	0.37 (0.00)	0.00 (0.69)	1.00		
Chldrn	-0.05 (0.00)	-0.06 (0.00)	-0.20 (0.00)	-0.16 (0.00)	-0.12 (0.00)	-0.28 (0.00)	0.17 (0.00)	-0.02 (0.00)	0.00 (0.93)	-0.40 (0.00)	1.00	
Child_5	0.00 (0.54)	0.05 (0.00)	-0.06 (0.00)	-0.07 (0.00)	-0.12 (0.00)	-0.18 (0.00)	0.10 (0.00)	-0.63 (0.00)	0.01 (0.36)	-0.14 (0.00)	0.29 (0.00)	1.00
Race	-0.12 (0.00)	-0.08 (0.00)	-0.33 (0.00)	-0.33 (0.00)	-0.23 (0.00)	-0.28 (0.00)	0.28 (0.00)	-0.03 (0.00)	0.00 (0.48)	-0.04 (0.00)	0.07 (0.00)	0.10 (0.00)
MSA	0.03 (0.00)	0.04 (0.00)	0.02 (0.00)	0.04 (0.00)	0.06 (0.00)	0.05 (0.00)	0.00 (1.00)	-0.02 (0.00)	0.00 (0.72)	-0.01 (0.24)	-0.01 (0.21)	0.01 (0.12)
Region	-0.06 (0.00)	-0.05 (0.00)	-0.23 (0.00)	-0.22 (0.00)	-0.10 (0.00)	-0.15 (0.00)	0.16 (0.00)	0.00 (0.45)	-0.01 (0.08)	-0.03 (0.00)	0.06 (0.00)	0.04 (0.00)
MoHlth	0.14 (0.00)	0.17 (0.00)	0.09 (0.00)	0.10 (0.00)	0.11 (0.00)	0.13 (0.00)	-0.09 (0.00)	-0.02 (0.00)	0.01 (0.34)	0.01 (0.08)	-0.03 (0.00)	-0.01 (0.05)
FaHlth	0.11 (0.00)	0.14 (0.00)	0.05 (0.00)	0.06 (0.00)	0.11 (0.00)	0.10 (0.00)	-0.05 (0.00)	-0.03 (0.00)	0.00 (0.63)	0.00 (0.81)	-0.02 (0.00)	0.01 (0.24)
Msmok	-0.02 (0.00)	-0.04 (0.00)	-0.09 (0.00)	-0.08 (0.00)	-0.10 (0.00)	-0.07 (0.00)	0.04 (0.00)	0.05 (0.00)	0.00 (0.63)	0.02 (0.00)	-0.02 (0.00)	-0.06 (0.00)
Fsmok	-0.04 (0.00)	-0.05 (0.00)	-0.11 (0.00)	-0.15 (0.00)	-0.13 (0.00)	-0.13 (0.00)	0.09 (0.00)	0.01 (0.03)	0.00 (0.74)	0.01 (0.31)	0.00 (0.99)	-0.01 (0.32)
Panel	0.04 (0.00)	0.03 (0.00)	0.05 (0.00)	0.04 (0.00)	-0.08 (0.00)	-0.04 (0.00)	0.03 (0.00)	-0.01 (0.09)	0.00 (0.52)	0.01 (0.30)	-0.02 (0.00)	0.00 (0.41)

[27] One, two and three stars in the appendix tables imply statistical significance at 0.10, 0.05, and 0.01 levels respectively.

	Race	MSA	Region	MoHlth	FaHlth	Msmok	Fsmok	Panel
MSA	0.15 (0.00)	1.00						
Region	0.29 (0.00)	0.05 (0.00)	1.00					
MoHlth	0.00 (0.61)	0.05 (0.00)	-0.03 (0.00)	1.00				
FaHlth	0.01 (0.03)	0.00 (0.69)	-0.01 (0.29)	0.43 (0.00)	1.00			
Msmok	-0.15 (0.00)	-0.11 (0.00)	-0.09 (0.00)	-0.14 (0.00)	-0.08 (0.00)	1.00		
Fsmok	-0.06 (0.00)	-0.10 (0.00)	-0.05 (0.00)	-0.12 (0.00)	-0.10 (0.00)	0.42 (0.00)	1.00	
Panel	0.08 (0.00)	0.07 (0.00)	0.01 (0.02)	0.01 (0.29)	-0.01 (0.29)	-0.04 (0.00)	-0.05 (0.00)	1.00

A.2: Correlation Coefficients Between the Variables Used in Sample 2 (Children with Single Mother)

	HLTH	MLTH	MoSch	Minc	EcoSt	Insur	Age	Female	Brthrd	Chldrn	Child_5	Race
MLTH	0.58 (0.00)	1.00										
MoSch	0.09 (0.00)	0.08 (0.00)	1.00									
Minc	0.05 (0.00)	0.04 (0.00)	0.28 (0.00)	1.00								
EcoSt	0.09 (0.00)	0.08 (0.00)	0.35 (0.00)	0.29 (0.00)	1.00							
Insur	-0.07 (0.00)	-0.04 (0.00)	-0.27 (0.00)	-0.24 (0.00)	-0.35 (0.00)	1.00						
Age	-0.02 (0.00)	-0.13 (0.00)	0.09 (0.00)	0.17 (0.00)	0.13 (0.00)	-0.09 (0.00)	1.00					
Female	0.02 (0.08)	0.05 (0.00)	0.00 (0.66)	-0.01 (0.42)	-0.01 (0.32)	0.01 (0.35)	0.01 (0.47)	1.00				
Brthrd	0.02 (0.00)	-0.02 (0.07)	0.10 (0.00)	0.05 (0.00)	0.15 (0.00)	-0.06 (0.00)	0.37 (0.00)	0.00 (0.90)	1.00			
Chldrn	-0.05 (0.00)	-0.06 (0.00)	-0.20 (0.00)	-0.09 (0.00)	-0.27 (0.00)	0.12 (0.00)	-0.04 (0.00)	0.02 (0.01)	-0.45 (0.00)	1.00		
Child_5	0.01 (0.54)	0.07 (0.00)	-0.15 (0.00)	-0.17 (0.00)	-0.20 (0.00)	0.13 (0.00)	-0.60 (0.00)	0.01 (0.17)	-0.16 (0.00)	0.32 (0.00)	1.00	
Race	-0.04 (0.00)	0.01 (0.42)	-0.21 (0.00)	-0.10 (0.00)	-0.13 (0.00)	0.16 (0.00)	-0.05 (0.00)	0.01 (0.22)	-0.06 (0.00)	0.11 (0.00)	0.08 (0.00)	1.00
MSA	0.02 (0.00)	0.03 (0.00)	-0.01 (0.37)	0.01 (0.21)	0.08 (0.00)	-0.03 (0.00)	0.01 (0.11)	0.00 (0.70)	0.00 (0.94)	0.01 (0.16)	0.00 (0.64)	0.14 (0.00)
Region	0.01 (0.16)	0.03 (0.00)	-0.08 (0.00)	-0.01 (0.27)	-0.02 (0.02)	0.07 (0.00)	-0.01 (0.09)	0.00 (0.89)	-0.01 (0.15)	0.02 (0.06)	0.01 (0.34)	0.14 (0.00)
MoHlth	0.15 (0.00)	0.21 (0.00)	0.06 (0.00)	0.03 (0.00)	0.11 (0.00)	-0.05 (0.00)	-0.06 (0.00)	0.00 (0.65)	0.01 (0.33)	-0.06 (0.00)	0.03 (0.00)	0.03 (0.00)
Msmok	-0.02 (0.03)	-0.06 (0.00)	-0.07 (0.00)	-0.05 (0.00)	-0.09 (0.00)	0.04 (0.00)	0.02 (0.00)	-0.01 (0.27)	0.00 (0.80)	0.03 (0.00)	0.01 (0.18)	-0.19 (0.00)
Panel	0.04 (0.00)	0.02 (0.00)	0.04 (0.00)	-0.06 (0.00)	-0.03 (0.00)	0.05 (0.00)	-0.02 (0.06)	-0.01 (0.27)	-0.01 (0.33)	-0.01 (0.11)	0.03 (0.00)	0.08 (0.00)

	MSA	Region	MoHlth	Msmok	Panel
Region	-0.06 (0.00)	1.00			
MoHlth	0.04 (0.00)	-0.01 (0.32)	1.00		
Msmok	-0.07 (0.00)	-0.10 (0.00)	-0.170 (0.00)	1.00	
Panel	0.05 (0.00)	-0.02 (0.01)	0.02 (0.05)	-0.06 (0.00)	1.00

A.3: Estimated Coefficients for *Sample 1* (N = 31,756)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	Biprob	0.254*** (0.034)	0.229*** (0.034)	0.226*** (0.034)	0.212*** (0.034)	0.250*** (0.037)	0.225*** (0.037)	0.223*** (0.037)	0.210*** (0.037)
	Prob	0.255*** (0.034)	0.230*** (0.034)	0.226*** (0.034)	0.213*** (0.034)	0.260*** (0.037)	0.235*** (0.037)	0.233*** (0.037)	0.220*** (0.037)
	Oprob	0.246*** (0.032)	0.220*** (0.032)	0.216*** (0.032)	0.202*** (0.032)	0.250*** (0.036)	0.226*** (0.035)	0.222*** (0.036)	0.209*** (0.036)
College Degree	Biprob	0.459*** (0.042)	0.410*** (0.043)	0.403*** (0.043)	0.376*** (0.043)	0.426*** (0.044)	0.379*** (0.045)	0.373*** (0.045)	0.347*** (0.045)
	Prob	0.472*** (0.042)	0.424*** (0.043)	0.416*** (0.043)	0.390*** (0.043)	0.451*** (0.045)	0.404*** (0.046)	0.398*** (0.046)	0.372*** (0.046)
	Oprob	0.460*** (0.041)	0.411*** (0.042)	0.400*** (0.042)	0.374*** (0.042)	0.436*** (0.045)	0.391*** (0.045)	0.381*** (0.045)	0.357*** (0.046)
FaSch (Base: No Degree)									
HSD/GED	Biprob	0.186*** (0.034)	0.170*** (0.034)	0.159*** (0.034)	0.152*** (0.034)	0.154*** (0.036)	0.138*** (0.036)	0.128*** (0.037)	0.121*** (0.037)
	Prob	0.187*** (0.034)	0.171*** (0.034)	0.161*** (0.034)	0.154*** (0.034)	0.158*** (0.037)	0.142*** (0.037)	0.133*** (0.037)	0.126*** (0.037)
	Oprob	0.173*** (0.033)	0.158*** (0.033)	0.146*** (0.033)	0.139*** (0.033)	0.134*** (0.036)	0.120*** (0.036)	0.109*** (0.036)	0.102*** (0.036)
College Degree	Biprob	0.327*** (0.043)	0.283*** (0.044)	0.273*** (0.044)	0.249*** (0.044)	0.252*** (0.046)	0.208*** (0.046)	0.200*** (0.047)	0.176*** (0.047)
	Prob	0.337*** (0.043)	0.293*** (0.044)	0.284*** (0.044)	0.260*** (0.044)	0.266*** (0.047)	0.225*** (0.047)	0.217*** (0.048)	0.194*** (0.048)
	Oprob	0.320*** (0.043)	0.276*** (0.043)	0.264*** (0.043)	0.241*** (0.044)	0.234*** (0.047)	0.194*** (0.047)	0.183*** (0.048)	0.162*** (0.048)
Pinc	Biprob		0.079*** (0.013)		0.062*** (0.013)		0.077*** (0.013)		0.061*** (0.012)
	Prob		0.079*** (0.013)		0.063*** (0.012)		0.075*** (0.012)		0.060*** (0.012)
	Oprob		0.079*** (0.012)		0.062*** (0.011)		0.072*** (0.011)		0.056*** (0.011)
Insur (Base: Any Private)									
Only Public	Biprob			-0.215*** (0.030)	-0.172*** (0.032)			-0.210*** (0.032)	-0.168*** (0.033)
	Prob			-0.213*** (0.030)	-0.170*** (0.031)			-0.204*** (0.033)	-0.163*** (0.034)
	Oprob			-0.221*** (0.029)	-0.178*** (0.030)			-0.209*** (0.032)	-0.171*** (0.033)
None	Biprob			-0.058 (0.043)	-0.033 (0.043)			-0.037 (0.045)	-0.012 (0.046)
	Prob			-0.063 (0.042)	-0.037 (0.043)			-0.032 (0.046)	-0.007 (0.047)
	Oprob			-0.075* (0.041)	-0.050 (0.041)			-0.042 (0.045)	-0.018 (0.045)
Age	Biprob	-0.014*** (0.003)	-0.014*** (0.003)	-0.016*** (0.003)	-0.016*** (0.003)	-0.032*** (0.003)	-0.032*** (0.003)	-0.034*** (0.003)	-0.034*** (0.003)
	Prob	-0.012*** (0.002)	-0.013*** (0.002)	-0.015*** (0.002)	-0.0154*** (0.002)	-0.031*** (0.003)	-0.031*** (0.003)	-0.033*** (0.003)	-0.034*** (0.003)
	Oprob	-0.011*** (0.002)	-0.012*** (0.002)	-0.014*** (0.002)	-0.014*** (0.002)	-0.031*** (0.003)	-0.032*** (0.003)	-0.034*** (0.003)	-0.034*** (0.003)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Female	Biprob	0.045*** (0.018)	0.043** (0.018)	0.047*** (0.018)	0.045*** (0.018)	0.101*** (0.018)	0.099*** (0.019)	0.103*** (0.019)	0.101*** (0.019)
	Prob	0.037** (0.017)	0.035** (0.017)	0.039** (0.017)	0.037** (0.018)	0.086*** (0.018)	0.084*** (0.018)	0.088*** (0.018)	0.086*** (0.018)
	Oprob	0.036** (0.017)	0.034** (0.017)	0.038** (0.017)	0.036** (0.017)	0.086*** (0.018)	0.084*** (0.018)	0.088*** (0.018)	0.086*** (0.019)
Brthrd	Biprob	0.079*** (0.020)	0.086*** (0.020)	0.082*** (0.020)	0.087*** (0.020)	0.065*** (0.021)	0.072*** (0.021)	0.068*** (0.021)	0.073*** (0.021)
	Prob	0.083*** (0.020)	0.090*** (0.020)	0.086*** (0.020)	0.092*** (0.020)	0.064*** (0.021)	0.071*** (0.021)	0.068*** (0.021)	0.073*** (0.021)
	Oprob	0.085*** (0.020)	0.092*** (0.020)	0.089*** (0.020)	0.094*** (0.020)	0.050** (0.021)	0.056*** (0.021)	0.053*** (0.021)	0.058*** (0.021)
Chldrn	Biprob	0.010 (0.012)	0.012 (0.012)	0.016 (0.012)	0.016 (0.012)	-0.020* (0.012)	-0.019 (0.012)	-0.015 (0.012)	-0.015 (0.012)
	Prob	0.009 (0.011)	0.011 (0.011)	0.016 (0.011)	0.016 (0.011)	-0.0209* (0.0123)	-0.0191 (0.0123)	-0.015 (0.012)	-0.0150 (0.0124)
	Oprob	0.009 (0.011)	0.011 (0.011)	0.015 (0.011)	0.015 (0.011)	-0.026** (0.013)	-0.024** (0.012)	-0.020* (0.013)	-0.020* (0.013)
Child_5	Biprob	-0.006 (0.033)	0.002 (0.033)	0.001 (0.033)	0.006 (0.033)	0.053 (0.035)	0.061* (0.035)	0.060* (0.035)	0.065* (0.035)
	Prob	-0.005 (0.033)	0.002 (0.033)	0.001 (0.033)	0.006 (0.033)	0.057* (0.035)	0.065* (0.035)	0.064* (0.035)	0.069** (0.035)
	Oprob	-0.003 (0.032)	0.004 (0.032)	0.003 (0.032)	0.008 (0.032)	0.067** (0.035)	0.074** (0.035)	0.073** (0.035)	0.078** (0.035)
Race (Base: White)									
Black	Biprob	-0.165*** (0.043)	-0.147*** (0.043)	-0.142*** (0.043)	-0.132*** (0.043)	-0.158*** (0.044)	-0.140*** (0.045)	-0.135*** (0.045)	-0.125*** (0.045)
	Prob	-0.176*** (0.043)	-0.158*** (0.044)	-0.153*** (0.044)	-0.143*** (0.044)	-0.169*** (0.046)	-0.151*** (0.046)	-0.146*** (0.046)	-0.135*** (0.046)
	Oprob	-0.165*** (0.042)	-0.148*** (0.042)	-0.141*** (0.043)	-0.132*** (0.043)	-0.150*** (0.045)	-0.133*** (0.045)	-0.126*** (0.045)	-0.117*** (0.045)
Hispanic	Biprob	-0.282*** (0.032)	-0.261*** (0.033)	-0.246*** (0.033)	-0.238*** (0.033)	-0.209*** (0.035)	-0.189*** (0.035)	-0.176*** (0.035)	-0.167*** (0.035)
	Prob	-0.294*** (0.032)	-0.273*** (0.033)	-0.257*** (0.033)	-0.248*** (0.033)	-0.222*** (0.035)	-0.203*** (0.035)	-0.191*** (0.036)	-0.182*** (0.036)
	Oprob	-0.282*** (0.031)	-0.261*** (0.032)	-0.244*** (0.032)	-0.235*** (0.032)	-0.203*** (0.035)	-0.184*** (0.035)	-0.171*** (0.035)	-0.163*** (0.035)
Other	Biprob	-0.117** (0.048)	-0.098** (0.048)	-0.104** (0.048)	-0.092* (0.049)	-0.069 (0.052)	-0.050 (0.052)	-0.057 (0.053)	-0.045 (0.053)
	Prob	-0.137*** (0.049)	-0.119*** (0.049)	-0.125*** (0.049)	-0.113** (0.049)	-0.087* (0.054)	-0.068 (0.054)	-0.076 (0.054)	-0.063 (0.055)
	Oprob	-0.132*** (0.048)	-0.114** (0.048)	-0.120** (0.048)	-0.108** (0.048)	-0.090* (0.053)	-0.072 (0.054)	-0.078 (0.054)	-0.066 (0.054)
MSA	Biprob	0.094*** (0.032)	0.084*** (0.033)	0.085*** (0.033)	0.078** (0.033)	0.129*** (0.034)	0.119*** (0.035)	0.120*** (0.035)	0.114*** (0.035)
	Prob	0.102*** (0.033)	0.092*** (0.033)	0.093*** (0.033)	0.086*** (0.033)	0.140*** (0.035)	0.131*** (0.035)	0.131*** (0.035)	0.125*** (0.035)
	Oprob	0.097*** (0.031)	0.086*** (0.031)	0.087*** (0.031)	0.080*** (0.031)	0.136*** (0.034)	0.127*** (0.034)	0.126*** (0.034)	0.120*** (0.034)
Region (Base: NE)									
MW	Biprob	-0.083** (0.043)	-0.088** (0.043)	-0.094** (0.043)	-0.096** (0.043)	-0.125*** (0.045)	-0.129*** (0.045)	-0.136*** (0.045)	-0.137*** (0.045)
	Prob	-0.074* (0.044)	-0.079* (0.044)	-0.085** (0.044)	-0.087** (0.044)	-0.115*** (0.046)	-0.119*** (0.046)	-0.126*** (0.046)	-0.127*** (0.047)
	Oprob	-0.058 (0.043)	-0.063 (0.043)	-0.069* (0.043)	-0.071* (0.043)	-0.094** (0.046)	-0.098** (0.046)	-0.105** (0.046)	-0.107** (0.046)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
S	Biprob	-0.083**	-0.079**	-0.081**	-0.078**	-0.045	-0.040	-0.043	-0.040
		(0.039)	(0.039)	(0.039)	(0.039)	(0.041)	(0.041)	(0.041)	(0.041)
	Prob	-0.077**	-0.073*	-0.075**	-0.073*	-0.043	-0.037	-0.041	-0.038
		(0.039)	(0.040)	(0.039)	(0.040)	(0.042)	(0.042)	(0.042)	(0.042)
	Oprob	-0.059	-0.054	-0.056	-0.053	-0.023	-0.018	-0.021	-0.018
		(0.039)	(0.039)	(0.039)	(0.039)	(0.042)	(0.042)	(0.042)	(0.042)
W	Biprob	0.008	0.000	0.004	-0.002	-0.043	-0.051	-0.047	-0.052
		(0.041)	(0.042)	(0.041)	(0.042)	(0.043)	(0.043)	(0.043)	(0.043)
	Prob	0.019	0.011	0.016	0.010	-0.032	-0.040	-0.035	-0.041
		(0.042)	(0.042)	(0.042)	(0.042)	(0.044)	(0.045)	(0.045)	(0.045)
	Oprob	0.023	0.014	0.019	0.013	-0.020	-0.028	-0.024	-0.029
		(0.041)	(0.041)	(0.041)	(0.041)	(0.044)	(0.044)	(0.044)	(0.044)
MoHlth	Biprob	0.016***	0.016***	0.016***	0.016***	0.020***	0.019***	0.019***	0.019***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	Prob	0.015***	0.015***	0.015***	0.015***	0.019***	0.018***	0.018***	0.018***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	Oprob	0.015***	0.015***	0.015***	0.015***	0.020***	0.019***	0.019***	0.019***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
FaHlth	Biprob	0.011***	0.010***	0.010***	0.010***	0.014***	0.013***	0.013***	0.012***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
	Prob	0.010***	0.010***	0.010***	0.009***	0.013***	0.012***	0.012***	0.012***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	Oprob	0.010***	0.009***	0.010***	0.009***	0.014***	0.013***	0.013***	0.012***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Msmok	Biprob	0.016	0.028	0.027	0.034	-0.041	-0.029	-0.030	-0.023
		(0.037)	(0.037)	(0.037)	(0.037)	(0.038)	(0.039)	(0.039)	(0.039)
	Prob	0.028	0.041	0.039	0.047	-0.030	-0.018	-0.020	-0.013
		(0.037)	(0.037)	(0.037)	(0.037)	(0.039)	(0.039)	(0.039)	(0.039)
	Oprob	0.023	0.036	0.035	0.043	-0.039	-0.028	-0.029	-0.022
		(0.036)	(0.036)	(0.036)	(0.036)	(0.038)	(0.039)	(0.039)	(0.039)
Fsmok	Biprob	-0.041	-0.034	-0.027	-0.024	-0.037	-0.031	-0.024	-0.021
		(0.031)	(0.031)	(0.032)	(0.032)	(0.034)	(0.034)	(0.034)	(0.034)
	Prob	-0.040	-0.033	-0.026	-0.023	-0.033	-0.027	-0.0209	-0.018
		(0.032)	(0.032)	(0.032)	(0.032)	(0.034)	(0.034)	(0.0350)	(0.035)
	Oprob	-0.050*	-0.043	-0.036	-0.033	-0.046	-0.040	-0.033	-0.030
		(0.031)	(0.031)	(0.031)	(0.031)	(0.034)	(0.034)	(0.034)	(0.034)
Panel (Base: 6)									
7	Biprob	-0.048	-0.041	-0.033	-0.030	-0.062	-0.056	-0.047	-0.044
		(0.048)	(0.048)	(0.048)	(0.048)	(0.052)	(0.052)	(0.052)	(0.052)
	Prob	-0.047	-0.040	-0.032	-0.029	-0.061	-0.055	-0.046	-0.043
		(0.049)	(0.049)	(0.049)	(0.049)	(0.054)	(0.054)	(0.054)	(0.054)
	Oprob	-0.040	-0.032	-0.025	-0.021	-0.054	-0.047	-0.038	-0.036
		(0.047)	(0.047)	(0.047)	(0.047)	(0.052)	(0.052)	(0.052)	(0.052)
8	Biprob	0.016	0.026	0.037	0.041	-0.016	-0.006	0.006	0.009
		(0.049)	(0.049)	(0.049)	(0.049)	(0.053)	(0.053)	(0.053)	(0.053)
	Prob	0.019	0.029	0.041	0.044	-0.009	-0.000	0.011	0.014
		(0.050)	(0.050)	(0.050)	(0.050)	(0.055)	(0.055)	(0.055)	(0.055)
	Oprob	0.020	0.030	0.042	0.046	-0.020	-0.011	0.001	0.005
		(0.048)	(0.048)	(0.048)	(0.048)	(0.053)	(0.053)	(0.054)	(0.054)
9	Biprob	-0.042	-0.033	-0.019	-0.016	-0.078	-0.069	-0.055	-0.052
		(0.048)	(0.048)	(0.048)	(0.048)	(0.051)	(0.051)	(0.051)	(0.051)
	Prob	-0.044	-0.035	-0.020	-0.018	-0.086*	-0.077	-0.062	-0.060
		(0.048)	(0.048)	(0.048)	(0.048)	(0.052)	(0.052)	(0.053)	(0.053)
	Oprob	-0.041	-0.032	-0.016	-0.013	-0.082*	-0.073	-0.058	-0.055
		(0.046)	(0.046)	(0.047)	(0.046)	(0.051)	(0.051)	(0.051)	(0.051)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
10	Biprob	-0.024 (0.048)	-0.012 (0.048)	0.003 (0.048)	0.008 (0.048)	-0.029 (0.052)	-0.017 (0.052)	-0.001 (0.052)	0.004 (0.052)
	Prob	-0.023 (0.048)	-0.011 (0.048)	0.004 (0.048)	0.009 (0.048)	-0.036 (0.053)	-0.023 (0.053)	-0.008 (0.053)	-0.003 (0.053)
	Oprob	-0.029 (0.046)	-0.016 (0.046)	-0.000 (0.046)	0.003 (0.046)	-0.032 (0.051)	-0.021 (0.051)	-0.005 (0.051)	0.000 (0.051)
11	Biprob	0.051 (0.050)	0.065 (0.051)	0.080 (0.050)	0.086* (0.051)	0.059 (0.054)	0.072 (0.054)	0.088* (0.055)	0.093* (0.055)
	Prob	0.045 (0.051)	0.059 (0.051)	0.075 (0.051)	0.080 (0.051)	0.052 (0.056)	0.065 (0.056)	0.081 (0.056)	0.086 (0.056)
	Oprob	0.044 (0.049)	0.057 (0.049)	0.074 (0.049)	0.079* (0.049)	0.049 (0.054)	0.061 (0.054)	0.079 (0.054)	0.083 (0.054)
12	Biprob	0.238*** (0.055)	0.260*** (0.056)	0.269*** (0.056)	0.281*** (0.056)	0.164*** (0.058)	0.186*** (0.059)	0.195*** (0.059)	0.207*** (0.059)
	Prob	0.240*** (0.057)	0.263*** (0.057)	0.272*** (0.057)	0.283*** (0.057)	0.154*** (0.060)	0.175*** (0.060)	0.185*** (0.060)	0.196*** (0.060)
	Oprob	0.221*** (0.055)	0.243*** (0.056)	0.253*** (0.056)	0.264*** (0.056)	0.127** (0.059)	0.147*** (0.059)	0.158*** (0.059)	0.168*** (0.060)
13	Biprob	0.125*** (0.049)	0.147*** (0.049)	0.156*** (0.049)	0.168*** (0.049)	0.085* (0.052)	0.106** (0.053)	0.116** (0.053)	0.127** (0.053)
	Prob	0.131*** (0.050)	0.153*** (0.050)	0.162*** (0.050)	0.174*** (0.050)	0.088* (0.054)	0.108** (0.054)	0.117** (0.054)	0.128*** (0.054)
	Oprob	0.126*** (0.048)	0.148*** (0.048)	0.158*** (0.048)	0.169*** (0.049)	0.077 (0.053)	0.097** (0.053)	0.107** (0.053)	0.118** (0.053)
14	Biprob	0.131*** (0.051)	0.161*** (0.052)	0.160*** (0.052)	0.179*** (0.052)	0.132** (0.056)	0.161*** (0.056)	0.162*** (0.056)	0.180*** (0.056)
	Prob	0.132*** (0.052)	0.162*** (0.052)	0.161*** (0.052)	0.180*** (0.052)	0.122** (0.057)	0.151*** (0.057)	0.152*** (0.057)	0.170*** (0.057)
	Oprob	0.113** (0.052)	0.143*** (0.052)	0.142*** (0.052)	0.161*** (0.052)	0.110** (0.057)	0.138** (0.057)	0.140*** (0.057)	0.157*** (0.057)
15	Biprob	0.086 (0.055)	0.113** (0.055)	0.132** (0.055)	0.144*** (0.055)	0.066 (0.058)	0.092* (0.058)	0.112** (0.058)	0.125** (0.058)
	Prob	0.083 (0.056)	0.110** (0.056)	0.129** (0.056)	0.141*** (0.056)	0.055 (0.059)	0.080 (0.059)	0.099* (0.060)	0.111* (0.060)
	Oprob	0.082 (0.054)	0.109** (0.054)	0.129** (0.054)	0.142*** (0.054)	0.047 (0.057)	0.071 (0.057)	0.092 (0.058)	0.103* (0.058)
Constant	Biprob	-0.665*** (0.112)	-1.495*** (0.179)	-0.504*** (0.114)	-1.191*** (0.180)	-0.646*** (0.118)	-1.458*** (0.177)	-0.488*** (0.120)	-1.157*** (0.181)
	Prob	-0.649*** (0.114)	-1.482*** (0.179)	-0.490*** (0.116)	-1.185*** (0.181)	-0.639*** (0.121)	-1.426*** (0.175)	-0.483*** (0.124)	-1.143*** (0.179)
	Oprob	-0.737 (0.111)	0.086 (0.167)	-0.909 (0.113)	-0.225 (0.168)	-0.690 (0.119)	0.059 (0.165)	-0.857 (0.121)	-0.240 (0.169)
μ	Oprob	0.638 (0.110)	1.468 (0.166)	0.473 (0.112)	1.159 (0.167)	0.646 (0.117)	1.399 (0.165)	0.484 (0.120)	1.104 (0.169)
Wald Chi-squared (df)	Biprob	1821.39 (58)	1875.48 (60)	1868.79 (62)	1907.14 (64)				
	Prob	1279.01 (29)	1320.10 (30)	1319.09 (31)	1349.50 (32)	1329.05 (25)	1376.49 (30)	1356.09 (31)	1389 (32)
	Oprob	1292.24 (29)	1344.62 (30)	1337.35 (31)	1377.48 (32)	1395.38 (29)	1451.21 (30)	1428.79 (31)	1466.05 (32)
Log pseudo likelihood	Biprob	-19822.61	-19775.81	-19767.53	-19741.18				
	Prob	-12786	-12744.26	-12740.00	-12716.06	-11570.64	-11536.06	-11530.50	-11510.4
	Oprob	-14155.52	-14111.10	-14104.34	-14079.28	-12769.58	-12735.87	-12726.22	-12707.44
Pseudo R2	Prob	0.089	0.093	0.093	0.095	0.0985	0.1012	0.1016	0.1032
	Oprob	0.080	0.083	0.083	0.085	0.0893	0.0917	0.0924	0.0937
ρ	Biprob	0.895 (0.005)	0.894 (0.005)	0.894 (0.005)	0.894 (0.005)				
χ2(1)		4016.02	3998.19	3987.31	3978.05				

