The Health Value of the GED: Testing the Role of Noncognitive Resources, Health Behaviors, and Labor-Market Factors.

Anna Zajacova, University of Wyoming

Jennifer Karas Montez, Case Western Reserve University

September 27, 2013

Extended abstract prepared for submission to the Annual Meeting of the Population Association of America 2014.

ABSTRACT

Half a million Americans earn the General Educational Development (GED) every year. The GED certification is intended to be equivalent to a high school (HS) diploma; however, econometricians have long known that GED recipients are disadvantaged relative to HS graduates in numerous domains. Recently, several studies have turned attention to another domain, adult health, and uncovered a large health disadvantage of GED recipients. This project aims to explain the health disadvantage, focusing on three groups of factors known to differ between GED recipients and HS diploma holders: non-cognitive skills, health behaviors, and labor-market outcomes. We use the NLSY79 (N=3,869) data on respondents from adolescence to age 40 when they were administered a battery of health questions. Structural equation models will be used to examine the joint direct and indirect effects of the three explanatory factors on multiple health indicators. Preliminary results indicate the hypothesized factors explain the GED-HS health gap.

The Health Value of the GED: Testing the Role of Noncognitive Resources, Health Behaviors, and Labor-Market Factors.

The number of GED recipients in recent years has exceeded half a million annually, representing between 12% and 20% of all secondary credentials (1-3). Since its launch in 1942, about 18 million adults have earned the GED (4).

The value of the GED credential is predicated on the assumption of equivalence to a regular high school diploma. This assumed equivalence is reflected, for instance, in population statistics where GED recipients are grouped into the same category as high school graduates; it is also reflected among colleges and employers, most of whom accept the GED as a secondary-completion credential (4-5). The equivalency assumption has been supported in one important domain: the cognitive skills of GED recipients have been found to be comparable to those of regular graduates (6-9). In other vital areas, however, GED recipients have significantly worse outcomes. Specifically, the GED is associated with worse labor market outcomes than a HS diploma, with lower employment rates and lower hourly wages (8-11). The GED is also linked to lower college completion rates (7, 11), higher attrition from the military (7), and higher crime rates (12). Additionally, adults with a GED tend to have worse health behaviors; in particular they have higher rates of smoking and substance use than high school graduates (12-13).

The primary explanation for these differences in outcomes centers on the poorer non-cognitive skills of the GED graduates (9, 14-16). Non-cognitive skills comprise attitudes and beliefs, emotional and cognitive self-regulation, and personality traits, ranging from self-discipline, mastery, self-efficacy, perseverance, consistency, or motivation (17-19). The GED earners have lower level of non-cognitive skills compared to high school graduates (8, 10, 20). In fact, GED graduates are rather similar to high school dropouts in the distribution of non-cognitive skills (11).

A large gap in our understanding of the value of the GED concerns the *health* of GED recipients. Three recent studies have compared health outcomes of GED recipients versus HS diploma earners. Zajacova (21) compared 20 medical conditions, as well as functional and activity limitations among working-age adults and found GED recipients to be significantly more likely than HS graduates to report every single one. Focusing on an older sample, Liu, Chavan, and Glymour (22) found the GED to predict significantly higher odds of incident ADLs and IADLs. The GED disadvantage in general health, as measured by self-rated health and activity limitations, is substantively large: GED recipients have health levels that are equivalent to HS diploma earners about 15 years older (23).

These studies have not, however, explained why the GED-HS difference in health outcomes occurs. What causes these large health discrepancies? Previous research, briefly summarized above, suggests non-cognitive skills as an important potential explanation for various outcomes, including health. Non-cognitive skills appear to be lower among the GED recipients. These skills—especially a set of traits known as conscientiousness-- are also considered an important determinant of educational attainment in general (16, 19, 24); thus they may also help determine who completes a regular high school credential versus the GED. Finally, there is a connection between non-cognitive skills and health, whether directly (25-26) or as a critical component linking educational attainment and adult health (25, 27-29).

In addition to the non-cognitive skills as a potential confounder influencing both attainment and health, two important *mediating* pathways between educational attainment and adult health have also been discussed in the literature: health behaviors and labor-market circumstances. As noted above, GED recipients tend to be disadvantaged with respect to both. At the same

time, both health behaviors and labor-market experiences are critical determinants of health outcomes (27, 30-36). We therefore hypothesize that these two factors may explain some of the GED recipients'' health disadvantage relative to HS graduates.

