Magnitude, Severity and Time Trends

Counts, percents, rates and ratios are all data types which can be used to share information about alcohol, tobacco and other drugs with your community. However, you may wish to put your community's data into context. It's helpful to know, for example, that 9% of all motor vehicle crashes that occurred in your county in 2008 were alcohol related. It's also helpful to know how that compares to other locations (such as the state or surrounding counties), or how that compares to recent years within your county (higher or lower than 2007).

Magnitude refers to the size or extent. For example, how many students in your district reported alcohol use in the past month? This could be the number of students, or the percent of students reporting out of the entire number of students taking the survey.

Severity refers to degree. Determining severity involves comparing the rate for one group to another. For example, is past month alcohol use higher among students in your district than the state average? A rate ratio is often used for comparison, and can be calculated by dividing the percent of use in your area by the percent of use in the state. If the resulting rate ratio is 1.0, that means the two rates (or percents) are equal. If the resulting rate ratio is higher than 1.0, the use is higher in your area or district.

Time Trends can help you see patterns in the behavior or event you are observing. When considering trends in data, note the following:

- What time period are you looking at? (e.g. years, seasons, days)

- Is there an increase or decrease in the number of events over time?

- What is the overall extent of change over time?

- What might be affecting change over time? (e.g., change is survey questions, historical events—see the 'Limits and Caveats' section in 'Finding and Using Existing Data')

Magnitude, severity and time trends can be easier to determine when you are working with a large population. If you are tracking trends for a small rural community, or for a special population within a large city, you may run into problems with small numbers. Small numbers can make it difficult to track changes over time, and difficult to make meaningful comparisons to other locations.

Small Numbers—Issues and Strategies

One year a county has one liver cirrhosis death; the next year the county has two liver cirrhosis deaths. This means there has been a 100 percent increase in liver cirrhosis death. It seems dramatic, but the actual increase was by one case. When you are interested in events that happen infrequently, any change in the number of events leads to abrupt fluctuations in trends.

When you are dealing with a small number of cases or events, it might be best to simply report the number as opposed to a percent or a rate. If you do want to calculate a percent or rate, there are a couple of strategies that can be employed.

Strategy: Combine two or more years of the data. See Table 1. This strategy works as long as there has not been a major change in the way the event is measured (e.g.. changes in the law, data collection methods, the definition of the problem, or the cultural context).

Use the raw numbers instead of the percents—add the events across years, and then calculate the percentages. As in the example below, you would first add up the number of alcohol-related fatalities for the entire four year period, then divide by the total number of fatalities over the four year period (21/167 = 13%). Do not add up the percents and divide by the number of years (9% + 10% + 20% + 17% = 56%/4 = 14%). This method does not take into account any rounding.

Example: Combining two or more years of data

Table 1. Motor Vehicle Fatalities			
	Total Fatalities	Alcohol-Related Fatalities	Percent Alcohol-Related
2004	67	6	9%
2005	40	4	10%
2006	25	5	20%
2007	35	6	17%
Combined	167	21	Combined Average =13%

Communities with small population sizes may also notice that trend graphs depicting indicators fluctuate wildly. Say for example you'd like to graph the trend in cirrhosis deaths for a small community. Because the raw numbers are so small, graphing them makes the changes per year seem larger than they actually are and makes a trend hard to identify.

Strategy: Graph a rolling average by calculating the five year average for 1998-2002, then calculating the five year average for 1999-2003, and so on.

Table 2. Number of Cirrhosis Deaths in X County											
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Deaths	1	3	0	7	1	4	0	3	2	5	1

Table 3. Number of Cirrhosis Deaths in X County: Rolling Five-Year Average							
	1998-2002	1999-2003	2000-2004	2001-2005	2002-2006	2003-2007	2004-2008
Deaths	2.4	3.0	2.4	3.0	2.0	2.8	2.2

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This will smooth out the trend line, showing the average number of annual deaths over time. See the difference between Figure 1 and 2.

Note Figure 1 was created from Table 2 and Figure 2 was created from Table 3.

