Statistics in Health

Terminology Review

The first course in the MOPHIMS training series, *MOPHIMS*: *Introduction to Profiles and MICA*, covered many health statistics that will also be used in this course. Many of these statistics will be used to calculate additional statistics that are not presented in the MICA tools.

Crude rates are "calculated by dividing the total number of events that occur during a specified time period by the total number of individuals in the population who are at risk for these events."[1] This quotient is then multiplied by a constant (generally a multiple of 10, such as 100, 1,000, 10,000, or 100,000, depending on the rarity of the event).

Population at Risk is "a term applied to all those to whom an event could have happened, whether it did or not."[2] Population at risk is often used as the denominator when calculating rates. It may or may not consist of the entire population.

Unreliable rates may be encountered when analyzing data for small areas such as counties or with low frequency (rare) events such as cause-specific mortality or birth defects. For example, suppose that in 2007, one case of influenza occurred in a community of 1,000 people. The rate of flu incidence in 2007 was 1/1,000, or .1%. In 2008, the population was still 1,000 people, but two persons caught the flu. The rate of flu incidence in 2008 was thus 2/1,000, or .2%. The rate of flu incidence doubled, even though the number of cases only increased by one. The MICA system defines unreliable rates as those with a numerator less than 20.

Age-adjusted rates remove "differences in the age composition of two or more populations to allow comparisons between these populations independent of their age structure."[3] Stated another way, age-adjusting allows users to make fairer comparisons between populations with different age structures. Age is the variable most commonly adjusted because the onset of many health conditions is strongly correlated with age. A standard population distribution is used to adjust rates. The age-adjusted rates are the rates that would have existed if the population under study had been distributed in the same way as the 'standard' population.

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[1] Florida Department of Health. (n.d.). *FloridaCHARTS user's guide: Empowering communities with health information.* FloridaCHARTS. http://www.flhealthcharts.com/Charts/documents/CHARTS_USER_GUIDE_8_2012.pdf. Access October 27, 2017.

[2] Austin D. F., and Werner S. B. *Epidemiology for the health sciences: A primer on epidemiologic concepts and their uses*. Springfield, IL: Charles C. Thomas. 1974.

[3] Florida Department of Health. (n.d.). *FloridaCHARTS user's guide: Empowering communities with health information.* FloridaCHARTS.

Incidence is "the frequency with which something, such as a disease, appears in a particular population or area. In disease epidemiology, the incidence is the number of newly diagnosed cases during a specific time period."[4] "Incidence rates have new cases as the numerator and the population at risk for being a case as the denominator."[5]

Prevalence is "the proportion of individuals in a population having a disease. Prevalence is a statistical concept referring to the number of cases of a disease that are present in a particular population at a given time."[6] "The prevalence rate in a base population is the total of new cases occurring [in the current time period] plus any left over [from previous time periods]."[7]

Most prevalence data in Missouri come from surveillance systems that utilize surveys or registries. The Behavioral Risk Factor Surveillance System (BRFSS) is one notable example of survey data used to estimate prevalence. Registry data may be used to determine incidence, prevalence, or both and usually provide the ability to distinguish between prevalence and incidence. For example, all Cancer Registry data are incidence data (or new cases), while HIV Registry data are broken down by both incidence and prevalence.

Significant Difference indicates whether the difference between two rates is probably the result of chance factors or if the difference is meaningful. Significant difference can only be determined with the use of a statistical significance test. In the Profiles and MICA, significant difference is expressed at levels of 95% or 99% confidence.

[4] MedicineNet.com. *Incidence. MedTerms medical dictionary.* http://www.medterms.com/script/main/art.asp?articlekey=11516. Reviewed May 13, 2016. Accessed October 27, 2017.
[5] Austin D. F., and Werner S. B. *Epidemiology for the health sciences: A primer on epidemiologic concepts and their uses*. Springfield, IL: Charles C. Thomas. 1974.
[6] MedicineNet.com. *Incidence. MedTerms medical dictionary.* http://www.medterms.com/script/main/art.asp?articlekey=11516. Reviewed May 13, 2016. Accessed October 27, 2017.
[7] Austin D. F., and Werner S. B. *Epidemiology for the health sciences: A primer on epidemiologic concepts and their uses*. Springfield, IL: Charles C. Thomas. 1974.

Data from External Organizations

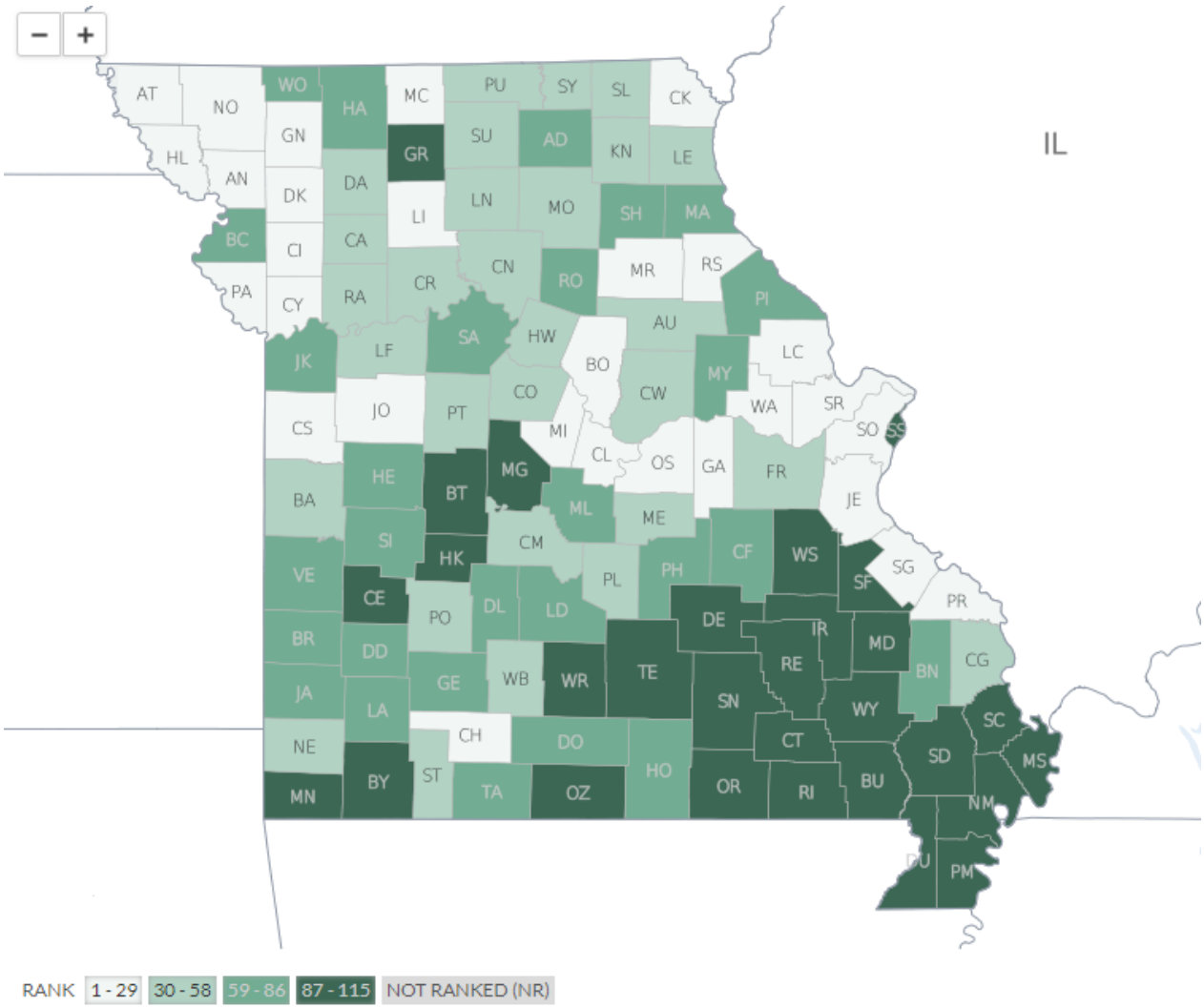
County Health Rankings

The Robert Wood Johnson (RWJ) Foundation, in conjunction with the University of Wisconsin Population Health Institute, has developed County Health Rankings. This is the first set of reports to rank the overall health of every county in the nation. Each county is ranked within its state based on health outcomes and health factors. The rankings for health outcomes and health factors are separate reports. The County Health Rankings are similar to Priorities MICA in that separate rankings are provided for diseases and risk factors.

The County Health Rankings may be useful in assessing a county's overall health status. These rankings take a large amount of information about health conditions and risk factors in each county, compile it into a ranking, and compare each county to the state as a whole. The website http://www.countyhealthrankings.org provides access to maps and tables for Missouri and the other 49 U.S. states. In Missouri, each county is ranked from 1 through 115 for both Health Outcomes and Health Factors. (In some years, Worth County is excluded from the rankings due to insufficient data. In those years, the remaining counties are ranked from 1 through 114.)

There are a couple of important limitations to the County Health Rankings that should be considered. The data used in forming the rankings are generally older than the data found on the Community Data Profiles/MICA. Because of the national scope of the project, the County Health Rankings must wait for all states to have comparable data before updating years. Another consideration is that some indicators take regional rates and assign values to individual counties based on those regional estimates. Tables showing the data years used in the County Health Rankings and comparability of measures across states are available in the Appendix.

