

EXAMINING ASSOCIATIONS BETWEEN ADULT HEALTH AND LITERACY, NUMERACY, TECHNOLOGICAL PROBLEM-SOLVING SKILLS, AND POST-INITIAL LEARNING IN THE U.S.



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THEORETICAL FRAMEWORK

Figure 1: Social Determinants of Health



Focus of PIAAC analyses

- Skills: literacy, numeracy, technological problem-solving
- Post-initial learning: participation in formal and non-formal education after highest degree completed

Adapted from Braveman, Egerter, & Williams (2011, p. 383)

RESEARCH QUESTIONS

- **Literacy, numeracy, and PS-TRE skills**
 - Are literacy, numeracy, and technological problem-solving skills associated with self-rated health, after controlling for various sociodemographic characteristics?
 - Does the relationship between skills in these areas and self-rated health vary across racial/ethnic groups?
 - Does the relationship between skills in these areas and self-rated health vary across levels of formal educational attainment?
- **Participation in post-initial learning**
 - Which types of post-initial learning activities are most strongly associated with self-rated health, after controlling for various sociodemographic characteristics?
 - Which types of post-initial learning matter most for the health statuses of different racial/ethnic groups?
 - Which types of post-initial learning matter most for the health statuses of people at different levels of formal educational attainment?

VARIABLES

- **Dependent Variable**

- Self-rated Health

- **Independent Variables**

- RQ #1: Literacy, numeracy, and PS-TRE scores
- RQ #2: Participation in post-initial learning in past year – distance education, on-the-job training, seminars or workshops, courses or private lessons, formal education

- **Moderators**

- Race/Ethnicity – non-Hispanic white (ref), non-Hispanic black, Hispanic, Asian, other race
- Formal Educational Attainment – did not complete HS (ref), high school graduate, certificate from trade school or other, associate's degree, bachelor's degree, and master's degree or higher

CONTROL VARIABLES

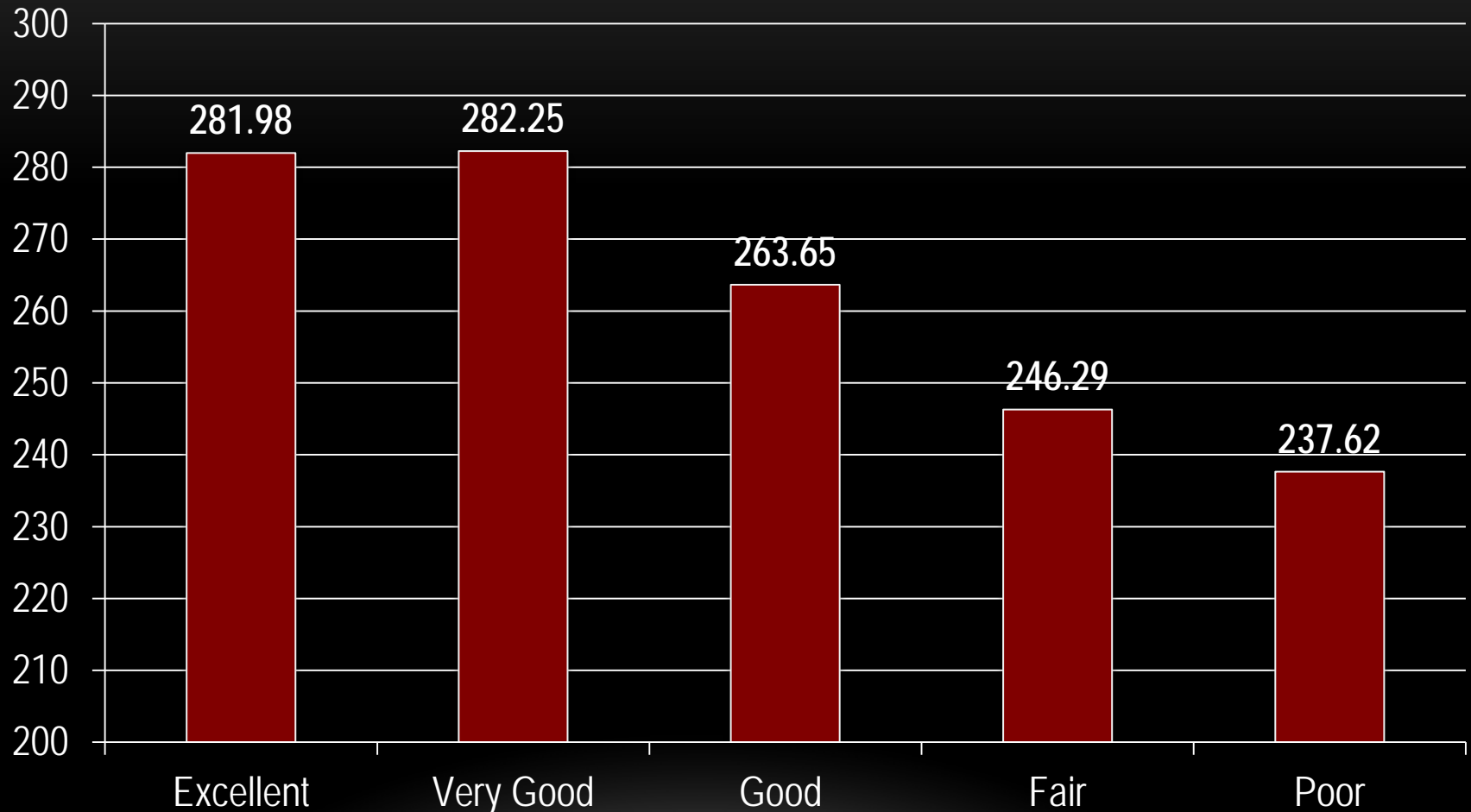
- Age
 - Sex
 - Employment status
 - Living with spouse or partner
 - Children 12 or younger
 - Total people in household
 - Nativity
 - Mother's and father's educational attainment
 - Vision problems, hearing problems, learning disability
 - Health insurance status
 - English proficiency score
-