The literature on the outcomes of GED recipients has found they differ from HS diploma holders in terms of non-cognitive skills, and, perhaps as a corollary, in health behaviors and labor market outcomes. The literature on the association between socioeconomic determinants of health has also highlighted these factors as important links through which schooling affects health or, to be more appropriately tentative about causality, factors that link schooling and health. We merge these bodies of work and test whether non-cognitive skills, health behaviors, and labor-market outcomes can explain the large health disadvantage of GED recipients compared to their HS diploma holders.

METHODS

Data

We use data from the National Longitudinal Survey of Youth 1979 (NLSY79). The NLSY79 is a panel survey of a large, nationally representative sample of young adults who were between 14 and 22 years old at the baseline 1979 interview. Respondents were re-interviewed annually until 1994 and every two years thereafter. By the 2006 interview, the last wave we utilize in our analyses, the respondents were between 41 and 49 years old. Our analysis used information on the respondents' family background, cognitive and non-cognitive skills collected primarily during the 1979 baseline, educational attainment and labor-market information from the follow-up interviews, and mid-life health information reported in a special module administered to respondents after they turned 40 (the module was offered from 1998 to 2006).

Analytic sample. We define our analytic sample as adults who earned a HS diploma as their highest credential, GED as their highest credential, and we also include HS dropouts as an additional comparison group. Respondents must also have answered the age 40 health module and provided at least one valid health measure.

Measures

1979 sociodemographic background. All models control for basic demographic characteristics: *age*, in single years; *gender* (male=reference); *race/ethnicity*, coded as white (reference – this category is strictly "non-black, non-Hispanic" and as such, includes predominantly non-Hispanic whites but also a small proportion of 'other' race respondents), black, and Hispanic; Census *region* of residence in 1979 coded as Northeast (reference), North Central, South, and West; and *rural/urban* residence in 1979. *Parents' education* is coded as the highest education of either parent and trichotomized as less than high school, high school, and more than high school. The *family's economic status* is dichotomized as "below poverty threshold" versus "above poverty" in 1978, the year prior to the baseline. The third variable, *family structure,* indicates whether the adolescent lived with both biological parents throughout their childhood and adolescence (yes=1).

1979 non/cognitive measures. The *Rotter locus-of-control scale* (37) measures the extent to which respondents believed they had control over their lives (internal locus) versus the environment controlled what was happening to them (external locus). The *Rosenberg self-esteem scale* (38), a 10-point instrument administered in 1980, measures the degree of approval or disapproval an individual makes when evaluating oneself. The *Armed Forces Qualification Test* (AFQT) percentile score is calculated from the Armed Services Vocational Aptitude Battery, which was administered in 1980 and comprises skills and knowledge across various areas including arithmetic reasoning, paragraph comprehension, word and mathematics

knowledge, and general science. The AFQT scores have been widely used as a measure of cognitive skills among adolescents and young adults (i.e., 8, 14).

Follow-up information. Educational attainment is trichotomized. We include adults whose highest credential is a HS diploma, the GED (reference), and HS dropouts. Family income is constructed from up to ten reports from 1986 to 1997 (prior to the age-40 module). We calculate long-term *family income* by taking the mean of all available reports, adjusted for inflation (to 2000 dollars) and log-transforming it due to the skewness of the distribution. We control for *marital status* at the time of the age 40 module, categorizing it as married, never married, and divorced/separated/widowed. We will also include measure of employment (specifics TBD) and own income, which will be calculated in a cumulative way similar to family income and may replace the family income as a better measure of own labor-market outcomes. Three indicators of health behaviors will be captured:obesity, cigarette use, and alcohol use.