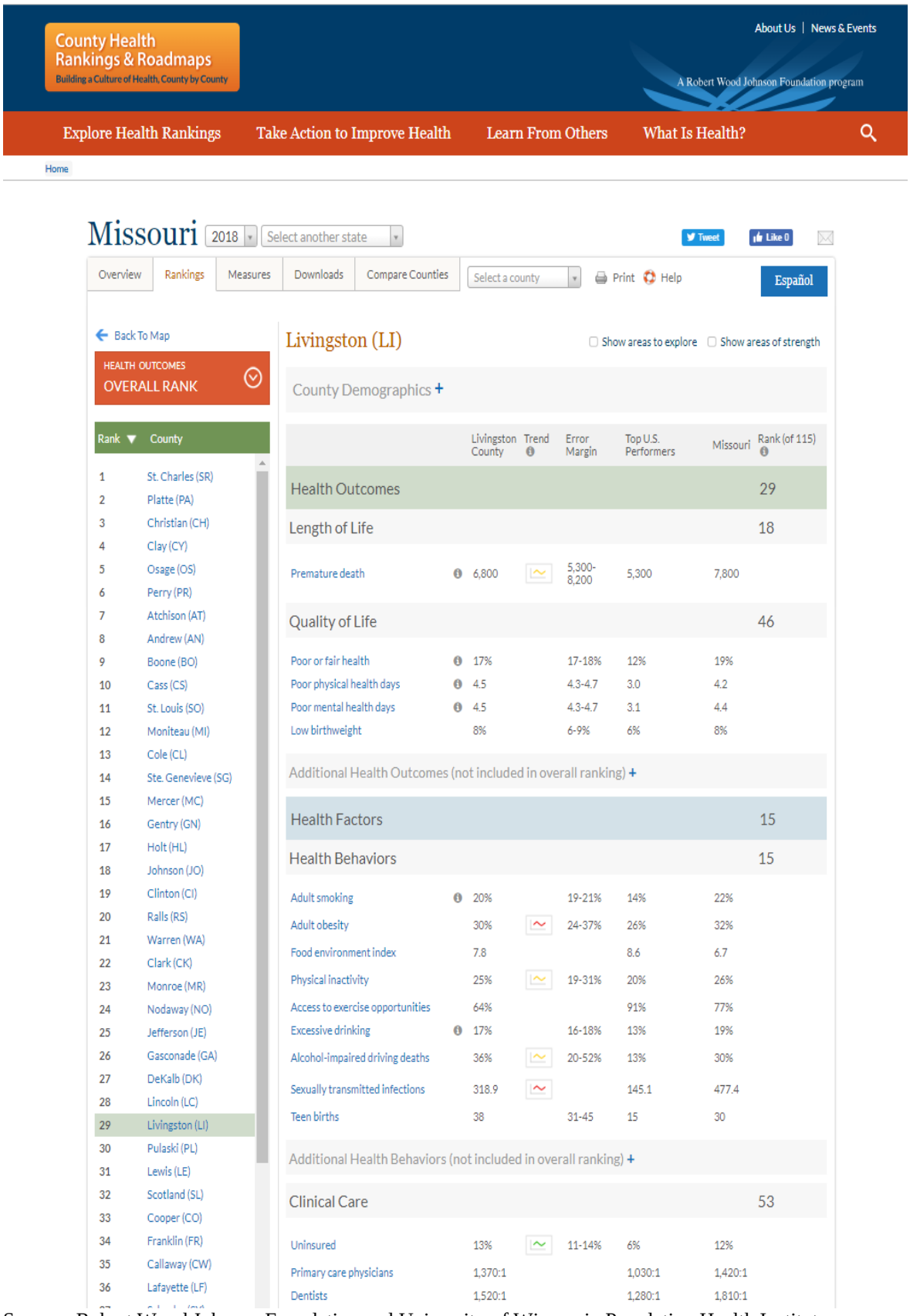
The 2018 Health Outcomes Map for Missouri follows.



Source: Robert Wood Johnson Foundation and University of Wisconsin Population Health Institute

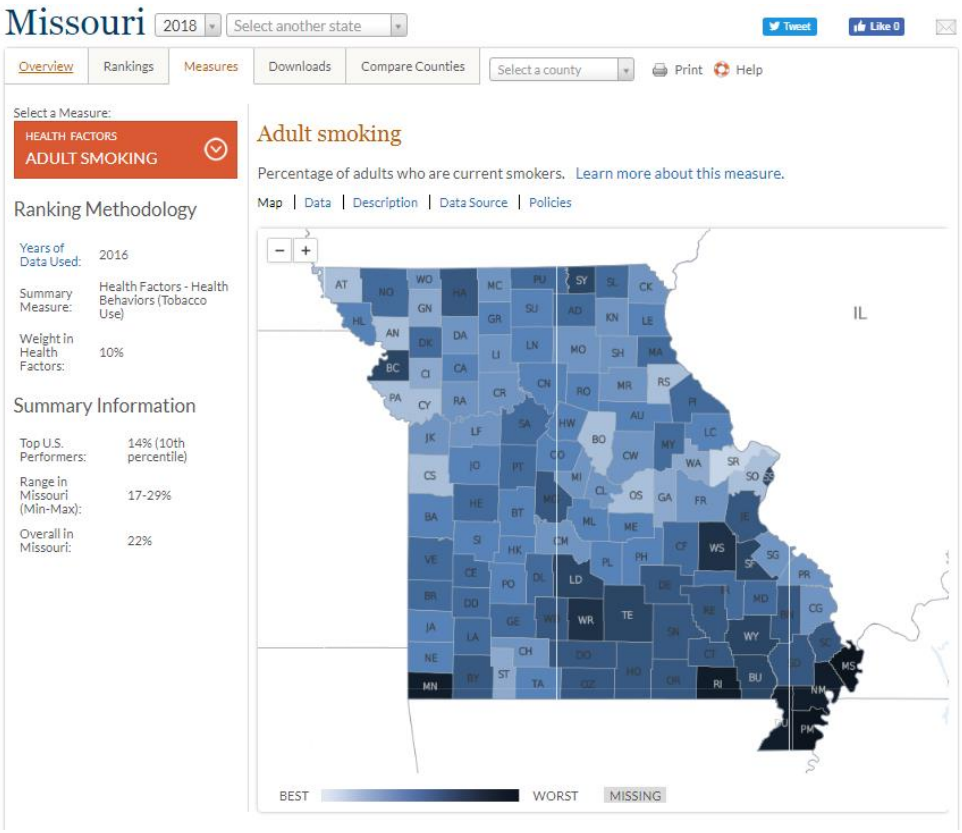
This site also contains links to individual county pages that list the specific statistics used in the ranking calculations. The Health Outcomes section includes statistics on how long people live (mortality) and how healthy people feel while alive (morbidity). The Health Factors section includes statistics on health behaviors, clinical care, social and economic factors, and the physical environment.[8] Next, a portion of the Livingston County table is shown.

[8] Robert Wood Johnson Foundation and University of Wisconsin Population Health Institute



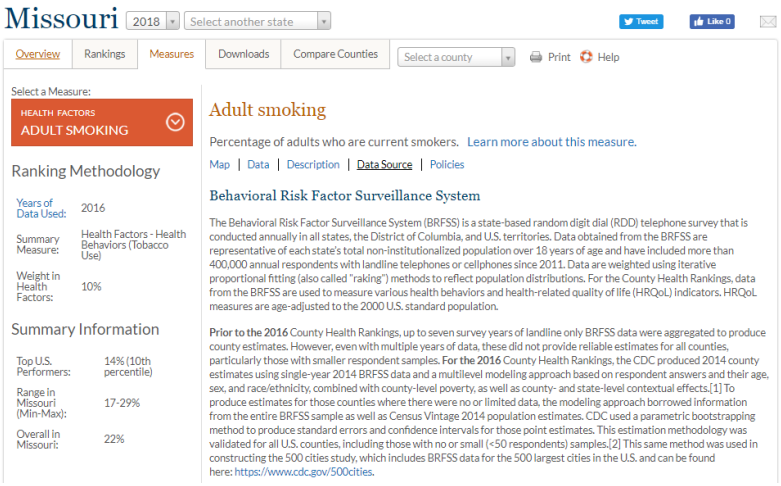
Source: Robert Wood Johnson Foundation and University of Wisconsin Population Health Institute

Clicking on any of the indicator labels reveals a map showing the distribution for that indicator across the state, as well as additional information about the indicator, such as the data years included in the ranking.



