**College Selectivity and Later-life Health and Mortality: Evidence from the Wisconsin Longitudinal Study**

**Sarah Garcia- University of Minnesota**

**Acknowledgements**

This work was supposed by the National Institute on Aging (AG-9775 and AG-21079), with additional support from the Vilas Estate Trust, the National Science Foundation, the Spencer Foundation, and the Graduate School of the University of Wisconsin- Madison. A public use file of WLS data is available from the Data and Program Library Service, University of Wisconsin-Madison, 1180 Observatory Drive, Madison, Wisconsin 53706, and at <http://dpls.dacc.wisc.edu/WLS/wlsarch.htm>.

**Abstract**

The relationship between educational attainment and health has been well documented and remains persistent. The quality of that education is often overlooked as a potentially important component of the relationship between education and health. I examine how college selectivity affects later-life health using longitudinal survey data from the Wisconsin Longitudinal Study. Among college-completers, those who attended selective colleges were less likely to be hypertensive in later-life. While the differences were not statistically significant, respondents who attended selective colleges were consistently less likely to be dead, to have heart problems, to have diabetes, or lower self-rated health. The hypertension result may be the result of lifestyle differences between those who graduated from more and less selective colleges, but this does not lead to other more serious health conditions. College selectivity appears to be weakly associated with later-life health; the estimated effects are small except in the case of hypertension.

**College Selectivity and Later-life Health and Mortality: Evidence from the Wisconsin Longitudinal Study**

**Introduction**

Educational attainment---specifically years of education or the highest degree obtained---is important in differentiating health and mortality outcomes. The inverse relationship between educational attainment and mortality has been well documented and remains persistent (Hummer & Hernandez, 2013; Lleras-Muney, 2005; Montez, Hummer, & Hayward, 2012). The relationship between education and health has also been well-established (Cutler & Lleras-Muney, 2006; Fletcher, 2015; Glied & Lleras-Muney, 2008; Grossman, 1997). While most researchers have focused on how the quantity of education affects health and mortality, the qualitative dimensions of education have been overlooked as potentially important components in the education-health and mortality relationship. I examine the relationship between college selectivity and later-life health among people who completed college. College selectivity is operationalized as the achievement level (e.g., grade point average, class rank) required to gain admission to the college.

There are several reasons to focus on educational quality and health. First, school quality, and college selectivity in particular, has been shown to significantly impact non-health outcomes such as post-education labor market outcomes and lifetime earnings. Behrman, Rosenzweig, and Taubman (1996) found that among pairs of female twins, school quality increased adult wages. In this study school quality was measured by type of school (public or private), whether it was a Ph.D. granting institution, and faculty salaries. Hoekstra (2009) found that attending a flagship state university increased earnings as a young adult. Black and Smith (2004) used matching estimators to show large effects of college selectivity on adult wages. Long (2008) found that college quality had a positive effect on college graduation rates and household income. Finally, Brand and Halaby (2006) used data that followed a high school graduation and college entry cohort for four decades and found that attending an elite college yielded advantages with respect to occupational status.

Second, Fletcher and Frisvold (2014) argued that college selectivity may provide better future employment opportunities through social contacts (Ishida, Spilerman, & Su, 1997; Rosenbaum, 1984) and may also affect health through different culture and norms for health behaviors (such as smoking and health investments) (Cockerham, Rütten, & Abel, 1997). This evidence suggests that quantity of education may not fully explain the relationship between education and health and mortality. Two individuals with the same quantity of education may experience different health outcomes if they went to qualitatively different colleges. A person who experienced higher quality education may have influential social networks and an environment that promotes positive health behaviors more so than someone who received lower quality education. Or a person who received higher quality education may obtain a better job with higher pay and access to higher quality health insurance and healthcare as compared to a person who received a lower quality education. In other words, the mechanisms that link education to health and mortality may also depend on the quality of that education.

Third, research suggests that quality of pre-college education affects health (Cutler & Lleras-Muney, 2006). Frisvold and Golberstein (2011) found that improvements in the quality of primary and secondary schools attended by blacks in the South during the first half of the twentieth century increased many health outcomes later in life and reduced disparities in health. Johnson (2009) found that increasing primary and secondary school quality following school desegregation improved self-reported health status for blacks. Finally, MacInnis (2009) demonstrated that primary and secondary school quality increased cognitive functioning in old age. Only one study examined how primary and secondary school quality affects mortality and found that death rates decreased as measures of school quality increased (Sansani, 2011). These studies are significant because they demonstrate that quality education in earlier life can affect later life health and mortality. However, college selectivity in particular may be influential as evidence suggests it is important in securing better future employment opportunities and creating norms around positive health behaviors (Ishida et al., 1997; Rosenbaum, 1984).