Mid-adulthood health. We use the following eight health measures from the age 40 module: self-rated health, health limitations, the CES-D score, the SF-12 physical and mental component scores, presence of pain sufficient to limit activities, doctor-diagnosed conditions, and other health symptoms or troubles. *Self-rated health* was measured on the standard 5-point scale from excellent=1 to poor=5 and is used in the analyses as an ordinal outcome with four levels (fair and poor were merged because of small cell sizes. *Health limitations* assess whether the respondent's health limited "moderate" activities. Any limitations (a little to a lot) is coded 1, no limitations is coded 0. The 7-item CES-D scale, which measured *depressive symptoms*, is dichotomized using an established threshold as 0=low distress versus 1=high distress (39). The *SF-12* (short-form 12) physical and mental health component scores (40) are dichotomized using the lowest quartile as threshold, following recommendations by Ware et al. (41). The *pain* item asked respondents to rate, from "not at all" to "extremely," how pain interfered with normal work or housework in the previous 4 weeks. We code pain as a three-level variable: no pain, little pain, and moderate to extreme pain. Respondents were also asked whether a *doctor diagnosed any of eight conditions*, including cancer, diabetes, lung disorders, heart conditions, hypertension, or arthritis. We categorize this 9-point scale as 0 conditions, 1 condition, and 2 or more conditions. Finally, a series of 23 items assessed a range of *health symptoms, troubles, or conditions*, from asthma and back problems, to urinary tract infections or ulcers. We trichotomize the count to 0, 1-2, and 3 or more. We will also explore condensing the individual measures or the health scales using factor analysis.

Analyses

We plan to estimate structural equation models (SEM) of health outcomes. We will explore the behavior of each individual outcome but for presentation will create a summary health measure using a confirmatory factor analysis (CFA) with the eight health outcomes as indicators, or a two-level CFA with the individual health measures. The SEM approach will allow us to observe the direct and indirect effects of the key explanatory factors on health. The preliminary results were generated using regression models.

PRELIMINARY RESULTS

The findings from the preliminary analyses are based on logistic and ordered logistic models of individual health outcomes on the three-category education, yielding a comparison of HS versus GED health (as well as dropout vs. GED). The results from the first two models adjusted only for demographics (Model 1) and parental background (Model 2) corroborate previous studies: with one exception (low SF-12 mental component score), GED recipients report significantly

worse health than HS graduates. Taking into account non-cognitive resources, the first explanation proposed above (Model 3 and 4 – the latter also takes into account background), attenuates all the GED-HS differences substantially although they remain evident. Cognitive skills (added in Model 5) do not have much of an effect on the GED-HS differences, as expected given the similarity in cognitive skills described previously (9, 14). Model 6 tests the second explanation for the poor health of the GED recipients: labor market disadvantage. Although we only controlled for income and marital status, the gross GED-HS difference attenuated considerably, to a similar degree as with non-cognitive skills. We are in the process of adding the health behaviors to test the third explanation. The final model in our preliminary analysis tests the joint impact of non-cognitive skills and labor-market factors: here the differences between GED and HS become, with one exception, not significant.

PRELIMINARY CONCLUSIONS

Several recent papers described the non-equivalent (poor) health of GED recipients compared to high school graduates (21-23). We move the literature forward by testing three explanations for the observed patterns: non-cognitive skills, health behaviors, and labor-market outcomes. Without a full complement of variables, we found that these mechanisms explained the observed differences for all but one health outcome.

