

Life Course Indicator: 4th Grade Proficiency

The Life Course Metrics Project

As MCH programs begin to develop new programming guided by a life course framework, measures are needed to determine the success of their approaches. In response to the need for standardized metrics for the life course approach, AMCHP launched a project designed to identify and promote a set of indicators that can be used to measure progress using the life course approach to improve maternal and child health. This project was funded with support from the [W.K. Kellogg Foundation](#).

Using an RFA process, AMCHP selected seven state teams, Florida, Iowa, Louisiana, Massachusetts, Michigan, Nebraska and North Carolina, to propose, screen, select and develop potential life course indicators across four domains: Capacity, Outcomes, Services, and Risk. The first round of indicators, proposed both by the teams and members of the public included 413 indicators for consideration. The teams distilled the 413 proposed indicators down to 104 indicators that were written up according to three data and five life course criteria for final selection.

In June of 2013, state teams selected 59 indicators for the final set. The indicators were put out for public comment in July 2013, and the final set was released in the Fall of 2013.

Basic Indicator Information

Name of indicator: Fourth Grade Proficiency (LC-57)

Brief description: Percent of fourth graders scoring proficient or above on math and reading

Indicator category: Social Capital

Indicator domain: Risk/Outcome

Numerator:

- a. Number of fourth graders scoring proficient or above on math
- b. Number of fourth graders scoring proficient or above on reading

Denominator: a. and b. Total enrolled fourth graders in public schools

Potential modifiers: Age, Developmental Capacity, Gender, race/ethnicity

Data source: National Assessment of Educational Progress (NAEP)

Notes on calculation: There is currently no composite score for fourth grade proficiency on math and reading available. This indicator should be calculated in two parts: a. the number of fourth graders scoring proficient or above on math over the total number of enrolled fourth graders in public schools, and b. the number of fourth graders scoring proficient or above on reading over the total number of enrolled fourth graders in public schools.

Similar measures in other indicator sets: HP 2020 Focus area AH-5.3.1; MIECHV Benchmark Area Improvements in School Readiness and Achievement: Child's general cognitive skills

Life Course Criteria

Introduction

Growing evidence suggests that social environments impact health. Research on this relationship focuses on aspects of support and cohesion within the social environment, often discussed as 'social capital' across populations. Social capital is the collection of features of social organization – such as civic participation, norms of reciprocity, and trust in others – that help facilitate cooperation for mutual benefit (Putnam, 2000). As such, social capital is a collective resource that benefits communities and can be distinguished from the individual health effects of social networks and support (Lochner et al., 1999).

Social capital is a hard concept to measure. The contemporary use of the term evolved from the context of the importance of education (Hanifan 1916). Research indicates that social capital is not only a critical input for the success of educational systems but also one of its valuable byproducts (Heyneman 1998). Strong education systems and educational attainment across populations also fosters social capital-rich networks. The World Bank summarizes the fundamental ways social capital is produced through education as:

- development and practice of social capacity skills such as participation and reciprocity
- provisions of forums for community activity
- delivery of civic education to learn how to participate responsibly in society
- contribute or promote overall societal cohesion and strengthened citizenship when children of all socio-economic backgrounds are enrolled in the public education system (World Bank 2013)

In addition to being a marker of educational attainment and an indicator of larger social capital, there is a large and persistent association between education and health (Vinciullo & Bradley, 2009; Wei, 2012; Eide & Showalter, 2011). The connection between education and health has been well documented and spans almost all health conditions including general health status and particular acute, chronic, or disabling health conditions. Educational attainment also is a strong predictor of overall life expectancy (Ross 1995) (Molla et al 2004; Lleras-Muney 2005).

In addition to the predictive value on individual trajectories, fourth grade proficiency marks a critical point in time where future academic performance can be projected but time is still available to intervene through policy or systems interventions (Koretz, 1991). Overall, fourth grade proficiency is a life course measure because the indicator reflects current academic progress, has the potential to predict future individual and intergenerational health and social outcomes, and reflects larger social capital characteristics of a community or population.