ANALYTIC APPROACH

- Ordinal Logistic Regression Models
 - Unadjusted (no control variables)
 - Adjusted (all control variables)
 - Interaction Models
 - PIAACTOOLS and PIAACREG in STATA to account for plausible values
 - Weighted
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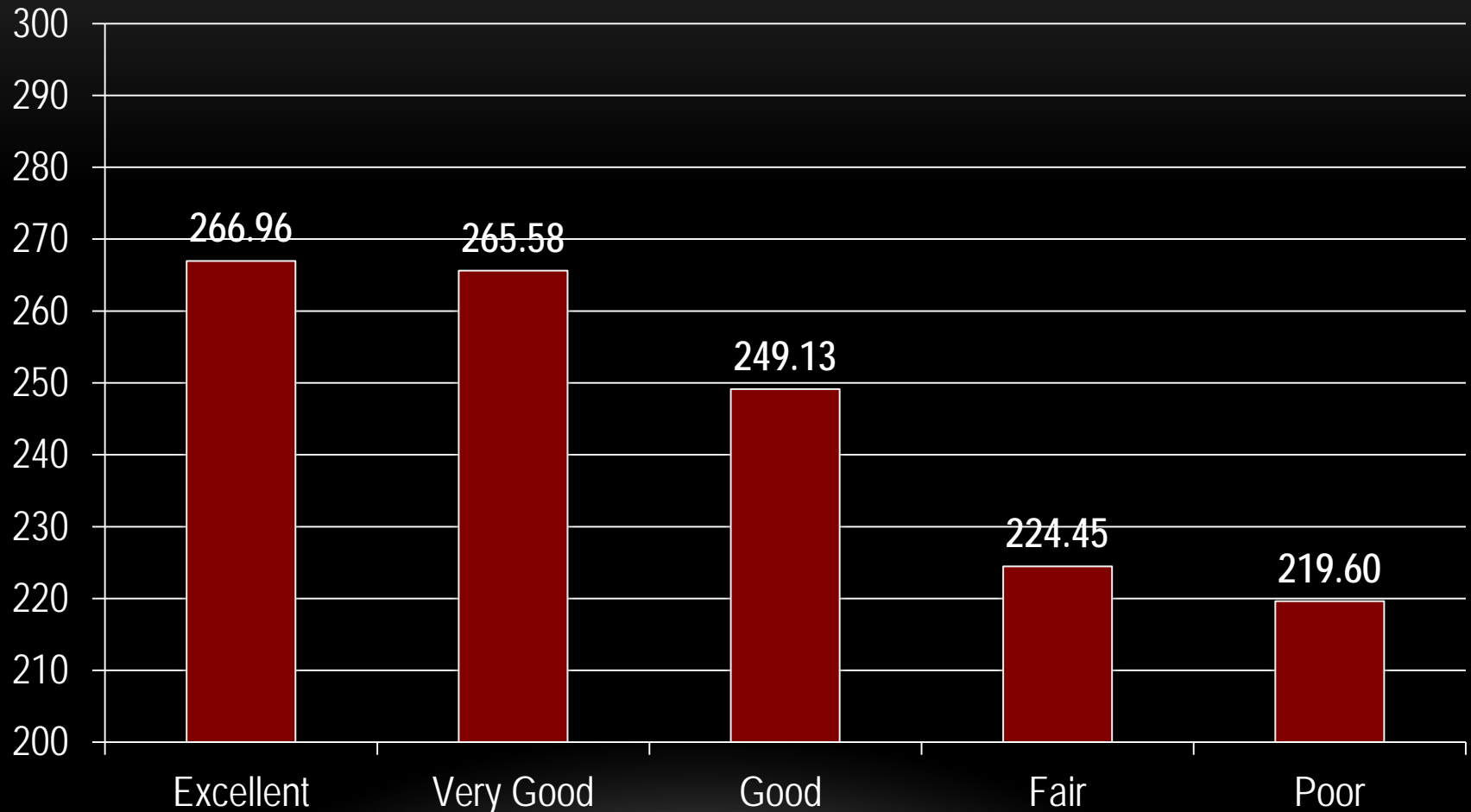
RQ #1
DESCRIPTIVE RESULTS