Source: Robert Wood Johnson Foundation and University of Wisconsin Population Health Institute

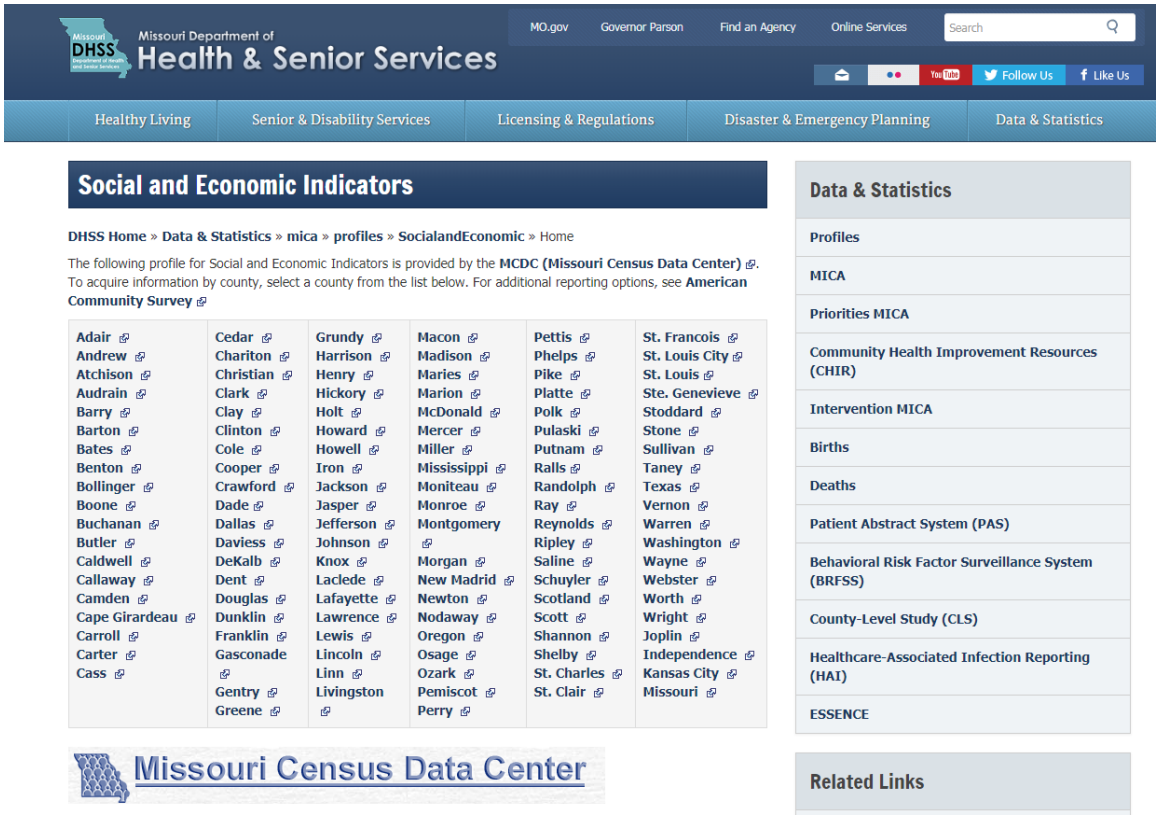
To find additional information about the data, click on one of the tabs above the map. For example, the screenshot below explains the data source for the Adult smoking indicator.



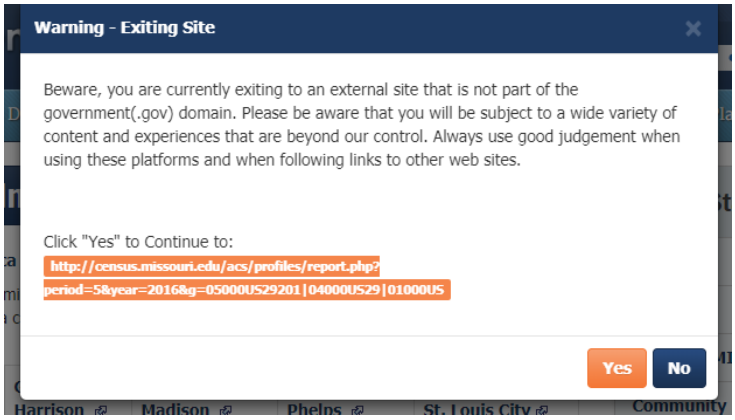
Source: Robert Wood Johnson Foundation and University of Wisconsin Population Health Institute

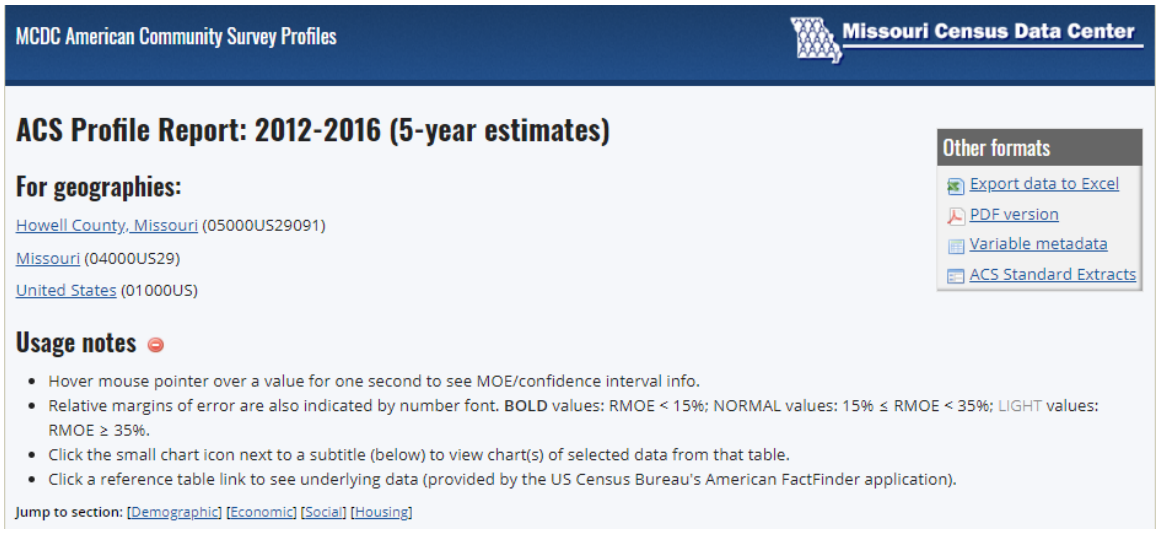
Social and Economic Indicators Profile

The **Social and Economic Indicators Profile** contains data provided by the Missouri Census Data Center (MCDC).



Once a county is selected, an External Link warning will appear. Select **Okay** to proceed to the MCDC site.




MCDC American Community Survey Profiles

Missouri Census Data Center

ACS Profile Report: 2012-2016 (5-year estimates)

For geographies:

Howell County, Missouri (05000US29091)

Missouri (04000US29)

United States (01000US)

Other formats

Export data to Excel

PDF version

Variable metadata

ACS Standard Extracts

Usage notes

- Hover mouse pointer over a value for one second to see MOE/confidence interval info.
- Relative margins of error are also indicated by number font. **BOLD** values: RMOE < 15%; NORMAL values: 15% ≤ RMOE < 35%; LIGHT values: RMOE ≥ 35%.
- Click the small chart icon next to a subtitle (below) to view chart(s) of selected data from that table.
- Click a reference table link to see underlying data (provided by the US Census Bureau's American FactFinder application).

Jump to section: [Demographic] [Economic] [Social] [Housing]

The tables provided by the MCDC contain data from the American Community Survey (ACS). The ACS replaced the long form that used to be distributed every ten years with the decennial census. Now the ACS is distributed to a sample of the population each year. This allows the U.S. Census Bureau to collect data more regularly so that population trends for the U.S., states, counties, and most cities can be tracked more closely. The MCDC reports these ACS data on county tables that contain sections on Demographic, Economic, Social, and Housing indicators.

E4. POVERTY STATUS OVER THE LAST 12 MONTHS

Universe: Persons for whom poverty status is determined

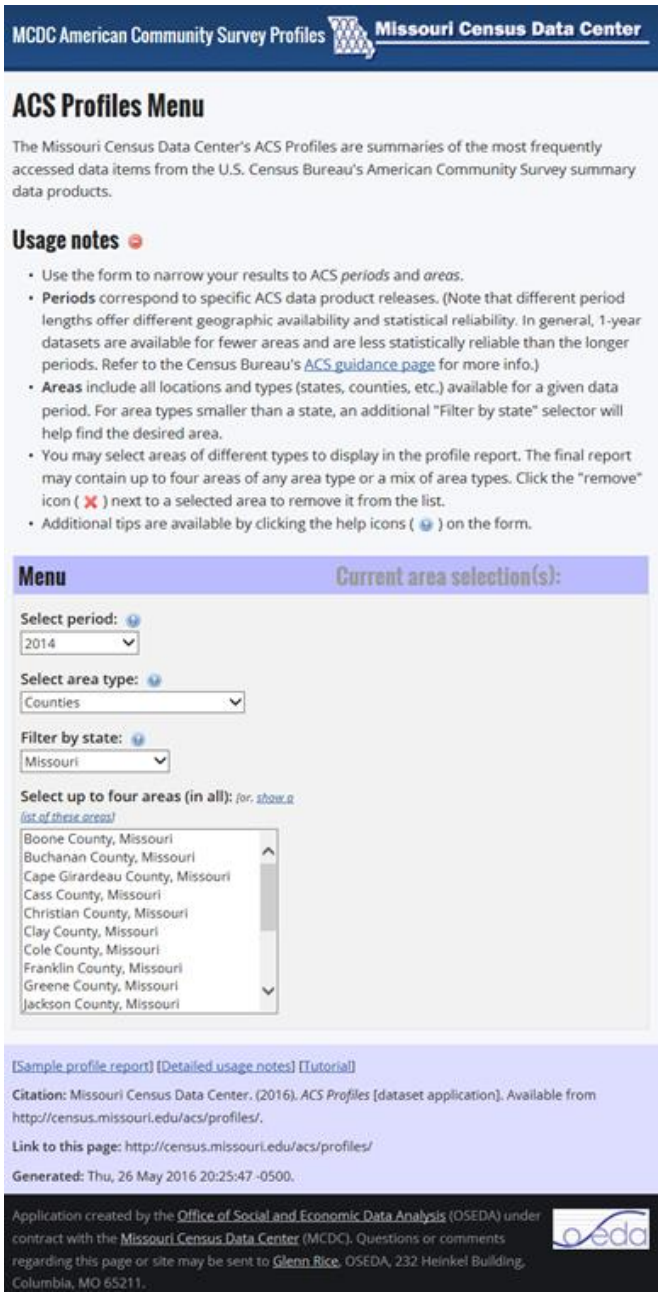
Reference tables: B17001 B17021 B17010 B17007 C17002