A.4: Estimated Marginal Effects for *Sample 1*

(N = 31,756)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	Biprob	6.403*** (0.900)	5.683*** (0.889)	5.588*** (0.884)	5.210*** (0.877)	5.602*** (0.859)	4.971*** (0.843)	4.907*** (0.844)	4.577*** (0.834)
	Prob	6.490*** (0.909)	5.759*** (0.898)	5.658*** (0.893)	5.270*** (0.886)	5.855*** (0.882)	5.218*** (0.865)	5.151*** (0.865)	4.814*** (0.855)
	Oprob	6.251*** (0.868)	5.513*** (0.855)	5.384*** (0.850)	4.993*** (0.842)	5.617*** (0.844)	5.001*** (0.825)	4.887*** (0.826)	4.565*** (0.815)
College Degree	Biprob	10.560*** (0.996)	9.389*** (1.009)	9.214*** (1.000)	8.582*** (1.006)	8.777*** (0.939)	7.753*** (0.943)	7.631*** (0.945)	7.077*** (0.946)
	Prob	10.787*** (1.003)	9.632*** (1.014)	9.446*** (1.007)	8.819*** (1.012)	9.152*** (0.962)	8.156*** (0.964)	8.027*** (0.967)	7.483*** (0.967)
	Oprob	10.508*** (0.974)	9.346*** (0.982)	9.102*** (0.976)	8.476*** (0.979)	8.869*** (0.938)	7.906*** (0.936)	7.698*** (0.940)	7.181*** (0.938)
FaSch (Base: No Degree)									
HSD/GED	Biprob	4.517*** (0.850)	4.049*** (0.837)	3.794*** (0.839)	3.586*** (0.831)	3.289*** (0.795)	2.889*** (0.781)	2.687*** (0.785)	2.508*** (0.776)
	Prob	4.566*** (0.857)	4.115*** (0.843)	3.856*** (0.845)	3.656*** (0.836)	3.344*** (0.809)	2.972*** (0.794)	2.764*** (0.796)	2.598*** (0.786)
	Oprob	4.208*** (0.833)	3.782*** (0.818)	3.484*** (0.818)	3.302*** (0.809)	2.820*** (0.784)	2.481*** (0.768)	2.239*** (0.770)	2.094*** (0.760)
College Degree	Biprob	7.438*** (0.992)	6.417*** (1.000)	6.181*** (1.003)	5.640*** (1.006)	5.114*** (0.939)	4.223*** (0.944)	4.039*** (0.953)	3.566*** (0.954)
	Prob	7.600*** (0.996)	6.609*** (1.003)	6.368*** (1.006)	5.841*** (1.009)	5.302*** (0.948)	4.468*** (0.951)	4.290*** (0.959)	3.841*** (0.959)
	Oprob	7.210*** (0.983)	6.234*** (0.988)	5.932*** (0.989)	5.420*** (0.991)	4.648*** (0.940)	3.857*** (0.944)	3.611*** (0.952)	3.194*** (0.953)
Pinc	Biprob		1.770*** (0.298)		1.393*** (0.287)		1.546*** (0.253)		1.213*** (0.249)
	Prob		1.759*** (0.294)		1.397*** (0.283)		1.465*** (0.241)		1.167*** (0.236)
	Oprob		1.761*** (0.272)		1.387*** (0.259)		1.409*** (0.224)		1.101*** (0.220)
Insur (Base: Any Private)									
Only Public	Biprob			-4.944*** (0.710)	-3.939*** (0.733)			-4.316*** (0.670)	-3.441*** (0.685)
	Prob			-4.879*** (0.715)	-3.866*** (0.736)			-4.117*** (0.682)	-3.269*** (0.694)
	Oprob			-5.081*** (0.689)	-4.072*** (0.707)			-4.244*** (0.661)	-3.443*** (0.671)
None	Biprob			-1.237 (0.926)	-0.696 (0.929)			-0.703 (0.863)	-0.234 (0.863)
	Prob			-1.331 (0.923)	-0.785 (0.925)			-0.590 (0.860)	-0.142 (0.859)
	Oprob			-1.608* (0.905)	-1.064 (0.906)			-0.759 (0.840)	-0.339 (0.839)
Age	Biprob	-0.304*** (0.064)	-0.320*** (0.064)	-0.359*** (0.065)	-0.363*** (0.064)	-0.635*** (0.060)	-0.647*** (0.060)	-0.685*** (0.061)	-0.686*** (0.060)
	Prob	-0.283*** (0.064)	-0.300*** (0.064)	-0.337*** (0.064)	-0.342*** (0.064)	-0.609*** (0.060)	-0.622*** (0.059)	-0.658*** (0.060)	-0.660*** (0.060)
	Oprob	-0.265*** (0.063)	-0.282*** (0.063)	-0.321*** (0.063)	-0.325*** (0.063)	-0.607*** (0.059)	-0.619*** (0.059)	-0.656*** (0.059)	-0.658*** (0.059)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Female	Biprob	1.001***	0.961**	1.040***	1.003***	2.016***	1.978***	2.047***	2.013***
		(0.398)	(0.398)	(0.397)	(0.397)	(0.369)	(0.368)	(0.368)	(0.368)
	Prob	0.824**	0.782**	0.864**	0.824**	1.683***	1.643***	1.712***	1.676***
		(0.398)	(0.398)	(0.397)	(0.397)	(0.367)	(0.366)	(0.366)	(0.365)
	Oprob	0.812**	0.767**	0.850**	0.809**	1.688***	1.646***	1.715***	1.680***
		(0.390)	(0.390)	(0.389)	(0.389)	(0.361)	(0.361)	(0.361)	(0.360)
Brthrd	Biprob	1.758***	1.914***	1.827***	1.937***	1.290***	1.426***	1.352***	1.447***
		(0.454)	(0.455)	(0.454)	(0.454)	(0.419)	(0.419)	(0.418)	(0.418)
	Prob	1.844***	2.004***	1.918***	2.030***	1.263***	1.397***	1.327***	1.421***
		(0.452)	(0.453)	(0.452)	(0.452)	(0.409)	(0.409)	(0.408)	(0.408)
	Oprob	1.894***	2.057***	1.969***	2.082***	0.971**	1.101***	1.036***	1.126***
		(0.452)	(0.452)	(0.452)	(0.451)	(0.410)	(0.409)	(0.408)	(0.407)
Chldrn	Biprob	0.218	0.258	0.352	0.356	-0.411*	-0.376	-0.293	-0.289
		(0.259)	(0.258)	(0.260)	(0.259)	(0.244)	(0.243)	(0.244)	(0.243)
	Prob	0.217	0.259	0.355	0.359	-0.408*	-0.372	-0.296	-0.291
		(0.259)	(0.258)	(0.260)	(0.259)	(0.242)	(0.241)	(0.242)	(0.241)
	Oprob	0.203	0.247	0.346	0.352	-0.509**	-0.472**	-0.394*	-0.387*
		(0.263)	(0.261)	(0.263)	(0.262)	(0.247)	(0.245)	(0.246)	(0.245)
Child_5	Biprob	-0.140	0.050	0.028	0.143	1.055	1.220*	1.199*	1.300*
		(0.743)	(0.743)	(0.741)	(0.742)	(0.703)	(0.702)	(0.702)	(0.702)
	Prob	-0.126	0.057	0.032	0.144	1.124*	1.279*	1.253*	1.352**
		(0.749)	(0.749)	(0.747)	(0.747)	(0.696)	(0.696)	(0.695)	(0.695)
	Oprob	-0.079	0.100	0.079	0.189	1.306**	1.455**	1.431**	1.525**
		(0.731)	(0.731)	(0.729)	(0.730)	(0.681)	(0.681)	(0.679)	(0.679)
Race (Base: White)									
Black	Biprob	-3.544***	-3.151***	-3.052***	-2.828***	-3.088***	-2.734***	-2.641***	-2.438***
		(0.965)	(0.963)	(0.968)	(0.966)	(0.912)	(0.910)	(0.916)	(0.913)
	Prob	-3.718***	-3.335***	-3.235***	-3.015***	-3.221***	-2.880***	-2.776***	-2.577***
		(0.981)	(0.979)	(0.984)	(0.982)	(0.935)	(0.933)	(0.938)	(0.935)
	Oprob	-3.500***	-3.124***	-3.002***	-2.789***	-2.862***	-2.539***	-2.405***	-2.224***
		(0.949)	(0.948)	(0.954)	(0.952)	(0.903)	(0.901)	(0.906)	(0.903)
Hispanic	Biprob	-6.389***	-5.899***	-5.551***	-5.350***	-4.199***	-3.779***	-3.517***	-3.344***
		(0.748)	(0.746)	(0.753)	(0.752)	(0.708)	(0.709)	(0.715)	(0.715)
	Prob	-6.598***	-6.111***	-5.751***	-5.552***	-4.375***	-3.981***	-3.735***	-3.569***
		(0.754)	(0.753)	(0.759)	(0.758)	(0.715)	(0.715)	(0.720)	(0.720)
	Oprob	-6.358***	-5.870***	-5.466***	-5.268***	-4.008***	-3.630***	-3.343***	-3.186***
		(0.730)	(0.728)	(0.733)	(0.732)	(0.694)	(0.693)	(0.697)	(0.697)
Other	Biprob	-2.437**	-2.046**	-2.196**	-1.939*	-1.281	-0.933	-1.069	-0.842
		(1.046)	(1.046)	(1.055)	(1.053)	(1.001)	(0.998)	(1.013)	(1.009)
	Prob	-2.831***	-2.448**	-2.604**	-2.348**	-1.581	-1.236	-1.387	-1.153
		(1.063)	(1.064)	(1.074)	(1.072)	(1.019)	(1.016)	(1.031)	(1.026)
	Oprob	-2.753***	-2.374**	-2.512**	-2.261**	-1.648*	-1.314	-1.442	-1.220
		(1.047)	(1.050)	(1.058)	(1.058)	(1.023)	(1.020)	(1.037)	(1.032)
MSA	Biprob	2.176***	1.926***	1.946***	1.788**	2.699***	2.478***	2.488***	2.349***
		(0.769)	(0.764)	(0.765)	(0.761)	(0.750)	(0.745)	(0.747)	(0.744)
	Prob	2.375***	2.125***	2.139***	1.982**	2.912***	2.701***	2.700***	2.567***
		(0.790)	(0.784)	(0.785)	(0.780)	(0.769)	(0.764)	(0.765)	(0.762)
	Oprob	2.239***	1.986***	1.996***	1.839**	2.810***	2.603***	2.590***	2.461***
		(0.748)	(0.743)	(0.743)	(0.739)	(0.737)	(0.732)	(0.733)	(0.730)
Region (Base: NE)									
MW	Biprob	-1.860**	-1.956**	-2.112**	-2.140**	-2.525***	-2.595***	-2.749***	-2.765***
		(0.955)	(0.957)	(0.956)	(0.957)	(0.894)	(0.895)	(0.896)	(0.897)
	Prob	-1.667*	-1.758*	-1.906**	-1.932**	-2.283***	-2.357***	-2.498***	-2.518***
		(0.976)	(0.978)	(0.977)	(0.978)	(0.913)	(0.915)	(0.915)	(0.916)
	Oprob	-1.319	-1.413	-1.559*	-1.588*	-1.883**	-1.959**	-2.102**	-2.124**
		(0.965)	(0.967)	(0.966)	(0.967)	(0.907)	(0.910)	(0.909)	(0.910)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
S	Biprob	-1.854**	-1.747**	-1.792**	-1.735**	-0.874	-0.765	-0.838	-0.777
		(0.857)	(0.857)	(0.854)	(0.854)	(0.786)	(0.784)	(0.783)	(0.782)
	Prob	-1.730**	-1.618*	-1.673**	-1.609*	-0.817	-0.712	-0.784	-0.725
		(0.868)	(0.868)	(0.864)	(0.865)	(0.795)	(0.793)	(0.790)	(0.790)
	Oprob	-1.328	-1.207	-1.252	-1.183	-0.440	-0.335	-0.397	-0.337
		(0.859)	(0.860)	(0.857)	(0.858)	(0.792)	(0.791)	(0.788)	(0.787)
W	Biprob	0.181	-0.008	0.095	-0.036	-0.836	-0.990	-0.903	-1.011
		(0.887)	(0.890)	(0.885)	(0.888)	(0.831)	(0.834)	(0.830)	(0.832)
	Prob	0.420	0.240	0.344	0.218	-0.609	-0.755	-0.664	-0.770
		(0.893)	(0.897)	(0.891)	(0.894)	(0.839)	(0.843)	(0.836)	(0.839)
	Oprob	0.495	0.310	0.422	0.292	-0.390	-0.536	-0.448	-0.551
		(0.890)	(0.894)	(0.888)	(0.891)	(0.837)	(0.841)	(0.834)	(0.837)
MoHlth	Biprob	0.367***	0.360***	0.354***	0.351***	0.391***	0.385***	0.379***	0.376***
		(0.032)	(0.032)	(0.032)	(0.032)	(0.029)	(0.029)	(0.029)	(0.029)
	Prob	0.352***	0.345***	0.338***	0.336***	0.374***	0.367***	0.361***	0.359***
		(0.032)	(0.032)	(0.032)	(0.032)	(0.030)	(0.030)	(0.030)	(0.030)
	Oprob	0.355***	0.348***	0.341***	0.338***	0.386***	0.380***	0.373***	0.371***
		(0.031)	(0.031)	(0.031)	(0.031)	(0.029)	(0.029)	(0.029)	(0.029)
FaHlth	Biprob	0.247***	0.227***	0.232***	0.219***	0.274***	0.256***	0.260***	0.248***
		(0.035)	(0.035)	(0.035)	(0.035)	(0.032)	(0.033)	(0.032)	(0.032)
	Prob	0.242***	0.222***	0.227***	0.214***	0.264***	0.247***	0.250***	0.239***
		(0.035)	(0.035)	(0.035)	(0.035)	(0.033)	(0.033)	(0.032)	(0.032)
	Oprob	0.238***	0.218***	0.222***	0.209***	0.268***	0.251***	0.253***	0.243***
		(0.034)	(0.034)	(0.034)	(0.034)	(0.031)	(0.032)	(0.031)	(0.031)
Msmok	Biprob	0.357	0.616	0.590	0.749	-0.825	-0.589	-0.615	-0.471
		(0.814)	(0.807)	(0.810)	(0.805)	(0.792)	(0.785)	(0.788)	(0.783)
	Prob	0.631	0.899	0.860	1.028	-0.606	-0.369	-0.411	-0.260
		(0.820)	(0.812)	(0.814)	(0.808)	(0.795)	(0.787)	(0.789)	(0.784)
	Oprob	0.528	0.809	0.768	0.943	-0.786	-0.547	-0.583	-0.433
		(0.793)	(0.785)	(0.786)	(0.781)	(0.780)	(0.772)	(0.774)	(0.769)
Fsmok	Biprob	-0.933	-0.764	-0.602	-0.531	-0.759	-0.615	-0.475	-0.416
		(0.721)	(0.715)	(0.716)	(0.712)	(0.688)	(0.683)	(0.685)	(0.682)
	Prob	-0.908	-0.742	-0.587	-0.517	-0.667	-0.542	-0.409	-0.357
		(0.730)	(0.725)	(0.725)	(0.721)	(0.696)	(0.690)	(0.690)	(0.687)
	Oprob	-1.139*	-0.978	-0.812	-0.745	-0.907	-0.789	-0.644	-0.597
		(0.719)	(0.713)	(0.713)	(0.709)	(0.687)	(0.682)	(0.682)	(0.679)
Panel (Base: 6)									
7	Biprob	-1.149	-0.981	-0.798	-0.728	-1.323	-1.187	-1.009	-0.955
		(1.159)	(1.164)	(1.169)	(1.171)	(1.111)	(1.119)	(1.125)	(1.129)
	Prob	-1.140	-0.973	-0.781	-0.713	-1.277	-1.153	-0.974	-0.927
		(1.181)	(1.190)	(1.196)	(1.200)	(1.129)	(1.140)	(1.145)	(1.151)
	Oprob	-0.972	-0.781	-0.603	-0.517	-1.112	-0.977	-0.805	-0.748
		(1.124)	(1.132)	(1.139)	(1.143)	(1.070)	(1.079)	(1.087)	(1.090)
8	Biprob	0.373	0.599	0.870	0.959	-0.321	-0.131	0.123	0.197
		(1.140)	(1.145)	(1.148)	(1.151)	(1.101)	(1.105)	(1.111)	(1.113)
	Prob	0.451	0.676	0.961	1.048	-0.196	-0.017	0.234	0.303
		(1.163)	(1.172)	(1.175)	(1.180)	(1.116)	(1.123)	(1.128)	(1.132)
	Oprob	0.470	0.697	0.999	1.085	-0.406	-0.235	0.029	0.094
		(1.119)	(1.127)	(1.131)	(1.136)	(1.085)	(1.092)	(1.098)	(1.101)
9	Biprob	-1.004	-0.788	-0.451	-0.379	-1.669	-1.482	-1.174	-1.112
		(1.151)	(1.154)	(1.159)	(1.160)	(1.100)	(1.104)	(1.110)	(1.111)
	Prob	-1.063	-0.858	-0.500	-0.437	-1.820*	-1.654	-1.334	-1.285
		(1.171)	(1.178)	(1.182)	(1.185)	(1.124)	(1.130)	(1.134)	(1.137)
	Oprob	-0.986	-0.770	-0.406	-0.335	-1.722*	-1.556	-1.231	-1.179
		(1.120)	(1.127)	(1.131)	(1.135)	(1.069)	(1.075)	(1.081)	(1.083)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
10	Biprob	-0.572	-0.277	0.081	0.200	-0.606	-0.350	-0.025	0.081
		(1.137)	(1.139)	(1.145)	(1.146)	(1.080)	(1.082)	(1.090)	(1.091)
	Prob	-0.555	-0.266	0.101	0.215	-0.738	-0.492	-0.183	-0.078
		(1.151)	(1.156)	(1.162)	(1.164)	(1.091)	(1.096)	(1.103)	(1.104)
	Oprob	-0.689	-0.401	-0.020	0.093	-0.661	-0.425	-0.103	-0.003
		(1.108)	(1.114)	(1.118)	(1.121)	(1.038)	(1.042)	(1.050)	(1.051)
11	Biprob	1.168	1.484	1.834*	1.965*	1.177	1.443	1.773*	1.881*
		(1.147)	(1.151)	(1.150)	(1.153)	(1.078)	(1.081)	(1.087)	(1.088)
	Prob	1.047	1.360	1.724	1.849	1.021	1.274	1.594	1.697
		(1.161)	(1.166)	(1.166)	(1.170)	(1.086)	(1.091)	(1.094)	(1.097)
	Oprob	1.010	1.318	1.708	1.828*	0.956	1.200	1.540	1.637
		(1.116)	(1.122)	(1.121)	(1.125)	(1.045)	(1.049)	(1.052)	(1.055)
12	Biprob	4.981***	5.453***	5.667***	5.909***	3.101***	3.512***	3.722***	3.930***
		(1.119)	(1.121)	(1.126)	(1.127)	(1.080)	(1.081)	(1.087)	(1.087)
	Prob	4.927***	5.392***	5.605***	5.842***	2.826***	3.216***	3.418***	3.615***
		(1.121)	(1.124)	(1.129)	(1.130)	(1.079)	(1.081)	(1.086)	(1.087)
	Oprob	4.576***	5.041***	5.274***	5.510***	2.356**	2.728**	2.959***	3.144***
		(1.109)	(1.112)	(1.117)	(1.118)	(1.075)	(1.077)	(1.082)	(1.083)
13	Biprob	2.764***	3.243***	3.466***	3.716***	1.675*	2.090**	2.298**	2.515**
		(1.074)	(1.078)	(1.083)	(1.085)	(1.027)	(1.029)	(1.038)	(1.038)
	Prob	2.865***	3.341***	3.558***	3.809***	1.677	2.069**	2.260**	2.469**
		(1.081)	(1.087)	(1.093)	(1.095)	(1.030)	(1.034)	(1.042)	(1.043)
	Oprob	2.761***	3.235***	3.473***	3.720***	1.482	1.854*	2.071**	2.265**
		(1.048)	(1.055)	(1.060)	(1.062)	(1.003)	(1.006)	(1.014)	(1.015)
14	Biprob	2.894***	3.533***	3.545***	3.937***	2.549**	3.094***	3.142***	3.473***
		(1.118)	(1.117)	(1.125)	(1.122)	(1.060)	(1.056)	(1.066)	(1.062)
	Prob	2.879***	3.523***	3.531***	3.928***	2.290**	2.814***	2.857***	3.181***
		(1.124)	(1.122)	(1.131)	(1.128)	(1.057)	(1.053)	(1.063)	(1.059)
	Oprob	2.490**	3.146***	3.158***	3.562***	2.069**	2.576**	2.643***	2.951***
		(1.138)	(1.131)	(1.143)	(1.135)	(1.058)	(1.051)	(1.063)	(1.056)
15	Biprob	1.932*	2.527**	2.949**	3.230***	1.316	1.834*	2.224**	2.469**
		(1.227)	(1.217)	(1.218)	(1.212)	(1.137)	(1.132)	(1.135)	(1.132)
	Prob	1.861	2.458**	2.876**	3.160***	1.075	1.555	1.933*	2.159*
		(1.238)	(1.228)	(1.228)	(1.223)	(1.152)	(1.146)	(1.147)	(1.143)
	Oprob	1.837	2.446**	2.891**	3.179***	0.908	1.374	1.789*	2.005*
		(1.192)	(1.183)	(1.183)	(1.178)	(1.111)	(1.105)	(1.104)	(1.101)