RELATIONSHIP BETWEEN LITERACY AND HEALTH



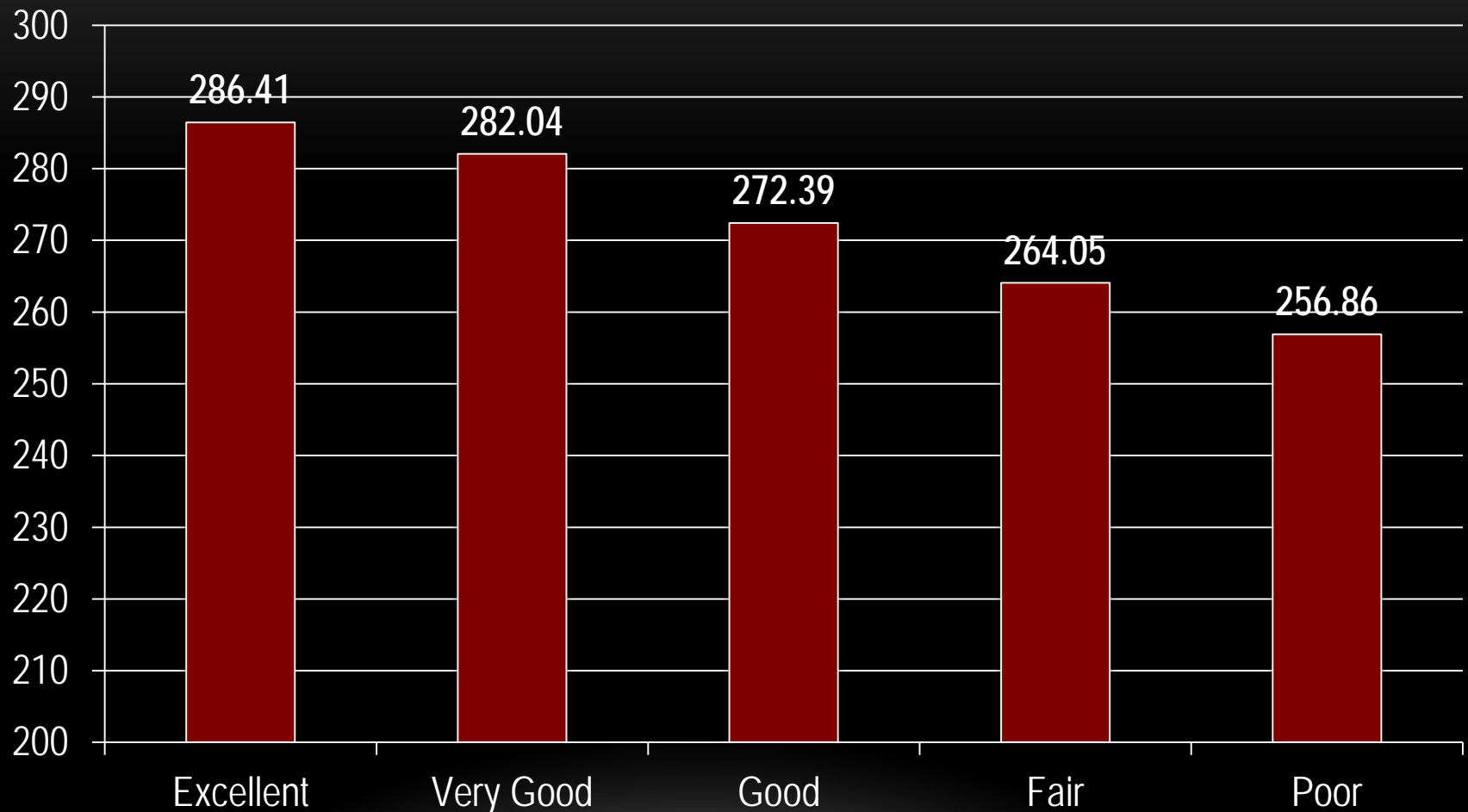
Literacy scores for good, fair, & poor categories significantly lower than excellent & very good categories (N=4,647; weighted)