Persons for whom poverty status is determined	**39,509**		**5,876,366**		**310,629,632**	
Persons below poverty	**8,980**	**22.7**	**897,755**	**15.3**	**46,932,224**	**15.1**
Persons under 18 for whom poverty status is determined	**9,522**		**1,364,095**		**72,456,096**	
Persons under 18 in poverty	**3,143**	**33.0**	**287,147**	**21.1**	**15,335,783**	**21.2**
Persons aged 18 to 64 for whom poverty status is determined	**22,793**		**3,620,233**		**193,298,962**	
Persons aged 18 to 64 in poverty	**4,686**	**20.6**	**531,348**	**14.7**	**27,401,015**	**14.2**
Persons over 65 for whom poverty status is determined	**7,194**		**892,038**		**44,874,586**	
Persons over 65 in poverty	1,151	16.0	**79,260**	**8.9**	**4,195,427**	**9.3**
Persons in families for whom poverty status is determined	**32,496**	**82.2**	**4,695,207**	**79.9**	**251,561,651**	**81.0**
Unrelated individuals for whom poverty status is determined	**7,013**		**1,181,159**		**59,067,988**	
Persons in families in poverty	6,579	20.2	**568,643**	**12.1**	**31,227,522**	**12.4**
Family households in poverty	2,058	18.7	**165,384**	**10.8**	**8,543,087**	**11.0**
Unrelated persons in poverty 15 years and over	**2,401**	**34.2**	**329,112**	**27.9**	**15,704,704**	**26.6**
Poverty ratio under 0.5	3,825	9.7	**395,468**	**6.7**	**20,787,162**	**6.7**
Poverty ratio in 0.5 to 0.99	5,155	13.0	**502,287**	**8.5**	**26,145,064**	**8.4**
Poverty ratio in 1 to 2	**10,945**	**27.7**	**1,135,295**	**19.3**	**57,457,973**	**18.5**
Poverty ratio in 2 and over	**19,584**	**49.6**	**3,843,316**	**65.4**	**206,239,440**	**66.4**

The MCDC tables contain some data that can be found in the MICA system, such as population and racial distribution, although a different time period is represented so the numbers provided will not exactly match MICA. However, many of the indicators available through the ACS and the MCDC are not available in the MICA system. For example, the portion of the Economic section that appears at the right contains several indicators on poverty status with direct comparisons to statewide and national statistics.

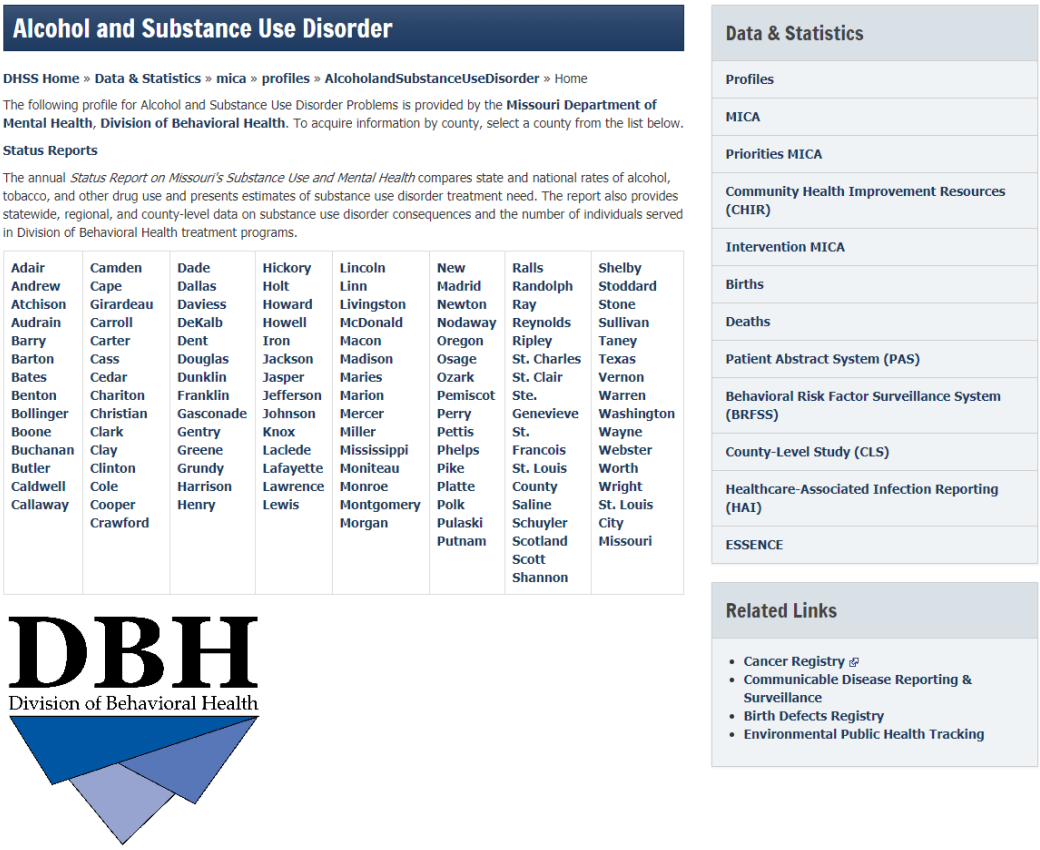
The **Social and Economic Indicators Profile** links to data for the 2012-2016 time period. Similar ACS Profile Reports using smaller time periods are available for larger counties through the query tool at http://mcdc1.missouri.edu/acsprofiles/acsprofilemenu.html. This website can also be accessed through the **MCDC American Community Survey Profiles** link in the upper right corner of the screen.

Single-year 2016 data are available for geographies with populations above 65,000. Five-year 2012-2016 data are available for all geographies. (In the past, three-year data were available for geographies with populations above 20,000, but this option was discontinued after 2013. Earlier three-year time periods, such as 2011-2013, are currently still available on the MCDC site.) Data for the U.S. and other states are also available through this tool.



Alcohol and Substance Use Disorder Profile

The **Alcohol and Substance Use Disorder Profile** provides links to data prepared by the Missouri Department of Mental Health.



Alcohol and Substance Use Disorder

DHSS Home » Data & Statistics » mica » profiles » AlcoholandSubstanceUseDisorder » Home

The following profile for Alcohol and Substance Use Disorder Problems is provided by the **Missouri Department of Mental Health, Division of Behavioral Health.** To acquire information by county, select a county from the list below.

Status Reports

The annual *Status Report on Missouri's Substance Use and Mental Health* compares state and national rates of alcohol, tobacco, and other drug use and presents estimates of substance use disorder treatment need. The report also provides statewide, regional, and county-level data on substance use disorder consequences and the number of individuals served in Division of Behavioral Health treatment programs.

Adair	Camden	Dade	Hickory	Lincoln	New Madrid	Ralls	Shelby
Andrew	Cape Girardeau	Dallas	Holt	Linn	Newton	Randolph	Stoddard
Atchison	Carroll	Daviess	Howard	Livingston	Nodaway	Ray	Stone
Audrain	Carter	DeKalb	Howell	McDonald	Oregon	Reynolds	Sullivan
Barry	Cass	Dent	Iron	Macon	Osage	Ripley	Taney
Barton	Cedar	Douglas	Jackson	Madison	Ozark	St. Charles	Texas
Bates	Chariton	Dunklin	Jasper	Maries	Pemiscot	St. Clair	Vernon
Benton	Christian	Franklin	Jefferson	Marion	Perry	Ste. Genevieve	Warren
Bollinger	Clark	Gasconade	Johnson	Mercer	Pettis	St. Francois	Washington
Boone	Clay	Gentry	Knox	Miller	Phelps	St. Louis County	Wayne
Buchanan	Clinton	Greene	Laclede	Mississippi	Pike	Saline	Webster
Butler	Cole	Grundy	Lafayette	Moniteau	Platte	Schuyler	Worth
Caldwell	Cooper	Harrison	Lawrence	Monroe	Polk	Scotland	Wright
Callaway	Crawford	Henry	Lewis	Montgomery	Pulaski	Scott	St. Louis City
				Morgan	Putnam	Shannon	Missouri