Fourth, there is some limited empirical evidence from three prior studies that college selectivity affects health. Ross and Mirowsky (1999) found suggestive correlational evidence that attending a selective college is associated with better-perceived health and physical functioning. This study is limited by the fact that the authors do not study college selectivity exclusively; they also include years of education in their model and find that quantity of education matters more than quality. Additionally, they do not include other measures that are known to confound the association between college selectivity and health such as cognitive ability, non-cognitive ability and childhood health (Auld & Sidhu, 2005; Conti, Heckman, & Urzua, 2010; Gottfredson, 2004; Gottfredson & Deary, 2004; Singh-Manoux, Ferrie, Lynch, & Marmot, 2005). Fletcher and Frisvold (2011) found evidence that selective college attendance decreased tobacco and marijuana use and increased binge drinking. This study was limited to people who were in college, had recently graduated, or left college. They found evidence that college selectivity influences health behaviors during college but could not conclude that college selectivity affects health in later life. Finally, Fletcher and Frisvold (2014) evaluated the long-run relationship between college selectivity and health behaviors and found large effects of college selectivity on reducing overweight for individuals in their sixties. They did not find evidence that college selectivity is associated with later smoking. Their work is limited in that they only examined health behaviors as opposed to actual health outcomes.

I extend previous research in several significant ways to consider how college selectivity affects later life health and mortality. I extend the work of Ross and Mirowsky (1999) by examining the exclusive influence of college selectivity on health and incorporate a variety of important variables known to confound the association between college selectivity and health. Fletcher and Frisvold (2014) examined how college selectivity affected health behaviors whereas I examined how it affects actual health in later life. The health behaviors that Fletcher and Frisvold measured may not translate into expected health outcomes in later life. For example, Fletcher and Frisvold (2014) acknowledged that a reduction in overweight or avoidance of obesity may translate into improvements in health outcomes. Their analysis misses potential respondents who lost weight and may have reduced risk of negative health outcomes. Further, they find no effects for obesity and while obesity is associated with many chronic conditions and risk of mortality as compared to normal weight, overweight is only associated with greater numbers of chronic conditions for women and is not related to mortality risk (Flegal, Graubard, Williamson, & Gail, 2005; Sturm & Wells, 2001). Because the relationship between college selectivity and overweight may not translate into negative health outcomes in later life, I extend this work to examine whether college selectivity affects health outcomes. Additionally, I extend previous work by examining health outcomes in an elderly population with a mean age of around 71. I study how college selectivity affects health and mortality in later life as opposed to health behaviors early in adulthood. Finally, I extend previous work by considering whether college selectivity differentially impacts health for men and women by completing a separate analysis for men and women. Evidence suggests that the economic returns to college selectivity may differ for men and women (Angle & Wissmann, 1981), so I completed a separate analysis to examine heterogeneity of effects.

I contribute to the literatures on health returns to education, the impact of school quality, and the social determinants of health by examining the impact of college selectivity on health throughout adulthood and mortality. I aim to answer the question: How does college selectivity affect later-life health outcomes and mortality? I hypothesize that—net of a rich set of potential confounding variables— those who attended more selective colleges will rate their health as better, will have fewer health conditions, and will have lower mortality than those who attended less selective colleges.

**Material and Methods**

*1.1 Overview/description of the WLS*

In this study, I use data from the Wisconsin Longitudinal Study (WLS) that includes a cohort of men and women from Wisconsin who were primarily born in 1939, who graduated from Wisconsin high schools in 1957, and who were around 71 years old when last interviewed in 2011. Data were collected via telephone, mail, and in person surveys. The WLS surveys include questions aimed to measure social background, youthful aspirations, schooling, military service, family formation, labor market experiences, social participation, and health. Survey respondents include parents, graduate respondents and one randomly chosen sibling of the graduate respondent. The initial sample included 10,317 women and men and data were collected in 1957, 1964, 1975, 1992, 2004, and 2011. The original respondent sample represents white, non-Hispanic American men and women who completed at least a high school education (Herd, Carr, & Roan, 2014).

*1.2 Sample Restrictions and response rates*

Similar to Fletcher and Frisvold (2014), I restricted the sample to those respondents who graduated from a four-year college. The 1975 and 1992 survey questionnaires included questions about the name of the college where the respondent earned a bachelor’s degree or its equivalent (if they graduated from college) so when available I used the more recent 1992 response. If the 1992 survey response was unavailable, I used the 1975 survey response to determine the college from which respondents graduated. Of the 8,493 respondents who completed the 1992 survey, 25% (2,159) graduated from a four-year college. For analysis of mortality, I restricted the sample to respondents who survived to at least 1993. Finally, for each of the health outcome measures, I limited the sample to those who responded to the 2011 in-person survey because this was when the health outcomes of interest were measured. The health outcomes of interest include self-rated health, diabetes, hypertension, and heart conditions that are described in further detail below. The sample size varied slightly across health outcome models because of item-level missing data in 2011 on health questions. The sample size for the health outcomes defined below ranged between 1,663 and 1,667. Multiple imputation using chained equations was used to impute missing data on the covariates of interest.

