Life Course Indicator:
Adverse Childhood Experiences Among Adults

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: Adverse Childhood Experiences Among Adults (LC-01)

Brief description: Prevalence of adverse childhood experiences

Indicator category: Childhood Experiences

Indicator domain: Risk/Outcome

Numerator: Number of adults ages 18 and over responding to the Behavioral Risk Factor Surveillance System (BRFSS) survey who report that they experienced three or more adverse childhood experiences (ACE)

Denominator: Number of adults ages 18 and over

Potential modifiers: Age, race/ethnicity, gender, education level, income level

Data source: Behavioral Risk Factor Surveillance System (BRFSS)

Notes on calculation: The BRFSS ACE module consists of 11 questions within eight categories of ACEs (verbal abuse, physical abuse, sexual abuse, household mental illness, household substance abuse, domestic violence, parental separation/divorce, and incarcerated family members). Respondents are told that the 11 questions referred to the time before they were aged 18 years. The questions in the ACE module are listed below, headed by the eight categories of ACEs.

1) Verbal abuse: “How often did your parent or adults in your home ever swear at you, insult you, or put you down?”
2) Physical abuse: “How often did your parents or an adult in your home ever hit, beat, kick, or physically hurt you in any way? Do not include spanking.”
3) Sexual abuse:
   a) “How often did anyone at least five years older than you or an adult, ever touch you sexually?”
   b) “How often did anyone at least five years older than
This indicator is comprised of the aggregate results from multiple ACE questions. The numerator is the number of adults who experienced at least three ACEs out of the 11 questions. For questions that assess “how often” an adverse event was witnessed or experienced, a response of “once” or “more than once” is considered an experience of that adverse event. For all other questions, a response of “yes” is considered an experience of that adverse event. The numerator is calculated as the sum of adverse events experienced. The denominator is the total number of adults. Analysts attempting to generate a multi-state estimate of ACES should limit the analysis dataset to include only those states who used the ACES module in that year in order to obtain an appropriate denominator. Analysts who use the raw datasets should apply the appropriate survey weights to generate the final estimates.

Similar measures in other indicator sets: None

**Life Course Criteria**

**Introduction**

Adverse childhood experiences (ACEs) are experiences of emotional, physical, or sexual abuse, and household dysfunction during childhood. The short- and long-term outcomes of these childhood exposures include a multitude of health and social problems. Childhood maltreatment – a component of ACEs – has been linked to a variety of changes in the structure and function of the brain and stress-responsive neurobiological systems. Epidemiological studies have documented the impact of childhood maltreatment on health and emotional well-being (Anda et al 2006).

Overall, the prevalence of adults reporting adverse childhood experiences is a life course measure because the indicator captures past childhood experiences that may have influenced the life course trajectory and have lasting impact on current health and social outcomes. The impact of ACEs (i.e. prevalence of or lack of) over the life span has been well established within the life course science literature. This research reveals that if ACEs are pervasive, they can negatively impact the life trajectory of the individuals experiencing them and increase the potential for inter-generational familial adversity. In addition, the lack of ACEs and increased prevalence of protective factors can decrease inter-generational familial adversity, reducing the potential for harm for the individual and his or her children. (Forrest 2004; Kelly-Irving 2013; Richardson 2013).

**Implications for equity**

ACEs include psychological, physical, or sexual abuse (witness or victim); living with household members who were substance abusers, mentally ill or suicidal or ever incarcerated, and living in a household with poor economic resources, with parents who got divorced or separated after the child was born, or childhood exposure to racial or ethnic discrimination. Exposures to these events are experienced differently across population subgroups, including gender and race/ethnicity. For example, while men and women report similar prevalence of some ACEs, women report more than twice as many experiences with sexual abuse as men (17.2 percent for women, 6.7 percent for men) and report a higher prevalence of living with a mentally ill or substance-abusing household or family member. Women are more likely to report five or more ACEs (10.3 percent) compared to men (6.9 percent). The prevalence of experiencing individual ACE categories and the number of ACEs reported differ by race/ethnicity: for example, Black, non-Hispanic respondents reported the highest prevalence of having a household member in prison (12.9 percent) or parents being separated or
divorced (37.9 percent) compared to other race/ethnicity categories; whereas Hispanic respondents indicated the highest prevalence of sexual abuse (14.8 percent) or having a substance-abusing household member (33.4 percent). By number of ACEs reported, Black, non-Hispanic respondents indicated the highest prevalence of experiencing 1 ACE, however the category that comprises “Other, non-Hispanic” – Asian, Native Hawaiian/Pacific Islander, American Indian/Alaska Native, and multiracial – had the highest prevalence of 5 or more ACEs. Finally, prevalence of ACES reported by adults differs by educational attainment, with respondents with less than a high school education having a greater prevalence of five or more ACEs when compared to those who have graduated high school or have more than a high school education (14.9 percent compared to 8.7 percent and 7.7 percent) (CDC 2010). ACEs related to incarceration and racial or ethnic discrimination are most intrinsically linked to inequity as both are markers of larger issues of institutionalized racism and are highly clustered within specific geographic areas and population groups (Lynch and Sabol 2004; Pettit and Western 2004).