Data & Statistics

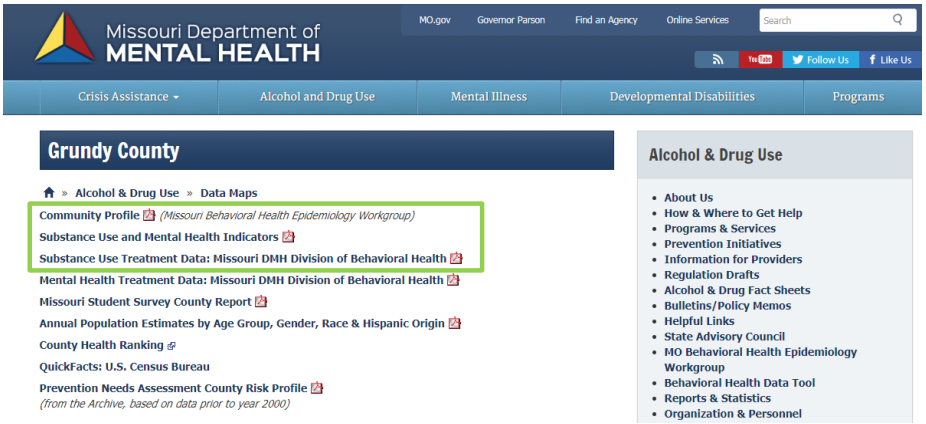
- Profiles
- MICA
- Priorities MICA
- Community Health Improvement Resources (CHIR)
- Intervention MICA
- Births
- Deaths
- Patient Abstract System (PAS)
- Behavioral Risk Factor Surveillance System (BRFSS)
- County-Level Study (CLS)
- Healthcare-Associated Infection Reporting (HAI)
- ESSENCE

Related Links

- Cancer Registry
- Communicable Disease Reporting & Surveillance
- Birth Defects Registry
- Environmental Public Health Tracking

DBH
Division of Behavioral Health

The Department of Mental Health has developed a collection of links for each county in Missouri. The Grundy County links are shown below. Alcohol and drug abuse information is available through the first three links. The Community Profile is a narrative report on substance abuse and mental health.



Missouri Department of MENTAL HEALTH

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Crisis Assistance | Alcohol and Drug Use | Mental Illness | Developmental Disabilities | Programs

Grundy County

» Alcohol & Drug Use » Data Maps

- Community Profile *(Missouri Behavioral Health Epidemiology Workgroup)*
- Substance Use and Mental Health Indicators
- Substance Use Treatment Data: Missouri DMH Division of Behavioral Health
- Mental Health Treatment Data: Missouri DMH Division of Behavioral Health
- Missouri Student Survey County Report
- Annual Population Estimates by Age Group, Gender, Race & Hispanic Origin
- County Health Ranking
- QuickFacts: U.S. Census Bureau
- Prevention Needs Assessment County Risk Profile *(from the Archive, based on data prior to year 2000)*

Alcohol & Drug Use

- About Us
- How & Where to Get Help
- Programs & Services
- Prevention Initiatives
- Information for Providers
- Regulation Drafts
- Alcohol & Drug Fact Sheets
- Bulletins/Policy Memos
- Helpful Links
- State Advisory Council
- MO Behavioral Health Epidemiology Workgroup
- Behavioral Health Data Tool
- Reports & Statistics
- Organization & Personnel

The Substance Use and Mental Health Indicators sheet contains statistics on several topics related to alcohol and drug abuse, including hospital and emergency room visits, juvenile court referrals, traffic crashes, police reports, school reports, criminal justice cases, and others. A portion of the Grundy County sheet appears below.

GRUNDY COUNTY

DBH REGION	Western
DBH SERVICE AREAS	
Substance Use	13
Adult Psychiatric	13
POPULATION	
Census 2010	10,261
2016 Estimate	10,165

BIRTH RISK	2015	2014	2013
Resident Births	136	170	163
Mother Reported Smoking while Pregnant	31	49	35

DISEASE INCIDENCE [1]	2016	2015	2014
HIV/AIDS Cases	1	1	0
Hepatitis B Chronic, Acute, Prenatal	0	0	1
Hepatitis C Chronic and Acute	7	13	5
Tuberculosis Infection Cases	2	3	2

DEATHS and INJURIES	2015	2014	2013
Resident Deaths	155	144	142
Suicide	1	2	1
Homicide	0	1	0
Alcohol Induced Deaths	0	2	1
Drug Induced Deaths	3	3	1
Smoking Attributable Deaths	15	20	21
Self-inflicted Injuries *	17	10	14
Assault Injuries *	30	31	28

IMPAIRED DRIVING	2016	2015	2014
Alcohol Involved Crashes	6	13	9
Fatal Crashes	0	1	0
Injury Crashes	0	7	3
Property Damage Crashes	6	5	8
Crash Fatalities	0	1	0
Crash Injuries	0	8	5
Drug Involved Crashes	1	1	2
Fatal Crashes	0	0	0
Injury Crashes	0	0	1
Property Damage Crashes	1	1	1
Crash Fatalities	0	0	0
Crash Injuries	0	0	1

POLICE REPORTS	2016	2015	2014
DUI Arrests, DWI Tracking System	29	24	39
Liquor Law Arrests	10	15	27
Drug Arrests	78	56	58
Methamphetamine Lab Seizures	0	0	0
Violent Offenses	9	13	9
Domestic Violence Reports	112	120	121
Property Offenses	154	198	158

SCHOOL REPORTS	2015-16	2014-15	2013-14
Enrollment Grades 9-12	404	412	425
Drop-outs	9	5	8
Drop-out Rate	2.2%	1.2%	1.9%
School Discipline Involving Alcohol	0	0	0
School Discipline Involving Drugs	2	1	0

The Substance Abuse Treatment Data sheet contains data on substance use and compulsive gambling treatment admissions. This data sheet includes information on type of treatment, demographic characteristics of admitted individuals, other services provided, primary drug problem, referral source, special populations such as pregnant women and military veterans, and several other categories.

GRUNDY COUNTY

DIVISION OF BEHAVIORAL HEALTH: SUBSTANCE USE AND COMPULSIVE GAMBLING TREATMENT ADMISSIONS

Some individuals were admitted to more than one category of substance use treatment and are counted once in each category they accessed during the fiscal year:

TREATMENT CATEGORY	FY2017	FY2016	FY2015
Detoxification	9	11	11
CSTAR Adolescent	*	*	5
CSTAR Women and Children	*	*	5
CSTAR General Adult	79	70	63
CSTAR Opioid	0	*	0
Primary Recovery Treatment	0	*	*
Clinical SATOP (CIP, YCIP, SROP)	7	8	8
Other Substance Abuse Treatment	0	0	0

SUBSTANCE ABUSE TRAFFIC OFFENDER PROGRAM (SATOP)	FY2017	FY2016	FY2015
Offender Management Unit	32	29	25
- Adolescent Diversion Education Prograr	0	0	0
- Offender Education Program	11	8	7
- Weekend Intervention Program	9	*	8
(See also Clinical SATOP at left)			
OTHER SERVICES PROVIDED			
Co-Dependency	*	*	*
Compulsive Gambling	0	0	0
Recovery Supports	*	*	0
Early Intervention	9	*	*

The profiles below summarize individuals admitted to Division of Behavioral Health substance use treatment programs. Individuals are counted only once, regardless of their number of admissions within the fiscal year. Individuals admitted only to categories listed in the box above-right are not included below. An asterisk (*) in a data cell indicates the count was fewer than 5 and suppressed to avoid disclosure of identifying information:

NUMBER ADMITTED	FY2017	FY2016	FY2015
Total Individuals	91	77	83
AGE			
Under 18	7	6	5

PRIMARY DRUG PROBLEM	FY2017	FY2016	FY2015
Alcohol	27	24	29
Marijuana / Hashish	26	22	24
Cocaine (total)	0	0	0

Percentage Change/Percentage Difference

You will often need to analyze changes in your study area over time, compare different groups within your study area, or compare your study area to another area. One of the simplest ways to analyze these changes or differences is to calculate the percentage change or percentage difference. **Percentage change** can be used to compare differences in rates from the same geographic area *over time*. **Percentage difference** can be used to compare differences in rates from different geographic areas or compare rates for different demographic groups (based on age, race, gender, etc.) within a single area *for the same time period*.

In order to perform either calculation, you need two numbers to compare. For percentage change, you would compare two numbers or rates for the same indicator and the same location but from different time periods (i.e., Cole County 2003 mortality rate vs. Cole County 2017 mortality rate). For percentage difference, you would compare two numbers or rates from the same time period but for different places (i.e., Jackson County 2002 mortality rate vs. St. Louis County 2017 mortality rate) or for different demographic groups (i.e., 2017 Cole County male mortality rate vs. 2017 Cole County female mortality rate, 2017 Cole County African-American mortality rate vs. 2017 Cole County White mortality rate, etc.).

The calculation for percentage change/percentage difference is based on five steps:

1) Obtain the numbers or rates for both time periods/areas/groups.
2) Choose one number to serve as the base value and one to serve as the comparison value.
3) Subtract the base value from the comparison value.
4) Divide the difference calculated in Step 3 by the base value.
5) Multiply the answer from Step 4 by 100 to convert it to a percentage.