The response rates in the WLS are quite high. The retention rate excluding those who died or had unknown eligibility from 1957 to 1992 was about 87%, for 2004 was about 81% and for 2011 was about 72%. To determine whether those respondents who remained in the sample were significantly different from those who were lost to follow-up or refused to participate, I created a variable indicating whether each respondent remained in the sample and completed the 1992, 2004, and 2011 survey and regressed it on a variety of demographic variables. Individuals who remained in the sample from 1957 until 2011 were not significantly different with regard to sex, number of siblings, or childhood health. Those who attended more selective colleges were significantly more likely to remain in the sample than those who attended less selective colleges. Those whose fathers had more education and who had higher family incomes were also more likely to remain in the sample. Additionally, respondents with higher IQ scores and high school ranks were significantly more likely to remain in the sample. Finally, those with good, fair or poor self-rated health in 2011 were less likely to have remained in the sample. The sample did not differ significantly on any other health outcomes. Those who were from more advantaged backgrounds, who had higher cognitive and non-cognitive ability and who had better health in 2011 were more likely to remain in the sample suggesting that adolescent characteristics like grit, as well as advantaged family background, promotes continued involvement in the WLS. These findings suggest a healthy selection effect where those who are less healthy are not willing or able to remain in the study. Because those that are more advantaged and rated their health as better were more likely to remain in the sample, it is possible that the results underestimate the true effect of college selectivity on later-life health. This bias is not concerning because it indicates that my findings are a conservative estimate of the true relationship between college selectivity and health as opposed to an exaggerated estimate.

*1.3 Measures*

The significant features of the WLS for this study are the longitudinal nature of the data set that includes information on health, mortality, and the name of Bachelor’s degree-granting College that was used to determine college selectivity. The data also contain variables that measure confounding influences on college selectivity and later life health such as childhood health, family socioeconomic status, and cognitive and non-cognitive ability. Below I describe the variables used to measure these concepts.

I reproduced the methods of Fletcher and Frisvold (2014) and merged the college name to information on college selectivity taken from Barron’s Profile of American Colleges (Fine, 1969). Barron’s Profile of American Colleges ranks schools based on median SAT scores, high school rank, and high school grade point average of the freshman class and produces categories of college selectivity. Based on the ranking system, colleges are categorized into six groups: most selective, highly selective, very selective, selective, least selective, and not selective. Very few individuals in the sample graduated from most selective (less than 1%) and not selective (about 2%) and a small minority graduated from highly selective (about 4%) and least selective colleges (about 4%). Because of this, I categorized college selectivity into two categories for analysis: more selective and less selective. More selective colleges included most selective, highly selective and very selective and constituted about 36% of the sample. Less selective colleges included selective, least selective and not selective colleges and constituted about 64% of the sample. Examples of colleges in the more selective category include the University of Wisconsin - Madison, the University of Michigan, and the University of Minnesota. Examples in the less selective category include the University of Wisconsin - Superior and the University of Wisconsin - Milwaukee. Of the 2,159 college graduates, 1,631 (about 76%) graduated from Wisconsin colleges.

I analyzed a variety of health measures collected in 2011. The first health measure was self-rated health. While self-rated health is limited in that it is a subjective and contextual measure (Jylhä, 2009), it is considered a valid measure of health as it is associated with illness, mortality, health conditions and fluctuates accordingly with changes in health status (Idler & Benyamini, 1997; Manor, Matthews, & Power, 2001). Self-rated health was measured using a Likert scale where the respondent answered whether their health was excellent, very good, good, fair or poor. I created a binary indicator for self-rated health where I compared respondents who rated their health as good, fair or poor and those who rated their health as excellent or very good. I combined the rating of good with fair or poor to increase the sample size because most respondents rate their health as excellent or very good (about 92% of the original sample). The results for self-rated health do not vary based on how it was measured.

The other health measures analyzed included: hypertension, diabetes, and heart attack or other heart problems. I chose these conditions as they are some of the most common health conditions in the U.S., have been associated with educational attainment in prior research, and are also measureable in the WLS (Control & Prevention, 2009; Espelt et al., 2008; Mirowsky & Ross, 2003; Qureshi, Suri, Saad, & Hopkins, 2003; Schiller, Adams, & Nelson, 2005; Vargas, Ingram, & Gillum, 2000). The respondent was asked whether a doctor has ever indicated to them that they have or have had any of the health conditions listed above. Regarding heart conditions, the survey question asked whether a doctor has ever indicated to the participants that they had a heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems.

Because school quality has been associated with mortality, I also include a measure of mortality as of November 2014 when participants were about age 75 (Lleras-Muney, 2005). Month and year of death were primarily gathered from the National Death Index and supplemented via telephone by a family member or other proxy respondents.