A.5: Estimated Coefficients for Sample 2

(N = 13,524)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	Biprob	0.180*** (0.038)	0.166*** (0.039)	0.158*** (0.039)	0.150*** (0.039)	0.238*** (0.042)	0.221*** (0.042)	0.223*** (0.042)	0.211*** (0.042)
	Prob	0.184*** (0.038)	0.170*** (0.039)	0.161*** (0.038)	0.153*** (0.039)	0.244*** (0.042)	0.226*** (0.043)	0.227*** (0.042)	0.215*** (0.043)
	Oprob	0.185*** (0.036)	0.169*** (0.037)	0.162*** (0.037)	0.153*** (0.037)	0.239*** (0.040)	0.222*** (0.040)	0.220*** (0.040)	0.208*** (0.041)
College Degree	Biprob	0.323*** (0.052)	0.298*** (0.054)	0.253*** (0.054)	0.240*** (0.055)	0.361*** (0.056)	0.329*** (0.057)	0.309*** (0.058)	0.288*** (0.059)
	Prob	0.338*** (0.053)	0.313*** (0.054)	0.265*** (0.055)	0.253*** (0.056)	0.385*** (0.057)	0.352*** (0.059)	0.330*** (0.059)	0.309*** (0.061)
	Oprob	0.318*** (0.051)	0.288*** (0.053)	0.243*** (0.053)	0.227*** (0.054)	0.355*** (0.055)	0.322*** (0.057)	0.291*** (0.057)	0.272*** (0.058)
Minc	Biprob		0.014** (0.006)		0.009 (0.007)		0.019*** (0.007)		0.015** (0.007)
	Prob		0.014** (0.006)		0.009 (0.006)		0.019*** (0.007)		0.015*** (0.007)
	Oprob		0.017*** (0.006)		0.011* (0.006)		0.019*** (0.006)		0.014** (0.007)
Insur (Base: Any Private)									
Only Public	Biprob			-0.201*** (0.038)	-0.191*** (0.039)			-0.153*** (0.041)	-0.137*** (0.041)
	Prob			-0.210*** (0.039)	-0.200*** (0.039)			-0.163*** (0.042)	-0.147*** (0.043)
	Oprob			-0.215*** (0.037)	-0.203*** (0.038)			-0.189*** (0.040)	-0.174*** (0.041)
None	Biprob			-0.071 (0.064)	-0.062 (0.065)			0.039 (0.069)	0.053 (0.069)
	Prob			-0.083 (0.064)	-0.074 (0.065)			0.020 (0.069)	0.035 (0.070)
	Oprob			-0.086 (0.063)	-0.074 (0.064)			-0.002 (0.067)	0.011 (0.068)
Age	Biprob	-0.008** (0.004)	-0.009** (0.004)	-0.010*** (0.004)	-0.010*** (0.004)	-0.032*** (0.004)	-0.033*** (0.004)	-0.034*** (0.004)	-0.035*** (0.004)
	Prob	-0.007** (0.003)	-0.008** (0.003)	-0.009*** (0.003)	-0.010*** (0.003)	-0.032*** (0.004)	-0.033*** (0.004)	-0.034*** (0.004)	0.035*** (0.004)
	Oprob	-0.006* (0.003)	-0.007** (0.003)	-0.008** (0.003)	-0.009*** (0.003)	-0.033*** (0.004)	-0.034*** (0.004)	-0.035*** (0.004)	-0.036*** (0.004)
Female	Biprob	0.040* (0.024)	0.041* (0.024)	0.043* (0.024)	0.043* (0.024)	0.133*** (0.025)	0.133*** (0.025)	0.135*** (0.025)	0.135*** (0.025)
	Prob	0.036 (0.024)	0.037 (0.024)	0.039* (0.024)	0.039* (0.024)	0.127*** (0.026)	0.127*** (0.026)	0.129*** (0.026)	0.130*** (0.026)
	Oprob	0.044* (0.023)	0.045** (0.023)	0.047** (0.023)	0.047** (0.023)	0.139*** (0.025)	0.140*** (0.025)	0.142*** (0.025)	0.143*** (0.025)
Brthrd	Biprob	0.042 (0.030)	0.046 (0.030)	0.045 (0.030)	0.048 (0.030)	0.016 (0.030)	0.022 (0.030)	0.019 (0.030)	0.022 (0.030)
	Prob	0.047* (0.029)	0.051* (0.030)	0.051* (0.029)	0.053* (0.030)	0.026 (0.030)	0.031 (0.030)	0.029 (0.030)	0.032 (0.030)
	Oprob	0.041 (0.029)	0.045* (0.029)	0.044 (0.029)	0.047* (0.029)	0.018 (0.029)	0.023 (0.029)	0.021 (0.029)	0.024 (0.029)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Chldrn	Biprob	-0.018 (0.016)	-0.017 (0.016)	-0.014 (0.016)	-0.013 (0.016)	-0.052*** (0.017)	-0.051*** (0.017)	-0.049*** (0.017)	-0.049*** (0.017)
	Prob	-0.019 (0.016)	-0.018 (0.016)	-0.015 (0.016)	-0.015 (0.016)	-0.053*** (0.017)	-0.052*** (0.017)	-0.050*** (0.017)	-0.050*** (0.017)
	Oprob	-0.020 (0.015)	-0.019 (0.015)	-0.016 (0.015)	-0.015 (0.015)	-0.053*** (0.016)	-0.052*** (0.016)	-0.049*** (0.016)	-0.049*** (0.016)
Child_5	Biprob	0.028 (0.044)	0.030 (0.044)	0.036 (0.044)	0.037 (0.044)	0.056 (0.046)	0.059 (0.046)	0.062 (0.046)	0.064 (0.046)
	Prob	0.030 (0.044)	0.033 (0.044)	0.039 (0.044)	0.040 (0.044)	0.056 (0.047)	0.059 (0.047)	0.062 (0.047)	0.065 (0.047)
	Oprob	0.031 (0.042)	0.035 (0.042)	0.040 (0.042)	0.042 (0.042)	0.065 (0.044)	0.069 (0.044)	0.073* (0.044)	0.075* (0.044)
Race (Base: White)									
Black	Biprob	-0.097** (0.043)	-0.092** (0.043)	-0.064 (0.043)	-0.063 (0.043)	0.029 (0.044)	0.036 (0.044)	0.057 (0.044)	0.060 (0.044)
	Prob	-0.109*** (0.043)	-0.104*** (0.043)	-0.076* (0.043)	-0.074* (0.043)	0.023 (0.045)	0.030 (0.045)	0.054 (0.046)	0.057 (0.046)
	Oprob	-0.117*** (0.041)	-0.111*** (0.041)	-0.083** (0.041)	-0.081** (0.041)	0.011 (0.043)	0.018 (0.043)	0.046 (0.044)	0.049 (0.044)
Hispanic	Biprob	-0.177*** (0.046)	-0.172*** (0.046)	-0.147*** (0.046)	-0.145*** (0.046)	0.015 (0.049)	0.021 (0.049)	0.036 (0.049)	0.038 (0.049)
	Prob	-0.187*** (0.046)	-0.182*** (0.046)	-0.156*** (0.047)	-0.154*** (0.047)	0.010 (0.050)	0.017 (0.050)	0.034 (0.050)	0.036 (0.050)
	Oprob	-0.180*** (0.044)	-0.174*** (0.044)	-0.148*** (0.045)	-0.146*** (0.045)	0.020 (0.047)	0.027 (0.047)	0.048 (0.048)	0.051 (0.048)
Other	Biprob	-0.081 (0.072)	-0.075 (0.072)	-0.060 (0.072)	-0.057 (0.072)	0.001 (0.078)	0.008 (0.078)	0.017 (0.078)	0.020 (0.078)
	Prob	-0.078 (0.074)	-0.072 (0.074)	-0.056 (0.074)	-0.054 (0.074)	0.008 (0.081)	0.015 (0.081)	0.026 (0.081)	0.030 (0.081)
	Oprob	-0.110 (0.073)	-0.103 (0.073)	-0.088 (0.072)	-0.084 (0.073)	0.007 (0.080)	0.014 (0.081)	0.028 (0.080)	0.032 (0.081)
MSA	Biprob	0.123*** (0.044)	0.121*** (0.044)	0.108*** (0.044)	0.108*** (0.044)	0.109** (0.046)	0.107** (0.046)	0.096** (0.046)	0.096** (0.046)
	Prob	0.125*** (0.044)	0.123*** (0.044)	0.110*** (0.044)	0.109*** (0.044)	0.114*** (0.047)	0.112*** (0.047)	0.101** (0.047)	0.100** (0.047)
	Oprob	0.107*** (0.041)	0.105*** (0.041)	0.092** (0.042)	0.092** (0.042)	0.100** (0.045)	0.098** (0.045)	0.084** (0.045)	0.084** (0.045)
Region (Base: NE)									
MW	Biprob	-0.018 (0.054)	-0.020 (0.054)	-0.029 (0.054)	-0.031 (0.054)	-0.010 (0.056)	-0.013 (0.056)	-0.021 (0.056)	-0.023 (0.056)
	Prob	-0.018 (0.054)	-0.021 (0.054)	-0.029 (0.054)	-0.031 (0.054)	-0.008 (0.057)	-0.011 (0.057)	-0.019 (0.057)	-0.021 (0.057)
	Oprob	-0.006 (0.052)	-0.009 (0.052)	-0.018 (0.052)	-0.020 (0.052)	-0.002 (0.054)	-0.006 (0.054)	-0.015 (0.054)	-0.017 (0.054)
S	Biprob	0.042 (0.047)	0.042 (0.047)	0.039 (0.048)	0.039 (0.048)	0.107** (0.049)	0.108** (0.049)	0.101** (0.049)	0.102** (0.049)
	Prob	0.038 (0.048)	0.038 (0.048)	0.036 (0.048)	0.036 (0.048)	0.105** (0.050)	0.106** (0.050)	0.098** (0.050)	0.099** (0.050)
	Oprob	0.054 (0.046)	0.055 (0.045)	0.052 (0.046)	0.053 (0.046)	0.108** (0.047)	0.109** (0.047)	0.102** (0.047)	0.102** (0.047)
W	Biprob	0.097* (0.053)	0.095* (0.053)	0.094* (0.053)	0.092* (0.053)	0.150*** (0.056)	0.147*** (0.056)	0.145*** (0.056)	0.142*** (0.056)
	Prob	0.096* (0.053)	0.093* (0.053)	0.094* (0.053)	0.092* (0.053)	0.149*** (0.057)	0.145*** (0.057)	0.143*** (0.057)	0.140*** (0.057)
	Oprob	0.110** (0.051)	0.107** (0.051)	0.108** (0.051)	0.106** (0.051)	0.138*** (0.054)	0.134*** (0.055)	0.132*** (0.054)	0.129*** (0.054)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoHlth	Biprob	0.019***	0.019***	0.018***	0.018***	0.024***	0.024***	0.023***	0.023***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
	Prob	0.018***	0.018***	0.017***	0.017***	0.023***	0.023***	0.023***	0.022***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
	Oprob	0.018***	0.018***	0.018***	0.018***	0.025***	0.024***	0.024***	0.024***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Msmok	Biprob	0.021	0.025	0.036	0.037	-0.026	-0.022	-0.015	-0.013
		(0.036)	(0.036)	(0.037)	(0.037)	(0.039)	(0.039)	(0.039)	(0.039)
	Prob	0.021	0.025	0.036	0.037	-0.020	-0.016	-0.009	-0.006
		(0.037)	(0.037)	(0.037)	(0.037)	(0.039)	(0.039)	(0.040)	(0.039)
	Oprob	0.019	0.023	0.033	0.035	-0.037	-0.033	-0.024	-0.021
		(0.035)	(0.035)	(0.035)	(0.035)	(0.038)	(0.038)	(0.038)	(0.038)
Panel (Base: 6)									
7	Biprob	0.075	0.077	0.087	0.087	-0.035	-0.033	-0.026	-0.025
		(0.070)	(0.070)	(0.070)	(0.070)	(0.074)	(0.074)	(0.074)	(0.074)
	Prob	0.070	0.071	0.082	0.083	-0.040	-0.037	-0.031	-0.029
		(0.071)	(0.071)	(0.071)	(0.071)	(0.076)	(0.076)	(0.076)	(0.076)
	Oprob	0.050	0.052	0.063	0.064	-0.032	-0.028	-0.021	-0.019
		(0.067)	(0.067)	(0.067)	(0.067)	(0.073)	(0.072)	(0.072)	(0.072)
8	Biprob	0.032	0.035	0.052	0.052	-0.087	-0.084	-0.072	-0.071
		(0.069)	(0.069)	(0.069)	(0.069)	(0.074)	(0.074)	(0.074)	(0.074)
	Prob	0.027	0.029	0.046	0.047	-0.093	-0.090	-0.077	-0.075
		(0.069)	(0.069)	(0.069)	(0.069)	(0.076)	(0.075)	(0.076)	(0.076)
	Oprob	0.020	0.022	0.040	0.041	-0.097	-0.093	-0.078	-0.076
		(0.066)	(0.066)	(0.066)	(0.066)	(0.073)	(0.073)	(0.073)	(0.073)
9	Biprob	-0.071	-0.065	-0.053	-0.051	-0.161**	-0.155**	-0.148**	-0.144*
		(0.070)	(0.070)	(0.070)	(0.070)	(0.075)	(0.075)	(0.075)	(0.075)
	Prob	-0.073	-0.068	-0.055	-0.053	-0.165**	-0.158**	-0.151**	-0.146**
		(0.070)	(0.070)	(0.071)	(0.071)	(0.076)	(0.076)	(0.077)	(0.077)
	Oprob	-0.067	-0.061	-0.048	-0.045	-0.137**	-0.130*	-0.121*	-0.117*
		(0.066)	(0.066)	(0.066)	(0.066)	(0.072)	(0.072)	(0.073)	(0.073)
10	Biprob	0.001	0.005	0.027	0.029	-0.166**	-0.161**	-0.143*	-0.140*
		(0.072)	(0.072)	(0.072)	(0.072)	(0.077)	(0.077)	(0.077)	(0.077)
	Prob	-0.010	-0.007	0.017	0.018	-0.180**	-0.174**	-0.156**	-0.153**
		(0.072)	(0.072)	(0.072)	(0.072)	(0.078)	(0.078)	(0.078)	(0.078)
	Oprob	-0.024	-0.019	0.004	0.006	-0.171**	-0.165**	-0.145**	-0.142**
		(0.069)	(0.068)	(0.069)	(0.069)	(0.074)	(0.074)	(0.074)	(0.074)
11	Biprob	0.025	0.029	0.051	0.052	-0.033	-0.029	-0.012	-0.011
		(0.068)	(0.068)	(0.068)	(0.068)	(0.074)	(0.074)	(0.074)	(0.074)
	Prob	0.018	0.021	0.045	0.046	-0.040	-0.036	-0.019	-0.017
		(0.068)	(0.068)	(0.069)	(0.069)	(0.076)	(0.076)	(0.076)	(0.076)
	Oprob	0.026	0.029	0.053	0.054	-0.025	-0.021	-0.001	0.001
		(0.064)	(0.064)	(0.065)	(0.065)	(0.073)	(0.073)	(0.073)	(0.073)
12	Biprob	0.084	0.089	0.108	0.111	0.008	0.014	0.027	0.030
		(0.075)	(0.075)	(0.076)	(0.075)	(0.080)	(0.081)	(0.081)	(0.081)
	Prob	0.079	0.084	0.103	0.106	0.000	0.006	0.019	0.023
		(0.076)	(0.076)	(0.076)	(0.076)	(0.083)	(0.083)	(0.083)	(0.083)
	Oprob	0.067	0.073	0.092	0.095	0.012	0.018	0.033	0.036
		(0.073)	(0.073)	(0.073)	(0.073)	(0.081)	(0.081)	(0.081)	(0.081)
13	Biprob	0.143**	0.149**	0.167***	0.169***	0.010	0.016	0.030	0.034
		(0.066)	(0.066)	(0.067)	(0.067)	(0.071)	(0.071)	(0.071)	(0.071)
	Prob	0.138**	0.143**	0.162***	0.164***	0.004	0.012	0.026	0.030
		(0.067)	(0.067)	(0.067)	(0.067)	(0.073)	(0.073)	(0.073)	(0.073)
	Oprob	0.116*	0.123**	0.141**	0.144**	0.009	0.016	0.033	0.037
		(0.064)	(0.064)	(0.064)	(0.064)	(0.071)	(0.071)	(0.071)	(0.071)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
14	Biprob	0.084 (0.071)	0.093 (0.071)	0.113 (0.072)	0.118* (0.072)	0.013 (0.076)	0.025 (0.076)	0.040 (0.076)	0.048 (0.076)
	Prob	0.080 (0.071)	0.089 (0.072)	0.110 (0.072)	0.115* (0.072)	0.010 (0.078)	0.023 (0.078)	0.037 (0.078)	0.046 (0.078)
	Oprob	0.075 (0.068)	0.085 (0.068)	0.106 (0.068)	0.111* (0.068)	0.017 (0.074)	0.030 (0.074)	0.048 (0.074)	0.056 (0.075)
15	Biprob	0.239*** (0.072)	0.246*** (0.072)	0.274*** (0.073)	0.277*** (0.073)	0.001 (0.077)	0.010 (0.077)	0.029 (0.078)	0.034 (0.078)
	Prob	0.227*** (0.072)	0.235*** (0.072)	0.264*** (0.073)	0.267*** (0.073)	-0.007 (0.078)	0.004 (0.078)	0.023 (0.079)	0.029 (0.079)
	Oprob	0.204*** (0.070)	0.213*** (0.070)	0.242*** (0.071)	0.246*** (0.071)	-0.011 (0.075)	0.000 (0.076)	0.023 (0.076)	0.028 (0.076)
Constant	Biprob	-0.311*** (0.124)	-0.442*** (0.135)	-0.152 (0.128)	-0.244* (0.142)	-0.243* (0.131)	-0.411*** (0.143)	-0.118 (0.135)	-0.268* (0.150)
	Prob	-0.276** (0.125)	-0.406*** (0.136)	-0.108 (0.129)	-0.197 (0.143)	-0.224* (0.134)	-0.396*** (0.146)	-0.091 (0.138)	-0.243* (0.153)
	Oprob	-0.973 (0.120)	-0.819 (0.131)	-1.148 (0.124)	-1.032 (0.138)	-0.897 (0.132)	-0.724 (0.143)	-1.055 (0.135)	-0.911 (0.149)
μ	Oprob	0.277 (0.118)	0.432 (0.129)	0.106 (0.122)	0.222 (0.135)	0.271 (0.130)	0.445 (0.141)	0.117 (0.134)	0.262 (0.147)
Wald Chi-squared (df)	Biprob	649.43 (50)	663.7 (52)	699.14 (54)	706.64 (56)				
