health policy institute of ohio

Adverse Childhood Experiences (ACEs)
Health impact of ACEs in Ohio

Appendix: Methodology and technical report

This appendix provides additional detail on the analysis that informed the Health Policy Institute of Ohio (HPIO) policy brief, **Adverse Childhood Experiences (ACEs): Health Impact of ACEs in Ohio**.

Behavioral Risk Factor Surveillance System (BRFSS) ACEs module
To produce estimates of ACEs in Ohio, Ohio University (OU) Voinovich School of Leadership and Public Affairs researchers used 2015 Behavioral Risk Factor Surveillance System (BRFSS) data. The BRFSS survey sample consists of non-institutionalized adults, 18 years and older. Since 2011, the BRFSS has conducted both landline telephone- and cell phone-based surveys. In 2015, the Ohio BRFSS sample included 11,929 interviews, and 14 regions were oversampled to produce regional estimates. The Ohio BRFSS data are weighted to ensure that estimates are representative of the Ohio adult population.

The Ohio BRFSS questionnaire is designed by a working group of BRFSS state coordinators and Centers for Disease Prevention and Control (CDC) staff, as well as the Ohio BRFSS advisory group and other stakeholders. The questionnaire has three parts:
1. Core component questions, which must be asked by all states without modification in wording
2. Optional modules, which are supported by the CDC, but not required to be asked in all states
3. State-added questions, which are not offered as core or optional modules

The Ohio BRFSS implements a two-way split survey design to allow for larger coverage of optional modules and state-added questions. The 2015 Ohio BRFSS ACE module included 11 questions about eight types of ACEs. These questions were asked of 7,028 Ohioans.

Additional estimates of ACEs prevalence in Ohio
Figures 1 and 2 include estimates of ACEs prevalence for specific groups of Ohioans, including some that are not published in **Health Impacts of ACEs in Ohio**. Figure 1 illustrates the prevalence of ACEs disaggregated by race, income, disability status and age.

Figure 2 illustrates the prevalence of adults who report experiencing multiple ACEs (two or more) by Ohio county.
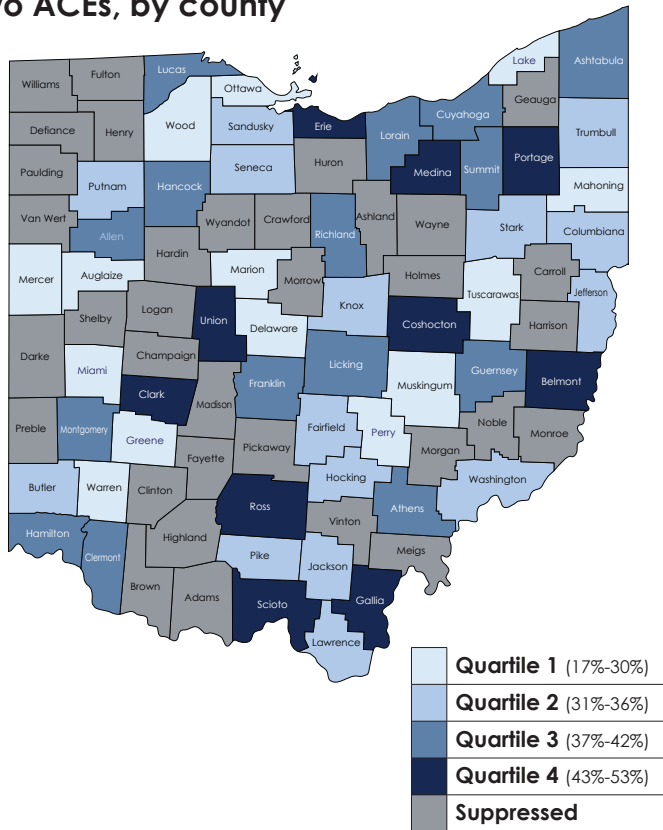
Figure 1. **Prevalence of ACEs among adult Ohioans, by demographic characteristics**