Family background is known to influence education and later-life health outcomes (Case, Fertig, & Paxson, 2005; Kennedy, Kawachi, Glass, & Prothrow-Stith, 1998; Wolfe & Behrman, 1987). I incorporated a variety of family background measures in the analysis including: mother and father’s educational attainment, family household income gathered from tax data, number of siblings, and birth order. Mother and father’s educational attainment was gathered from an in-person survey from a parent in 1957. Number of siblings and birth order was gathered from the original respondent in 1975. Parental income was gathered from Wisconsin Tax Data in 1957 and was originally a measure of average parental income which I transformed into an annual household income variable using the number of years for which average parental income was based. I also include respondent sex because it is known to influence the type of college attended and health (Case & Paxson, 2005).

Educational quality and health may be linked due to self-selection where individuals with higher cognitive and non-cognitive abilities may attend higher quality colleges and have better learning, reasoning, and problem-solving skills useful in health promotion and disease prevention (Auld & Sidhu, 2005; Conti et al., 2010; Gottfredson, 2004; Gottfredson & Deary, 2004; Singh-Manoux et al., 2005). I controlled for these potential confounders using an IQ score obtained from respondents in high school as a measure of cognitive ability and high school rank as a measure of non-cognitive ability. IQ score from freshman year of high school was gathered from the Wisconsin State Testing Service Records and incorporated into the WLS data. High school rank was gathered from school records and is a percentile ranking of students based on grade point average where the lowest rank is 0 and the highest is 99.

Finally, I also included a measure of childhood health because poor childhood health negatively affects adult educational attainment and socioeconomic outcomes (Case et al., 2005; Currie, 2009; Smith, 2009). Childhood health was measured using a mail survey question in 2004 asking the respondent whether they had ever missed school for one month or more through age 16 due to a health condition or whether the respondent rated their health as good, fair, or poor in childhood. I combined these responses due to low response rates so the final variable indicated that the respondent had poor childhood health if they responded that they had missed more than one month of school or if they reported fair or poor health in childhood.

*1.4 Analysis*

The modeling strategy employed in this paper examined the relationship between college selectivity and later life health and mortality. I estimated three models where the baseline model estimated the bivariate association between college selectivity on health. For the second model I estimated the likelihood of each health outcome and mortality as a function of graduates’ college selectivity, sex, and observed family background (parental income during childhood, mother and father’s educational attainment, number of siblings, birth order, and whether the respondent lived with both parents while growing up). In the third model I included a measure of childhood health to control for reverse causality from health to college quality. Additionally, I controlled for cognitive skill and non-cognitive using the respondent’s high school IQ score as a measure of cognitive ability and their high school rank as a measure of non-cognitive ability. Finally, I estimated a final regression model using an index summing the number of health conditions each respondent reported.

**Results**

Table 1 about here

Table 1 reports descriptive statistics for original respondents who are college graduates and then separately for graduates of more selective colleges and graduates of less selective colleges. Approximately 36% of the sample graduated from very, highly, or selective colleges. While about 42% of the total sample is women, only 35% of those attending very selective colleges are women and 46% of women in the sample attended less selective colleges. Not surprisingly, selective college graduates had significantly higher IQ scores and high school ranks than those who attended less selective colleges. As expected, graduates of selective colleges had more advantaged family socioeconomic backgrounds as indicated by family income and parental education.

With regards to health, about 13% of college graduates were dead by November 2014. About 13% had a diabetes diagnosis, 55% had a hypertension diagnosis, and about 23% had a heart attack, heart disease or heart failure. About 8% rated their health as good, fair or poor. These percentages are reasonably similar to those found in a national sample of white, college educated individuals in the same age range from the Integrated Health Interview Series. With regard to college selectivity, those who attended more selective colleges on average had slightly lower rates of mortality, diabetes, and hypertension and were slightly less likely to rate their health as good, fair or poor as compared to very good or excellent. The percentages of those who had experienced a heart condition were about the same for those who graduated from more or less selective colleges.

Tables 2-6 about here

Tables 2 through 6 report results from logistic regression models. Model 1 in each table reports results from a bivariate model that includes only college selectivity as a predictor of health. Model 2 includes controls for family background and individual characteristics such as gender. Model 3 adds controls for cognitive skills, non-cognitive skills, and childhood health. Model 4 reports results from the full model for men only, and model five depicts the full model for women only.