Implications for equity

As a measure of academic performance, fourth grade proficiency has strong implications for social equity across populations. Different populations across the United States experience different rates of fourth grade proficiency. The National Assessment of Educational Progress (NAEP) characterizes the following targets for reading and math in the fourth grade: Reading Basic = 208, Proficient = 238, and Advanced = 268; Math Basic = 214, Proficient = 249, and Advanced = 282. Trend analysis from the past forty years of national fourth grade proficiency assessments in reading and math show overall population improvements, but lower average scores for racial and ethnic minorities. In 2004, the national average reading proficiency score of White students was 224 whereas the national average reading proficiency score of Black students was 197 and Hispanic students was 199. Similar disparities are reflected in national math proficiency scores. In 2004, the national average math proficiency score of White students was 245 whereas the national average math proficiency score of Black students was 221 and Hispanic students was 229. (NAEP 2013)

As a community level implication for equity, fourth grade proficiency also is reflective of the resources within a community surrounding a specific school. Schools located in low socioeconomic status (SES) communities are more likely to experience high levels of unemployment, teacher migration, and poor academic achievement (Muijs et al., 2009).

Finally, fourth grade proficiency also has implications for equitable distribution of resources. Under the *No Child Left Behind Act* of 2001 schools were encouraged to pay more attention to adequate yearly progress indicators (AYP). Strong attention to AYP creates an unintended incentive for schools to focus resources on children that fall below the proficiency threshold rather than to provide services that would improve resources for all students (Wei, 2012). As one of the

nationally reported indicators, fourth grade proficiency has implications for meeting state AYP and corrective measures that are likely to affect schools that serve predominantly low-income communities and racially diverse communities.

Public health impact

The benefits of investments in education are shared not only by individual students but also by the societies of which they are a part. Education, measured as academic performance, has been shown to affect employment options and health choices later in life (Harper & Lynch, 2007; NCHS, 2011; Vernez, Krop, Rydell, 1999). Individuals who perform better academically are more likely to have a higher SES, make healthier choices in their daily lives, and have knowledge of and access to quality health care. When the proportion of individuals who perform well academically increases in a community, the community's standard of living improves. Interventions that improve academic performance within a given community, measured as fourth grade proficiency levels, have the potential to make a lasting public health impact.

Health also is causally associated with education, predominantly due to attendance rates and nutrition (Carlson et al., 2008; Spriggs & Halpern, 2008; Sraubstein & Piazza, 2008). Chronically ill students, frequently due to poor nutrition or underlying health problems, are more likely to miss school, which can cause them to fall behind and perform poorly academically. Additionally, health-risk behaviors such as physical inactivity and violence can lead to poor academic performance (Dunkle & Nash, 1991). Poor academic performance reduces the probability of attaining a well-paying job or affording adequate health care to treat chronic illness. This widely influences resources for the school (those who perform well receive more), neighborhood income levels, health care utilization, and intergenerational academic performance.

From another angle, there also is potential for public health impact through wider social capital improvements. Increased social capital has been linked to various health outcomes, including self-rated health (Blakely 2001; Kawachi et al., 1999; Hyyppä and Mäki, 2001; Subramanian et al., 2002; Helliwell, 2003; Poortinga, 2006a and Poortinga, 2006b), cardiovascular and cancer mortality rates (Kawachi et al., 1997), suicide rates (Helliwell, 2003), and child mental health (Caughy et al., 2003).

Leverage or realign resources

As a societal factor, education is a powerful predictor of health, but the public health field has very little control over increasing educational performance. This indicator has the potential to leverage or realign resources as multiple potential partners, including many non-traditional public health partners, have a vested interest in students testing as proficient during the fourth grade. Some examples of potential new or strengthened partnerships include:

- New or strengthened partnerships with public school systems as proficiency rates are national performance measures for schools
- New or strengthened partnerships with business, commerce and union associations as employers need employees who are well trained
- New or strengthened partnerships with justice system stakeholders as there is a strong correlation between education and involvement in the justice system, and this indicator could open new avenues for collaborative public policy and strategies