	Prob	275.04 (25)	282.02 (26)	309.92 (27)	312.42 (28)	480.03 (25)	493.45 (26)	512.77 (27)	519.98 (28)
	Oprob	287.33 (25)	295.78 (26)	322.79 (27)	325.94 (28)	564.45 (25)	582.29 (26)	600.91 (27)	610.09 (28)
Log Pseudo likelihood	Biprob	-11171.32	-11164.94	-11146.20	-11142.39				
	Prob	-6893.27	-6889.40	-6870.67	-6869.20	-6378.65	-6372.43	-6362.68	-6358.84
	Oprob	-7911.13	-7905.32	-7886.15	-7883.51	-7418.15	-7411.51	-7397.00	-7393.32
Pseudo R2	Prob	0.034	0.035	0.037	0.037	0.063	0.064	0.065	0.066
	Oprob	0.030	0.031	0.033	0.034	0.061	0.062	0.064	0.064
ρ	Biprob	0.853 (0.008)	0.853 (0.008)	0.853 (0.008)	0.853 (0.008)				
χ2(1)		2093.32	2092	2085.67	2085.83				

A.6: Estimated Marginal Effects for Sample 2

(N = 13,524)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	Biprob	5.396*** (1.180)	4.961*** (1.196)	4.682*** (1.174)	4.445*** (1.187)	6.622*** (1.190)	6.110*** (1.205)	6.127*** (1.187)	5.778*** (1.199)
	Prob	5.609*** (1.202)	5.171*** (1.219)	4.856*** (1.196)	4.623*** (1.211)	6.976*** (1.236)	6.432*** (1.252)	6.441*** (1.233)	6.073*** (1.246)
	Oprob	5.649*** (1.144)	5.139*** (1.160)	4.893*** (1.136)	4.598*** (1.149)	6.806*** (1.169)	6.277*** (1.182)	6.186*** (1.164)	5.849*** (1.174)
College Degree	Biprob	9.195*** (1.446)	8.467*** (1.497)	7.235*** (1.525)	6.863*** (1.557)	9.582*** (1.432)	8.722*** (1.483)	8.218*** (1.508)	7.669*** (1.540)
	Prob	9.713*** (1.478)	8.992*** (1.529)	7.686*** (1.561)	7.326*** (1.593)	10.371*** (1.479)	9.485*** (1.534)	8.952*** (1.559)	8.387*** (1.594)
	Oprob	9.190*** (1.447)	8.337*** (1.494)	7.098*** (1.516)	6.634*** (1.546)	9.624*** (1.438)	8.741*** (1.486)	7.963*** (1.516)	7.431*** (1.546)
Minc	Biprob		0.414** (0.182)		0.265 (0.186)		0.487*** (0.178)		0.394** (0.181)
	Prob		0.418** (0.185)		0.262 (0.188)		0.509*** (0.183)		0.407** (0.187)
	Oprob		0.495*** (0.183)		0.339* (0.187)		0.509*** (0.173)		0.386** (0.176)
Insur (Base: Any Private)									
Only Public	Biprob			-5.588*** (1.037)	-5.324*** (1.055)			-3.949*** (1.027)	-3.541*** (1.048)
	Prob			-5.889*** (1.062)	-5.631*** (1.079)			-4.271*** (1.072)	-3.860*** (1.094)
	Oprob			6.042*** (1.018)	-5.706*** (1.036)			-4.934*** (1.015)	-4.546*** (1.034)
None	Biprob			-1.885 (1.718)	-1.640 (1.730)			0.917 (1.617)	1.274 (1.634)
	Prob			-2.217 (1.754)	-1.976 (1.767)			0.492 (1.654)	0.850 (1.672)
	Oprob			-2.302 (1.719)	-1.990 (1.735)			-0.056 (1.608)	0.274 (1.626)
Age	Biprob	-0.227** (0.111)	-0.252** (0.111)	-0.281*** (0.111)	-0.295*** (0.112)	-0.845*** (0.105)	-0.873*** (0.105)	-0.891*** (0.105)	-0.910*** (0.105)
	Prob	-0.223** (0.112)	-0.249** (0.113)	-0.278*** (0.113)	-0.292*** (0.113)	-0.861*** (0.110)	-0.891*** (0.110)	-0.909*** (0.110)	-0.930*** (0.110)
	Oprob	-0.195* (0.108)	-0.225** (0.109)	-0.250** (0.109)	-0.268*** (0.110)	-0.889*** (0.105)	-0.919*** (0.105)	-0.943*** (0.105)	-0.962*** (0.106)
Female	Biprob	1.159* (0.691)	1.166* (0.691)	1.215* (0.690)	1.218* (0.690)	3.484*** (0.663)	3.490*** (0.663)	3.533*** (0.663)	3.535*** (0.663)
	Prob	1.067 (0.704)	1.076 (0.704)	1.134 (0.704)	1.137* (0.704)	3.404*** (0.684)	3.418*** (0.685)	3.465*** (0.684)	3.472*** (0.685)
	Oprob	1.293* (0.687)	1.305** (0.687)	1.361** (0.687)	1.366** (0.687)	3.742*** (0.660)	3.759*** (0.660)	3.811*** (0.660)	3.819*** (0.660)
Brthrd	Biprob	1.196 (0.858)	1.309 (0.861)	1.292 (0.857)	1.359 (0.859)	0.433 (0.782)	0.568 (0.782)	0.486 (0.781)	0.587 (0.781)
	Prob	1.393* (0.868)	1.503* (0.871)	1.484* (0.867)	1.548* (0.870)	0.707 (0.804)	0.844 (0.805)	0.769 (0.803)	0.870 (0.804)
	Oprob	1.198 (0.846)	1.327* (0.850)	1.290 (0.845)	1.371* (0.849)	0.482 (0.783)	0.618 (0.785)	0.556 (0.782)	0.651 (0.784)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Chldrn	Biprob	-0.511 (0.474)	-0.487 (0.473)	-0.394 (0.472)	-0.385 (0.471)	-1.365*** (0.449)	-1.338*** (0.447)	-1.285*** (0.447)	-1.272*** (0.446)
	Prob	-0.571 (0.479)	-0.549 (0.478)	-0.452 (0.477)	-0.444 (0.476)	-1.438*** (0.469)	-1.410*** (0.468)	-1.352*** (0.467)	-1.338*** (0.467)
	Oprob	-0.586 (0.451)	-0.560 (0.450)	-0.469 (0.451)	-0.458 (0.449)	-1.417*** (0.442)	-1.388*** (0.441)	-1.321*** (0.440)	-1.307*** (0.439)
Child_5	Biprob	0.794 (1.254)	0.872 (1.253)	1.027 (1.253)	1.067 (1.253)	1.461 (1.205)	1.553 (1.206)	1.630 (1.204)	1.687 (1.205)
	Prob	0.880 (1.286)	0.969 (1.286)	1.136 (1.286)	1.180 (1.286)	1.494 (1.255)	1.594 (1.256)	1.675 (1.255)	1.738 (1.256)
	Oprob	0.915 (1.226)	1.026 (1.226)	1.176 (1.226)	1.238 (1.226)	1.750 (1.191)	1.851 (1.192)	1.952* (1.191)	2.013* (1.192)
Race (Base: White)									
Black	Biprob	-2.681** (1.165)	-2.549** (1.167)	-1.773 (1.184)	-1.729 (1.185)	0.775 (1.163)	0.944 (1.164)	1.510 (1.174)	1.580 (1.174)
	Prob	-3.038*** (1.196)	-2.906*** (1.198)	-2.132* (1.216)	-2.085* (1.217)	0.629 (1.221)	0.807 (1.224)	1.455 (1.237)	1.528 (1.238)
	Oprob	-3.262*** (1.142)	-3.101*** (1.144)	-2.342** (1.163)	-2.280** (1.164)	0.294 (1.164)	0.479 (1.166)	1.243 (1.183)	1.316 (1.184)
Hispanic	Biprob	-5.036*** (1.298)	-4.905*** (1.299)	-4.186*** (1.316)	-4.149*** (1.316)	0.405 (1.297)	0.567 (1.297)	0.960 (1.309)	1.013 (1.309)
	Prob	-5.377*** (1.337)	-5.240*** (1.338)	-4.503*** (1.355)	-4.462*** (1.356)	0.275 (1.355)	0.457 (1.356)	0.925 (1.371)	0.990 (1.371)
	Oprob	-5.159*** (1.272)	-4.994*** (1.273)	-4.277*** (1.291)	-4.222*** (1.292)	0.527 (1.273)	0.713 (1.274)	1.306 (1.290)	1.371 (1.290)
Other	Biprob	-2.209 (2.010)	-2.062 (2.014)	-1.650 (2.006)	-1.578 (2.009)	0.024 (2.066)	0.205 (2.074)	0.448 (2.074)	0.545 (2.079)
	Prob	-2.150 (2.091)	-1.991 (2.096)	-1.573 (2.089)	-1.497 (2.092)	0.214 (2.179)	0.412 (2.189)	0.707 (2.188)	0.821 (2.195)
	Oprob	-3.071 (2.096)	-2.880 (2.101)	-2.469 (2.090)	-2.371 (2.094)	0.178 (2.165)	0.369 (2.175)	0.768 (2.175)	0.868 (2.182)
MSA	Biprob	3.636*** (1.332)	3.584*** (1.330)	3.168** (1.327)	3.156** (1.326)	2.952** (1.283)	2.887** (1.281)	2.592** (1.273)	2.574** (1.272)
	Prob	3.763*** (1.373)	3.709*** (1.372)	3.291*** (1.368)	3.278*** (1.367)	3.183** (1.355)	3.116** (1.353)	2.790** (1.345)	2.773** (1.344)
	Oprob	3.214*** (1.281)	3.155*** (1.278)	2.746** (1.276)	2.732** (1.275)	2.767** (1.268)	2.708** (1.267)	2.322** (1.258)	2.311* (1.258)
Region (Base: NE)									
MW	Biprob	-0.518 (1.591)	-0.600 (1.590)	-0.859 (1.592)	-0.901 (1.591)	-0.276 (1.572)	-0.376 (1.571)	-0.573 (1.564)	-0.638 (1.563)
	Prob	-0.550 (1.646)	-0.632 (1.645)	-0.893 (1.647)	-0.934 (1.647)	-0.216 (1.652)	-0.324 (1.652)	-0.544 (1.646)	-0.616 (1.646)
	Oprob	-0.196 (1.588)	-0.296 (1.587)	-0.552 (1.590)	-0.607 (1.589)	-0.060 (1.553)	-0.177 (1.552)	-0.427 (1.548)	-0.500 (1.547)
S	Biprob	1.213 (1.382)	1.222 (1.379)	1.121 (1.377)	1.123 (1.375)	2.870** (1.335)	2.885** (1.331)	2.696** (1.327)	2.706** (1.323)
	Prob	1.129 (1.420)	1.143 (1.417)	1.069 (1.4162	1.073 (1.414)	2.872** (1.400)	2.893** (1.395)	2.677** (1.392)	2.689** (1.389)
	Oprob	1.608 (1.369)	1.627 (1.365)	1.552 (1.365)	1.558 (1.362)	2.971** (1.319)	2.991** (1.313)	2.773** (1.310)	2.785** (1.307)
W	Biprob	2.761* (1.502)	2.684* (1.502)	2.654* (1.492)	2.604* (1.493)	3.957*** (1.471)	3.863*** (1.472)	3.789*** (1.461)	3.709*** (1.463)
	Prob	2.768* (1.545)	2.695* (1.546)	2.693* (1.536)	2.643* (1.537)	4.006*** (1.539)	3.909*** (1.541)	3.823*** (1.529)	3.743*** (1.531)
	Oprob	3.179** (1.498)	3.090** (1.499)	3.113** (1.488)	3.046** (1.488)	3.731*** (1.478)	3.626*** (1.478)	3.541*** (1.466)	3.460*** (1.468)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoHlth	Biprob	0.547*** (0.043)	0.544*** (0.043)	0.528*** (0.044)	0.527*** (0.044)	0.620*** (0.042)	0.617*** (0.042)	0.604*** (0.042)	0.603*** (0.042)
	Prob	0.538*** (0.045)	0.536*** (0.045)	0.518*** (0.045)	0.517*** (0.045)	0.622*** (0.045)	0.619*** (0.045)	0.604*** (0.045)	0.603*** (0.045)
	Oprob	0.545*** (0.043)	0.542*** (0.043)	0.524*** (0.043)	0.523*** (0.043)	0.660*** (0.044)	0.656*** (0.044)	0.640*** (0.044)	0.639*** (0.044)
Msmok	Biprob	0.609 (1.033)	0.708 (1.031)	1.013 (1.030)	1.058 (1.029)	-0.694 (1.025)	-0.573 (1.022)	-0.399 (1.021)	-0.331 (1.019)
	Prob	0.631 (1.068)	0.728 (1.066)	1.037 (1.065)	1.080 (1.064)	-0.553 (1.067)	-0.432 (1.064)	-0.239 (1.064)	-0.172 (1.062)
	Oprob	0.569 (1.021)	0.681 (1.020)	0.975 (1.018)	1.030 (1.018)	-0.998 (1.027)	-0.879 (1.025)	-0.640 (1.023)	-0.577 (1.022)
Panel (Base: 6)									
7	Biprob	2.182 (2.039)	2.238 (2.040)	2.550 (2.056)	2.574 (2.056)	-0.902 (1.913)	-0.839 (1.915)	-0.676 (1.927)	-0.638 (1.927)
	Prob	2.067 (2.094)	2.124 (2.096)	2.455 (2.114)	2.479 (2.114)	-1.057 (1.990)	-0.979 (1.994)	-0.823 (2.008)	-0.773 (2.010)
	Oprob	1.489 (1.988)	1.557 (1.990)	1.894 (2.006)	1.923 (2.007)	-0.838 (1.901)	-0.748 (1.905)	-0.562 (1.920)	-0.508 (1.922)
8	Biprob	0.962 (2.033)	1.039 (2.036)	1.537 (2.052)	1.563 (2.053)	-2.285 (1.945)	-2.216 (1.948)	-1.898 (1.955)	-1.877 (1.957)
	Prob	0.816 (2.084)	0.891 (2.088)	1.417 (2.107)	1.440 (2.108)	-2.504 (2.024)	-2.406 (2.029)	-2.083 (2.040)	-2.037 (2.043)
	Oprob	0.597 (1.978)	0.682 (1.980)	1.211 (2.000)	1.239 (2.000)	-2.609 (1.967)	-2.504 (1.969)	-2.122 (1.984)	-2.075 (1.984)
9	Biprob	-2.163 (2.142)	-2.001 (2.142)	-1.646 (2.167)	-1.565 (2.167)	-4.359** (2.024)	-4.188** (2.026)	-4.008** (2.045)	-3.902* (2.045)
	Prob	-2.294 (2.198)	-2.131 (2.200)	-1.745 (2.230)	-1.665 (2.230)	-4.564** (2.122)	-4.373** (2.125)	-4.201** (2.150)	-4.077** (2.151)
	Oprob	-2.079 (2.047)	-1.891 (2.049)	-1.521 (2.077)	-1.421 (2.077)	-3.761** (1.980)	-3.568* (1.983)	-3.352* (2.008)	-3.234* (2.010)
10	Biprob	0.018 (2.156)	0.142 (2.158)	0.820 (2.172)	0.870 (2.172)	-4.488** (2.093)	-4.356** (2.093)	-3.866* (2.104)	-3.803* (2.103)
	Prob	-0.332 (2.205)	-0.215 (2.207)	0.525 (2.225)	0.568 (2.225)	-5.008** (2.182)	-4.851** (2.184)	-4.356** (2.197)	-4.272** (2.198)
	Oprob	-0.730 (2.098)	-0.603 (2.098)	0.139 (2.116)	0.187 (2.115)	-4.776** (2.073)	-4.615** (2.076)	-4.055** (2.089)	-3.972** (2.090)
11	Biprob	0.754 (2.022)	0.858 (2.025)	1.524 (2.039)	1.558 (2.040)	-0.841 (1.896)	-0.739 (1.902)	-0.315 (1.909)	-0.279 (1.912)
	Prob	0.554 (2.066)	0.652 (2.070)	1.365 (2.088)	1.395 (2.090)	-1.055 (1.978)	-0.941 (1.986)	-0.489 (1.994)	-0.441 (1.999)
	Oprob	0.785 (1.931)	0.892 (1.936)	1.599 (1.952)	1.632 (1.954)	-0.656 (1.906)	-0.546 (1.914)	-0.026 (1.924)	0.017 (1.929)
12	Biprob	2.435 (2.180)	2.588 (2.178)	3.155 (2.188)	3.225 (2.187)	0.194 (2.032)	0.344 (2.035)	0.679 (2.040)	0.758 (2.042)
	Prob	2.323 (2.238)	2.480 (2.238)	3.065 (2.250)	3.135 (2.250)	-0.007 (2.134)	0.160 (2.138)	0.487 (2.144)	0.585 (2.146)
	Oprob	1.971 (2.137)	2.151 (2.132)	2.721 (2.147)	2.807 (2.143)	0.301 (2.080)	0.467 (2.081)	0.852 (2.089)	0.943 (2.090)
13	Biprob	4.077** (1.887)	4.234** (1.890)	4.754*** (1.911)	4.830*** (1.912)	0.254 (1.791)	0.412 (1.797)	0.763 (1.804)	0.851 (1.807)
	Prob	3.965** (1.933)	4.125** (1.937)	4.689*** (1.960)	4.761*** (1.962)	0.106 (1.865)	0.303 (1.872)	0.657 (1.883)	0.775 (1.887)
	Oprob	3.364* (1.857)	3.545** (1.861)	4.095** (1.880)	4.182** (1.882)	0.225 (1.815)	0.420 (1.823)	0.844 (1.833)	0.953 (1.837)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
14	Biprob	2.432	2.700	3.292	3.430*	0.334	0.639	1.001	1.200
		(2.063)	(2.067)	(2.082)	(2.085)	(1.909)	(1.909)	(1.913)	(1.912)
	Prob	2.367	2.631	3.267	3.400	0.244	0.575	0.957	1.173
		(2.107)	(2.111)	(2.128)	(2.131)	(1.979)	(1.982)	(1.986)	(1.987)
	Oprob	2.200	2.506	3.114	3.281*	0.431	0.769	1.235	1.444
		(1.984)	(1.988)	(2.004)	(2.006)	(1.898)	(1.903)	(1.907)	(1.910)
15	Biprob	6.533***	6.746***	7.497***	7.594***	0.016	0.252	0.729	0.856
		(1.954)	(1.953)	(1.969)	(1.967)	(1.951)	(1.951)	(1.967)	(1.966)
	Prob	6.291***	6.507***	7.312***	7.406***	-0.178	0.093	0.587	0.742
		(1.997)	(1.996)	(2.014)	(2.013)	(2.019)	(2.019)	(2.038)	(2.037)
	Oprob	5.667***	5.920***	6.713***	6.831***	-0.277	-0.005	0.592	0.738
		(1.936)	(1.936)	(1.947)	(1.947)	(1.959)	(1.961)	(1.977)	(1.978)

