Timing of Educational Attainment and Levels of Depressive Symptoms and Self-Rated Health at Mid-Life

Katrina M. Walsemann, Ph.D., MPH

Bethany A. Bell, Ph.D., MPH

Robert A. Hummer, Ph.D.

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ABSTRACT

Much of the education-health research assumes that education is stable after early adulthood even though a significant proportion of U.S. adults later return to school. We examined if the attainment of a higher degree after age 25 was associated with depressive symptoms and self-rated health at mid-life using data from the National Longitudinal Survey of Youth (NLSY79). We restricted our sample to respondents who were interviewed between ages 24 and 26, and once after age 40 (n=8,298). We employed weighted multivariate regression (for depressive symptoms) and ordered logistic regression (for self-rated health) to examine the effect of education beyond age 25 on our health outcomes. Attaining a bachelor's or graduate degree after age 25 was associated with fewer depressive symptoms and better self-rated health, net of the highest degree attained by 25. Our study provides preliminary evidence that increased educational attainment beyond age 25 is associated with better health.

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With increasing education individuals experience more favorable health[1-5] and greater longevity.[6-9] Yet, much of this body of research implicitly, and sometimes explicitly, assumes that education is completed at or around age 25 and is stable thereafter.[8-12] Although this likely reflected the educational pathways of white, middle class men prior to the 1970s, U.S. educational pathways have become much more differentiated since the 1970s as women entered the labor force in greater numbers, the economy shifted from industrial to service-based, higher education became more affordable, and a college degree became necessary to attain a middle-class lifestyle.[13-15] These societal changes were accompanied by an increase in the number of adults returning to school after age 25.[16] In 1970, 28% of U.S. undergraduate students were 25 years or older. By 2003-4, the percentage had increased to 38%.[16] The number of individuals returning to school after age 25 is projected to rise from 6.9 million in 2006 to 8.1 million by 2017.[17]

The timing of certain events is often seen as age-graded and normative; traditionally, educational attainment has been considered one of these events,[18-20] with "on-time" completion occurring by the mid-20's. Generally, individuals who diverge from the normative time-sequencing of such events are more vulnerable in terms of social and economic resources.[15, 21] One mechanism linking education to health is employment;[22] higher education yields more stable employment and in turn higher earnings,[23-24] both of which are associated with better health. Taken together, these findings suggest that individuals who complete their education by their mid-20's will be able to accumulate more social and economic resources that they can use to forestall the onset or progression of illness compared to individuals who complete their education after their mid-20's.[25] This process, termed the path-dependent model of cumulative advantage,[26] suggests that the length of exposure to a given level of education may be an

important factor linking education to health. Attainment of a college degree by the mid-20's will result in a greater length of time in the labor market at that level of education. Those who attain their college degree later in adulthood will have fewer years in the labor market to recoup their investment in education and accumulate the economic and social (e.g., personal control, social support, cognitive ability, and moral reasoning)[4, 27] benefits associated with a college degree that may lead to better psychological and physical functioning.

Even so, returning to school to attain a higher degree after the mid-20's may still result in positive mental and physical health benefits for U.S. adults. First, regardless of the age at which one returns to school, educational activities can increase social contact, provide individuals with additional and fulfilling life experiences, and foster adult development and intellectual enrichment.[28] Such experiences may be particularly important for mental health. In one study, individuals who attained their General Educational Development certificate (GED) in adulthood had lower levels of depressive symptoms than permanent high school drop-outs,[29] whereas in another study, Finnish women who returned to school to attain additional education reported greater optimism and achieved identity in mid-life than they had reported in early adulthood.[30] Although the norms and structure of the Finnish education system differ from the U.S. education system, these results suggest that individuals who return to school after their mid-20's may experience improvements in their mental health and well-being. Second, individuals who attain a higher degree after their mid-20's experience increases in their earnings and more stable employment, which in turn may promote mental and physical health. For example, Clark and Jaeger found that high school dropouts who attained their GED certificate in adulthood earned wages closer to individuals who attained a high school diploma at the end of their 12th grade year than to permanent drop-outs.[31]