Additionally, fourth grade proficiency, as measured by the NAEP, is an appropriate measure to determine the time for intervention since, as mentioned in **Implications for Equity**, fourth grade proficiency is a national AYP. As a performance measure, fourth grade proficiency can leverage or realign resources because primary school is an opportune time to intervene on poor academic performance and reduce the probability of the intergenerational effect of poor academic performance. As noted above, however, strong political attention to AYP can create unintended incentives for schools to focus or realign resources on children that fall just below the proficiency threshold rather than all students. In addition, many schools may use strategies such as re-assigning student enrollment-to specific sub-groups given special consideration under AYP guidance, such as students with disabilities and English language learners which allows for more focus on the students who have the potential to pass the NAEP exam. Re-assignment strategies have both negative and positive side-effects. These strategies may produce better overall assessment scores for schools while masking true rates of struggling or underperforming students. However, these strategies may also result in the provision of more resources to specific individuals who may genuinely require additional academic assistance. Finally, moving these students to special education classes provides academic and developmental resources that may be influential in identifying special health care and academic needs. (Wei, 2012)

Predict an individual's health and wellness and/or that of their offspring

Generally, there is a large and persistent association between education and health. The connection between education and health has been well documented and spans almost all health conditions (Ross 1995). There is a positive association between education and health behaviors, health status, and particular acute, chronic, or disabling health conditions. Educational attainment also is a strong predictor of overall life expectancy. In addition to these positive associations, the effect of education increases with increasing years of education (Molla et al 2004; Lleras-Muney 2005).

In addition, educational attainment also is a predictive factor for the health and wellness of an individual's offspring. Students who fail to perform at the proficient level or above are at risk for unemployment, criminal behavior, developing risky health behaviors such as smoking, poor health, and inadequate health insurance coverage. One or more of these outcomes has the potential to lock individuals into a cycle of poor academic performance, poor health, and poor employment. Studies show living in resource-poor communities affects future generations (Brooks-Gunn, Duncan, & Maritato, 1997). In addition, multiple individual research studies as well as meta-analyses have shown the very strong predictive nature of level of parent's education on educational achievement and thus future health and well-being for children (Klebanov et. al. 1994; Haveman & Wolfe 1995; Smith et. al. 1997) In particular, mother's education level has a large, positive association on the health of her children. That relationship, observed in many small studies in rich countries, turns out to be true everywhere on the globe. A recent meta-analysis of global data illustrates half the reduction in child mortality over the past 40 years can be attributed to the better education of women, or for every one-year increase in the average education of reproductive-age women, a country experienced a 9.5 percent decrease in the child deaths (Gakidou 2010).

Specific predictability, however, may be limited by the data set. The NAEP data suggested for measuring fourth grade proficiency as a life course indicator is a tool that measures an individual's ability to decipher vocabulary meaning, make simple inferences, and find relevant information, which are necessary skills to perform well in school (DCKC, 2013). Scoring at least a "proficient" on the NAEP would indicate at least average performance. An individual who shows average or above average performance in school early on is more likely to attend college, achieve gainful employment, and experience positive health outcomes (described generally above). Conversely, the literature also has found that health can have a causal effect on schooling, which is primarily the result of poor attendance rates due to illness (Eide & Showalter, 2011). Although the NAEP does not provide scores for individual students or schools and these reports are not associated with individual health outcomes, they do provide strong indication of a child's level of education achieved (Buckendahl et al., 2009). As such, the indicator, fourth grade proficiency, is a predictor of early childhood education performance which has been shown to be predictive of future academic achievement (NAEP, 2012, fourth Grade Reading; Buckendahl et al., 2009; Noell, 2009). Fourth grade proficiency as measured on the NAEP has not been used as an independent predictor of health outcomes in the past, but could certainly be used to examine correlations between education and health in conjunction with another valid indicator for health (Eide & Showalter, 2011).

Data Criteria

Data availability

State and national level data for this indicator can be downloaded from the National Assessment of Educational Progress (NAEP) website: nces.ed.gov/nationsreportcard/naepdata/. NAEP only provides results on subject-matter achievement, instructional experiences, and school environment for populations of students and groups within them. NAEP does not provide scores for individual students or schools, although state NAEP can report results by selected large urban districts (Buckendahl et al., 2009).