	No ACEs	One ACE	Two+ ACEs
Sex			
Female	39%	23%	38%
Male	39%	27%	34%
Race/ethnicity			
Black, non-Hispanic	26%	30%	44%
White, non-Hispanic	41%	25%	34%
Other	34%	18%	48%
Income level			
Less than $15,000	26%	21%	53%
$15,000 to less than $25,000	30%	27%	42%
$25,000 to less than $35,000	36%	27%	38%
$35,000 to less than $50,000	44%	18%	38%
$50,000 or more	41%	27%	32%
Don't know/not sure/missing	47%	23%	30%
Disability status			
Disability	29%	22%	49%
No disability	42%	25%	32%
Age			
18-34	28%	27%	45%
35-54	33%	26%	41%
55+	51%	23%	27%

Note: Results were produced using weighted tabulations from 7,028 individuals that answered any of the ACE questions. Those that answered "Don't know/not sure" and those that refused to answer, have their answers coded similarly to those that answered "No." All prevalence estimates have a relative standard error (RSE) lower than 30% and a number of observations higher than 50, following the CDC recommendation. American Indian/Alaskan Native, Asian, Hispanic and other races/ethnicities are combined in the "other" category in this table. Estimates are not reported separately for these categories since they are statistically unreliable (fewer than 50 observations or RSE higher than 30%).
Source: 2015 CDC BRFSS data provided by the Ohio Department of Health's Division of Health Improvement and Wellness

Figure 2. **Prevalence of adult Ohioans who reported experiencing experiencing at least two ACEs, by county**

Quartile 1 (17%-30%)
Quartile 2 (31%-36%)
Quartile 3 (37%-42%)
Quartile 4 (43%-53%)
Suppressed

Note: This analysis uses weighted tabulations from 7,028 individuals that answered any of the ACE questions. Those that answered, "Don't know/not sure" and those that refused to answer, have their answers coded similarly to those that answered "No." Prevalence estimates are suppressed for 34 counties (in gray) with an RSE higher than 30% or with less than 50 observations, following the CDC recommendations. Colors on the map illustrate prevalence distribution across Ohio counties with the first quartile shown in the lightest blue shade and the fourth quartile shown in the darkest blue shade.
Source: OU analysis of 2015 CDC BRFSS data provided by the Ohio Department of Health's Division of Health Improvement and Wellness

Additional estimates of negative outcomes by number of ACEs

The associations between ACEs and negative outcomes later in life, including health behaviors that increase risk of poor outcomes, health problems and limited access to health care, are displayed in figure 3. In this analysis, OU researchers grouped Ohioans into three categories: people who experienced no ACEs, people who experienced one ACE and people who experienced two or more ACEs. All estimates in figure 3 are age-adjusted to reduce the confounding effect of age. The confounding effect of age may be caused by recall bias, because BRFSS asks adults to remember their childhood, and/or the reluctance that older generations may feel toward sharing experiences of ACEs.

Figure 3. **Health behaviors, outcomes, and healthcare access of Ohioans across ACE categories**

	No ACEs	One ACE	Two+ ACEs
Health behaviors			
Heavy drinking (recent)	3%	6%	7%
Smoking (recent)	11%	21%	32%
Physical inactivity (recent)	47%	52%	49%
Fruit consumption (below average) (recent)	63%	65%	66%
Vegetable consumption (below average) (recent)	54%	60%	59%
Health outcomes			
Depression (ever)	12%	16%	32%
Diabetes (ever)	11%	11%	12%
COPD (ever)	5%	7%	12%
Cardiovascular disease (ever)	8%	11%	10%
Asthma (ever)	9%	13%	20%
Overweight (recent)	63%	67%	65%
Hypertension (ever)	33%	37%	37%
Healthcare access			
Lack of coverage (recent)	8%	8%	10%
Inability to afford care (past year)	7%	8%	16%

Note: Results produced using weighted tabulations from 6,966 individuals for whom age is known and who answered any of the ACE questions. Those that answered, "Don't know/not sure" and those that refused to answer, have their answers coded similarly to those that answered "No".
Source: OU analysis of 2015 CDC BRFSS data provided by the Ohio Department of Health's Division of Health Improvement and Wellness

Methodology for estimating population attributable risk (PAR) for experiencing multiple ACEs

To examine the associations between experiencing multiple ACEs (two or more) and negative outcomes later in life, the researchers estimated the percentage of each health behavior or outcome that is attributable to ACEs. This type of estimate is known as PAR. Researchers used logistic regressions to adjust PAR estimates for other factors that are known to be associated with positive or negative outcomes. These factors include education,