REFERENCES

1. Heckman JJ. Schools, Skills, and Synapses. Economic Inquiry. 2008;46(3):289-324.
2. Snyder TD, Dillow SA. Digest of Education Statistics, 2011 (NCES 2012-001). In: National Center for Education Statistics IoES, U.S. Department of Education, editor. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education; 2012.
3. American Council on Education. GED testing program statistical report. . In: Author, editor. Washington, DC2009.
4. American Council on Education. 2009 GED Testing Program Statistical Report. Washington, DC: GED Testing Service, American Council on Education; 2010 Contract No.: Document Number|.
5. Chapman C, Laird J, KewalRamani A. Trends in High School Dropout and Completion Rates in the United States: 1972–2008 (NCES 2011-012). In: National Center for Education Statistics IoES, U.S. Department of Education, editor. Washington, DC2010.
6. Tyler JH. Economic benefits of the GED: Lessons from recent research. Review of Educational Research. 2003;73(3):369-403.
7. Boesel D, Alsalam N, Smith TM. Educational and Labor Market Performance of GED Recipients: Research Synthesis. Washington, DC: National Library of Education, Office of Educational Research and Improvement, US Department of Education; 1998.
8. Heckman JJ, Rubinstein Y. The Importance of Noncognitive Skills: Lessons from the GED Testing Program. American Economic Review. 2001;91(2):145-49.
9. Heckman JJ, Humphries JE, Mader NS. The GED. Cambridge, MA: NBER; 2010 June 2010 Contract No.: Document Number|.
10. Cameron SV, Heckman JJ. The Nonequivalence of High School Equivalents. . Journal of Labor Economics. 1993;11(1):1-47.
11. Heckman JJ, LaFontaine PA. The American High School Graduation Rate: Trends and Levels. Review of Economics and Statistics. 2010;92(2):244-62.
12. Ou S-R. Do GED Recipients Differ from Graduates and School Dropouts? Findings from an Inner-City Cohort. Urban Education. 2008;43(1):83-117.
13. Kenkel D, Lillard D, Mathios A. The Roles of High School Completion and GED Receipt in Smoking and Obesity. Journal of Labor Economics. 2006;24(3):635-60.
14. Heckman JJ, Stixrud J, Urzua S. The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior. Journal of Labor Economics. 2006;24(3):411-82.
15. Tyler J, Lofstrom M. Is the GED an effective route to postsecondary education for school dropouts? Economics of Education Review. 2010;29(5):813-25.
16. Almlund M, Duckworth AL, Heckman JJ, Kautz TD. Personality Psychology and Economics. Bonn, Germany: National Bureau of Economic Research; 2011 Contract No.: Document Number|.
17. Lipnevich AA, Roberts RD. Noncognitive skills in education: Emerging research and applications in a variety of international contexts. Learning and Individual Differences. 2012;22(2):173-7.
18. DiPrete TA, Jennings JL. Social and behavioral skills and the gender gap in early educational achievement. Social Science Research. 2012;41(1):1-15.
19. Rosen JA, Glennie EJ, Dalton BW, Lennon JM, Bozick RN. Noncognitive Skills in the Classroom: New Perspectives on Educational Research: RTI Press publication No. BK-0004-1009. Research Triangle Park, NC: RTI International. Retrieved September 26, 2013, from http://www.rti.org/rtipress; 2010.
20. Boesel D. The street value of the GED diploma. Phi Delta Kappan. 1998;80(1):65.

21. Zajacova A. Health in working-aged Americans: Adults with high school equivalency diploma are similar to dropouts, not high school graduates. American Journal of Public Health. 2012;102(S2):S284-S90.
22. Liu SY, Chavan NR, Glymour MM. Type of High-School Credentials and Older Age ADL and IADL Limitations: Is the GED Credential Equivalent to a Diploma? The Gerontologist. 2013;53(2):326-33.
23. Zajacova A, Everett BG. The Nonequivalent Health of High School Equivalents. Social Science Quarterly. 2013:n/a-n/a.
24. O'Connor MC, Paunonen SV. Big Five personality predictors of post-secondary academic performance. Personality and Individual Differences. 2007;43(5):971-90.
25. Conti G, Heckman JJ, Urzua S. The Education-Health Gradient. American Economic Review. 2010;100(2):234-8.
26. Diener E, Oishi S, Lucas RE. Subjective well-being: The science of happiness and life satisfaction. In: Snyder CR, Lopez SJ, editors. Handbook of Positive Psychology. Oxford, UK: Oxford University Press; 2002. p. 187-94.
27. Mirowsky J, Ross CE. Education, Social Status, and Health. New York: Aldine de Gruyter; 2003.
28. Marmot M. The Status Syndrome: How Social Standing Affects Our Health and Longevity: Holt Paperbacks; 2004.
29. Mirowsky J, Ross CE. Education, Personal Control, Lifestyle and Health. Research on Aging. 1998;20(4):415-49.
30. Ross CE, Mirowsky J. Does Employment Affect Health? Journal of Health and Social Behavior. 1995;36(3):230-43.
31. Ross CE, Wu CL. The Links between Education and Health. American Sociological Review. 1995;60(5):719-45.
32. Lantz PM, House JS, Lepkowski JM, Williams DR, Mero RP, Chen J. Socioeconomic factors, health behaviors, and mortality: results from a nationally representative prospective study of US adults. JAMA. 1998;279(21):1703-8.
33. Pampel FC, Krueger PM, Denney JT. Socioeconomic Disparities in Health Behaviors. Annual Review of Sociology. 2010;36(1):349-70.
34. Montez JK, Zajacova A. Explaining the Widening Education Gap in Mortality among U.S. White Women. Journal of Health and Social Behavior. 2013;54(2):166-82.
35. Zajacova A, Hummer RA, Rogers RG. Education and Health Among U.S. Working-Age Adults: A Detailed Portrait Across the Full Educational-Attainment Spectrum. Biodemography and Social Biology. 2012;58(1):40-61.
36. Cutler DM, Lleras-Muney A. Education and Health: Evaluating Theories and Evidence. In: Schoeni RF, House JS, Kaplan GA, Pollack H, editors. Making Americans Healthier: Social and Economic Policy as Health Policy. New York, NY: Russel Sage Foundation; 2008. p. 29-60.
37. Rotter JB. Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs: General and Applied. 1966;80(1):1-28.
38. Rosenberg M. Society and the Adolescent Self-Image. Princeton, NJ: Princeton University Press; 1965.
39. Huba GJ, Melchior LA, HRSA/HAB's SPNS Cooperative Measurement Group Agreement Steering Committee. Module 26b: Ces-D8 Form (Interview). Culver City, CA: The Measurement Group.; 1995 Contract No.: Document Number|.
40. Ware JE, Jr., Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: Construction of Scales and Preliminary Tests of Reliability and Validity. Medical Care. 1996;34(3):220-33.
41. Ware J, Kosinski M, Keller S, Lincoln R. How to Score the SF-12 Physical and Mental Summary Scales. Boston, MA: The Health Institute, New England Medical Center; 1995.