These steps can also be written as a formula:

$$\frac{\text{(Comparison Value – Base Value)}}{\text{Base Value}} \times 100 = \text{Percentage Change/Percentage Difference}$$[9]

Examples will illustrate the process of performing these calculations using data from the MICAs or Profiles.

[9] Steps and formula adapted from the North Carolina Department of Health and Human Services *Community Assessment Guide Book*, 65

Percentage Change Example: Calculate Madison County's percentage change in heart disease mortality rates using data from 2002 and 2017.

1) We must use the Death MICA to determine that the age-adjusted 2003 heart disease death rate for Madison County was 277.05 per 100,000, while the 2017 rate was 253.58 per 100,000.
2) When making comparisons over time, the base year must be the older of the two time periods under consideration. Thus, in this case, the 2003 rate of 277.05 must be used as the base value. The 2017 rate of 253.58 becomes the comparison value.
3) When we subtract the comparison value from the base value, we calculate 253.58 – 277.05 = -23.47.
4) The difference from Step 3 divided by the base value = -23.47/277.05 = -.0847.
5) Multiplying the answer from Step 4 by 100 gives us -.0847x 100 = -8.47%.

Madison County's percentage change in heart disease mortality rates $= \frac{253.58 - 277.05}{277.05} \times 100 = -8.47\%$

In a report, we could state that Madison County's death rate from heart disease decreased by 8.5% between 2003 and 2017.

The same basic steps are used to perform a percentage difference calculation. The main difference between the two calculations is that percentage change analyzes linear (time) data, while percentage difference analyzes non-linear data. The percentage difference calculation can be used to compare genders, age groups, racial groups, or any number of other variables. Although the calculation is the same, analysis of percentage difference requires extra caution related to the choice of base values. An example will illustrate this point.

Percentage Difference Example: Calculate the percentage difference in premature birth rates between African-Americans and Whites in Missouri for 2017.

We can use the Birth MICA to find that the 2017 premature birth rate (preterm gestation) for Whites was 9.75% (or 9.75 per 100), while for African-Americans it was 14.76% (or 14.76 per 100). Now we must decide which rate to use as the base value. When calculating percentage difference, the analyst could choose to use either value as the base value. We will perform the calculation both ways to demonstrate the differences.

White rate as base:

$\frac{14.76 - 9.75}{9.75} = 0.5138 \times 100 = 51.4\%$

African-American rate as base:

$\frac{9.75 - 14.76}{14.76} = -0.3394 \times 100 = -33.9\%$

The first calculation uses Whites as the base and thus compares the African-American rate to the base rate for Whites. If writing a report, we would say:

The 2017 premature birth rate for African-Americans in Missouri was 51% higher than the rate for Whites.

OR

If we choose to use African-Americans as the base and compare the White rate to the African-American base rate, we would say:

The 2017 premature birth rate for Whites in Missouri was 34% lower than the rate for African-Americans.

NOTE: As this example demonstrates, the percentage difference changes depending on which group is used as the base. You must use caution when writing your report so that you appropriately reflect which subpopulation was used as the base and which was used as the comparison value in your percentage difference calculation.

Context must be considered and reported when using percentage change and percentage difference. Otherwise these statistics may provide a distorted interpretation of the data. For example, suppose County A had an immunization rate of 90% in 2008, whereas County B's immunization rate in the same year was 55%. In 2009, County A's immunization rate was 88%, while County B's rate increased to 75%. Thus, the percentage change for County A was -2.2%, while the percentage change for County B was +36.4%.

County A: $\frac{.88 - .90}{.90} \times 100 = -2.2\%$ County B: $\frac{.75 - .55}{.55} \times 100 = +36.4\%$

However, even though County B achieved a greater improvement in its immunization rate, County A's rate was still 13% higher than County B's rate for 2009. Furthermore, since County A's 2008 rate was 90%, County A could only have improved by a maximum of 10% (100% - 90%), while County B could have improved by as much as 45% (100% - 55%). Keep in mind that percentage change and percentage difference do not involve testing for statistical significance. For some data, analysts may therefore wish to utilize confidence intervals when comparing two areas, populations, or data years.

Statistics in Health Exercises – Part I

1. You are researching health disparities in Jackson County.

   a) Use the following rates of hospitalizations due to congestive heart failure to calculate the 2008 percentage difference in discharge rates between Blacks and Whites in Jackson County.

      Rate for Whites: 24.2
      Rate for Blacks: 54.8

      Base Group: Percentage Difference:

   b) Report your findings using a narrative sentence: _____

      _____

      _____

   c) The 95% confidence interval for Whites is 22.9 to 25.5. The 95% confidence interval for Blacks is 50.9 to 58.9. Based on this information, is there a significant difference between the White and Black rates?
      -

      _____

      _____

Years of Potential Life Lost (YPLL)

Even when death rates are age-adjusted, certain diseases and conditions will be given more weight in death rate calculations due to the fact that these diseases and conditions disproportionately affect the elderly, who are more likely to die. Traditional mortality calculations therefore give less weight to conditions that disproportionately affect the young and thus "do not fully account for the burden of premature mortality, an important indicator of a population's health status."[10]

"Years of potential life lost (YPLL) involves estimating the average time a person would have lived had he or she not died prematurely. This measure is used to help quantify social and economic loss owing to premature death, and it has been promoted to emphasize specific causes of death affecting younger age groups."[11] **YPLL is an important measure for public health because "deaths at younger ages are more likely to be attributable to preventable causes and therefore subject to prevention and intervention."**[12]

Most federal and state agencies use age 75 as the benchmark for YPLL calculations. This is sometimes expressed as $YPLL_{75}$. Alternatively, the average life expectancy or age 65 is also sometimes used as benchmarks for YPLL calculations. On the DHSS website, the age of 75 is used to calculate YPLL. As an example, a YPLL calculation for an individual record is:

75 - age of death = individual YPLL[13]

For example, if a newborn baby dies from birth complications, he or she would have a YPLL of 75 (75 – 0 = 75). A 16-year-old teen who dies in a traffic accident would receive a YPLL of 59 (75 – 16= 59). A 73-year-old person who dies of a heart attack would receive a YPLL of 2 (75 – 73= 2). Any person who dies at age 75 or above is not considered to have died prematurely and would receive a YPLL of 0.

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[10] Dranger E., and Remington P. *YPLL: A summary measure of premature mortality used in measuring the health of communities*. Wisconsin Public Health and Health Policy Institute Issue Brief. http://uwphi.pophealth.wisc.edu/publications/issue-briefs/issueBriefv05n07.pdf. October, 2004. Accessed October 27, 2017.

[11] Gardner J. W., and Sanborn J. S. *Years of potential life lost (YPLL) – What does it measure?* [Abstract]. *Epidemiology 1*(4), 322-329. http://www.ncbi.nlm.nih.gov/pubmed/2083312. July, 1990. Accessed October 27, 2017.

[12] Dranger E., and Remington P. *YPLL: A summary measure of premature mortality used in measuring the health of communities*. Wisconsin Public Health and Health Policy Institute Issue Brief. http://uwphi.pophealth.wisc.edu/publications/issue-briefs/issueBriefv05n07.pdf. October, 2004. Accessed October 27, 2017.

[13] CDC - Principles of Epidemiology in Public Health Practice, Third Edition An Introduction to Applied Epidemiology and Biostatistics. Lesson 3: Measures of Risk. **https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson3/section3.html .** May 1, 2017.