Our study advances current research on the education-health relationship by exploring the extent to which the timing of educational attainment is associated with levels of depressive symptoms and self-rated health among U.S. adults at mid-life. That is, we investigate if the attainment of a higher degree after the mid-20's is associated with fewer depressive symptoms and better self-rated health at mid-life, net of the highest degree attained by the mid-20's. We chose depressive symptoms and self-rated health for two reasons. First, the few studies to have examined the effect of the timing of educational attainment on health have focused on depressive symptoms or psychological well-being. Second, self-rated health is commonly used in education-health research,[1, 4, 22, 32] and is a valid and reliable measure of subjective well-being that correlates strongly with physician assessments of morbidity as well as subsequent mortality.[33-35]

We hypothesize that, net of the highest degree attained by the mid-20's, attaining a higher degree by mid-life will be associated with fewer depressive symptoms and better self-rated health among U.S. adults. It is likely, however, that attaining a bachelor's or graduate degree after the mid-20's will provide greater health benefits than attaining a lesser degree after the mid-20's, given their stronger association with employment, occupation, and wages.[36]

METHODS

Sample

We analyzed data from the National Longitudinal Survey of Youth 1979 (NLSY79), a nationally representative sample of individuals who were 14 to 21 years old in 1979.[37] Respondents were interviewed annually from 1979 to 1994, and interviewed biennially after 1994, with data collection ongoing. We restricted our analyses to respondents who were interviewed during a window between the ages of 24 and 26, and at least once after age 40 (n=8,370). We further excluded 72 respondents because of item-missingness. After exclusions, our final analytic sample consisted of 8,298 respondents.

An important feature of our analytic plan was to measure educational attainment at age 25, since that is the age at which many studies assume that education is complete. However, some people were not interviewed at age 25 given differences in the timing of NLSY79 interviews or because respondents skipped a year and were re-interviewed the next; of those interviewed between 24 and 26 years of age, 89% were interviewed at age 25, 10% were interviewed at age 26, and 1% was interviewed at age 24.

Measures

Our two dependent variables come from the health module administered to NLSY79 respondents once after they turned 40 years old. We measured *depressive symptoms* using a 7-item Center for Epidemiological Studies Depression Scale (CES-D). Using a 4-point Likert scale, respondents were asked how often in the past week they: 1) did not feel like eating or had poor appetite; 2) had trouble keeping their mind on what they were doing; 3) felt depressed; 4) felt that everything was an effort; 5) had restless sleep; 6) felt sad; and 7) could not get going. Per convention, the seven items were summed (Cronbach's $\alpha = 0.83$), with higher values representing greater depressive symptomotology. The distribution was skewed, so we used a square-root transformation to normalize the distribution. We measured *self-rated health* using an ordinal scale where 1=excellent, 2=very good, 3=good, 4=fair, and 5=poor. Thus, higher values on both dependent variables reflect worse health.

We measured *educational attainment* as the highest degree the respondent had attained by ages 24-26, categorized as no degree, GED, high school diploma, associate's degree, bachelor's degree, master's/professional/doctorate degree (henceforth graduate degree), and other degree or certificate (not specified). We included a set of dummy variables to measure changes in the highest degree respondents had attained after ages 24-26 but prior to approximately 40 years of age (henceforth referred to as mid-life). We chose this cut point to

coincide with our measures of depressive symptoms and self-rated health; approximately 96% of respondents provided education and health data when they were 40 to 42 years old; highest degree attained at mid-life was measured simultaneous or prior to the health measure. We classified respondents as those who had attained by mid-life a: 1) GED; 2) high school diploma; 3) associate's degree; 4) bachelor's degree; 5) graduate degree; or 6) some other degree or certificate (not specified). The reference group included those that had not attained a higher degree since ages 24-26.