As a composite, the ACEs indicator has implications for many social and psychosocial equity-related measures. Examples of social conditions that are captured in the ACES indicator include limitations in educational attainment/occupational opportunities, reductions in income/socioeconomic status, and increased risk of food insecurity. Adults who grew up in families with adverse experiences are at increased risk for cognitive and social development problems that may result in learning difficulties and barriers to higher education (Felitti et al 1998; Perry 1998; Anda et al 2006). Lower education levels may translate into fewer job opportunities and a reduced income potential in adulthood (Bremmer 2003). Children raised in certain types of adverse family environments may also be more vulnerable to food insecurity as a result of parental substance abuse, physical/emotional abuse, or neglect (Anda 2004).

Examples of psychosocial measures that are captured in the ACES indicator include depression, hopelessness, and aggression/hostility. Research suggests that individuals who had adverse experiences in childhood are more vulnerable to social/developmental problems (poor self-control, aggression, violence, and social isolation) (Dong et al 2004; Evans et al 2008). Additionally, they may be more likely to have alcohol, tobacco, substance abuse disorders or mental health disorders such as depression, suicidal thoughts/attempts, borderline personality disorder, or post-traumatic-stress disorder (Van Der Kolk et al 1991; Chapman et al 2004; Dube et al 2001; Varese et al 2012).

The basic framework for examining and understanding the impact of any ACE or collection of ACEs across the trajectory of an individual’s life span has multiple inherent implications for equity. As Braveman and Barclay (2009) summarize, the life course approach “is particularly relevant to understanding and addressing health disparities, because the social and physical contextual factors underlie socioeconomic and racial/ethnic disparities in health.”

**Public health impact**

The public health impact of ACEs can be framed in two ways: the relationship of individual health trajectories on larger public health spending and the overall impact of risk and protective factors throughout the life course and their influences on intergenerational outcomes.

ACEs put individuals at risk for a wide variety of chronic mental, physical and emotional health problems in adulthood. Additionally, ACEs have been associated with an increased propensity to engage in health risk behaviors, including risky sexual behavior, alcohol, drug, and tobacco use, that are associated with chronic disease and injury (Goodwin 2004; CDC 2013; Anda 2007). Overall, in relation to individual’s experiences of ACEs and larger public health impacts, if the number of children experiencing multiple adverse circumstances was reduced, one might expect to see a substantial reduction in mortality and prevalence rates for these key indicators of risk and chronic disease. Additionally, a reduction in overall health costs would be expected as individuals experiencing ACEs are more likely to incur higher health care costs as a result of riskier behavior and a higher rate of physical and mental health issues (Bremner 2003; Walker et al 1999).

A measure called the population attributable fraction (PAF) can be used to quantify the reduction in population disease or mortality if exposure to a risk factor were reduced or eliminated. A specific analysis conducted in the state of Maine of the PAF of a person with four or more ACEs having a subsequent poor adult mental, physical or emotional health outcome demonstrated PAFs of seven -58 percent. For example, severe obesity in adulthood had a PAF of seven percent while attempted suicide had a PAF of 58 percent. The authors of this report noted these ACEs are therefore resulting in millions of dollars in costs for individuals and health systems---$863 million for severe obesity and $29.5 million for attempted suicides (Forstadt and Rains, 2011).
When framing impact beyond specific health outcomes, linking ACEs to the broader life course approach is important. The life course approach focuses on exposures and experiences, including both risk and protective factors, that occur during critical periods of development, such as childhood, and their impact on the future for the individual, the family unit, the community, and the larger society. The impact of ACEs over the life span has been well established within the life course science literature. This research reveals that ACEs are pervasive, can negatively impact the life trajectory of the individuals experiencing them, and increase the potential for inter-generational familial adversity (Forrest and Riley 2004; Kelly-Irving et al. 2013). On the other hand, protective factors can decrease inter-generational familial adversity (Bremner 2003; Richardson et al 2013).