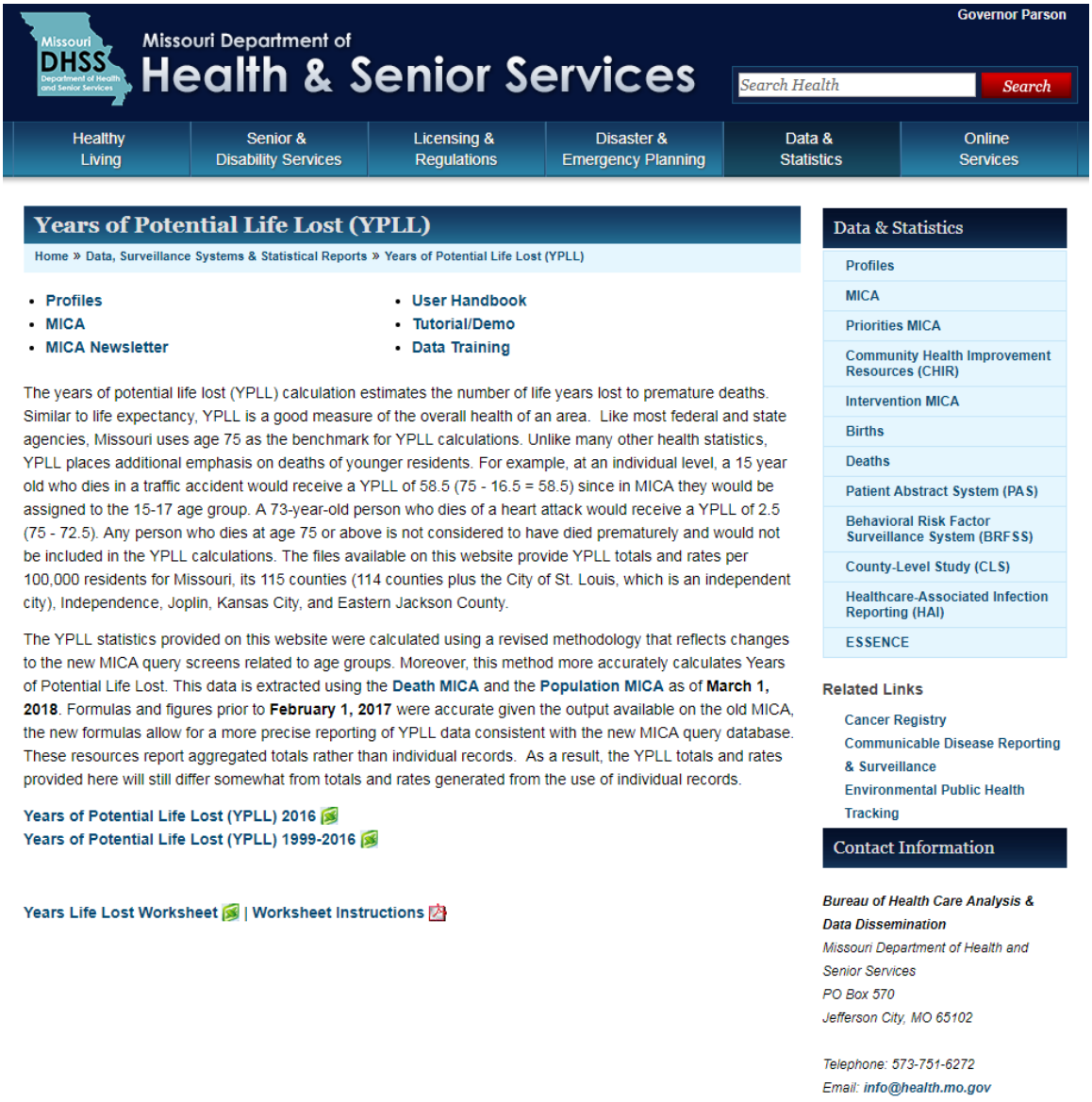
Calculating YPLL for groups of mortality in which the exact age of death is not available for each member of the cohort is slightly different. In these cases, analysts must subtract the midpoint of the age grouping (shown in the table below) from the end point to determine the years of potential life lost for the group. Often, it is helpful to convert the YPLL to a rate, especially if comparisons are being made between geographies, demographic groups, or specific causes of death.

Persons age 75 and above are not included when calculating the YPLL rate. To calculate a YPLL rate:

(YPLL for Region Specified / Population for Region Specified Under Age 75) * 100,000
*Note the 100,000 is a constant generally used for death rates.

Years of Potential Life Lost ($YPLL_{75}$) Midpoints			
Age group	End point	Midpoint by age group	**YPLL for each age group**
Under 1	75	0.5	**74.5**
1 to 4	75	3	**72**
5 to 9	75	7.5	**67.5**
10 to 14	75	12.5	**62.5**
15 to 17	75	16.5	**58.5**
18 to 19	75	19	**56**
20 to 24	75	22.5	**52.5**
25 to 29	75	27.5	**47.5**
30 to 34	75	32.5	**42.5**
35 to 39	75	37.5	**37.5**
40 to 44	75	42.5	**32.5**
45 to 49	75	47.5	**27.5**
50 to 54	75	52.5	**22.5**
55 to 64	75	60	**15**
65 to 69	75	67.5	**7.5**
70 to 74	75	72.5	**2.5**

The Bureau of Health Care Analysis and Data Dissemination (BHCADD) has developed a Years of Potential Life Lost (YPLL) website that explains this statistic, provides YPLL counts and rates for both the state and individual counties, and includes a worksheet and instructions for calculating YPLL statistics other than those available for download. A link to this website is available on the Data, Surveillance Systems & Statistical Reports page under the Community Health Assessment and Intervention Planning header. The YPLL website (http://health.mo.gov/data/ypll/) is shown here.



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Years of Potential Life Lost (YPLL)

Home » Data, Surveillance Systems & Statistical Reports » Years of Potential Life Lost (YPLL)

- Profiles
- MICA
- MICA Newsletter
- User Handbook
- Tutorial/Demo
- Data Training

The years of potential life lost (YPLL) calculation estimates the number of life years lost to premature deaths. Similar to life expectancy, YPLL is a good measure of the overall health of an area. Like most federal and state agencies, Missouri uses age 75 as the benchmark for YPLL calculations. Unlike many other health statistics, YPLL places additional emphasis on deaths of younger residents. For example, at an individual level, a 15 year old who dies in a traffic accident would receive a YPLL of 58.5 (75 - 16.5 = 58.5) since in MICA they would be assigned to the 15-17 age group. A 73-year-old person who dies of a heart attack would receive a YPLL of 2.5 (75 - 72.5). Any person who dies at age 75 or above is not considered to have died prematurely and would not be included in the YPLL calculations. The files available on this website provide YPLL totals and rates per 100,000 residents for Missouri, its 115 counties (114 counties plus the City of St. Louis, which is an independent city), Independence, Joplin, Kansas City, and Eastern Jackson County.

The YPLL statistics provided on this website were calculated using a revised methodology that reflects changes to the new MICA query screens related to age groups. Moreover, this method more accurately calculates Years of Potential Life Lost. This data is extracted using the Death MICA and the Population MICA as of **March 1, 2018**. Formulas and figures prior to **February 1, 2017** were accurate given the output available on the old MICA, the new formulas allow for a more precise reporting of YPLL data consistent with the new MICA query database. These resources report aggregated totals rather than individual records. As a result, the YPLL totals and rates provided here will still differ somewhat from totals and rates generated from the use of individual records.

Years of Potential Life Lost (YPLL) 2016
Years of Potential Life Lost (YPLL) 1999-2016

Years Life Lost Worksheet | Worksheet Instructions

Data & Statistics

- Profiles
- MICA
- Priorities MICA
- Community Health Improvement Resources (CHIR)
- Intervention MICA
- Births
- Deaths
- Patient Abstract System (PAS)
- Behavioral Risk Factor Surveillance System (BRFSS)
- County-Level Study (CLS)
- Healthcare-Associated Infection Reporting (HAI)
- ESSENCE

Related Links

- Cancer Registry
- Communicable Disease Reporting & Surveillance
- Environmental Public Health Tracking

Contact Information

Bureau of Health Care Analysis & Data Dissemination
Missouri Department of Health and Senior Services
PO Box 570
Jefferson City, MO 65102

Telephone: 573-751-6272
Email: info@health.mo.gov

YPLL counts and rates for all causes of death and all Missouri residents are available through downloadable Microsoft Excel files. However, YPLL can also be an effective statistic for specific causes of death, especially those such as motor vehicle accidents that disproportionately affect younger persons, or for comparing different demographic groups. The YPLL Worksheet can be used to calculate these more specific statistics. For example, suppose an analyst is asked to calculate the 2015 YPLL rate for motor vehicle accident (MVA) deaths in Missouri.

The analyst can use **Death MICA** to determine the number of deaths in each age category. Select **Age**: Expanded and expand the Accidents **Cause** category to check Motor vehicle accidents. Choose Main Row: Age and Main Column: Year to produce the following results for Missouri.

Table Results

Save Table As ▾ | Send Table to Side by Side

Title:	**Missouri Resident Deaths**	
Data selected in addition to rows and columns below:	Cause: Accidents (unintentional injuries)#: Motor vehicle accidents;	
Year:	2015	2015
Statistics:	Count	Rate
Age		
Under 1	0	0.00
1 - 4	4	1.34 *
5 - 9	10	2.58 *
10 - 14	10	2.57 *
15 - 17	38	15.85
18 - 19	35	22.26
20 - 24	98	22.78
25 - 29	92	22.68
30 - 34	70	17.45
35 - 39	50	13.46
40 - 44	46	12.74
45 - 49	64	17.11
50 - 54	72	16.70
55 - 59	72	16.74
60 - 64	48	12.80
65 - 69	52	16.63
70 - 74	36	15.63
75 - 79	32	19.38
80 - 84	34	28.30
85 and Over	31	24.46
Unknown	0	0.00
Total for selection	894	14.23
Rate:	**For each Age: Crude Rate per 100,000 Total for selection: Age Adjusted Rate per 100,000 using 2000 Standard Population**	
Source:	**DHSS - MOPHIMS - Death MICA**	
Generated On:	**10/17/2017 3:39:20 PM**	
*	**Rate is unreliable; numerator less than 20**	

The analyst can then download the MICA table into Excel by clicking the green **Save Table As** button and choosing 'Excel'. The YPLL Worksheet assigns values to the mid-age population for each of the age groups because single-year-of-age death data is not available on MICA. The following table summarizes the calculations from the YPLL Worksheet:

Age	Number of Deaths	Mid-Age Population	Formula	Formula Result
Under 1	0	0.5	(75-0.5)*deaths	0
1 to 4	4	3	(75-3)*deaths	288
5 to 9	10	7.5	(75-7.5)*deaths	675
10 to 14	10	12.5	(75-12.5)*deaths	625
15 to 17	38	16.5	(75-16.5)*deaths	2223
18 to 19	35	19	(75-19)*deaths	1960
20 to 24	98	22.5	(75-22.5)*deaths	5145
25 to 29	92	27.5	(75-27.5)*deaths	4370
30 to 34	70	32.5	(75-32.5)*deaths	2975
35 to 39	50	37.5	(75-37.5)*deaths	1875
40 to 44	46	42.5	(75-42.5)*deaths	1495
45 to 49	64	47.5	(75-47.5)*deaths	1760
50 to 54	72	52.5	(75-52.5)*deaths	1620
55 to 59	72	57.5	(75-57.5)*deaths	1260
60 to 64	48	62.5	(75-62.5)*deaths	600
65 to 69	52	67.5	(75-67.5)*deaths	390
70 to 74	36	72.5	(75-72.5)*deaths	90
75 to 84				
85 and over				
All ages				
Total				27351