We included covariates that may be associated with attaining a higher degree after ages 24-26 or our dependent variables. Respondents self-reported their *race/ethnicity*, which we categorized as non-Hispanic white, non-Hispanic black, Hispanic (any race), or other. We classified respondents' *nativity* as foreign-born versus US-born. The *nativity of respondents' parents* was categorized as both or known parent(s) US-born, one of two parents foreign-born, both or known parent(s) foreign-born, or unknown nativity status. If the respondent indicated never knowing one of his or her parents, the nativity of the known parent was used to categorize parents' nativity (i.e., if known parent was US born, we categorized as "both or known parents US-born"). *Parent's education* was measured using the education of the parent who completed the most years of schooling and was categorized as 0-11 years, 12 years, 13-15 years, 16 or more years, or unknown. For those who reported the education of only one parent, that parent's education was used. Respondent's *poverty status* at ages 24-26 was categorized as in poverty (0-100% of poverty), not in poverty, or unknown. We included a measure of *marital status* (married, divorced/separated/widowed, or never married) when respondents were ages 24-26. Other covariates included *gender*, *birth cohort* (1957-1960 versus 1961-1964), if respondents had a *health condition* at ages 24-26 that limited their ability to work or the amount or type of

work they could perform, and if the respondent was in the *active military forces* when they were ages 24-26.

We considered additional covariates, including family structure at age 14, parental occupation at age 14, and attitudes towards women working, but the inclusion of these covariates did not alter our results. Thus, for parsimony and to retain sample size, we did not include these variables in our final models.

Analytic Approach

First, we began with descriptive statistics to understand the data distribution. Next, we examined bivariate associations between educational attainment at ages 24-26 and educational attainment at mid-life to understand the extent to which respondents in our sample attained a higher degree after they were 24-26 years old. Multivariate linear regression (for depressive symptoms) and ordered logistic regression (for self-rated health) were employed to examine the association between attaining a higher degree after ages 24-26 and the health outcomes, conditional on the highest degree respondents had attained by ages 24-26. All analyses were weighted to adjust for the complex sampling design and respondent attrition using the custom weights developed by NLSY79 and the *svy* commands in Stata v11.[38]

RESULTS

Sample Characteristics

NLSY79 respondents were primarily white (64.3%), US-born (95.7%), not in poverty at ages 24-26 (85.2%), and born into families where both or known parent(s) were US-born (90.7%) (Table 1). Approximately 49% of respondents were born between 1961 and 1964, 51.2% were female, 41.7% had a parent who completed 12 years of schooling, and 45.3% were married at ages 24-26. Five percent of respondents reported a health limitation at ages 24-26.

The mean square-root of depressive symptoms was 1.85 and 10.8% of respondents reported their health as fair or poor at mid-life. Approximately 52% of respondents' highest degree attained by ages 24-26 was a high school diploma; 16.5% had attained a bachelor's degree and 13.0% had attained no degree. Although a majority of respondents (79.8%) did not attain a degree after ages 24-26, over one-fifth of the respondents did so: 3.7% attained a GED or high school diploma, 4.2% attained an associate's, 5.8% attained a bachelor's, and 5.8% attained a graduate degree by mid-life.

Bivariate Analyses

In Table 2, we examined bivariate associations between the highest degree respondents completed at ages 24-26 and the highest degree they had completed by mid-life, to determine the extent to which respondents achieved a higher degree after they were ages 24-26. Of those who had not attained a degree by ages 24-26, 31.2% went on to attain a higher degree: 19.7% attained a GED, 7.2% attained a high school diploma, and 3.8% attained an associate's degree or higher. Of those who had attained a high school diploma by ages 24-26, 6.3% attained an associate's, 7.1% attained a bachelor's, and 2% attained a graduate degree by mid-life. Approximately the same percentage of respondents who had an associate's or bachelor's degree by ages 24-26 went on to attain a higher degree: 27% of respondents with an associate's degree attained a bachelor's or graduate degree whereas 25.5% of respondents with a bachelor's degree attained a graduate degree.

Multivariate Analyses

We examined the extent to which an increase in educational attainment after ages 24-26 was associated with depressive symptoms at mid-life, conditional on educational attainment at ages 24-26 and socio-demographic and health covariates (Table 3). Our base model reports the main effects of educational attainment at ages 24-26, after adjustment for socio-demographic and

health covariates at that same age. As expected, respondents with no degree or a GED had higher levels of depressive symptoms (b=0.24 and b=0.22, respectively), whereas respondents with an associate's or bachelor's degree had lower levels of depressive symptoms (b=-0.11 and b=-0.17, respectively), compared to respondents with a high school diploma. Holding a graduate degree or some other degree or certificate was unrelated to depressive symptoms in the base model.