**Leverage or realign resources**

Traditionally, MCH programs have tended to focus on physical and developmental health outcomes as they pertain to the pregnant mother and her fetus, infant, or child. Collecting and using data on ACEs opens up opportunities for data-driven approaches to improving pediatric and adult primary care; one possible mechanism would be to enhance screening to identify risk for poor mental and physical health outcomes in childhood and beyond. The inclusion of ACEs in public health data analyses expands the sphere of MCH services to include collaborations with mental/behavioral health services, child abuse/neglect programs, and law enforcement; home visiting programs are already modeling this type of partnership to provide services to young families. Additionally, the assessment of ACEs risks within the MCH community can benefit other public health promotion and disease prevention programs including chronic disease and communicable/sexually transmitted disease (Fine and Kotelchuck 2010; Shonkoff et al 2009; Foege 1998).

Protective factors (e.g., child’s positive relationship with a caring adult, easy temperament of the child, health insurance coverage for the child) can be more important than risk factors because they mitigate the negative effects of risk factors such as ACEs (Werner and Smith 1992). Leveraging or realigning resources to provide supports for positive factors would complement the traditional risk-based approaches of medicine and health. Public health and other partners could work together to support policy and program interventions that contribute to or enhance protective factors such as helping parents and family members understand how to support easy temperament in children, establishing family friendly work policies (i.e. paid maternity and paternity leaves) and working to provide health insurance coverage for all children.

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

The level of exposure to ACEs correlates to an association with adult risk behavior, poor health status and disease. The number of categories of adverse childhood experiences shows a graded relationship to the presence of adult diseases (Felitti 1998). This graded relationship has been documented throughout a significant body of research (Dube et al. 2003; Danese et al. 2009; Hillis et al. 2001; Williamson et al. 2002; Ford et al. 2011; Chapman et al. 2013). Specifically, individuals reporting ACEs, especially multiple ACEs, have greater risks of developing:

- Chronic diseases (autoimmune, COPD, chronic headaches, ischemic heart disease, liver disease, and lung cancer)
- Poor reproductive health outcomes and risky sexual behaviors (fetal death, promiscuity, sexual risk behaviors, sexually transmitted diseases, teen pregnancy, and unintended pregnancy)
- Health risk behaviors (alcohol abuse, drug abuse, obesity, smoking)
- Poor mental health (memory disturbances, depression, hallucinations, suicidal tendencies, work absenteeism, sleep disturbances)

As a result, individuals having ACEs are at increased risk of premature mortality, compared with individuals who did not have ACEs (Brown et al. 2009). Additionally, research reveals that ACEs often do not occur in a vacuum – they are comorbid conditions that often occur simultaneously (e.g. a single parent that is mentally ill becomes an alcoholic and physically abuses their child) (Dong et al; Chartier 2010; Edwards 2003). This in turn underscores the individual and population impact of ACEs not just on the victim, but also on the family (including the perpetrator) and the community.

**Data Criteria**

**Data availability**

The Behavioral Risk Factor Surveillance System (BRFSS) is the world’s largest, on-going telephone health survey system, tracking health conditions and risk behaviors in the United States yearly since 1984. Currently, data are collected...
monthly in all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam for adults 18 years and older. CDC provides state and national level prevalence data on their web site.

The CDC develops approximately 80 BRFSS questions each year. Some of these are core questions asked each year, and some are rotating core questions asked every other year. There are also CDC supported modules that address specific topics that states can use on an optional basis. States can also develop additional questions to supplement the core questions (CDC 2008). Modules used by states are noted on the CDC website.