Table 2 displays the results from modeling the odds of mortality as a function of college selectivity. There is no significant association between college selectivity and mortality in all three models, although the results are in the expected direction where those who attended more selective colleges are less likely to be dead. Table 3 reports the results of estimating the relationship between college selectivity and diabetes. Again, there is no statistically significant relationship between college selectivity and risk of diabetes in any of the models, but those who attended more selective colleges are less likely to have a diabetes diagnosis. Table 4 shows the results of modeling the odds of a diagnosis of a heart condition (such as a heart attack or heart failure) for original respondents who attended more and less selective colleges. There is no statistically significant association between college selectivity and the risk of having heart problems, although the results are again in the expected direction. Table 5 reports the results of modeling the odds of a hypertension diagnosis for original respondents who attended more selective colleges. Model one demonstrates that those who attended selective colleges have 23% lower odds of having hypertension (p<.05). The results are similar after controlling for family background characteristics in Model 2 and after controlling for childhood health, cognitive skill and non-cognitive abilities in Model 3. This suggests that family background, childhood health, and cognitive and non-cognitive ability do not confound the relationship between college selectivity and risk of hypertension. The association between college selectivity and hypertension appears to be driven by men. As shown in models 4 and 5, the association is significant among men but not among women. Finally, Table 6 depicts the results of modeling the odds of the original respondent rating their health as good, fair or poor for those who attended more selective colleges. While individuals who graduated from more selective colleges were less likely to rate their health as worse, the results were not statistically significant.

Table 7 about here

Table 7 reports the results from the combined health index outcome which demonstrates that those who attended selective colleges have significantly fewer conditions in all three models. While these findings are statistically significant, the effect size is small (-.12 less likely in model one, -.14 in model two, and -.11 in model three). In general, these results suggest that if selective college attendance affects health, those effects are substantively small in magnitude; indeed in models for individual health outcomes, they are too small to detect even with a fairly large sample.

**Robustness Checks**

It is possible that the WLS is a unique sample where neither college selectivity nor educational attainment affect health. To demonstrate that this is not the case I completed a robustness check where I estimated the same models using educational attainment as the main independent variable rather than college selectivity. The results for these models are shown in Appendix 1.

Table appendices 1A-1E about here

Educational attainment was measured by taking the most recent response for the highest degree or number of years of education attained by respondent. Educational attainment was measured for the original respondent in 1975, 1992, 2004 and 2011. If a respondent did not complete the 2011 survey, their response for 2004 was used. If the respondent did not complete the 2004 survey, their response in 1992 was used, and 1975 was used if the respondent did not complete the 1992 survey. For the models I combined the years of education into a binary variable indicating whether the respondent graduated college (1) or did not graduate college (0).

Results from these models demonstrate that obtaining a college degree does affect later life health in this sample. Individuals who graduated from college were significantly less likely to be dead, have a diabetes diagnosis, had a hypertension diagnosis, have experienced a heart condition, and less likely to report their health as good, fair or poor. These findings are significant because they show that this sample is not unique with respect to their health. In line with previous literature, those who graduated from college enjoy health benefits in later life. These findings suggest that a college education matters more for health than the selectivity of the college.

Additionally, it is possible that the lack of significant findings with respect to most of the health outcomes is due to low power. A power analysis demonstrated that there is low power to detect a statistically significant difference between those who attended less selective colleges and those who attended more selective colleges with regards to the health outcomes of interest, except with regards to hypertension. Power ranged from .07 to .19 for all conditions except hypertension where the analysis yielded a power of .69. These findings suggest that a larger sample size may produce more power to detect significant differences between the groups with respect to health, but the effects would be small. The significant findings for hypertension may be a function of hypertension being relatively more common (and thus power being greater in those analyses). About 55% of the sample had a diagnosis of hypertension, whereas rates of other health conditions were much lower. As an additional robustness check, I completed the same analysis as in Tables 2 through 6 using the same sample as observed in 2004 and found similar results to those in 2011; while the only significant finding was hypertension, the results for other health outcomes were all in the expected directions. In general, this again suggests that the effects of college selectivity on health are small in magnitude—so small that (with the exception of hypertension) they cannot be detected using a sample that ”only” includes a few thousand people.

**Discussion**

*1.1 Summary*

While the results are in the expected directions, the relationships between college selectivity and health are not statistically significant with the exception of hypertension. College selectivity is associated with mortality and later-life health, but the effects are small with the exception of hypertension. The combined health index outcome did produce statistical significant where those who graduated from more selective colleges were significantly less likely to have multiple health conditions, but as discussed below these findings do not have much practical significance. Taken together, these findings suggest that college selectivity may matter for health, but not very much. If I had a much larger sample, coefficients for college selectivity may have been statistically significant but they would still likely be substantively small in magnitude.