The full model included changes in educational attainment since ages 24-26, conditional on educational attainment at ages 24-26 and covariates from the base model. The main effects of educational attainment at ages 24-26 remain similar to those found in the base model, except that an associate's degree is no longer associated with depressive symptoms (b=-0.09, $p>.05$). Conditional on respondents' educational attainment at ages 24-26, those who attained a bachelor's or graduate degree after that age had fewer depressive symptoms at mid-life (b=-0.13) compared to those who did not attain a higher degree after ages 24-26.

Next, we used the same model sequencing to assess the association between increases in educational attainment after ages 24-26 and self-rated health (Table 4). As expected, our base model estimates showed an inverse association between education and self-rated health; those with no degree or a GED at ages 24-26 were more likely to have poorer health at mid-life (OR=1.77, OR=1.49, respectively) than respondents who had attained a high school diploma by that age, whereas respondents with an associate's (OR=0.68), bachelor's (OR=0.57), or graduate degree (OR=0.48) had lower odds of being in poorer health at mid-life. These estimates remained similar in the full model. Conditional on respondents' educational attainment at ages 24-26, those who attained a bachelor's (OR=0.66) or graduate degree (OR=0.67) after that age had lower odds of poorer health at mid-life compared to respondents who did not attain a higher degree after ages 24-26.

DISCUSSION

Education is often viewed as a measure of socio-economic status (SES) that is "generally stable over the course of an adult's lifetime" (p. 38).[10] Although education does not change in adulthood as much as other measures of SES might, our results suggest that a non-trivial percentage of U.S. individuals attain their highest degree in their late 20's and 30's. Our findings correspond to secular trends occurring in the 1970s and 1980s, which saw greater percentages of adults returning to school later in life.[16] Such correspondence is expected given that the NLSY79 cohort was making the transition to adulthood during this same period. The trend towards less stability in measures of education will likely increase even more so among younger U.S. birth cohorts, as more people return to school later in life.[17]

A common practice in health research, especially in cross-sectional studies or studies of older adults, is to measure educational attainment at the time of the interview without regard to the timing of educational attainment. Our results, however, suggest that the timing of educational attainment matters for health; individuals who attained a bachelor's or graduate degree after 24-26 years old reported fewer depressive symptoms and better self-rated health at midlife than those who did not attain a higher degree, conditional on highest degree attained by ages 24-26.

Given the significant inverse association between educational attainment at ages 24-26 and our dependent variables, the benefits from attaining a bachelor's or graduate degree after the mid-20's may not necessarily override the protective benefits of securing these degrees by the mid-20's. For example, post-estimation hypothesis testing (not shown) using estimates from our final models suggested that respondents who had attained less than a high school diploma by ages 24-26 but went on to attain a bachelor's degree had similar levels of depressive symptoms and self-rated health at mid-life compared to respondents who attained a high school diploma by age 24-26, but higher levels of depressive symptoms and poorer self-rated health at mid-life

compared to respondents who initially completed their bachelor's degree by ages 24-26. This effect may be less pronounced among those who complete a high school diploma or associate's degree by their mid-20's, and attain a higher degree by mid-life. In fact, post-estimation hypothesis testing also revealed that respondents who had attained an associate's degree by ages 24-26 but attained a bachelor's degree by mid-life had similar levels of depressive symptoms and self-rated health at mid-life as those who had completed a bachelor's degree in their mid-20's. It is possible, however, that the relationship between level of education and timing of education are not additive as we have modeled, but interactive. That is, the effects of timing of education on health may be dependent on the level of education attained by the mid-20's. We ran sensitivity analyses to test for this possibility and found that, in general, the benefits secured from attaining a bachelor's or graduate degree were similar in size regardless of initial educational attainment at ages 24-26.

The timing of education may actually have a more complex association with health than what we were able to demonstrate here. That is, we measured educational attainment at just two points in the life course (i.e., education prior to and after ages 24-26). We modeled the timing of education in this way to correspond with the assumption made in the current education-health literature that education is stable after the mid-20's. Our findings demonstrate that this is not necessarily the case, and that attaining a higher degree later in adulthood can still result in health benefits. Future studies should consider if other specifications of timing (e.g., age at which education is completed) are also related to health.