A.7: Estimated Marginal Effects on the Bivariate Probit Model by Sex

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	Male	6.980*** (1.120)	6.277*** (1.106)	6.243*** (1.097)	5.866*** (1.088)	6.691*** (1.076)	6.023*** (1.058)	5.973*** (1.052)	5.618*** (1.041)
	Female	5.833*** (1.097)	5.084*** (1.084)	4.959*** (1.080)	4.577*** (1.071)	4.622*** (1.033)	4.011*** (1.012)	3.957 (1.017)	3.643*** (1.005)
College Degree	Male	10.500*** (1.258)	9.402*** (1.275)	9.173*** (1.265)	8.595*** (1.272)	9.424*** (1.189)	8.385*** (1.196)	8.161*** (1.195)	7.614*** (1.197)
	Female	10.685*** (1.232)	9.409*** (1.246)	9.344*** (1.236)	8.643*** (1.243)	8.234*** (1.152)	7.190*** (1.156)	7.202 (1.157)	6.621*** (1.160)
FaSch (Base: No Degree)									
HSD/GED	Male	4.644*** (1.064)	4.214*** (1.049)	3.897*** (1.044)	3.717*** (1.035)	3.067*** (0.992)	2.679*** (0.976)	2.383** (0.972)	2.223** (0.963)
	Female	4.367*** (1.032)	3.858*** (1.017)	3.667*** (1.024)	3.429*** (1.014)	3.449*** (0.956)	3.031*** (0.939)	2.926 (0.948)	2.726*** (0.936)
College Degree	Male	7.495*** (1.253)	6.502*** (1.265)	6.146*** (1.261)	5.641*** (1.267)	5.003*** (1.198)	4.079*** (1.208)	3.732*** (1.209)	3.266*** (1.215)
	Female	7.358*** (1.224)	6.311*** (1.236)	6.184*** (1.243)	5.614*** (1.247)	5.128*** (1.141)	4.260*** (1.149)	4.231 (1.160)	3.750*** (1.161)
Pinc	Male		1.636*** (0.368)		1.252*** (0.353)		1.536*** (0.335)		1.173*** (0.323)
	Female		1.948*** (0.369)		1.559*** (0.359)		1.601*** (0.305)		1.291*** (0.313)
Insur (Base: Any Private)									
Only Public	Male			-5.279*** (0.888)	-4.329*** (0.912)			-4.959*** (0.859)	-4.066*** (0.875)
	Female			-4.606*** (0.895)	-3.540*** (0.928)			-3.718 (0.812)	-2.839*** (0.839)
None	Male			-0.044 (1.109)	0.411 (1.112)			-0.462 (1.066)	-0.031 (1.067)
	Female			-2.518** (1.203)	-1.864 (1.204)			-0.974 (1.069)	-0.442 (1.066)
Age	Male	-0.174** (0.087)	-0.190** (0.086)	-0.240*** (0.087)	-0.244*** (0.087)	-0.581*** (0.082)	-0.594*** (0.081)	-0.640*** (0.082)	-0.642*** (0.082)
	Female	-0.438*** (0.084)	-0.454*** (0.084)	-0.482*** (0.084)	-0.485*** (0.084)	-0.686*** (0.078)	-0.697*** (0.078)	-0.727 (0.079)	-0.729*** (0.078)
Brthrd	Male	1.228* (0.674)	1.348** (0.673)	1.271* (0.672)	1.352** (0.672)	0.743 (0.638)	0.857 (0.636)	0.781 (0.636)	0.859 (0.635)
	Female	2.306*** (0.656)	2.512*** (0.656)	2.377*** (0.657)	2.527*** (0.656)	1.829*** (0.597)	1.996*** (0.596)	1.908 (0.596)	2.029*** (0.596)
Chldrn	Male	0.208 (0.316)	0.251 (0.314)	0.343 (0.316)	0.350 (0.315)	-0.687** (0.300)	-0.648** (0.298)	-0.560* (0.300)	-0.554* (0.298)
	Female	0.221 (0.310)	0.259 (0.309)	0.354 (0.311)	0.353 (0.310)	-0.118 (0.284)	-0.086 (0.283)	-0.008 (0.284)	-0.008 (0.284)
Child_5	Male	0.242 (0.940)	0.421 (0.939)	0.374 (0.936)	0.486 (0.936)	1.955** (0.900)	2.128** (0.900)	2.081** (0.900)	2.189** (0.899)
	Female	-0.532 (0.930)	-0.333 (0.929)	-0.351 (0.928)	-0.234 (0.928)	0.114 (0.861)	0.274 (0.861)	0.262 (0.860)	0.358 (0.860)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Race (Base: White)									
Black	Male	-3.594*** (1.226)	-3.264*** (1.228)	-3.100** (1.231)	-2.918** (1.230)	-3.306*** (1.212)	-2.983** (1.214)	-2.839** (1.221)	-2.661** (1.221)
	Female	-3.496*** (1.187)	-3.020*** (1.183)	-3.030*** (1.194)	-2.747** (1.190)	-2.921*** (1.086)	-2.522** (1.080)	-2.513 (1.089)	-2.275** (1.083)
Hispanic	Male	-6.226*** (0.937)	-5.790*** (0.936)	-5.408*** (0.948)	-5.249*** (0.947)	-4.023*** (0.911)	-3.618*** (0.913)	-3.252*** (0.924)	-3.102*** (0.925)
	Female	-6.495*** (0.949)	-5.935*** (0.950)	-5.646*** (0.955)	-5.395*** (0.956)	-4.357*** (0.864)	-3.912*** (0.863)	-3.757 (0.870)	-3.557*** (0.870)
Other	Male	-2.596** (1.304)	-2.142* (1.302)	-2.311* (1.315)	-2.024 (1.311)	-0.606 (1.206)	-0.176 (1.198)	-0.322 (1.215)	-0.051 (1.207)
	Female	-2.263* (1.332)	-1.966 (1.337)	-2.086 (1.345)	-1.886 (1.346)	-2.102* (1.269)	-1.857 (1.277)	-1.973 (1.290)	-1.804 (1.292)
MSA	Male	2.463*** (0.955)	2.209** (0.948)	2.118** (0.948)	1.974** (0.943)	3.053*** (0.950)	2.818*** (0.945)	2.742*** (0.945)	2.610*** (0.941)
	Female	1.871* (0.973)	1.627* (0.968)	1.760* (0.972)	1.591* (0.968)	2.360*** (0.913)	2.152** (0.908)	2.233 (0.913)	2.087** (0.909)
Region (Base: NE)									
MW	Male	-1.836 (1.215)	-1.905 (1.215)	-2.141* (1.211)	-2.145* (1.212)	-2.567** (1.141)	-2.620** (1.142)	-2.852*** (1.141)	-2.846*** (1.142)
	Female	-1.885 (1.206)	-2.014* (1.209)	-2.082* (1.211)	-2.140* (1.212)	-2.484** (1.114)	-2.574** (1.114)	-2.662 (1.116)	-2.700** (1.116)
S	Male	-2.684** (1.102)	-2.550** (1.101)	-2.682*** (1.095)	-2.599** (1.095)	-1.259 (1.025)	-1.117 (1.022)	-1.234 (1.019)	-1.146 (1.018)
	Female	-1.073 (1.075)	-0.997 (1.076)	-0.936 (1.074)	-0.911 (1.075)	-0.546 (0.959)	-0.467 (0.956)	-0.501 (0.957)	-0.467 (0.955)
W	Male	-0.132 (1.128)	-0.313 (1.130)	-0.211 (1.120)	-0.332 (1.123)	-0.883 (1.065)	-1.041 (1.068)	-0.947 (1.059)	-1.053 (1.062)
	Female	0.423 (1.118)	0.229 (1.122)	0.353 (1.119)	0.213 (1.122)	-0.864 (1.015)	-1.010 (1.016)	-0.934 (1.014)	-1.041 (1.015)
MoHlth	Male	0.370*** (0.040)	0.365*** (0.040)	0.353*** (0.040)	0.352*** (0.040)	0.393*** (0.037)	0.388*** (0.037)	0.377*** (0.037)	0.376*** (0.037)
	Female	0.361*** (0.039)	0.352*** (0.039)	0.351*** (0.039)	0.346*** (0.039)	0.388*** (0.036)	0.381*** (0.036)	0.379 (0.036)	0.375*** (0.036)
FaHlth	Male	0.241*** (0.045)	0.220*** (0.045)	0.225*** (0.045)	0.212*** (0.045)	0.292*** (0.042)	0.272*** (0.042)	0.277*** (0.042)	0.265*** (0.042)
	Female	0.252*** (0.044)	0.232*** (0.044)	0.237*** (0.043)	0.225*** (0.043)	0.254*** (0.040)	0.238*** (0.040)	0.240 (0.040)	0.230*** (0.040)
Msmok	Male	0.595 (1.013)	0.882 (1.004)	0.840 (1.008)	1.021 (1.001)	-0.781 (1.001)	-0.501 (0.992)	-0.553 (0.998)	-0.377 (0.992)
	Female	0.153 (1.045)	0.378 (1.039)	0.376 (1.038)	0.505 (1.036)	-0.871 (0.984)	-0.676 (0.978)	-0.683 (0.977)	-0.571 (0.974)
Fsmok	Male	-1.630* (0.902)	-1.478* (0.895)	-1.254 (0.894)	-1.200 (0.890)	-1.002 (0.850)	-0.866 (0.846)	-0.661 (0.845)	-0.613 (0.843)
	Female	-0.243 (0.889)	-0.048 (0.883)	0.040 (0.886)	0.133 (0.882)	-0.532 (0.833)	-0.374 (0.826)	-0.301 (0.830)	-0.225 (0.826)
Panel (Base: 6)									
7	Male	-0.750 (1.447)	-0.594 (1.449)	-0.429 (1.462)	-0.364 (1.461)	-0.958 (1.398)	-0.825 (1.402)	-0.656 (1.419)	-0.606 (1.419)
	Female	-1.568 (1.422)	-1.385 (1.436)	-1.232 (1.434)	-1.157 (1.442)	-1.704 (1.310)	-1.562 (1.330)	-1.374 (1.324)	-1.316 (1.337)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
8	Male	0.726	0.926	1.343	1.402	0.280	0.461	0.842	0.893
		(1.426)	(1.431)	(1.430)	(1.433)	(1.364)	(1.368)	(1.373)	(1.375)
	Female	0.005	0.261	0.371	0.496	-0.920	-0.718	-0.568	-0.470
		(1.405)	(1.414)	(1.417)	(1.423)	(1.334)	(1.342)	(1.351)	(1.355)
9	Male	0.076	0.268	0.723	0.777	-0.726	-0.543	-0.126	-0.075
		(1.453)	(1.456)	(1.464)	(1.464)	(1.392)	(1.395)	(1.410)	(1.409)
	Female	-2.277	-2.027	-1.802	-1.704	-2.725**	-2.523*	-2.317	-2.237*
		(1.430)	(1.440)	(1.442)	(1.447)	(1.321)	(1.331)	(1.331)	(1.337)
10	Male	-0.346	-0.129	0.419	0.472	-0.905	-0.704	-0.213	-0.164
		(1.451)	(1.457)	(1.459)	(1.462)	(1.370)	(1.371)	(1.382)	(1.381)
	Female	-0.929	-0.527	-0.407	-0.197	-0.343	-0.014	0.143	0.320
		(1.395)	(1.398)	(1.409)	(1.409)	(1.264)	(1.269)	(1.279)	(1.280)
11	Male	3.206**	3.461***	3.937***	4.019***	2.540*	2.761**	3.211**	3.274**
		(1.404)	(1.410)	(1.414)	(1.418)	(1.341)	(1.345)	(1.356)	(1.357)
	Female	-0.947	0.555	-0.390	-0.197	-0.234	0.086	0.296	0.457
		(1.418)	(1.425)	(1.424)	(1.428)	(1.299)	(1.304)	(1.312)	(1.314)
12	Male	6.395***	6.832***	7.158***	7.367***	4.874***	5.271***	5.592***	5.774***
		(1.397)	(1.400)	(1.406)	(1.408)	(1.364)	(1.366)	(1.375)	(1.375)
	Female	3.454**	3.966***	4.034***	4.312***	1.213	1.639	1.750	1.984
		(1.436)	(1.436)	(1.445)	(1.443)	(1.346)	(1.347)	(1.354)	(1.353)
13	Male	2.954**	3.368***	3.759***	3.950***	1.455	1.844	2.195*	2.375*
		(1.364)	(1.371)	(1.374)	(1.378)	(1.308)	(1.309)	(1.319)	(1.319)
	Female	2.538**	3.104**	3.114**	3.439***	1.841	2.298*	2.360	2.625**
		(1.298)	(1.303)	(1.308)	(1.310)	(1.202)	(1.207)	(1.215)	(1.218)
14	Male	4.344***	4.851***	5.101***	5.381***	4.188***	4.650***	4.878***	5.129***
		(1.401)	(1.396)	(1.405)	(1.400)	(1.315)	(1.309)	(1.323)	(1.317)
	Female	1.379	2.197	1.892	2.434*	0.884	1.549	1.387	1.831
		(1.371)	(1.376)	(1.379)	(1.380)	(1.275)	(1.275)	(1.281)	(1.280)
15	Male	2.505*	2.999**	3.654**	3.853***	0.898	1.367	1.974	2.160
		(1.543)	(1.537)	(1.533)	(1.530)	(1.485)	(1.479)	(1.479)	(1.476)
	Female	1.276	2.001	2.139	2.525*	1.731	2.313*	2.490	2.803**
		(1.483)	(1.473)	(1.474)	(1.468)	(1.326)	(1.325)	(1.325)	(1.325)