The significant findings for hypertension may be indicative of lifestyle differences between those who attended more and less selective colleges. Hypertension is associated with lifestyle factors such as a sedentary lifestyle, poor diet, and overweight (Appel et al., 1997; Mulrow et al., 1998; Whelton, Chin, Xin, & He, 2002). While hypertension is associated with health conditions such as diabetes and cardiovascular disease and is also a risk factor for mortality (Sowers, Epstein, & Frohlich, 2001), these conditions were not significantly more likely to be experienced by those who attended less selective colleges. Awareness and treatment of hypertension has increased over time for older adults (Ong, Cheung, Man, Lau, & Lam, 2007), so it is possible that while graduates from less selective colleges are more likely to have the condition, they may also have higher health literacy than those who did not attend college and are more likely to be aware of and treated for the condition. Health literacy has been shown to be higher among those with more education and in particular among the college educated (Kutner, Greenburg, Jin, & Paulsen, 2006). Further, health literacy has been shown to be higher among women than men (Kutner et al., 2006), and the significant findings for hypertension were driven by men. The hypertension finding may be indicative of lifestyle differences between those who graduated from more and less selective colleges, but may also demonstrate that these differences only matter to a point for health because they do not transform into more severe health conditions. In other words, those who attended less selective colleges may still have the health literacy necessary to control health conditions such as hypertension so that it does not transform into more severe conditions such as heart disease or diabetes. With regards to the potential mechanisms that could drive the college selectivity-health relationship, lifestyle differences may be as a result of different culture and norms surrounding health behaviors for those who graduated from more and less selective colleges. Future research could explore the potential mechanisms for the college selectivity-hypertension relationship and try to understand whether lifestyle differences and health literacy are driving this relationship or if there are other factors that have not been considered.

With regard to the other health outcomes, the power analysis demonstrated that I could not detect small effects of college selectivity on health. College selectivity may matter for health, but those effects are apparently too small to be detected with a reasonably large sample. With regard to the other potential mechanisms linking college selectivity to health not mentioned above, the findings suggest that the additional resources associated with college selectivity (such as higher income and more prestigious jobs) do not significantly matter for health. A college degree significantly influences factors that lead to better health such as higher income and better jobs, but the benefit of these additional resources above and beyond a college degree only minimally affects health. It is possible that the benefits gained from a more selective college are not enough to substantially affect health, or it could mean that they only matter to a point and benefits above that point no longer matter for health.

The combined health index outcome variable demonstrated significant findings where those who attended more selective colleges were significantly less likely to have multiple health conditions. While the key coefficient is statistically significant, in practical terms it is small in magnitude. Those who attended more selective colleges had .12 fewer conditions in the baseline model, .14 fewer conditions in model two and .11 fewer conditions in model three than those who attended less selective colleges. While those who attended more selective colleges appear to have fewer comorbid conditions, in practical this corresponds to about one fewer health condition per 10 people. College selectivity does appear to be associated with comorbidities, but the estimated effects are small in practical terms.

College graduates enjoy health benefits in later life irrespective of the type of college they attend. While prior literature demonstrates that graduates of more selective colleges do enjoy greater resources, the benefits of these resources appear to reach a point where they only minimally matter for health above and beyond a college education. These findings are significant because they suggest that there is a limit to health benefits achieved through increased resources. The implication of this finding is that better later-life health and longevity can be achieved through promoting educational attainment but not through promoting more exclusive education. An individual who does not have the resources or level of achievement to be accepted into a more selective college can achieve nearly equivalently better health through attending and graduating from any four-year college. While this is an important finding, future research should consider whether other educational paths differentially affect health. For example, it would be interesting to ascertain whether an individual who attends a two-year college and then transitions to and graduates from a four-year college would experience the same health benefits as an individual who attended and graduated from a four-year college.

*1.2 Limitations*

There are some limitations associated with this study. First, mortality rates vary geographically and because participants in this study are exclusively from Wisconsin, the results may not be generalizable to other regions in the U.S. (Miniño & Murphy, 2012). Second, because this sample is comprised primarily of individuals who identify as white, the results cannot be generalized to the non-white population. Because evidence suggests that students who identify as Black and Hispanic may receive larger returns to college selectivity (Dale & Krueger, 2011), future research should explore the possibility that college selectivity matters for health among non-white populations.

**Conclusion**

These findings suggest that college selectivity does not influence health in the way that educational attainment influences health. In this sample, college graduates had significantly better health outcomes than non-college graduates, but the selectivity of the college only mattered slightly for health with the exception of hypertension. The significant hypertension finding may suggest that different culture and norms surrounding health behaviors at selective colleges may translate into lifestyle differences that affect certain health outcomes like hypertension, but that they do not translate into more serious conditions like diabetes or heart disease. This may be due to higher health literacy among college graduates irrespective of whether they graduated from a more or less selective college. College graduates enjoy health benefits in later life irrespective of the type of college they attended and the additional resources gained from graduating from a more selective college, like higher income and more prestigious occupations, only have a minimal impact on health.

**References**

Angle, J., & Wissmann, D. A. (1981). Gender, college major, and earnings. *Sociology of Education*, 25-33.

Appel, L. J., Moore, T. J., Obarzanek, E., Vollmer, W. M., Svetkey, L. P., Sacks, F. M., . . . Windhauser, M. M. (1997). A clinical trial of the effects of dietary patterns on blood pressure. *New England journal of medicine, 336*(16), 1117-1124.

Auld, M. C., & Sidhu, N. (2005). Schooling, cognitive ability and health. *HEALTH ECONOMICS-CHICHESTER-, 14*(10), 1019.