Completing additional years of schooling without degree attainment could also be associated with health. Attending school costs individuals money and time; expending resources to attain a degree and being unsuccessful in doing so could result in no or negative changes in

health given that individuals may not receive significant economic gains if they do not attain a degree. We chose to focus on degree attainment because of its link to wages and employment; however, additional studies that investigate other specifications of attainment are needed.

A number of factors may explain why attaining a bachelor's or graduate degree after ages 24-26 is associated with fewer depressive symptoms and better self-rated health among mid-life U.S. adults. First, college education is associated with increased knowledge, cognitive development, and moral reasoning, as well as greater social support and feelings of personal control.[4, 27] All of these things may result in a more optimistic outlook on life[30] and provide individuals with the means to respond effectively to stressful life experiences when they arise.[4] Second, attaining at least a bachelor's degree is associated with higher earnings and more stable employment,[36] which allows individuals greater opportunity to engage in healthy behaviors that can prevent the onset of illness. Attaining a bachelor's degree or higher is also associated with occupations that allow for greater autonomy on the job and engagement in less routine work, both of which are associated with greater work fulfillment and better psychological and physical functioning.[4] Examining the mechanisms linking the timing of education to depressive symptoms and self-rated health is an important next step for future investigation.

Limitations

Our sample represents individuals who were born between 1957 and 1964; as such, inferences can only be made to this population. However, our study is one of the only studies to investigate whether or not the timing of education is related to depressive symptoms and self-rated health. Because the NLSY79 did not collect information on depressive symptoms or self-rated health before the mid-20s, we were unable to fully adjust for prior depressive symptomotology or self-rated health. The only health-related measure collected consistently

since the start of the study was a measure of health-induced work limitations, which we used to adjust for health in early adulthood.

Conclusions

Education is often seen as the gateway to the American Dream.[39] Yet, many individuals are not able to attain their degree of choice by their mid-20s. Our study provides preliminary evidence that the timing of education matters for health, and that attaining a degree after the mid-20's can result in health benefits for U.S. adults. Additional studies are needed to identify the extent to which the timing of educational attainment matters for population health and, if so, the mechanisms by which education in later life benefits health.

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Table 1: Sample Characteristics of National Longitudinal Study of Youth (1979) Respondents, Weighted Means and Percentages, N=8,298 [a]

	Mean or %
Square-root Depressive Symptoms	1.85
Self-Rated Health	
Excellent	23.0
Very Good	39.8
Good	26.5
Fair	8.6
Poor	2.2
Education at ages 24-26	
No Degree	13.0
GED	6.8
High School Diploma	52.1
Associate's Degree	5.9
Bachelor's Degree	16.5
Master's/Professional/Doctorate Degree	1.5
Other Degree or Certificate	4.2
Changes in Education by Mid-Life	
No change in highest degree	79.8
Attained GED	2.6
Attained High School Diploma	1.1
Attained Associate's Degree	4.2
Attained Bachelor's Degree	5.8
Attained Master's/Professional/Doctoral Degree	5.8
Attained Other Degree or Certificate	1.0
Demographics	
Race/Ethnicity	
White	64.3
Black	14.9
Hispanic	7.5
Other	13.2
Female	51.2
Birth Cohort	
1957-1960	50.9
1961-1964	49.1
Respondent's Nativity Status	
Respondent US-Born	95.7
Respondent Foreign-Born	4.3
Parents' Nativity Status	
Both Parents Foreign-Born	4.5
One Parent Foreign-Born	4.2
Both Parents US-Born	90.7
Unknown	0.6
Parent's Education	
0 – 11 Years	22.4
12 Years	41.7

13 – 15 Years	13.3
16 Years or more	20.1
Unknown	2.5
Household Poverty at ages 24-26	
In Poverty	12.8
Not in Poverty	85.2
Unknown	2.0
Marital Status at ages 24-26	
Married	45.3
Divorced/Separated/Widowed	10.3
Never Married	44.5
Health Limitations at ages 24-26	5.0
In Active Military Forces at ages 24-26	2.8

Notes:
[a] Percentages may not add to 100 due to rounding error

Table 2: Weighted Cross-Tabulations Between Highest Degree Attained at ages 24-26 and Highest Degree Attained by Mid-Life, National Longitudinal Study of Youth, 1979 [a]