Table 1. Health Outcomes at Age 40 for HS Graduates (Top Panel) and Dropouts (Bottom Panel) Compared to GED.

HS relative to GED	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Self-rated health	0.73***	0.76**	0.79**	0.82*	0.83*	0.81*	0.89
Activity limitations	0.72*	0.76*	0.80	0.83	0.84	0.80	0.90
Elevated CES-D score	0.67***	0.71**	0.74**	0.78*	0.79*	0.77*	0.86
Low SF-12 physical component score	0.69***	0.74**	0.75**	0.79*	0.80*	0.77*	0.85
Low SF-12 mental component score	0.82	0.85	0.91	0.92	0.92	0.92	0.99
Pain	0.74**	0.75**	0.79*	0.80*	0.80*	0.79*	0.83
Conditions diagnosed by a physician	0.77**	0.81*	0.79*	0.83	0.82*	0.81*	0.85
Other health problems and troubles	0.71***	0.72***	0.77**	0.77**	0.77**	0.76**	0.80*
Dropout status relative to GED							
Self-rated health	1.48***	1.39**	1.34**	1.29*	1.22	1.40***	1.20
Activity limitations	1.31	1.26	1.22	1.19	1.10	1.27	1.12
Elevated CES-D score	1.22	1.13	1.06	1.01	0.96	1.16	0.96
Low SF-12 physical component score	1.36*	1.31*	1.25	1.23	1.19	1.30*	1.19
Low SF-12 mental component score	1.38**	1.34*	1.21	1.21	1.19	1.34*	1.21
Pain	1.10	1.11	1.05	1.07	1.05	1.07	1.05
Conditions diagnosed by a physician	1.03	1.02	0.98	0.97	0.96	1.00	0.96
Other health problems and troubles	1.03	1.05	0.95	0.98	0.97	1.00	0.98

* p<.05, ** p<.01, *** p<.001

Data source: NLSY79, N=3,812 to 3,836 across the different health outcomes.

Note: the results from the top and bottom panel are from the same equation for each model of health outcome on three-category education: dropouts, GED (reference), and HS diploma. The models differ in the blocks of covariates:

Model 1 controls for demographics (age, sex, race, Census region, and rural/urban region)

Model 2 controls for demographics and parental background

Model 3 controls for demographics and non-cognitive resources

Model 4 controls for demographics, background, and non-cognitive resources

Model 5 controls for demographics, background, noncognitive resources, and cognitive skills

Model 6 controls for demographics and adulthood socioeconomic factors (marital status and cumulative family income)

Model 7 controls for demographics, background, noncognitive resources, cognitive skills, and adulthood socioeconomic factors