A.8: Estimated Marginal Effects on the Bivariate Probit Model by Age-Group

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	0-5	6.360*** (1.243)	5.881*** (1.228)	5.729*** (1.224)	5.490*** (1.216)	4.906*** (1.069)	4.411*** (1.039)	4.428*** (1.049)	4.133*** (1.030)
	6-11	6.340*** (1.294)	5.622*** (1.287)	5.520*** (1.275)	5.173*** (1.269)	5.779*** (1.285)	5.072*** (1.268)	5.044*** (1.267)	4.690*** (1.256)
	12-17	6.729*** (1.413)	5.752*** (1.393)	5.763*** (1.402)	5.212*** (1.388)	6.729*** (1.435)	6.055*** (1.429)	5.949*** (1.425)	5.599*** (1.422)
College Degree	0-5	10.756*** (1.410)	9.956*** (1.415)	9.550*** (1.421)	9.164*** (1.423)	8.200*** (1.179)	7.415*** (1.169)	7.342*** (1.188)	6.896*** (1.179)
	6-11	10.559*** (1.477)	9.390*** (1.516)	9.226*** (1.491)	8.628*** (1.506)	9.387*** (1.425)	8.228*** (1.452)	8.201*** (1.439)	7.586*** (1.449)
	12-17	10.613*** (1.592)	9.100*** (1.606)	9.329*** (1.603)	8.408*** (1.610)	9.118*** (1.631)	8.069*** (1.652)	8.046*** (1.637)	7.462*** (1.651)
FaSch (Base: No Degree)									
HSD/GED	0-5	3.704*** (1.127)	3.476*** (1.116)	3.140*** (1.109)	3.071*** (1.104)	3.121*** (0.928)	2.893*** (0.910)	2.715*** (0.912)	2.624*** (0.902)
	6-11	4.045*** (1.186)	3.564*** (1.171)	3.398*** (1.174)	3.175*** (1.164)	2.411** (1.138)	1.952* (1.119)	1.864* (1.127)	1.639 (1.113)
	12-17	6.081*** (1.409)	5.273*** (1.386)	5.109*** (1.401)	4.683*** (1.382)	4.431*** (1.436)	3.931*** (1.416)	3.647*** (1.430)	3.418** (1.414)
College Degree	0-5	5.673*** (1.407)	5.066*** (1.421)	4.546*** (1.431)	4.286*** (1.437)	3.671*** (1.188)	3.043*** (1.199)	2.827** (1.216)	2.510** (1.220)
	6-11	6.501*** (1.450)	5.327*** (1.474)	5.230*** (1.476)	4.585*** (1.487)	4.279*** (1.392)	3.099** (1.412)	3.168** (1.416)	2.484* (1.425)
	12-17	10.382*** (1.610)	9.033*** (1.620)	9.053*** (1.626)	8.257*** (1.625)	7.496*** (1.664)	6.598*** (1.665)	6.398*** (1.682)	5.926*** (1.676)
Pinc	0-5		1.123*** (0.341)		0.800** (0.339)		1.112*** (0.267)		0.922*** (0.263)
	6-11		1.933*** (0.538)		1.507*** (0.509)		1.924*** (0.484)		1.566*** (0.464)
	12-17		2.324*** (0.500)		1.935*** (0.486)		1.589*** (0.481)		1.195*** (0.480)
Insur (Base: Any Private)									
Only Public	0-5			-3.901*** (0.936)	-3.308*** (0.960)			-2.833*** (0.755)	-2.155*** (0.771)
	6-11			-5.220*** (1.072)	-4.150*** (1.115)			-4.610*** (1.032)	-3.503*** (1.057)
	12-17			-5.576*** (1.214)	-4.222*** (1.238)			-4.864*** (1.238)	-4.041*** (1.277)
None	0-5			-2.060 (1.379)	-1.769 (1.380)			-2.090* (1.151)	-1.720 (1.148)
	6-11			-0.098 (1.381)	0.441 (1.385)			-0.170 (1.370)	0.390 (1.369)
	12-17			-1.955 (1.438)	-1.147 (1.440)			-0.643 (1.419)	-0.147 (1.428)
Female	0-5	1.460** (0.633)	1.421** (0.633)	1.501** (0.633)	1.467** (0.633)	1.516*** (0.527)	1.467*** (0.525)	1.546*** (0.527)	1.500*** (0.526)
	6-11	1.531** (0.686)	1.462** (0.685)	1.505** (0.684)	1.456** (0.684)	2.352*** (0.654)	2.284*** (0.652)	2.329*** (0.653)	2.281*** (0.652)
	12-17	-0.251 (0.743)	-0.248 (0.740)	-0.186 (0.740)	-0.198 (0.738)	1.899*** (0.742)	1.900*** (0.741)	1.958*** (0.740)	1.950*** (0.739)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Brthrd	0-5	3.841***	3.888***	3.848***	3.881***	3.018***	3.064***	3.024***	3.061***
		(0.718)	(0.716)	(0.718)	(0.716)	(0.568)	(0.564)	(0.567)	(0.565)
	6-11	0.368	0.432	0.436	0.472	-0.436	-0.376	-0.372	-0.338
		(0.774)	(0.775)	(0.773)	(0.774)	(0.744)	(0.743)	(0.741)	(0.741)
	12-17	0.074	0.407	-0.023	0.274	-0.708	-0.483	-0.792	-0.613
		(0.776)	(0.785)	(0.773)	(0.781)	(0.763)	(0.772)	(0.759)	(0.768)
Chldrn	0-5	0.164	0.177	0.246	0.244	-0.258	-0.244	-0.194	-0.197
		(0.329)	(0.328)	(0.329)	(0.328)	(0.274)	(0.272)	(0.275)	(0.274)
	6-11	0.065	0.104	0.202	0.204	-0.403	-0.367	-0.278	-0.279
		(0.386)	(0.385)	(0.387)	(0.386)	(0.382)	(0.380)	(0.380)	(0.380)
	12-17	0.119	0.209	0.278	0.316	-0.707*	-0.639*	-0.563	-0.537
		(0.391)	(0.391)	(0.394)	(0.394)	(0.395)	(0.394)	(0.396)	(0.395)
Child_5	6-11	0.577	0.786	0.812	0.930	1.303	1.517*	1.502	1.633*
		(0.955)	(0.955)	(0.955)	(0.955)	(0.943)	(0.941)	(0.942)	(0.940)
	12-17	0.268	0.471	0.562	0.661	1.081	1.200	1.341	1.392
		(1.210)	(1.206)	(1.207)	(1.205)	(1.230)	(1.229)	(1.231)	(1.230)
Race (Base: White)									
Black	0-5	-2.424*	-2.269*	-2.153	-2.082	-1.584	-1.442	-1.424	-1.340
		(1.349)	(1.351)	(1.373)	(1.372)	(1.100)	(1.101)	(1.123)	(1.119)
	6-11	-2.834**	-2.321*	-2.161	-1.876	-3.217***	-2.682**	-2.595*	-2.284*
		(1.401)	(1.401)	(1.394)	(1.394)	(1.412)	(1.415)	(1.410)	(1.412)
	12-17	-5.172***	-4.609***	-4.638***	-4.279***	-4.708***	-4.302***	-4.176***	-3.941**
		(1.612)	(1.608)	(1.612)	(1.606)	(1.664)	(1.662)	(1.666)	(1.662)
Hispanic	0-5	-7.395***	-7.045***	-6.460***	-6.350***	-5.901***	-5.571***	-5.206***	-5.099***
		(1.042)	(1.044)	(1.047)	(1.048)	(0.857)	(0.856)	(0.861)	(0.861)
	6-11	-7.163***	-6.628***	-6.460***	-6.213***	-4.988***	-4.459***	-4.365***	-4.106***
		(1.132)	(1.133)	(1.149)	(1.148)	(1.111)	(1.115)	(1.128)	(1.129)
	12-17	-4.088***	-3.561***	-3.406***	-3.172***	-0.285	0.074	0.173	0.323
		(1.213)	(1.211)	(1.228)	(1.227)	(1.225)	(1.226)	(1.236)	(1.237)
Other	0-5	-3.931***	-3.907***	-3.961***	-3.939***	-3.137***	-3.142***	-3.200***	-3.188***
		(1.456)	(1.464)	(1.477)	(1.480)	(1.245)	(1.258)	(1.282)	(1.284)
	6-11	-3.085**	-2.379	-2.721*	-2.251	-1.870	-1.153	-1.542	-1.041
		(1.633)	(1.613)	(1.640)	(1.623)	(1.556)	(1.531)	(1.570)	(1.547)
	12-17	0.077	0.761	0.539	0.993	1.653	2.085	2.040	2.294
		(1.706)	(1.700)	(1.704)	(1.699)	(1.762)	(1.746)	(1.752)	(1.741)
MSA	0-5	0.878	0.759	0.768	0.700	1.643*	1.533*	1.576*	1.502*
		(1.074)	(1.069)	(1.072)	(1.069)	(0.931)	(0.926)	(0.933)	(0.929)
	6-11	3.206***	2.946***	2.940***	2.786**	3.631***	3.365***	3.392***	3.225***
		(1.162)	(1.154)	(1.157)	(1.152)	(1.166)	(1.158)	(1.161)	(1.156)
	12-17	2.426**	2.046*	2.165*	1.900*	3.107***	2.829**	2.825**	2.646**
		(1.192)	(1.179)	(1.185)	(1.175)	(1.227)	(1.219)	(1.221)	(1.216)
Region (Base: NE)									
MW	0-5	-2.292*	-2.369*	-2.510*	-2.530*	-1.285	-1.358	-1.429	-1.453
		(1.425)	(1.428)	(1.428)	(1.430)	(1.205)	(1.207)	(1.213)	(1.214)
	6-11	-2.358*	-2.425*	-2.633*	-2.629*	-3.202**	-3.273**	-3.457***	-3.460***
		(1.429)	(1.432)	(1.432)	(1.434)	(1.386)	(1.386)	(1.390)	(1.389)
	12-17	-0.833	-0.935	-1.006	-1.063	-3.203**	-3.249**	-3.398**	-3.411**
		(1.525)	(1.523)	(1.528)	(1.525)	(1.498)	(1.497)	(1.495)	(1.494)
S	0-5	-1.358	-1.353	-1.264	-1.273	-0.495	-0.463	-0.406	-0.394
		(1.283)	(1.284)	(1.278)	(1.279)	(1.084)	(1.083)	(1.081)	(1.081)
	6-11	-2.131*	-1.906	-2.131*	-1.986	-1.796	-1.565	-1.796	-1.644
		(1.269)	(1.275)	(1.264)	(1.268)	(1.210)	(1.204)	(1.206)	(1.202)
	12-17	-2.157	-1.966	-2.064	-1.959	-0.240	-0.131	-0.252	-0.200
		(1.397)	(1.392)	(1.400)	(1.396)	(1.334)	(1.331)	(1.332)	(1.331)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
W	0-5	0.613	0.451	0.454	0.363	0.346	0.202	0.242	0.151
		(1.302)	(1.307)	(1.302)	(1.306)	(1.079)	(1.084)	(1.083)	(1.086)
	6-11	-0.531	-0.650	-0.569	-0.654	-0.973	-1.097	-1.010	-1.106
		(1.320)	(1.328)	(1.317)	(1.322)	(1.271)	(1.272)	(1.268)	(1.269)
	12-17	0.203	-0.046	0.208	-0.005	-2.474*	-2.632*	-2.474*	-2.593*
		(1.423)	(1.425)	(1.421)	(1.423)	(1.421)	(1.424)	(1.415)	(1.419)
MoHlth	0-5	0.317***	0.314***	0.311***	0.310***	0.228***	0.226***	0.225***	0.224***
		(0.046)	(0.046)	(0.046)	(0.046)	(0.037)	(0.037)	(0.037)	(0.037)
	6-11	0.363***	0.362***	0.344***	0.346***	0.429***	0.427***	0.411***	0.414***
		(0.048)	(0.048)	(0.048)	(0.048)	(0.046)	(0.046)	(0.046)	(0.046)
	12-17	0.426***	0.407***	0.410***	0.398***	0.545***	0.532***	0.531***	0.524***
		(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)
FaHlth	0-5	0.148***	0.138***	0.141***	0.135***	0.166***	0.155***	0.161***	0.153***
		(0.051)	(0.051)	(0.051)	(0.051)	(0.041)	(0.041)	(0.041)	(0.041)
	6-11	0.299***	0.273***	0.279***	0.262***	0.338***	0.312***	0.321***	0.303***
		(0.053)	(0.054)	(0.053)	(0.053)	(0.052)	(0.052)	(0.051)	(0.052)
	12-17	0.296***	0.269***	0.276***	0.258***	0.354***	0.336***	0.335***	0.324***
		(0.054)	(0.054)	(0.054)	(0.054)	(0.053)	(0.054)	(0.053)	(0.054)
Msmok	0-5	0.908	1.081	1.181	1.264	1.265	1.430	1.444	1.538
		(1.227)	(1.224)	(1.220)	(1.220)	(0.998)	(0.990)	(0.992)	(0.987)
	6-11	0.438	0.691	0.536	0.710	-1.457	-1.194	-1.354	-1.167
		(1.220)	(1.204)	(1.219)	(1.207)	(1.263)	(1.248)	(1.263)	(1.251)
	12-17	-0.020	0.359	0.250	0.501	-2.016	-1.747	-1.768	-1.605
		(1.251)	(1.240)	(1.245)	(1.237)	(1.319)	(1.312)	(1.312)	(1.308)
Fsmok	0-5	-0.037	0.085	0.256	0.298	-0.033	0.071	0.162	0.203
		(1.010)	(1.005)	(1.004)	(1.002)	(0.844)	(0.839)	(0.840)	(0.837)
	6-11	-1.165	-0.974	-0.827	-0.740	-0.873	-0.689	-0.578	-0.492
		(1.077)	(1.069)	(1.071)	(1.065)	(1.035)	(1.025)	(1.030)	(1.023)
	12-17	-1.856*	-1.673	-1.542	-1.464	-1.968*	-1.839*	-1.695	-1.642
		(1.106)	(1.098)	(1.103)	(1.098)	(1.146)	(1.143)	(1.145)	(1.143)
Panel (Base: 6)									
7	0-5	-3.380**	-3.280**	-3.200**	-3.158*	-2.260	-2.162	-2.144	-2.100
		(1.675)	(1.686)	(1.692)	(1.697)	(1.414)	(1.427)	(1.434)	(1.440)
	6-11	-0.536	-0.391	-0.048	-0.015	-0.533	-0.396	-0.113	-0.081
		(1.654)	(1.667)	(1.680)	(1.686)	(1.648)	(1.664)	(1.679)	(1.685)
	12-17	0.869	1.150	1.246	1.404	-0.598	-0.422	-0.271	-0.183
		(1.826)	(1.830)	(1.834)	(1.835)	(1.846)	(1.854)	(1.851)	(1.857)
8	0-5	-0.035	0.099	0.267	0.315	-0.155	-0.018	0.100	0.153
		(1.555)	(1.562)	(1.567)	(1.571)	(1.347)	(1.350)	(1.351)	(1.353)
	6-11	1.013	1.298	1.752	1.853	-0.364	-0.092	0.266	0.362
		(1.586)	(1.595)	(1.602)	(1.606)	(1.638)	(1.648)	(1.656)	(1.660)
	12-17	0.127	0.428	0.606	0.760	-0.537	-0.356	-0.083	-0.003
		(1.892)	(1.899)	(1.900)	(1.904)	(1.880)	(1.887)	(1.898)	(1.900)
9	0-5	-1.481	-1.390	-1.165	-1.148	-0.556	-0.457	-0.343	-0.317
		(1.568)	(1.574)	(1.577)	(1.580)	(1.312)	(1.318)	(1.323)	(1.326)
	6-11	-1.499	-1.256	-0.737	-0.681	-1.887	-1.644	-1.229	-1.168
		(1.707)	(1.716)	(1.734)	(1.737)	(1.674)	(1.683)	(1.699)	(1.702)
	12-17	0.351	0.746	0.904	1.120	-2.273	-2.031	-1.794	-1.684
		(1.832)	(1.838)	(1.845)	(1.847)	(1.912)	(1.912)	(1.927)	(1.925)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
10	0-5	0.701	0.861	1.182	1.226	0.667	0.837	1.004	1.062
		(1.521)	(1.527)	(1.526)	(1.530)	(1.235)	(1.238)	(1.246)	(1.247)
	6-11	-2.688	-2.330	-1.816	-1.671	-1.270	-0.922	-0.533	-0.385
		(1.706)	(1.710)	(1.725)	(1.724)	(1.625)	(1.630)	(1.647)	(1.646)
	12-17	0.240	0.649	0.835	1.057	-1.532	-1.247	-0.962	-0.820
		(1.847)	(1.849)	(1.860)	(1.858)	(1.950)	(1.954)	(1.959)	(1.960)
11	0-5	0.636	0.816	1.104	1.161	-0.441	-0.248	-0.107	-0.034
		(1.588)	(1.594)	(1.591)	(1.595)	(1.369)	(1.369)	(1.377)	(1.377)
	6-11	0.104	0.523	0.983	1.157	0.486	0.898	1.249	1.432
		(1.681)	(1.692)	(1.692)	(1.698)	(1.623)	(1.631)	(1.635)	(1.637)
	12-17	2.856	3.204*	3.474*	3.644**	3.804**	4.037**	4.381***	4.486***
		(1.824)	(1.829)	(1.831)	(1.834)	(1.750)	(1.759)	(1.762)	(1.767)
12	0-5	5.473***	5.716***	5.922***	6.028***	3.732***	3.985***	4.042***	4.174***
		(1.520)	(1.524)	(1.530)	(1.532)	(1.258)	(1.260)	(1.269)	(1.269)
	6-11	3.164*	3.827**	4.059**	4.405**	1.050	1.736	1.842	2.220
		(1.731)	(1.736)	(1.737)	(1.741)	(1.735)	(1.731)	(1.740)	(1.737)
	12-17	6.347***	6.900***	7.054***	7.355***	4.053**	4.433**	4.690**	4.872***
		(1.886)	(1.882)	(1.909)	(1.901)	(1.922)	(1.927)	(1.936)	(1.938)
13	0-5	1.048	1.349	1.517	1.661	1.010	1.315	1.332	1.507
		(1.527)	(1.530)	(1.535)	(1.536)	(1.280)	(1.281)	(1.295)	(1.293)
	6-11	2.804*	3.285**	3.766***	3.979***	1.115	1.602	1.957	2.181
		(1.492)	(1.505)	(1.518)	(1.523)	(1.559)	(1.565)	(1.573)	(1.575)
	12-17	4.965***	5.643***	5.637***	6.054***	3.331**	3.792**	3.926**	4.189**
		(1.719)	(1.723)	(1.728)	(1.730)	(1.735)	(1.739)	(1.754)	(1.754)
14	0-5	3.823***	4.245***	4.255***	4.491***	2.478**	2.900**	2.773**	3.046**
		(1.483)	(1.480)	(1.488)	(1.485)	(1.239)	(1.233)	(1.249)	(1.243)
	6-11	0.617	1.353	1.530	1.962	1.947	2.667*	2.731*	3.173**
		(1.684)	(1.675)	(1.699)	(1.688)	(1.608)	(1.599)	(1.622)	(1.611)
	12-17	4.311**	5.047***	4.882***	5.369***	3.155*	3.660**	3.682**	3.995**
		(1.821)	(1.826)	(1.834)	(1.837)	(1.860)	(1.862)	(1.862)	(1.863)
15	0-5	2.617	2.955*	3.337**	3.468**	1.275	1.635	1.791	1.958
		(1.692)	(1.681)	(1.679)	(1.674)	(1.401)	(1.389)	(1.395)	(1.388)
	6-11	-0.273	0.308	0.916	1.159	0.118	0.695	1.141	1.395
		(1.767)	(1.761)	(1.771)	(1.766)	(1.758)	(1.756)	(1.766)	(1.763)
	12-17	3.551*	4.511**	4.655**	5.210***	2.948	3.586	3.953**	4.289**
		(1.944)	(1.930)	(1.933)	(1.923)	(1.904)	(1.908)	(1.899)	(1.901)