	Highest Degree Attained (Mid-Life)						
	No Degree	GED	High School Diploma	Associate's Degree	Bachelor's Degree	Graduate Degree	Other Degree or Certificate
Highest Degree Attained (24-26 Years)							
No Degree	68.8	19.7	7.2	1.9	1.5	0.4	0.5
GED		88.9	1.6	3.6	2.7	0.9	2.2
High School Diploma			83.4	6.3	7.1	2.0	1.2
Associate's Degree				73.0	21.2	5.8	0.0
Bachelor's Degree					74.5	25.5	0.0
Graduate Degree						100.0	0.0
Other Degree or Certificate				10.5	10.5	1.5	77.4

Notes:

[a] Row percentages reported; Percentages may not add to 100 due to rounding error

Table 3: Weighted Estimates from Linear Regression Models Predicting Square-root Depressive Symptoms by Highest Degree Attained at ages 24-26, Gains in Degree Attainment by Mid-Life and Socio-Demographic and Health Covariates, National Longitudinal Study of Youth, 1979 [a]

	Base Model b (SE)	Full Model b (SE)
Intercept	1.68 (0.03)***	1.68 (0.03)***
Highest Degree Attained (24-26 Years)		
No Degree	0.24 (0.04)***	0.24 (0.04)***
GED	0.22 (0.05)***	0.21 (0.05)***
High School Diploma (reference)	-----	-----
Associate's Degree	-0.11 (0.04)*	-0.09 (0.04)
Bachelor's Degree	-0.17 (0.03)***	-0.15 (0.03)***
Graduate Degree	-0.12 (0.09)	-0.14 (0.09)
Other Degree or Certificate	0.04 (0.06)	0.04 (0.06)
Changes in Highest Degree by Mid-Life		
No Change in Degree (reference)		-----
Attained GED		-0.01 (0.09)
Attained High School Diploma		0.01 (0.12)
Attained Associate's Degree		0.03 (0.06)
Attained Bachelor's Degree		-0.13 (0.04)**
Attained Graduate Degree		-0.13 (0.04)**
Attained Other Degree or Certificate		0.24 (0.15)

Notes:

[a] All models adjust for race/ethnicity, gender, birth cohort, respondent's nativity, parents' nativity, parent's education, poverty status at 24-26 years, marital status at 24-26 years, health condition at 24-26 years, and in active forces at 24-26 years.

*p<0.05; **p<0.01; ***p<0.001

Table 4: Weighted Estimates from Ordered Logistic Regression Models Predicting Self-Rated Health by Highest Degree Attained at ages 24-26, Gains in Degree Attainment by Mid-Life and Socio-Demographic and Health Covariates, National Longitudinal Study of Youth, 1979 [a,b]

	Base Model OR (95% CI)	Full Model OR (95% CI)
Highest Degree Attained (24-26 Years)		
No Degree	1.77 (1.52, 2.06)	1.79 (1.51, 2.14)
GED	1.49 (1.23, 1.80)	1.48 (1.22, 1.79)
High School Diploma (reference)	1.00	1.00
Associate's Degree	0.68 (0.56, 0.83)	0.71 (0.58, 0.87)
Bachelor's Degree	0.57 (0.49, 0.66)	0.57 (0.49, 0.67)
Graduate Degree	0.48 (0.34, 0.68)	0.44 (0.31, 0.62)
Other Degree or Certificate	0.89 (0.68, 1.18)	0.90 (0.69, 1.19)
Changes in Highest Degree by Mid-Life		
No Change in Degree (reference)		1.00
Attained GED		0.90 (0.65, 1.24)
Attained High School Diploma		0.75 (0.48, 1.19)
Attained Associate's Degree		0.78 (0.61, 1.01)
Attained Bachelor's Degree		0.67 (0.54, 0.83)
Attained Graduate Degree		0.68 (0.53, 0.87)
Attained Other Degree or Certificate		0.63 (0.36, 1.09)

Notes:

[a] All models adjust for race/ethnicity, gender, birth cohort, respondent's nativity, parents' nativity, parent's education, poverty status at 24-26 years, marital status at 24-26 years, health condition at 24-26 years, and in active forces at 24-26 years.

[b] Self-rated health coded 1=Excellent to 5=Poor.