Figure 1
Number of Annual Cirrhosis Deaths in X County

Figure 2
Number of Annual Cirrhosis Deaths in X County: Rolling Five-Year Average
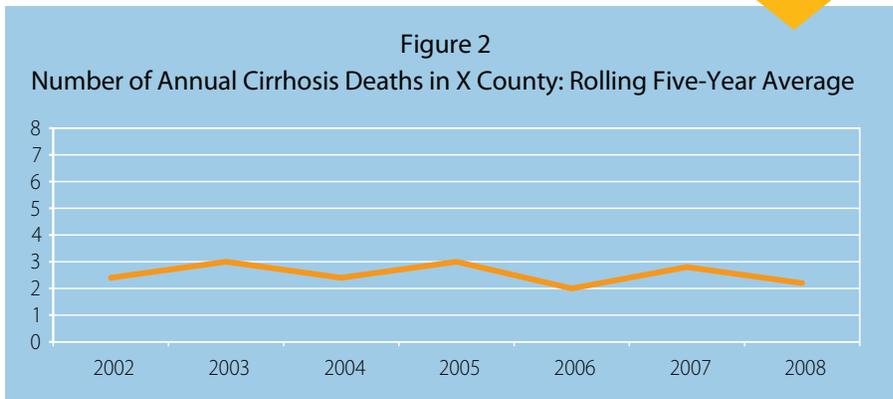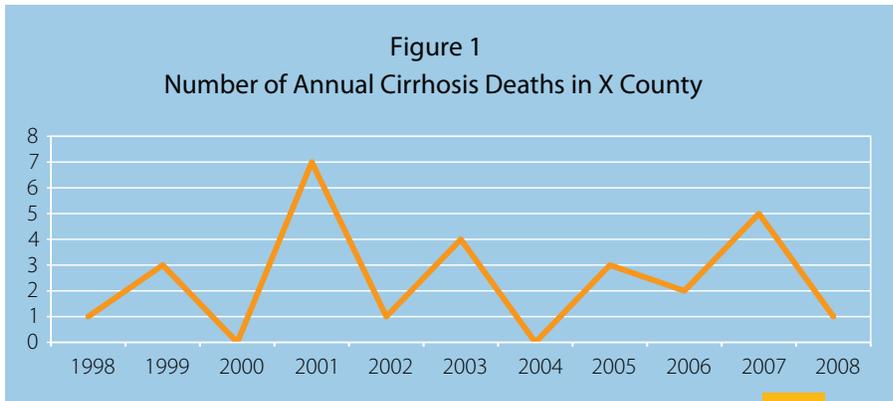
Prioritization Matrix Activity

You can use the tips and tools provided in this section to create a prioritization matrix. Below is an example of a prioritization matrix, which can be used to provide a snapshot of magnitude, time trends, and severity for your community using counts, percents and rate ratios.

Cornfield County, MN					
	Number and Percent, 2007		Trend	Rate Ratio, 2007	
30-Day Youth Alcohol Use Among 6th, 9th and 12th Graders	1,020 3,923	26%	↓ (33% in 1998, 31% in 2001, 27% in 2004, 26% in 2007)	1.13	County: 26% State: 23%
Past Two-week Youth Binge Drinking Among 9th and 12th Graders	460 2,556	18%	↓ (28% in 1998, 24% in 2001, 21% in 2004, 18% in 2007)	0.90	County: 18% State: 20%
Alcohol-Related Motor Vehicle Crashes	225 3,214	7%	↔ (7% in 2004, 8% in 2005, 8% in 2006, 7% in 2007)	1.4	County: 7% State: 5%
Cost per Capita of Alcohol-Related Motor Vehicle Crashes, Fatalities and Injuries	$90	N/A	↑ ($52 in 2004, $70 in 2005, $68 in 2006, $90 in 2007)	1.5	County: $90 State: $60

Note: the denominator for each indicator may not be the same within a county—some Minnesota Student Survey questions were asked of 6th, 9th and 12th graders while others were asked only of 9th and 12th graders.

A simpler version might look like this:

Cornfield County, MN			
	Number and Percent, 2007	Trend	Rate Ratio, 2007
30-Day Youth Alcohol Use Among 6th, 9th and 12th Graders	1,020 (26%)	↓	1.13
Past Two-week Youth Binge Drinking Among 9th and 12th Graders	460 (18%)	↓	0.90
Alcohol-Related Motor Vehicle Crashes	225 (7%)	↔	1.4
Cost per Capita of Alcohol-Related Motor Vehicle Crashes, Fatalities and Injuries	$90 (N/A)	↑	1.5

To complete this matrix for your county, go to www.sumn.org and click on Data by Topic. Select Alcohol, Consumption, and then Youth Alcohol Use by clicking on the small plus signs. Choose 'by Grade and Gender'. Click on 'Choose specific Counties' and select your county by clicking on the box next to the appropriate name. You can also click next to 'State of Minnesota' before hitting the 'Submit' button in the lower right corner.