Local level estimates for BRFSS data can be obtained using the Selected Metropolitan/ Micropolitan Area Risk Trends (SMART) data. Local areas are metropolitan or micropolitan statistical areas (MMSAs) as defined by the Office of Management and Budget. SMART data is currently available for data going back to 2002 for MMSAs with 500 or more respondents.

The ACE questions are currently available as an optional CDC module. As a result, the collection of ACE data is not part of the required set of questions that must be collected by all states on a routine basis (CDC 2010). The data are relatively timely; the 2012 BRFSS data were released in July 2013, indicating an approximate six month delay in data availability for the preceding year.

**Data quality**

Numerous studies have compared estimates of chronic conditions and behaviors obtained from BRFSS to other national surveys including the National Health Interview Survey and the National Health and Nutrition Examination Survey; while there are some differences, findings on overall health status and certain chronic conditions tended to be similar despite declining response rates for BRFSS.

Since some questions on the BRFSS address sensitive health conditions and behaviors, there is intermittent missing data throughout the dataset. However, refusal to answer generally accounts for a small proportion of responses for most data elements. The notable exception is income, where refusals accounted for more than 23 percent of the data in one state in 2010; the median percent missing across BRFSS for income in 2010 was 14 percent.

Quality control computer programs are used to check the raw data for values out of range. CDC performs quality checks for core questions, and each state has its own protocol for checking state-specific questions. Interviewers are monitored during the annual questionnaire pilot period and intermittently during the data collection period to determine whether any interviewer bias exists and to correct any bias that might be found. On an ongoing basis, 10 percent of interview calls are verified.

Prior to 2011, the sampling for BRFSS represented only adults living in a private residence with a landline telephone, but starting in 2011, the sample also included data from respondents living in cell phone-only households. Weighted response rates are presented by state. For 2011, the median weighted response rate for the combined cell phone and landline was 49.7 percent.

The survey adjusts for non-response to reduce the known differences between respondents and non-respondents. Although participants interviewed may not represent a state in terms of age, sex and race distribution, it is believed that weighting the data corrects for this potential bias. As with other health surveys, estimates are based on self-report data and they may over- or underestimate the actual prevalence of a particular risk factor in the population. Despite some oversampling in states by geography, the annual sample size is too small to compute precise estimates at the county level. The child prevalence data are reliant on proxy report from the adult respondent to the BRFSS and may be subject to misclassification related to this method.

The ACE questions were adapted from large, validated survey instruments measuring the frequency of adverse childhood experiences. The BRFSS ACE module was initially tested in five states (Arkansas, Louisiana, New Mexico, Tennessee, and Washington).

Studies specific to the quality of data from the ACE module are not available. Factors that might impact the quality of the BRFSS and/or ACE data include:
1) The BRFSS data are weighted to account for non-response. However, low response rates overall may impact the reliability of the estimates. BRFSS response rates vary by state and by demographic groups.

2) Some respondents may quit the BRFSS survey before the ACE module can be asked, thereby reducing the number of respondents eligible for the ACE module.

3) Respondents may refuse to respond to one or more questions included in the ACE module because they may feel uncomfortable responding to the sensitive, personal nature of the questions and/or the relationship of the ACE questions to a health survey. As a result, the ACE module may have lower response rates than other sections of the BRFSS, which increases the risk for response bias.

4) The sensitive, personal nature of the ACE questions may result in "social desirability bias." Respondents may feel uncomfortable revealing negative childhood experiences to a stranger over the phone. This tendency may vary by race/ethnicity, gender, or age.

5) ACE prevalence might be underestimated because BRFSS excludes persons in institutions and hospitals, who might be disproportionately vulnerable to ACEs.

6) The ACE questions require that the respondent recall a variety of events that occurred in childhood. Some respondents may have forgotten some adverse events that occurred in childhood or the events may have occurred before an age that they were cognitively able to remember them.

**Simplicity of indicator**

As described above, the BRFSS ACE Module is optional, so not all states will have data for this indicator. The Notes On Calculation section describes the process for calculating the indicator from the 11 ACE questions. Given that this indicator is a composite measure of 11 questions that comprise the concept of ‘adverse childhood experiences,’ its level of difficulty to calculate is moderate. However, the concept of ACE and its implications for health and development are not difficult to explain.

**References**


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