Behrman, J. R., Rosenzweig, M. R., & Taubman, P. (1996). College choice and wages: Estimates using data on female twins. *The Review of Economics and Statistics*, 672-685.

Brand, J. E., & Halaby, C. N. (2006). Regression and matching estimates of the effects of elite college attendance on educational and career achievement. *Social Science Research, 35*(3), 749-770. Retrieved from <http://ac.els-cdn.com/S0049089X05000268/1-s2.0-S0049089X05000268-main.pdf?_tid=ca675716-3ab2-11e5-bc1c-00000aacb35e&acdnat=1438697708_74d532bfbf8652695a1bb7fd709fa8f8>

Case, A., Fertig, A., & Paxson, C. (2005). The lasting impact of childhood health and circumstance. *Journal of health economics, 24*(2), 365-389.

Case, A., & Paxson, C. (2005). Sex differences in morbidity and mortality. *Demography, 42*(2), 189-214.

Cockerham, W. C., Rütten, A., & Abel, T. (1997). Conceptualizing contemporary health lifestyles. *The Sociological Quarterly, 38*(2), 321-342.

Conti, G., Heckman, J., & Urzua, S. (2010). The education-health gradient. *The American economic review, 100*(2), 234.

Control, C. f. D., & Prevention. (2009). Prevalence and most common causes of disability among adults--United States, 2005. *MMWR: Morbidity and mortality weekly report, 58*(16), 421-426.

Currie, J. (2009). Healthy, wealthy, and wise: Socioeconomic status, poor health in childhood, and human capital development. *JoUrnal of economIc lIteratUre, 47*(1), 87-122.

Cutler, D. M., & Lleras-Muney, A. (2006). *Education and health: evaluating theories and evidence*. Retrieved from

Dale, S., & Krueger, A. B. (2011). *Estimating the return to college selectivity over the career using administrative earnings data*. Retrieved from

Espelt, A., Borrell, C., Roskam, A.-J., Rodriguez-Sanz, M., Stirbu, I., Dalmau-Bueno, A., . . . Leinsalu, M. (2008). Socioeconomic inequalities in diabetes mellitus across Europe at the beginning of the 21st century. *Diabetologia, 51*(11), 1971-1979.

Fine, B. (1969). *Barron’s profiles of American colleges*. Woodbury, NY: Barron’s Educational Series.

Flegal, K. M., Graubard, B. I., Williamson, D. F., & Gail, M. H. (2005). Excess deaths associated with underweight, overweight, and obesity. *Jama, 293*(15), 1861-1867.

Fletcher, J. M. (2015). New evidence of the effects of education on health in the US: Compulsory schooling laws revisited. *Social Science & Medicine, 127*, 101-107.

Fletcher, J. M., & Frisvold, D. E. (2011). College selectivity and young adult health behaviors. *Economics of Education Review, 30*(5), 826-837.

Fletcher, J. M., & Frisvold, D. E. (2014). The long run health returns to college quality. *Review of Economics of the Household, 12*(2), 295-325.

Frisvold, D., & Golberstein, E. (2011). School quality and the education–health relationship: Evidence from Blacks in segregated schools. *Journal of health economics, 30*(6), 1232-1245. Retrieved from <http://ac.els-cdn.com/S0167629611001111/1-s2.0-S0167629611001111-main.pdf?_tid=e1a02b06-3ab2-11e5-a437-00000aab0f02&acdnat=1438697746_a40af1314a1366398949522d0adec607>

Glied, S., & Lleras-Muney, A. (2008). Technological innovation and inequality in health. *Demography, 45*(3), 741-761.

Gottfredson, L. S. (2004). Intelligence: is it the epidemiologists' elusive" fundamental cause" of social class inequalities in health? *Journal of personality and social psychology, 86*(1), 174.

Gottfredson, L. S., & Deary, I. J. (2004). Intelligence predicts health and longevity, but why? *Current Directions in Psychological Science, 13*(1), 1-4.

Grossman, M., & Kaestner, R. (1997). Effects of education on health. In J. B. N. Stancey (Ed.), *The social benefits of education*. Ann Arbor: The University of Michigan Press.

Herd, P., Carr, D., & Roan, C. (2014). Cohort profile: Wisconsin longitudinal study (WLS). *International journal of epidemiology, 43*(1), 34-41.

Hoekstra, M. (2009). The effect of attending the flagship state university on earnings: A discontinuity-based approach. *The Review of Economics and Statistics, 91*(4), 717-724.

Hummer, R. A., & Hernandez, E. M. (2013). The Effect of Educational Attainment on Adult Mortality in the United States\*. *Population bulletin, 68*(1), 1. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4435622/pdf/nihms-669551.pdf>

Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: a review of twenty-seven community studies. *Journal of health and social behavior*, 21-37.