A.9: Estimated Marginal Effects on the Bivariate Probit Model by Race

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	White	3.182*** (1.113)	2.444** (1.111)	2.366** (1.125)	1.961* (1.121)	3.087*** (1.087)	2.529** (1.078)	2.363** (1.092)	2.088** (1.085)
	Black	5.244** (2.549)	4.517* (2.652)	4.826* (2.575)	4.372* (2.650)	4.033* (2.259)	3.477 (2.347)	3.653* (2.281)	3.337 (2.345)
	Hispan	7.901*** (1.324)	7.066*** (1.334)	6.932*** (1.320)	6.474*** (1.324)	6.793*** (1.259)	6.033*** (1.255)	5.995*** (1.258)	5.565*** (1.254)
	Other	4.737* (2.606)	4.663* (2.606)	4.517* (2.576)	4.496* (2.577)	2.959 (2.704)	2.890 (2.707)	2.684 (2.656)	2.671 (2.652)
College Degree	White	6.823*** (1.255)	5.620*** (1.272)	5.512*** (1.281)	4.837*** (1.284)	5.827*** (1.218)	4.919*** (1.221)	4.676*** (1.237)	4.219*** (1.237)
	Black	8.906*** (3.060)	7.626** (3.253)	8.079*** (3.113)	7.316** (3.253)	5.905** (2.762)	4.922* (2.924)	5.162* (2.801)	4.617 (2.921)
	Hispan	12.796*** (1.985)	11.062*** (2.008)	10.859*** (1.988)	9.892*** (2.000)	11.466*** (1.858)	9.886*** (1.861)	9.861*** (1.874)	8.950*** (1.874)
	Other	10.328*** (2.884)	10.166*** (2.892)	9.877*** (2.894)	9.826*** (2.898)	6.034** (2.896)	5.868** (2.902)	5.695** (2.860)	5.614** (2.857)
FaSch (Base: No Degree)									
HSD/GED	White	1.797* (1.076)	1.366 (1.075)	1.067 (1.096)	0.883 (1.092)	0.502 (1.036)	0.179 (1.032)	-0.147 (1.040)	-0.267 (1.037)
	Black	1.999 (2.598)	1.564 (2.573)	1.567 (2.604)	1.355 (2.583)	3.134 (2.396)	2.782 (2.370)	2.708 (2.397)	2.541 (2.377)
	Hispan	6.948*** (1.341)	6.418*** (1.339)	6.191*** (1.337)	5.929*** (1.335)	5.280*** (1.275)	4.789*** (1.273)	4.675*** (1.275)	4.418*** (1.272)
	Other	0.071 (2.604)	-0.070 (2.620)	-0.555 (2.675)	-0.588 (2.677)	1.624 (2.604)	1.468 (2.598)	1.510 (2.674)	1.440 (2.659)
College Degree	White	3.872*** (1.237)	2.987** (1.247)	2.797** (1.262)	2.325* (1.263)	2.045* (1.195)	1.388 (1.200)	1.097 (1.212)	0.784 (1.214)
	Black	6.992** (3.133)	6.068** (3.100)	6.255** (3.167)	5.748* (3.127)	7.390** (2.950)	6.661** (2.922)	6.634** (2.989)	6.257** (2.954)
	Hispan	10.055*** (2.238)	8.599*** (2.254)	8.066*** (2.242)	7.318*** (2.251)	5.397*** (2.053)	4.057** (2.066)	3.750* (2.067)	3.031 (2.073)
	Other	2.305 (2.929)	1.892 (2.997)	1.178 (3.047)	1.025 (3.075)	3.835 (2.909)	3.397 (2.928)	3.624 (3.008)	3.363 (2.996)
Pinc	White		1.619*** (0.371)		1.329*** (0.351)		1.224*** (0.335)		0.900*** (0.337)
	Black		1.491* (0.899)		1.222 (0.948)		1.150 (0.857)		0.871 (0.891)
	Hispan		2.891*** (0.642)		2.246*** (0.595)		2.629*** (0.484)		2.099*** (0.459)
	Other		0.429 (0.549)		0.237 (0.584)		0.452 (0.490)		0.410 (0.503)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Insur (Base: Any Private)									
Only Public	White			-4.082***	-3.163***			-3.651***	-3.025***
				(0.886)	(0.919)			(0.856)	(0.882)
	Black			-2.511	-1.676			-2.480	-1.887
				(1.912)	(2.038)			(1.777)	(1.887)
	Hispan			-7.845***	-6.431***			-6.622***	-5.309***
				(1.312)	(1.369)			(1.219)	(1.248)
	Other			-2.727	-2.516			-0.901	-0.530
				(2.086)	(2.151)			(2.076)	(2.139)
None	White			0.094	0.467			0.475	0.721
				(1.356)	(1.362)			(1.298)	(1.301)
	Black			-0.989	-0.549			0.327	0.625
				(3.257)	(3.271)			(3.096)	(3.115)
	Hispan			-3.681**	-2.692			-2.518	-1.598
				(1.716)	(1.729)			(1.611)	(1.615)
	Other			-0.487	-0.342			-1.895	-1.676
				(3.379)	(3.402)			(2.969)	(2.987)
Age	White	-0.310***	-0.317***	-0.333***	-0.333***	-0.703***	-0.706***	-0.722***	-0.721***
		(0.083)	(0.082)	(0.083)	(0.082)	(0.078)	(0.078)	(0.078)	(0.078)
	Black	-0.526***	-0.533***	-0.552***	-0.551***	-0.984***	-0.988***	-1.014***	-1.011***
		(0.205)	(0.205)	(0.206)	(0.206)	(0.188)	(0.188)	(0.189)	(0.189)
	Hispan	-0.267**	-0.310***	-0.375***	-0.393***	-0.521***	-0.559***	-0.619***	-0.635***
		(0.122)	(0.121)	(0.123)	(0.123)	(0.112)	(0.111)	(0.113)	(0.113)
	Other	0.141	0.143	0.132	0.133	-0.244	-0.241	-0.245	-0.241
		(0.198)	(0.198)	(0.198)	(0.199)	(0.197)	(0.196)	(0.199)	(0.197)
Female	White	0.911*	0.867*	0.934*	0.891*	1.971***	1.941***	1.986***	1.960***
		(0.496)	(0.495)	(0.494)	(0.494)	(0.474)	(0.473)	(0.473)	(0.472)
	Black	1.052	1.060	1.119	1.107	2.630**	2.633**	2.673**	2.662**
		(1.215)	(1.215)	(1.216)	(1.216)	(1.175)	(1.174)	(1.174)	(1.172)
	Hispan	0.801	0.780	0.845	0.823	2.034***	2.008***	2.075***	2.050***
		(0.776)	(0.774)	(0.773)	(0.772)	(0.707)	(0.705)	(0.705)	(0.704)
	Other	1.430	1.382	1.408	1.385	0.460	0.413	0.423	0.387
		(1.190)	(1.190)	(1.188)	(1.187)	(1.098)	(1.096)	(1.095)	(1.095)
Brthrd	White	1.795***	1.919***	1.842***	1.933***	0.498	0.591	0.543	0.606
		(0.556)	(0.557)	(0.556)	(0.557)	(0.553)	(0.555)	(0.553)	(0.554)
	Black	2.377	2.527*	2.480*	2.574*	3.090**	3.201**	3.181**	3.243**
		(1.507)	(1.518)	(1.505)	(1.515)	(1.347)	(1.346)	(1.342)	(1.342)
	Hispan	1.714**	1.999**	1.832**	2.033**	2.068***	2.330***	2.170***	2.360***
		(0.890)	(0.889)	(0.890)	(0.889)	(0.797)	(0.793)	(0.794)	(0.791)
	Other	0.071	0.114	0.088	0.109	-0.842	-0.800	-0.853	-0.816
		(1.362)	(1.360)	(1.355)	(1.353)	(1.208)	(1.211)	(1.208)	(1.210)
Chldrn	White	0.406	0.420	0.560*	0.535*	-0.559**	-0.543**	-0.425	-0.437
		(0.293)	(0.291)	(0.293)	(0.291)	(0.274)	(0.273)	(0.276)	(0.276)
	Black	0.510	0.585	0.649	0.666	0.276	0.337	0.420	0.435
		(0.722)	(0.722)	(0.728)	(0.729)	(0.662)	(0.660)	(0.673)	(0.672)
	Hispan	-0.075	-0.033	0.023	0.034	-0.622	-0.587	-0.538	-0.529
		(0.549)	(0.545)	(0.553)	(0.549)	(0.515)	(0.508)	(0.514)	(0.509)
	Other	-0.658	-0.624	-0.577	-0.568	-0.394	-0.357	-0.383	-0.359
		(0.712)	(0.709)	(0.709)	(0.708)	(0.653)	(0.650)	(0.653)	(0.652)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Child_5	White	0.053	0.302	0.263	0.429	1.382	1.566*	1.582*	1.690**
		(0.897)	(0.897)	(0.898)	(0.899)	(0.869)	(0.870)	(0.869)	(0.870)
	Black	1.732	1.837	1.769	1.838	1.742	1.829	1.765	1.819
		(2.239)	(2.245)	(2.236)	(2.243)	(2.097)	(2.100)	(2.106)	(2.108)
	Hispan	-1.790	-1.477	-1.366	-1.199	-0.731	-0.450	-0.386	-0.230
		(1.493)	(1.490)	(1.489)	(1.487)	(1.393)	(1.390)	(1.391)	(1.389)
	Other	2.040	2.038	1.977	1.987	2.490	2.487	2.433	2.446
		(2.290)	(2.285)	(2.299)	(2.298)	(2.293)	(2.282)	(2.306)	(2.297)
MSA	White	1.513**	1.168*	1.250*	1.016	1.817***	1.556**	1.588**	1.429**
		(0.712)	(0.711)	(0.709)	(0.708)	(0.698)	(0.701)	(0.699)	(0.701)
	Black	5.809**	5.579**	5.742**	5.583**	7.354***	7.210***	7.338***	7.246***
		(2.398)	(2.411)	(2.408)	(2.414)	(2.233)	(2.245)	(2.241)	(2.248)
	Hispan	1.675	1.703	1.617	1.643	1.816	1.852	1.748	1.783
		(1.797)	(1.783)	(1.783)	(1.775)	(1.667)	(1.654)	(1.653)	(1.646)
	Other	2.979	2.955	2.750	2.754	4.738*	4.708*	4.648*	4.653*
		(2.640)	(2.641)	(2.672)	(2.670)	(2.527)	(2.526)	(2.539)	(2.532)
Region (Base: NE)									
MW	White	-0.832	-0.830	-0.991	-0.961	-0.939	-0.929	-1.082	-1.056
		(0.946)	(0.944)	(0.946)	(0.945)	(0.900)	(0.899)	(0.900)	(0.900)
	Black	-2.177	-1.861	-1.959	-1.770	-3.385	-3.136	-3.201	-3.067
		(3.052)	(3.034)	(3.041)	(3.031)	(2.788)	(2.786)	(2.785)	(2.786)
	Hispan	-8.806***	-9.755***	-9.888***	-10.414***	-7.886***	-8.762***	-8.800***	-9.315***
		(2.797)	(2.820)	(2.793)	(2.812)	(2.566)	(2.589)	(2.564)	(2.583)
	Other	5.964**	5.963**	5.752**	5.761**	-0.802	-0.808	-0.848	-0.838
		(2.611)	(2.608)	(2.611)	(2.611)	(2.667)	(2.662)	(2.674)	(2.671)
S	White	-1.673*	-1.559*	-1.601*	-1.533*	-0.270	-0.180	-0.207	-0.161
		(0.917)	(0.914)	(0.914)	(0.912)	(0.885)	(0.881)	(0.881)	(0.879)
	Black	-1.888	-1.576	-1.694	-1.500	0.984	1.228	1.141	1.278
		(2.425)	(2.421)	(2.432)	(2.426)	(2.283)	(2.278)	(2.291)	(2.288)
	Hispan	-3.610	-4.032*	-3.696*	-4.030*	-3.081	-3.454*	-3.214	-3.527*
		(2.273)	(2.308)	(2.272)	(2.299)	(2.050)	(2.079)	(2.044)	(2.068)
	Other	3.574	3.718	3.591	3.673	0.287	0.433	0.251	0.376
		(2.423)	(2.423)	(2.428)	(2.431)	(2.539)	(2.534)	(2.535)	(2.533)
W	White	-0.828	-0.894	-0.907	-0.951	-1.128	-1.164	-1.197	-1.219
		(1.035)	(1.033)	(1.037)	(1.035)	(0.990)	(0.989)	(0.992)	(0.991)
	Black	-0.716	-0.720	-0.732	-0.727	-1.512	-1.524	-1.569	-1.578
		(3.351)	(3.346)	(3.339)	(3.340)	(3.009)	(2.998)	(3.021)	(3.012)
	Hispan	-0.422	-1.318	-0.770	-1.397	-2.113	-2.935	-2.416	-3.019
		(2.233)	(2.273)	(2.230)	(2.261)*	(2.001)	(2.039)	(1.993)	(2.025)
	Other	4.233*	4.229*	4.194*	4.200*	-0.150	-0.155	-0.226	-0.229
		(2.224)	(2.221)	(2.225)	(2.224)	(2.333)	(2.328)	(2.339)	(2.333)
MoHlth	White	0.299***	0.287***	0.291***	0.284***	0.405***	0.396***	0.398***	0.393***
		(0.036)	(0.036)	(0.036)	(0.036)	(0.033)	(0.033)	(0.033)	(0.033)
	Black	0.280***	0.270***	0.270***	0.265***	0.265***	0.257***	0.254***	0.250***
		(0.092)	(0.091)	(0.091)	(0.091)	(0.080)	(0.080)	(0.080)	(0.080)
	Hispan	0.485***	0.485***	0.458***	0.463***	0.395***	0.395***	0.371***	0.376***
		(0.068)	(0.068)	(0.068)	(0.068)	(0.065)	(0.064)	(0.064)	(0.064)
	Other	0.223**	0.222**	0.215**	0.216**	0.315***	0.314***	0.309***	0.309***
		(0.100)	(0.100)	(0.100)	(0.100)	(0.088)	(0.087)	(0.088)	(0.088)
FaHlth	White	0.203***	0.187***	0.183***	0.174***	0.239***	0.227***	0.221***	0.215***
		(0.040)	(0.040)	(0.039)	(0.039)	(0.037)	(0.037)	(0.036)	(0.036)
	Black	0.194*	0.178*	0.183*	0.174*	0.289***	0.278***	0.277***	0.271***
		(0.104)	(0.106)	(0.104)	(0.105)	(0.095)	(0.096)	(0.095)	(0.096)
	Hispan	0.345***	0.310***	0.344***	0.317***	0.386***	0.353***	0.385***	0.358***
		(0.075)	(0.075)	(0.075)	(0.075)	(0.069)	(0.069)	(0.069)	(0.070)
	Other	0.147	0.142	0.127	0.125	0.095	0.089	0.094	0.091
		(0.105)	(0.106)	(0.105)	(0.105)	(0.096)	(0.097)	(0.095)	(0.096)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Msmok	White	-1.117	-0.899	-0.941	-0.808	-1.770**	-1.600**	-1.625**	-1.531*
		(0.819)	(0.818)	(0.822)	(0.821)	(0.821)	(0.822)	(0.824)	(0.825)
	Black	2.767	3.043	2.968	3.133	0.990	1.190	1.218	1.322
		(2.492)	(2.507)	(2.493)	(2.505)	(2.117)	(2.136)	(2.120)	(2.135)
	Hispan	3.189	3.282	2.905	3.042	1.402	1.478	1.180	1.297
		(2.256)	(2.258)	(2.253)	(2.256)	(2.057)	(2.056)	(2.050)	(2.051)
	Other	1.144	1.257	1.324	1.375	0.382	0.499	0.406	0.491
		(2.603)	(2.574)	(2.570)	(2.553)	(2.421)	(2.393)	(2.417)	(2.393)
Fsmok	White	-1.873**	-1.640**	-1.482*	-1.375*	-1.252	-1.078	-0.913	-0.843
		(0.803)	(0.800)	(0.811)	(0.808)	(0.796)	(0.795)	(0.807)	(0.805)
	Black	1.291	1.551	1.458	1.617	0.531	0.735	0.727	0.842
		(2.003)	(1.995)	(1.993)	(1.988)	(1.814)	(1.803)	(1.802)	(1.796)
	Hispan	-0.294	-0.132	-0.040	0.043	-1.198	-1.064	-0.992	-0.925
		(1.490)	(1.480)	(1.478)	(1.472)	(1.397)	(1.388)	(1.388)	(1.383)
	Other	-3.698*	-3.756*	-3.532*	-3.570*	-0.824	-0.890	-0.789	-0.867
		(2.035)	(2.022)	(2.052)	(2.043)	(2.036)	(2.021)	(2.055)	(2.038)
Panel (Base: 6)									
7	White	-2.047*	-1.829	-1.873*	-1.733	-2.359**	-2.209*	-2.189*	-2.106*
		(1.161)	(1.154)	(1.153)	(1.149)	(1.161)	(1.159)	(1.155)	(1.155)
	Black	9.072***	9.097***	9.413***	9.322***	6.325*	6.348*	6.730**	6.670**
		(3.500)	(3.501)	(3.527)	(3.530)	(3.367)	(3.376)	(3.410)	(3.416)
	Hispan	-1.607	-1.329	-0.871	-0.774	-0.839	-0.583	-0.164	-0.071
		(2.328)	(2.316)	(2.323)	(2.315)	(2.191)	(2.178)	(2.190)	(2.180)
	Other	-4.686	-4.664	-4.375	-4.392	-3.052	-3.037	-3.019	-3.044
		(3.860)	(3.860)	(3.823)	(3.822)	(3.867)	(3.868)	(3.830)	(3.820)
8	White	-0.119	0.012	0.146	0.199	-1.661	-1.562	-1.412	-1.379
		(1.202)	(1.191)	(1.193)	(1.186)	(1.161)	(1.153)	(1.158)	(1.153)
	Black	2.928	3.214	3.131	3.295	1.644	1.874	1.941	2.063
		(3.051)	(3.068)	(3.040)	(3.056)	(2.872)	(2.879)	(2.863)	(2.869)
	Hispan	0.617	0.899	1.614	1.667	1.098	1.337	2.003	2.037
		(2.419)	(2.412)	(2.414)	(2.410)	(2.293)	(2.281)	(2.289)	(2.281)
	Other	-0.281	-0.127	0.218	0.267	0.279	0.441	0.392	0.483
		(3.727)	(3.725)	(3.696)	(3.697)	(3.975)	(3.964)	(3.898)	(3.892)
9	White	-0.810	-0.675	-0.532	-0.484	-1.804	-1.698	-1.556	-1.523
		(1.181)	(1.175)	(1.174)	(1.171)	(1.148)	(1.143)	(1.140)	(1.138)
	Black	10.317***	10.565***	10.487***	10.645***	4.350	4.564	4.611	4.733
		(3.480)	(3.483)	(3.491)	(3.485)	(3.182)	(3.181)	(3.197)	(3.192)
	Hispan	-3.159	-2.748	-1.965	-1.841	-1.605	-1.214	-0.534	-0.404
		(2.337)	(2.322)	(2.338)	(2.327)	(2.177)	(2.163)	(2.178)	(2.166)
	Other	-3.981	-3.931	-3.630	-3.637	-4.377	-4.322	-4.361	-4.346
		(3.566)	(3.562)	(3.553)	(3.549)	(3.534)	(3.523)	(3.495)	(3.480)
10	White	-0.288	-0.034	0.065	0.204	-0.718	-0.519	-0.396	-0.298
		(1.183)	(1.184)	(1.188)	(1.187)	(1.173)	(1.172)	(1.180)	(1.178)
	Black	4.274	4.630	4.502	4.718	3.052	3.332	3.386	3.546
		(3.077)	(3.055)	(3.064)	(3.048)	(2.993)	(2.963)	(2.982)	(2.960)
	Hispan	-1.662	-1.223	-0.263	-0.148	-0.554	-0.152	0.693	0.804
		(2.312)	(2.301)	(2.316)	(2.308)	(2.172)	(2.155)	(2.180)	(2.166)
	Other	-1.207	-1.123	-0.656	-0.652	-2.152	-2.063	-2.076	-2.058
		(3.690)	(3.680)	(3.682)	(3.677)	(3.770)	(3.769)	(3.711)	(3.705)
11	White	0.575	0.834	1.048	1.162	0.222	0.408	0.653	0.722
		(1.295)	(1.286)	(1.285)	(1.281)	(1.218)	(1.214)	(1.221)	(1.218)
	Black	3.706	3.948	3.867	4.016	4.914	5.091*	5.209*	5.306*
		(3.174)	(3.165)	(3.156)	(3.152)	(3.129)	(3.132)	(3.132)	(3.133)
	Hispan	1.049	1.637	2.441	2.666	1.390	1.926	2.640	2.853
		(2.371)	(2.371)	(2.371)	(2.373)	(2.256)	(2.245)	(2.259)	(2.251)
	Other	2.450	2.523	2.827	2.838	2.922	3.000	2.927	2.961
		(3.910)	(3.905)	(3.906)	(3.902)	(4.204)	(4.199)	(4.172)	(4.162)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
12	White	2.280*	2.655**	2.596**	2.827**	1.429	1.709	1.731	1.882
		(1.344)	(1.343)	(1.346)	(1.345)	(1.395)	(1.394)	(1.389)	(1.389)
	Black	13.705***	14.184***	13.957***	14.267***	7.051**	7.437**	7.368**	7.595**
		(3.680)	(3.714)	(3.713)	(3.727)	(3.419)	(3.426)	(3.446)	(3.442)
	Hispan	9.415***	10.054***	11.003***	11.235***	6.364***	6.939***	7.787***	7.998***
		(2.739)	(2.723)	(2.722)	(2.713)	(2.440)	(2.428)	(2.439)	(2.431)
	Other	-1.385	-1.145	-0.852	-0.769	-1.428	-1.189	-1.193	-1.050
		(3.765)	(3.798)	(3.805)	(3.824)	(3.648)	(3.673)	(3.631)	(3.648)
13	White	0.118	0.547	0.610	0.847	-1.581	-1.258	-1.131	-0.972
		(1.297)	(1.297)	(1.301)	(1.301)	(1.208)	(1.212)	(1.214)	(1.216)
	Black	13.023***	13.563***	13.372***	13.699***	6.427**	6.836**	6.832**	7.059**
		(3.240)	(3.245)	(3.282)	(3.273)	(3.105)	(3.083)	(3.135)	(3.110)
	Hispan	3.548	4.355**	4.963**	5.363**	5.171**	5.897***	6.425***	6.792***
		(2.252)	(2.256)	(2.256)	(2.257)	(2.158)	(2.150)	(2.164)	(2.157)
	Other	1.645	1.762	1.868	1.929	-1.448	-1.315	-1.516	-1.407
		(3.675)	(3.680)	(3.665)	(3.672)	(3.534)	(3.537)	(3.504)	(3.508)
14	White	2.301*	2.836**	2.650**	3.006**	0.817	1.218	1.119	1.356
		(1.282)	(1.282)	(1.275)	(1.277)	(1.245)	(1.245)	(1.241)	(1.242)
	Black	8.448**	9.182***	8.772***	9.273***	7.002**	7.544**	7.437**	7.770***
		(3.456)	(3.514)	(3.484)	(3.522)	(3.106)	(3.152)	(3.136)	(3.162)
	Hispan	2.935	3.925*	4.248*	4.820**	4.868**	5.753**	6.088***	6.605***
		(2.456)	(2.454)	(2.456)	(2.454)	(2.371)	(2.359)	(2.365)	(2.355)
	Other	1.549	1.821	1.949	2.062	-0.473	-0.174	-0.402	-0.165
		(3.570)	(3.553)	(3.583)	(3.566)	(3.472)	(3.465)	(3.425)	(3.425)
15	White	1.130	1.665	1.726	2.034	0.201	0.598	0.724	0.923
		(1.469)	(1.448)	(1.467)	(1.451)	(1.353)	(1.349)	(1.364)	(1.359)
	Black	7.766**	8.454**	8.278**	8.661**	0.399	0.930	0.993	1.280
		(3.599)	(3.591)	(3.568)	(3.571)	(3.247)	(3.256)	(3.194)	(3.212)
	Hispan	0.751	1.663	2.762	3.145	3.276	4.128*	5.099**	5.475**
		(2.588)	(2.574)	(2.587)	(2.577)	(2.399)	(2.386)	(2.411)	(2.400)
	Other	3.394	3.580	4.133	4.180	2.520	2.713	2.698	2.780
		(3.836)	(3.838)	(3.818)	(3.822)	(3.768)	(3.765)	(3.666)	(3.664)