The analyst now knows the total YPLL from MVA deaths in Missouri (27,351 years), but still needs to convert the total YPLL into a rate so that fair comparisons can be made across different geographies with different population sizes. To convert the total YPLL into a rate the analyst must first divide the total YPLL by the population under age 75. Users can access **Population MICA** to find that, in 2015, there were 5,671,712 Missouri residents under age 75. Then multiply by a constant so that the end result will be greater than or equal to 1, which allows for easier interpretation by users. The standard constant to use for YPLL is 100,000. Thus, the formula for calculating the Missouri rate of YPLL from MVA deaths is:

YPLL Rate = (Total YPLL / Population under age 75) * 100,000

YPLL Rate = (27,351 / 5,671,712) * 100,000 = 482

The report could state:

Missouri had 482 years of potential life lost per 100,000 residents in 2015. This was a decrease from 2001, when the rate was 723 per 100,000 residents.

Another option would be to run in **Population MICA** the same type of query that was created in **Death MICA**. The analyst could then export that data and plug it into the YPLL Worksheet:

Age	Number of Deaths	Mid-Age Population	Formula	Formula Result		Age	Population
Under 1	0	0.5	(75-0.5)*deaths	0		Under 1	75,042
1 to 4	4	3	(75-3)*deaths	288		1 to 4	299,318
5 to 9	10	7.5	(75-7.5)*deaths	675		5 to 9	387,978
10 to 14	10	12.5	(75-12.5)*deaths	625		10 to 14	389,347
15 to 17	38	16.5	(75-16.5)*deaths	2223		15 to 17	239,791
18 to 19	35	19	(75-19)*deaths	1960		18 to 19	157,230
20 to 24	98	22.5	(75-22.5)*deaths	5145		20 to 24	430,169
25 to 29	92	27.5	(75-27.5)*deaths	4370		25 to 29	405,591
30 to 34	70	32.5	(75-32.5)*deaths	2975		30 to 34	401,176
35 to 39	50	37.5	(75-37.5)*deaths	1875		35 to 39	371,574
40 to 44	46	42.5	(75-42.5)*deaths	1495		40 to 44	361,101
45 to 49	64	47.5	(75-47.5)*deaths	1760		45 to 49	374,058
50 to 54	72	52.5	(75-52.5)*deaths	1620		50 to 54	431,233
55 to 59	72	57.5	(75-57.5)*deaths	1260		55 to 59	430,236
60 to 64	48	62.5	(75-62.5)*deaths	600		60 to 64	374,906
65 to 69	52	67.5	(75-67.5)*deaths	390		65 to 69	312,664
70 to 74	36	72.5	(75-72.5)*deaths	90		70 to 74	230,298
75 to 84						75 to 84	
85 and over						85 and over	
All ages						All ages	
Total				27351			
Population Under 75				5671712		Population U75	5671712
YPLL per 100,000				**482**			

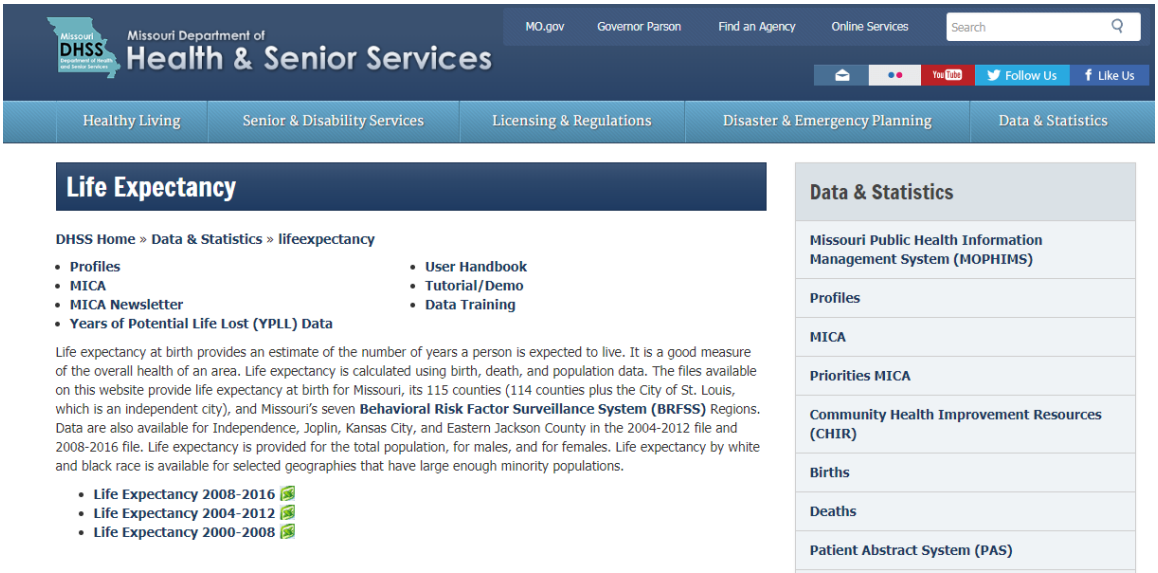
The blue cell at the bottom of the worksheet features a background formula that contains the $YPLL_{75}$ rate calculation and displays the result. Using the worksheet is especially handy if analysts are calculating multiple causes of death from the same geography with the same U75 population.

Life Expectancy

Life expectancy refers to "the average number of years of life remaining [for] a person at a particular age and is often used as a summary measure of the health status of a population. The most commonly used life expectancy measure is life expectancy at birth, [which is] the number of years a person born in a given year is expected to live."[14]

The *Annual Vital Statistics* reports at http://health.mo.gov/data/vitalstatistics/data.php provide life expectancy tables for Missouri only. Older, county-specific life expectancy rates as of 1998-2002 can be obtained from the Office of Administration's Office of Budget and Planning website at https://oa.mo.gov/budget-planning/demographic-information/population-projections/additional-information.

The Bureau of Health Care Analysis and Data Dissemination has developed a Life Expectancy website (http://www.health.mo.gov/data/lifeexpectancy/) that provides county-specific rates for more current time periods. A link to this website is available on the Data, Surveillance Systems & Statistical Reports page under the Community Health Assessment and Intervention Planning header. The Life Expectancy home page is shown below. Life expectancy rates for Missouri, its 115 counties, Independence, Joplin, Kansas City, Eastern Jackson County, and Missouri's seven Behavioral Risk Factor Surveillance System regions are available for two separate time periods through downloadable Microsoft Excel files. Life expectancy rates by White and Black/African-American race are provided for the state and counties with large African-American populations.



[14] New Jersey Department of Health and Senior Services. *Center for Health Statistics information for local health officers*. https://www26.state.nj.us/doh-shad/resources/LHOinfo.html. Last modified, October 17, 2017. Accessed October 27, 2017.

Statistics in Health Exercises – Part II

2. The Buchanan County Health Center is contacted by a local journalist. She is very concerned about some data she found on the Department of Health and Senior Services' MICA website. While researching an article on obesity in Buchanan County, she discovered the 2015 rate of obesity among white children participating in the WIC program is 19.20%! The rate for black children is only 8.54%. She would like someone at the Health Center to comment on this disparity.

   a) How many cases does the 8.54% rate reflect? _____

      Is this a stable rate? _____

      If not, how many years must be included to produce a stable rate? _____

      _____

   b) How many cases does the 19.20% rate reflect? _____

      Is this a stable rate? _____

      If not, how many years must be included to produce a stable rate? _____

      _____

   c) Add years 2013, 2014, and 2015 to the data table. Do the available data indicate a health disparity in Buchanan County?
      _____
      _____

   d) What other type of health statistic would be useful for answering this question? Can we add this to our data table? If so, do so to the table with three years of data present._____
      _____

   e) What would you say to the journalist? _____

      _____

      _____

      _____

3. A citizen's group is concerned about a series of premature deaths from accidents. The group asks the St. Louis County LPHA to provide some statistics on Years of Potential Life Lost all unintentional injuries so they can compare the 2011-2015 rate for St. Louis County to that of the state. Use the YPLL Worksheet to calculate the 2011-2015 YPLL rate from unintentional injuries for St. Louis County.

   a) Which MICAs would you use to find the information to calculate YPLL?

   _____

   b) How many years of potential life were lost in St. Louis County due to unintentional accidents for the years 2011 through 2015?

   _____

   c) What was the 2011-2015 YPLL rate from unintentional accidents for St. Louis County?

   _____

   d) The 2011-2015 Missouri YPLL rate from unintentional accidents was 1,308 per 100,000 population. Was there a statistically significant difference between the rates for St. Louis County and the State of Missouri?

   _____

   _____

   e) If you were writing a report about these YPLL rates, how would you choose to present your findings?

   _____

   _____

   _____

   _____

   _____