Now, use the toolbar at the top of the screen to change the 'Years' to 1998-2007. Unselect 6th, 9th, 12th, Male and Female so that only 'All Grades' and 'Total' are checked.

From the data table that appears, you can find the percent of students reporting any use of alcohol in the past 30 days in 2007. Enter this percent in your matrix. Now, using the toolbar at the top of the screen, click on 'Display by: Number'. You can now enter the number of students reporting any use of alcohol in the past 30 days in 2007.

Switch back to percent to assess the trend in past-month alcohol use among students from 1998 to 2007—be sure to pay attention to what happened in 2001 and 2004. Sometimes it will be quite clear if the trend is going down, going up, or staying fairly flat. Sometimes it is less obvious. If this is the case, you may wish to work with a data analyst or statistical analysis software program to create a trend line.

Finally, divide the percent of students reporting any use of alcohol in the past 30 days for your county by the percent of students reporting past-month use in the entire state of Minnesota. This will give you the rate ratio. If the ratio is close to 1.0, youth alcohol use in your county is similar to the state average. A rate ratio over 1.0 means youth alcohol use is higher in your county than the state average, and a rate ratio under 1.0 means it's lower. A ratio of 1.1 does not indicate a big difference, whereas a ratio of 1.5 to 2.0 does indicate greater severity.

[Your County], MN			
	Number & Percent, 2007	Trend	Rate Ratio, 2007
30-Day Youth Alcohol Use Among 6th, 9th and 12th Graders			
Past-Two-Week Binge Drinking Among 9th and 12th Graders			
Alcohol-Related Motor Vehicle Crashes			
Cost per Capita of Alcohol-Related Motor Vehicle Crashes, Fatalities & Injuries			
30-Day Youth Cigarette Smoking Among 6th, 9th and 12th Graders			
30-Day Chewing Tobacco Use Among 6th, 9th and 12th Graders			
Lung, Bronchus and Trachea Cancer Death Rate			
30-Day Youth Marijuana Use Among 6th, 9th and 12th Graders			
12-Month Youth Methamphetamine Use Among 9th and 12th Graders			
12-Month Youth Inhalant Use Among 6th, 9th and 12th Graders			
Adult Prison Inmates in Minnesota Sentenced for Drug Offenses			
Juveniles Admitted to Minnesota Treatment Facilities			
Adults Admitted to Minnesota Treatment Facilities			

Classroom Fact-Finding Worksheet

Using the 'Data by Topic' search feature on www.sumn.org, find answers to the following questions:

Which county(s) in Minnesota had the highest percent of alcohol related car crashes in 2008?

Where do most youth who live in the Metro Region obtain alcohol (hint: look under Risk and Protective Factors)? How does this compare with non-metro youth?

In 2007, which county reported the highest cost per capita of alcohol-related motor vehicle crashes, injuries and fatalities? Now go to Data by Location and select that county. Use the population size to determine the cost for the entire county (for 2007 estimates, scroll to the bottom of the page and click on 'Complete Population Data (2000-2007).

In the county where you live, what percent of students did not report any use of alcohol in the past month for 2007?—complete the table below

	Males	Females
6th Graders		
9th Graders		
12th Graders		

In the county where you live, are male students or females students more likely to report binge drinking (having 5 or more drinks in a row on one occasion in the past 2 weeks)?

Which region of MN has the lowest rates of lung, bronchus and trachea cancer deaths? Approximately what percent of lung cancer deaths are smoking-related (hint: read the footnotes)?

Among adults in Minnesota, how do smoking rates differ by age group?

How have youth smoking rates changed over time for your county? For your region?

For the county where you live, are students more likely or less likely than the state average to report first having smoked all or part of a cigarette by the age of 13 or younger?

Is past month marijuana use increasing or decreasing over time among 12th graders in the Metro Region? How does this compare with non-metro 12th graders?

In the county where you live, which drug (other than marijuana) is reported by the highest percentage of students?

Which age group is most likely to be admitted for substance abuse treatment in MN (hint: look under 'All Substances')? Has this changed over time? Are there differences by primary substance of abuse?

Discussion Questions:

If you were asked to name the counties that should be most concerned about drug use problems, other than alcohol or tobacco, what information in SUMN will be most useful?

Why might reported alcohol use be higher than average in a certain county, but the DWI arrest rate lower than average for that same county?

See Appendix A for the answer key.