A.10: Estimated Marginal Effects on the Bivariate Probit Model by Economic Status

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
MoSch (Base: No Degree)									
HSD/GED	Low	6.079*** (1.237)	5.864*** (1.235)	5.885*** (1.238)	5.733*** (1.237)	5.194*** (1.189)	4.985*** (1.186)	5.066*** (1.188)	4.916*** (1.186)
	High	5.589*** (1.446)	4.840*** (1.401)	5.178*** (1.408)	4.623*** (1.376)	4.977*** (1.330)	4.424 (1.292)	4.608*** (1.305)	4.210*** (1.277)
College Degree	Low	8.080*** (1.823)	7.898*** (1.825)	7.664*** (1.835)	7.563*** (1.836)	8.977*** (1.652)	8.791*** (1.654)	8.660*** (1.668)	8.550*** (1.669)
	High	8.958*** (1.501)	7.730*** (1.474)	8.365*** (1.467)	7.417*** (1.450)	6.731*** (1.379)	5.815 (1.357)	6.215*** (1.360)	5.528*** (1.346)
FaSch (Base: No Degree)									
HSD/GED	Low	3.932*** (1.253)	3.827*** (1.250)	3.736*** (1.252)	3.668*** (1.249)	3.072*** (1.181)	2.964*** (1.177)	2.901*** (1.177)	2.829** (1.174)
	High	3.556*** (1.176)	3.138*** (1.144)	3.076*** (1.156)	2.830*** (1.132)	2.105** (1.081)	1.807 (1.052)	1.681 (1.066)	1.511 (1.044)
College Degree	Low	8.770*** (1.824)	8.477*** (1.836)	8.092*** (1.860)	7.906*** (1.867)	5.604*** (1.811)	5.306*** (1.823)	4.940*** (1.855)	4.750*** (1.862)
	High	4.657*** (1.285)	3.776*** (1.276)	4.046*** (1.270)	3.416*** (1.263)	2.826** (1.185)	2.177 (1.169)	2.290** (1.175)	1.834 (1.163)
Pinc	Low		1.085*** (0.406)		0.945** (0.403)		1.054*** (0.356)		0.924*** (0.358)
	High		2.559*** (0.597)		2.281*** (0.603)		1.926 (0.527)		1.668*** (0.531)
Insur (Base: Any Private)									
Only Public	Low			-3.318*** (1.247)	-2.952** (1.258)			-2.984*** (1.180)	-2.626** (1.188)
	High			-3.464*** (1.007)	-2.750*** (1.001)			-2.798*** (0.970)	-2.288** (0.962)
None	Low			0.678 (1.695)	0.895 (1.701)			1.663 (1.570)	1.876 (1.574)
	High			-0.733 (1.062)	-0.266 (1.043)			-1.300 (1.023)	-0.947 (1.003)
Age	Low	-0.477*** (0.113)	-0.482*** (0.113)	-0.537*** (0.114)	-0.538*** (0.114)	-0.785*** (0.106)	-0.789*** (0.105)	-0.849*** (0.107)	-0.849*** (0.106)
	High	-0.236*** (0.071)	-0.236*** (0.071)	-0.248*** (0.072)	-0.246*** (0.071)	-0.586*** (0.068)	-0.583 (0.068)	-0.595*** (0.068)	-0.591*** (0.068)
Female	Low	0.802 (0.713)	0.755 (0.713)	0.830 (0.713)	0.789 (0.712)	2.785*** (0.654)	2.741*** (0.654)	2.813*** (0.653)	2.774*** (0.653)
	High	1.154*** (0.435)	1.147*** (0.435)	1.185*** (0.435)	1.173*** (0.434)	1.382*** (0.412)	1.371 (0.411)	1.412*** (0.411)	1.398*** (0.411)
Brthrd	Low	2.621*** (0.803)	2.717*** (0.803)	2.688*** (0.803)	2.765*** (0.803)	2.236*** (0.740)	2.329*** (0.738)	2.301*** (0.737)	2.376*** (0.736)
	High	1.308*** (0.500)	1.476*** (0.504)	1.321*** (0.500)	1.468*** (0.503)	0.741 (0.467)	0.868 (0.469)	0.747 (0.467)	0.855* (0.469)
Chldrn	Low	0.548 (0.450)	0.506 (0.450)	0.553 (0.450)	0.516 (0.450)	-0.162 (0.418)	-0.204 (0.418)	-0.151 (0.416)	-0.188 (0.417)
	High	0.567** (0.287)	0.481* (0.287)	0.600** (0.285)	0.513* (0.286)	-0.165 (0.271)	-0.225 (0.271)	-0.137 (0.271)	-0.196 (0.271)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Child_5	Low	1.097	1.187	1.180	1.249	1.710	1.798	1.774	1.843
		(1.385)	(1.385)	(1.383)	(1.384)	(1.298)	(1.298)	(1.295)	(1.295)
	High	-0.642	-0.477	-0.556	-0.419	0.728	0.853	0.787	0.887
		(0.764)	(0.768)	(0.761)	(0.765)	(0.750)	(0.753)	(0.750)	(0.752)
Race (Base: White)									
Black	Low	-2.801	-2.691	-2.527	-2.445	-2.648	-2.532	-2.352	-2.264
		(1.803)	(1.804)	(1.806)	(1.806)	(1.696)	(1.697)	(1.697)	(1.697)
	High	-2.938***	-2.690***	-2.782***	-2.585***	-2.525***	-2.331	-2.407**	-2.256**
		(1.019)	(1.015)	(1.019)	(1.015)	(0.994)	(0.991)	(0.996)	(0.993)
Hispanic	Low	-8.317***	-8.240***	-8.105***	-8.075***	-5.066***	-4.989***	-4.944***	-4.911***
		(1.357)	(1.357)	(1.365)	(1.365)	(1.285)	(1.286)	(1.290)	(1.290)
	High	-2.788***	-2.387***	-2.367***	-2.109***	-1.853**	-1.556	-1.475*	-1.288*
		(0.813)	(0.808)	(0.812)	(0.809)	(0.796)	(0.791)	(0.798)	(0.794)
Other	Low	-3.142	-2.878	-3.078	-2.849	-1.620	-1.354	-1.546	-1.314
		(2.210)	(2.208)	(2.221)	(2.219)	(2.138)	(2.130)	(2.152)	(2.144)
	High	-0.907	-0.816	-0.813	-0.758	-0.400	-0.321	-0.305	-0.255
		(0.967)	(0.973)	(0.971)	(0.976)	(0.922)	(0.924)	(0.928)	(0.929)
MSA	Low	4.623***	4.608***	4.536***	4.518***	4.963***	4.952***	4.822***	4.807***
		(1.435)	(1.434)	(1.434)	(1.434)	(1.385)	(1.385)	(1.384)	(1.384)
	High	-0.093	-0.409	-0.210	-0.469	0.634	0.379	0.534	0.331
		(0.746)	(0.739)	(0.744)	(0.737)	(0.752)	(0.748)	(0.751)	(0.748)
Region (Base: NE)									
MW	Low	-4.978**	-5.148**	-5.250**	-5.375**	-3.618*	-3.772**	-3.899**	-4.015**
		(2.146)	(2.154)	(2.150)	(2.156)	(1.947)	(1.953)	(1.949)	(1.953)
	High	-0.454	-0.407	-0.605	-0.537	-1.941**	-1.898	-2.057**	-2.000**
		(0.859)	(0.859)	(0.858)	(0.859)	(0.841)	(0.841)	(0.841)	(0.841)
S	Low	-3.739**	-3.750**	-3.883**	-3.897**	-2.264	-2.259	-2.489	-2.491
		(1.843)	(1.846)	(1.839)	(1.841)	(1.665)	(1.665)	(1.659)	(1.659)
	High	-0.526	-0.452	-0.518	-0.463	0.319	0.369	0.339	0.375
		(0.791)	(0.791)	(0.788)	(0.789)	(0.739)	(0.739)	(0.738)	(0.738)
W	Low	-0.241	-0.450	-0.317	-0.493	-0.791	-0.989	-0.882	-1.051
		(1.879)	(1.890)	(1.877)	(1.886)	(1.715)	(1.725)	(1.710)	(1.719)
	High	-0.113	-0.102	-0.149	-0.133	-1.248	-1.242	-1.267	-1.259
		(0.840)	(0.842)	(0.836)	(0.838)	(0.815)	(0.816)	(0.812)	(0.813)
MoHlth	Low	0.399***	0.400***	0.391***	0.393***	0.423***	0.423***	0.414***	0.415***
		(0.058)	(0.058)	(0.058)	(0.058)	(0.053)	(0.053)	(0.053)	(0.053)
	High	0.306***	0.300***	0.303***	0.298***	0.342***	0.338	0.340***	0.336***
		(0.033)	(0.033)	(0.033)	(0.033)	(0.031)	(0.031)	(0.031)	(0.031)
FaHlth	Low	0.340***	0.327***	0.329***	0.318***	0.367***	0.353***	0.354***	0.343***
		(0.064)	(0.064)	(0.064)	(0.064)	(0.058)	(0.058)	(0.058)	(0.058)
	High	0.150***	0.143***	0.146***	0.140***	0.187***	0.180	0.184***	0.179***
		(0.037)	(0.037)	(0.036)	(0.036)	(0.035)	(0.035)	(0.035)	(0.035)
Msmok	Low	1.152	1.311	1.306	1.432	0.295	0.448	0.454	0.577
		(1.506)	(1.500)	(1.501)	(1.497)	(1.412)	(1.406)	(1.404)	(1.400)
	High	0.150	0.258	0.200	0.283	-1.450*	-1.351	-1.397	-1.323
		(0.837)	(0.833)	(0.836)	(0.832)	(0.873)	(0.868)	(0.873)	(0.869)
Fsmok	Low	1.525	1.531	1.666	1.659	0.891	0.894	1.020	1.012
		(1.264)	(1.262)	(1.261)	(1.260)	(1.212)	(1.210)	(1.209)	(1.208)
	High	-2.542***	-2.316***	-2.364***	-2.194***	-1.705**	-1.545	-1.564**	-1.448**
		(0.806)	(0.797)	(0.801)	(0.794)	(0.759)	(0.754)	(0.756)	(0.752)

Variables		Physical Health				Mental Health			
		Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)	Eqn. (I)	Eqn. (II)	Eqn. (III)	Eqn. (IV)
Panel (Base: 6)									
7	Low	-3.983*	-3.895*	-3.712	-3.658	-2.545	-2.467	-2.244	-2.197
		(2.323)	(2.323)	(2.340)	(2.339)	(2.204)	(2.206)	(2.224)	(2.224)
	High	1.173	1.125	1.314	1.251	-0.076	-0.124	0.014	-0.041
		(1.125)	(1.140)	(1.123)	(1.136)	(1.132)	(1.147)	(1.132)	(1.144)
8	Low	-0.429	-0.360	-0.023	0.003	-0.322	-0.257	0.114	0.137
		(2.261)	(2.266)	(2.273)	(2.277)	(2.215)	(2.218)	(2.233)	(2.234)
	High	1.240	1.296	1.387	1.416	0.223	0.251	0.322	0.330
		(1.143)	(1.148)	(1.145)	(1.149)	(1.074)	(1.081)	(1.076)	(1.081)
9	Low	-3.078	-3.010	-2.555	-2.536	-2.732	-2.658	-2.171	-2.148
		(2.288)	(2.291)	(2.304)	(2.306)	(2.189)	(2.191)	(2.205)	(2.206)
	High	1.055	1.135	1.184	1.235	-0.283	-0.235	-0.192	-0.165
		(1.124)	(1.132)	(1.128)	(1.135)	(1.089)	(1.097)	(1.094)	(1.100)
10	Low	-1.701	-1.592	-1.150	-1.098	-0.350	-0.240	0.246	0.298
		(2.256)	(2.258)	(2.272)	(2.273)	(2.153)	(2.155)	(2.168)	(2.168)
	High	0.825	1.026	1.075	1.221	-0.091	0.054	0.060	0.163
		(1.123)	(1.130)	(1.125)	(1.129)	(1.071)	(1.075)	(1.076)	(1.077)
11	Low	1.275	1.453	1.962	2.058	1.933	2.108	2.643	2.737
		(2.303)	(2.306)	(2.312)	(2.315)	(2.208)	(2.209)	(2.227)	(2.227)
	High	1.410	1.552	1.609	1.711	1.079	1.187	1.202	1.276
		(1.140)	(1.144)	(1.140)	(1.143)	(1.045)	(1.050)	(1.048)	(1.052)
12	Low	8.232***	8.499***	8.851***	9.025***	5.948***	6.206***	6.586***	6.753***
		(2.166)	(2.166)	(2.177)	(2.178)	(2.128)	(2.130)	(2.138)	(2.139)
	High	3.209***	3.513***	3.445***	3.676***	1.663	1.883	1.835*	1.996*
		(1.172)	(1.172)	(1.173)	(1.172)	(1.084)	(1.084)	(1.088)	(1.087)
13	Low	4.382**	4.606**	4.968**	5.112**	3.975**	4.191**	4.565**	4.702**
		(2.081)	(2.086)	(2.101)	(2.104)	(2.005)	(2.008)	(2.025)	(2.027)
	High	2.090*	2.398**	2.309**	2.553**	0.579	0.809	0.722	0.899
		(1.110)	(1.113)	(1.110)	(1.112)	(1.060)	(1.057)	(1.064)	(1.061)
14	Low	1.565	1.924	2.185	2.449	2.285	2.632	2.962	3.217
		(2.259)	(2.255)	(2.270)	(2.266)	(2.170)	(2.166)	(2.177)	(2.174)
	High	4.266***	4.743***	4.426***	4.836***	3.271***	3.608	3.372***	3.652***
		(1.044)	(1.045)	(1.049)	(1.048)	(0.976)	(0.971)	(0.982)	(0.976)
15	Low	1.276	1.534	2.178	2.323	2.478	2.731	3.385	3.528
		(2.482)	(2.479)	(2.486)	(2.484)	(2.274)	(2.272)	(2.284)	(2.282)
	High	3.267***	3.717***	3.580***	3.929***	1.176	1.517	1.401	1.659
		(1.114)	(1.105)	(1.114)	(1.106)	(1.096)	(1.096)	(1.091)	(1.092)

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ABSTRACT

**PARENTAL SCHOOLING AND CHILD HEALTH:
EVIDENCE FROM MEDICAL EXPENDITURE PANEL SURVEY**

by

UDBODHA USHAKAR RIJAL

May 2016

Advisor: Dr. Allen Charles Goodman

Major: Economics

Degree: Doctor of Philosophy

This study applies bivariate probit models to the Medical Expenditure Panel Survey data set to explore the effects of parental schooling on the physical and mental health of child and the underlying mechanism of the transmission of these beneficial effects. Using the perceived physical and mental health status of child as the outcome variable, the results indicate that the benefits of parental schooling increases with levels of parental schooling; mother's schooling has greater impacts than father's; and the impacts of parental schooling on physical health of child is slightly larger than on mental health. For instance, relative to having *No Degree* at all, mother's having an *HSD/GED* (and *College Degree*) increases the probability that the reported physical health status of her child is *Very Good/Excellent* as opposed to *Poor/Fair/Good* by about 6.4% (and 10.6%) in terms of the total effects. Similar probabilities for father's schooling are about 4.5% (and 7.4%) respectively. For mental health, these probabilities are about 5.6% and 8.8% for mother's schooling, and 3.3% and 5.1% for father's schooling respectively. The non-monetary effects of parental schooling are about four-fifths of these total effects and are much larger than the combined monetary effects of income and health

insurance attributable to parental schooling. In case of the households with single mother, the beneficial effects of mother's schooling are however marginally greater on mental health than on physical health. Beneficial effects of parental schooling can be observed across most of the subgroups with varying degree. For instance, the effects of parental schooling on child health are particularly highest for the *Hispanic*, followed by *Black* and *White*.

AUTOBIOGRAPHICAL STATEMENT

EDUCATION

Ph.D. in Economics, Wayne State University, Detroit, MI 2016
M.A. in Economics, Wayne State University, Detroit, MI 2011
M.A. in Economics, Tribhuvan University, Kathmandu, Nepal 2000
B.A. in Economics, Tribhuvan University, Kathmandu, Nepal 1996

MAJOR FIELDS

Health Economics, Labor Economics

RESEARCH INTERESTS

Health Care Financing/Evaluation, Global Health, Labor Economics, Applied Econometrics

TEACHING EXPERIENCE (only in the US)

Economics Department, Wayne State University (Fall 2009 - Present)
Taught Survey of Economics; Principles of Microeconomics; Principles of Macroeconomics; Intermediate Microeconomics; and Introductory Statistics and Econometrics

School of Business, Wayne State University (Winter 2015 - Present)
Taught Quantitative Methods II: Statistical Methods; and Basics of Business Economics.

RESEARCH EXPERIENCE

Research Officer, Institute for Integrated Development Studies, Kathmandu, Nepal (2005-2008)

PROFESSIONAL ACTIVITIES (only in the US)

2015 Eastern Economic Association Annual Conference, New York
(Presenter and Discussant)

PROFESSIONAL ORGANIZATIONS

American Economic Association; Eastern Economic Association; Midwest Economics Association