Data users may access the NAEP website to view proficiency with respect to subject (e.g. geography, mathematics, writing, reading) and sub-scales and achievement levels in those subjects for grades four, eight, and 12. In most instances, data are available for at least 2007, 2009, and 2011 assessments in both reading and math. The 2011 assessment was conducted early in the year, and data for all 50 states were made available in November 2011, with data from the Trial Urban District Assessment (voluntary assessment of public school students at the school district level) available in December 2011.

Data quality

The NAEP is the largest nationally representative and continuing assessment of the capacities of America's students on exams in several subject areas. The assessments, which are uniform throughout the nation, are administered to a representative sample of students in fourth, eighth, and 12th grade in each state every two years (NAEP, 2012, fourth Grade Reading; Buckendahl et al., 2009). The assessments also stay relatively unchanged from year to year to maintain consistency and allow for examination of student academic progress over time (Buckendahl et al., 2009). However, the degrees to which cut points are set for scoring standards have been heavily criticized (Buckendahl et al., 2009; Sireci et al., 2009). Nationally, there also are issues associated with the inferences made from the NAEP results and how the scores are interpreted by each state (Sireci et al., 2009).

Key data quality features:

- NAEP results are based on a representative sample of students in fourth, eighth and 12th grade for its main assessments (NAEP, 2013). It is the only available metric that allows for strict comparisons both across states and across years in student achievement (KPI, 2010).
- Beginning with the 2003 assessment, results from the NAEP reading and math assessments are released six months after their administration except when based on a new framework. Results from other assessments are released one year after administration (NAEP, 2012, FAQ).
- States that do not have enough students in the specified demographic cohort to meet reporting standards are scored and ranked 999 (KPI, 2010).
- Spending Per-Pupil is based on 2009 data reported by the Census Bureau (most recent available data) for current spending and excludes Capital and Debt (KPI, 2010).

Limitations

- The extent to which NAEP student achievement scores are systematically related to state implementations following policies around No Child Left Behind (NCLB) have yet to be rigorously examined in the literature (Buckendahl et al., 2009; Lee & Reeves, 2012).
- NAEP achievement levels do not appear to have a strong measure of external validity as measured by other educational assessments of students in the United States according to a report conducted by the U.S. Department of Education in 2009 (Buckendahl et al., 2009).

The 2009 U.S. Department of Education Evaluation also found that although more evidence on external validity is needed for NAEP achievement levels, the procedures used for setting achievement levels are consistent with current standards (Noell, 2009).

Simplicity of indicator

Fourth grade proficiency is moderately easy to explain. NAEP is recognized as a standard of literacy in the broader literacy community (Hock & Mellard, 2005). Scoring proficient or above on reading would indicate fourth grade level literacy or above. Some studies have utilized NAEP data as a proxy for school achievement, finding that school achievement, measured as fourth grade proficiency, is associated with positive health and occupation outcomes (Vinciullo & Bradley, 2009).

Fourth grade proficiency, however, is moderately difficult to calculate. This indicator is actually two scores, one for reading and one for math with varied levels of proficiency (proficient, advanced) since no standard composite score is available. NAEP proficiency scores for fourth grade are reported as percentage of fourth graders scoring proficient or above on math and reading (separately) over total enrolled fourth graders in public schools (NAEP, 2012, fourth Grade Reading). Additionally, researchers should be aware of certain data reporting practices that could influence the calculation of this indicator. In order to receive federal Title I funding, each state is mandated to test its students from grade three to eight each year to establish measurable objectives, or adequate yearly progress (AYP) for math and reading (Wei, 2012). While all states are required to participate in the NAEP test, states may choose whether to use a confidence interval or margin of error to determine if their entire population or a smaller subset of the school has met the AYP standards (Wei, 2012). Although most states choose to set their confidence levels at 95 percent, there has been a trend in some states to select 99 percent confidence and the wider confidence level allows for an increase in the percentage of students that have met AYP (Wei, 2012).

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