Ishida, H., Spilerman, S., & Su, K.-H. (1997). Educational credentials and promotion chances in Japanese and American organizations. *American Sociological Review*, 866-882.

Johnson, R. C. (2009). Long-Run Impacts of School Desegregation and School Quality on Adult Health. *Unpublished manuscript, UC-Berkeley*.

Jylhä, M. (2009). What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Social Science & Medicine, 69*(3), 307-316.

Kennedy, B. P., Kawachi, I., Glass, R., & Prothrow-Stith, D. (1998). Income distribution, socioeconomic status, and self rated health in the United States: multilevel analysis. *Bmj, 317*(7163), 917-921.

Kutner, M., Greenburg, E., Jin, Y., & Paulsen, C. (2006). The Health Literacy of America's Adults: Results from the 2003 National Assessment of Adult Literacy. NCES 2006-483. *National Center for Education Statistics*.

Lleras-Muney, A. (2005). The relationship between education and adult mortality in the United States. *The Review of Economic Studies, 72*(1), 189-221.

Long, M. C. (2008). College quality and early adult outcomes. *Economics of Education Review, 27*(5), 588-602. Retrieved from <http://ac.els-cdn.com/S027277570700101X/1-s2.0-S027277570700101X-main.pdf?_tid=f12d77ae-3ab2-11e5-bd20-00000aab0f27&acdnat=1438697773_d6aecc766315ce53d8db31f0f90d9296>

MacInnis, B. (2009). Returns to school quality on elderly cognition and cognitive aging. *working paper*.

Manor, O., Matthews, S., & Power, C. (2001). Self-rated health and limiting longstanding illness: inter-relationships with morbidity in early adulthood. *International journal of epidemiology, 30*(3), 600-607.

Miniño, A. M., & Murphy, S. L. (2012). Death in the united states, 2010. *NCHS data brief, 99*(10), 1-8.

Mirowsky, J., & Ross, C. E. (2003). *Education, social status, and health*: Transaction Publishers.

Montez, J. K., Hummer, R. A., & Hayward, M. D. (2012). Educational attainment and adult mortality in the United States: A systematic analysis of functional form. *Demography, 49*(1), 315-336.

Mulrow, C., Chiquette, E., Angel, L., Cornell, J., Summerbell, C., Anagnostelis, B., . . . Grimm Jr, R. (1998). Dieting to reduce body weight for controlling hypertension in adults. *The Cochrane Library*.

Ong, K. L., Cheung, B. M., Man, Y. B., Lau, C. P., & Lam, K. S. (2007). Prevalence, awareness, treatment, and control of hypertension among United States adults 1999–2004. *Hypertension, 49*(1), 69-75.

Qureshi, A. I., Suri, M. F. K., Saad, M., & Hopkins, L. N. (2003). Educational attainment and risk of stroke and myocardial infarction. *Medical Science Monitor, 9*(11), CR466-CR473.

Rosenbaum, J. E. (1984). *Career mobility in a corporate hierarchy*: Academic Pr.

Ross, C. E., & Mirowsky, J. (1999). Refining the association between education and health: the effects of quantity, credential, and selectivity. *Demography, 36*(4), 445-460.

Sansani, S. (2011). The effects of school quality on long-term health. *Economics of Education Review, 30*(6), 1320-1333.

Schiller, J. S., Adams, P. F., & Nelson, Z. C. (2005). Summary health statistics for the US population: National Health Interview Survey, 2003. *Vital and health statistics. Series 10, Data from the National Health Survey*(224), 1-104.

Singh-Manoux, A., Ferrie, J. E., Lynch, J. W., & Marmot, M. (2005). The role of cognitive ability (intelligence) in explaining the association between socioeconomic position and health: evidence from the Whitehall II prospective cohort study. *American Journal of Epidemiology, 161*(9), 831-839.

Smith, J. P. (2009). The impact of childhood health on adult labor market outcomes. *The Review of Economics and Statistics, 91*(3), 478-489.

Sowers, J. R., Epstein, M., & Frohlich, E. D. (2001). Diabetes, hypertension, and cardiovascular disease an update. *Hypertension, 37*(4), 1053-1059.

Sturm, R., & Wells, K. B. (2001). Does obesity contribute as much to morbidity as poverty or smoking? *Public health, 115*(3), 229-235.

Vargas, C. M., Ingram, D. D., & Gillum, R. F. (2000). Incidence of Hypertension and Educational Attainment The NHANES I Epidemiologic Followup Study. *American Journal of Epidemiology, 152*(3), 272-278.

Whelton, S. P., Chin, A., Xin, X., & He, J. (2002). Effect of aerobic exercise on blood pressure: a meta-analysis of randomized, controlled trials. *Annals of internal medicine, 136*(7), 493-503.

Wolfe, B. L., & Behrman, J. R. (1987). Women's schooling and children's health: Are the effects robust with adult sibling control for the women's childhood background? *Journal of health economics, 6*(3), 239-254.