Figure 4. **Population attributable risk (PAR) adjustment factors**

	Demographics	Health behaviors	Health outcomes
Asthma	• Age • Education • Income • Race	• Inactive • Smoking	Overweight
Heavy drinking	• Age • Education • Income • Race		
COPD	• Age • Education • Income • Race	• Inactive • Smoking	• Asthma • Overweight
Depression	• Age • Education • Income • Race	• Heavy drinking • Inactive • Smoking	• Arthritis • Cardiovascular disease • Kidney disease • Overweight
Smoking	• Age • Education • Income • Race		
Inability to afford care	• Age • Education • Income • Race		

Note: This table lists categorical variables used while estimating PAR.

income, race, age and related health problems. By adjusting for these factors, researchers isolate the effects of ACEs from the effects of related factors. Figure 4 lists the variables that researchers adjusted for to estimate the PARs displayed in **Health impacts of ACEs in Ohio**.

Methodology for estimating PAR for experiencing specific ACEs

For the six health outcomes with statistically significant PARs for experiencing multiple ACEs, researchers also estimated the percent of negative outcomes that can be attributed to experiencing a specific type of ACE. In this analysis, researchers isolated the impact of a specific ACE (e.g., emotional abuse or living in a household with a person who is incarcerated) by adjusting for exposure to other types of ACEs. For example, researchers found that, after adjusting for exposure to other types of ACEs, 16% of depression diagnoses can be attributed to experiencing emotional abuse. Figure 5 illustrates statistically significant PARs for specific ACEs.

Figure 5. **Population attributable risk (PAR) for experiencing specific ACEs**

	Type of ACE							
Outcome	**Mental illness**	**Emotional abuse**	**Sexual abuse**	**Substance abuse in house**	**Living with incarcerated individual**	**Divorced**	**Domestic abuse**	**Physical abuse**
Depression	20%	16%	15%	*	*	*	*	*
Smoking	*	12%	*	14%	7%	*	*	*
Asthma	13%	*	*	*	*	*	*	*
Heavy drinking	*	*	*	*	*	*	*	*
COPD	*	*	*	*	*	*	*	*
Inability to afford care	14%	*	*	*	12%	*	*	*

*PAR is not statistically significant
Source: OU analysis of 2015 CDC BRFSS data provided by the Ohio Department of Health's Division of Health Improvement and Wellness

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ACEs surveillance and BRFSS variable definitions

Figure 6 lists the names, BRFSS codes and definitions for variables that researchers used in this analysis.

Figure 6. Information about BRFSS variables used in this analysis

	BRFSS variable codes	Definition
Heavy drinking	_RFDRHV5	Male respondents who reported having more than 14 drinks per week, or female respondents who reported having more than seven drinks per week
Smoking	_RFSMOK3	Respondents who reported having smoked at least 100 cigarettes in their lifetime and currently smoke
Physical activity	_PACAT1	People who reported doing no, or an insufficient amount, of physical activity
Fruit consumption (below average)	_FRUTSUM	Number of fruits consumed per day is below average
Vegetable consumption (below average)	_VEGESUM	Number of vegetables consumed per day is below average
Depression	ADDEPEV2	Ever told you have a depressive disorder, including depression, major depression, dysthymia or minor depression
Diabetes	DIABETE3	Ever told you have diabetes, not including gestational diabetes
COPD	CHCCOPD	Ever told you have chronic obstructive pulmonary disease or COPD, emphysema or chronic bronchitis
Cardiovascular disease	CVDINFR4 CVDCRHD4 CVDSTRK3	Ever told you had a heart attack, also called a myocardial infarction, or an angina or coronary heart disease or a stroke
Asthma	ASTHMA3	Ever told you had asthma
Overweight	_BMI5CAT	Overweight respondents (classified as overweight based on body mass index) and obese respondents (classified as obese based on body mass index)
Hypertension	BPHIGH4	Ever been told by a doctor, nurse or other health professional that you have high blood pressure (not including gestational hypertension)
Lack of coverage	HLTHPLN1	No healthcare coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare or Indian Health Service
Inability to afford care	MEDCOST	Could not see a doctor in the past 12 months because of cost