RELATIONSHIP BETWEEN NUMERACY AND HEALTH



Numeracy scores for good, fair, & poor categories significantly lower than excellent & very good categories (N=4,647; weighted)

RELATIONSHIP BETWEEN PS-TRE AND HEALTH



PS-TRE scores for good, fair, & poor categories significantly lower than excellent & very good categories (N=3,942; weighted)

RQ #1
REGRESSION RESULTS

ODDS RATIOS AND CONFIDENCE INTERVAL FROM ORDINAL LOGISTIC REGRESSION MODELS PREDICTING SELF-RATED HEALTH

	UNADJUSTED	ADJUSTED
LITERACY		
NUMERACY		
PS-TRE		

ODDS RATIOS AND CONFIDENCE INTERVAL FROM ORDINAL LOGISTIC REGRESSION MODELS PREDICTING SELF-RATED HEALTH

	UNADJUSTED	ADJUSTED
LITERACY	1.105*** (1.090-1.120)	
NUMERACY	1.085*** (1.073-1.098)	
PS-TRE	1.076*** (1.057-1.095)	

***p<.001 (two-tailed tests); weighted

- 10-point increase on literacy scale: 10.5% greater odds of being in a better health category
- Numeracy: 8.5% greater odds
- PS-TRE: 7.6% greater odds

ODDS RATIOS AND CONFIDENCE INTERVAL FROM ORDINAL LOGISTIC REGRESSION MODELS PREDICTING SELF-RATED HEALTH

	UNADJUSTED	ADJUSTED
LITERACY	1.105 ^{***} (1.090-1.120)	1.026* (1.004-1.049)
NUMERACY	1.085 ^{***} (1.073-1.098)	1.010 (0.922-1.028)
PS-TRE	1.076 ^{***} (1.057-1.095)	1.004 (0.983-1.026)

^{***}p<.001; *p<.05 (two-tailed tests); weighted

- 10-point increase on the literacy scale: 2.6% greater odds of being in a better health category

ODDS RATIOS FROM ORDINAL LOGISTIC REGRESSION MODELS PREDICTING SELF-RATED HEALTH

- Many control variables are more strongly associated with health

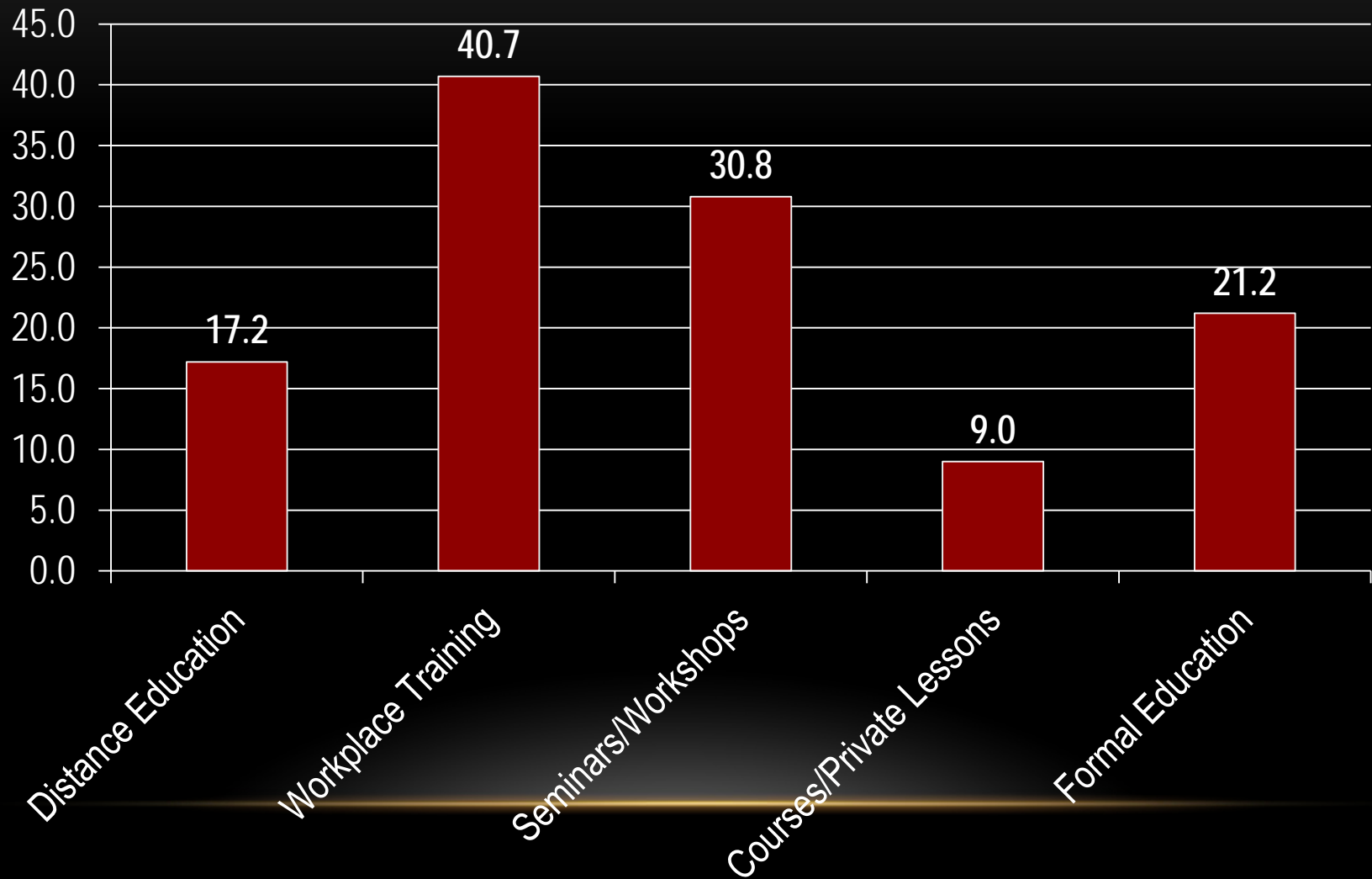
	Odds of being in better self-rated health category
LITERACY	3%
<i>Educational Attainment (ref. = <HS)</i>	
Master's degree or higher	212%
Bachelor's degree	92%
<i>Parental Educational Attainment (ref. = <HS)</i>	
Mother completed high school	23%
Father attended college or more	36%
<i>Employment Status (ref. = employed)</i>	
Unable to work due to disability	-96%
Retired	-39%
Foreign-born	48%
Vision/hearing problems or diagnosed learning disability	-42%
Worse English proficiency	-8%
Has health insurance	5%

ARE ASSOCIATIONS BETWEEN HEALTH AND THESE THREE SKILLS CONDITIONAL ON RACE/ETHNICITY OR FORMAL EDUCATION?

- Mostly...no!
 - Except...PS-TRE scores are positively associated with health only for those with master's degree or more, but effect size is very small.
- People from all racial/ethnic and formal educational attainment groups accrue equal health benefits from literacy, net of controls.
- Numeracy is not associated with health for any racial/ethnic groups or any formal educational attainment levels, net of controls.

RQ #2 RESULTS

PARTICIPATION IN POST-INITIAL LEARNING



N=4,473; weighted

ODDS RATIOS AND CONFIDENCE INTERVAL FROM ORDINAL LOGISTIC REGRESSION MODELS PREDICTING SELF-RATED HEALTH

	UNADJUSTED	ADJUSTED
DISTANCE EDUCATION		
WORKPLACE TRAINING		
SEMINARS/WORKSHOPS		
COURSES/PRIVATE LESSONS		
FORMAL EDUCATION		

ODDS RATIOS AND CONFIDENCE INTERVAL FROM ORDINAL LOGISTIC REGRESSION MODELS PREDICTING SELF-RATED HEALTH

	UNADJUSTED	ADJUSTED
DISTANCE EDUCATION	1.084 (0.934-1.259)	
WORKPLACE TRAINING	1.373*** (1.221-1.543)	
SEMINARS/WORKSHOPS	1.498*** (1.321-1.700)	
COURSES/PRIVATE LESSONS	1.817*** (1.504-2.195)	
FORMAL EDUCATION	1.464*** (1.282-1.671)	

***p<.001 (two-tailed tests); weighted; N=4,473

- 4 post-initial learning activities were associated with better health

ODDS RATIOS AND CONFIDENCE INTERVAL FROM ORDINAL LOGISTIC REGRESSION MODELS PREDICTING SELF-RATED HEALTH

	UNADJUSTED	ADJUSTED
DISTANCE EDUCATION	1.084 (0.934-1.259)	0.988 (0.849-1.151)
WORKPLACE TRAINING	1.373*** (1.221-1.543)	1.010 (0.892-1.144)
SEMINARS/WORKSHOPS	1.498*** (1.321-1.700)	1.116 (0.975-1.277)
COURSES/PRIVATE LESSONS	1.817*** (1.504-2.195)	1.586*** (1.306-1.925)
FORMAL EDUCATION	1.464*** (1.282-1.671)	1.092 (0.927-1.287)

***p<.001 (two-tailed tests); weighted; N=4,473

- Participation in courses/private lessons: 59% greater odds of being in better health category

ARE ASSOCIATIONS BETWEEN HEALTH AND PARTICIPATION IN POST-INITIAL LEARNING CONDITIONAL ON RACE/ETHNICITY OR FORMAL EDUCATIONAL ATTAINMENT?

- Mostly...no!
 - Except...participation in formal education was a weaker predictor of health for those with HS diploma than for those with < HS.
- Respondents from all racial/ethnic groups and levels of formal educational attainment gain equal health rewards from participating in courses/private lessons.

AREAS FOR FUTURE RESEARCH

- Why are numeracy and PS-TRE scores less strongly related to health than literacy?
- Why do only the most highly educated accrue health benefits from higher PS-TRE scores?
 - What prevents adults with less than a master's degree from converting PS-TRE skills into health benefits?
 - Does this stem from a “vicious cycle of digital exclusion”?
- What is the topical content of courses/private lessons?
 - How does participation in these activities improve health (e.g., through cognitive or skill development, information acquisition, social networks, psychosocial or material resources)?

AREAS FOR FUTURE RESEARCH

- PIAAC analyses
 - Substitute nativity for race/ethnicity: Do these skills and post-initial learning activities matter more for U.S.- or foreign-born adults?
 - Do our findings pertain to other countries?
 - Attending formal education courses did not predict better health.
 - Do respondents who complete their formal education course(s) or a full year of additional study report better health?
 - Employment status (retired or disabled) eliminated significance of participating in formal education.
 - Among working-age adults, do those who pursue formal education report better health compared to those who do not?

AREAS FOR FUTURE RESEARCH

- Analyze health care utilization as outcome
 - Do limited literacy, numeracy, and technological problem-solving skills impede people from using healthcare services, even after accounting for background characteristics?
- U.S. PIAAC National Supplement study: unemployed, younger, and older adults
 - How does access to health insurance via ACA change relationships between health indicators and literacy, numeracy, PS-TRE skills, and post-initial learning?

IMPLICATIONS FOR POLICY & PRACTICE

- Literacy matters for improving self-rated health – for all racial/ethnic and educational attainment groups
 - More important than numeracy or PS-TRE skills → need for literacy instruction, ongoing skill development
- But...literacy is not among the strongest predictors of health
 - Control variables with larger effect sizes → additional avenues for policy intervention
 - Increase college access & attainment: multi-generational impact
 - Expand ESL instruction
 - Increase access to health insurance

IMPLICATIONS FOR POLICY & PRACTICE

- Importance of participation in course/private lessons for self-rated health
 - Blacks & Hispanics, people with low levels of education were least likely to participate → increase participation by these groups

Percent participating in courses/private lessons
in past 12 months, by race/ethnicity

