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Using Archival Data to Develop Local Alcohol, Tobacco, and Other Drug Problem Indicators:

Reference Guide for Community Environmental Prevention

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Using Archival Data to Develop Local Alcohol, Tobacco, and Other Drug Problem Indicators: Reference Guide for Community Environmental Prevention

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This reference guide is part of a series of community guides and manuals entitled :

Guides for States and Communities in Support of Environmental Prevention

The guides and manuals provide instructions to assist States in supporting communities in full implementing and evaluating the effects of environmental prevention strategies focused on alcohol, tobacco and other drug problems. The guides in this series include the following:

- Guide to Strategic Planning of Environmental Prevention Using a Logic Model
- Scientific Evidence for Developing a Local Logic Model On Alcohol-Related Motor Vehicle Crashes: *A Reference Guide for Community Environmental Prevention*
- Scientific Evidence for Developing a Local Logic Model On Underage Drinking: *A Reference Guide for Community Environmental Prevention*
- Collecting Data in Support of a Local Strategic Plan Using a Logic Model: *A Guide for States in Support of Environmental Prevention*
- Using Archival Data to Develop Local Alcohol, Tobacco, and Other Drug Problem Indicators: *Reference Guide for Community Environmental Prevention*
- Creating a Local Prevention Data Storage and Retrieval System: *Guide in Support of a Local Management Information System for Environmental Prevention based upon a Logic Model*
- Implementation and Operation of a Local Strategic Plan for Environmental Prevention: *Guide in Support of a Logic Model*

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I. Introduction to Outcomes

A. Specification of Outcomes

The strategic planning of effective local environmental prevention requires the description of the specific alcohol, tobacco, or other drug (ATOD) problem which is the target or desired outcome. Outcome is a specific variable (event or level) which is the target for ATOD environmental prevention. This may include a level of ATOD use, e.g., High risk drinking over the past 30 days or a consequence of use, e.g., alcohol-related traffic crashes. The outcome variable is the target which is to be changed (usually lowered) as a result of the environmental prevention effort. Outcome evaluation has the purpose of documenting that the outcome variable has changed over time . Outcomes can include:

a. **Consumption and High Risk Use**. Patterns of use of alcohol, tobacco, and other drugs including initiation or first use, regular or typical use, and/or high risk use (amount, frequency, and situation/settings of use.

b. **Social, Health, and Safety Problems associated with ATOD use**. Outcomes including mortality and morbidity or undesired events for which one or more ATOD substance is clearly or consistently involved. While specific ATOD use may not be the single cause of a problem, scientific evidence must support a causal link to ATOD use as a contributing factor to the problem.

The purpose of this guide is to describe alternative substance-related social, health, and safety problems for which local outcome indicators could be developed in order to measure the effects of local environmental prevention efforts, i.e., **in other words to support an evaluation if there was a reduction in the targeted outcome(s) as a result of environmental prevention.** *Measurements of ATOD consumption and high risk use based upon self reports will be covered in a separate guide.*

In general, while a specific community will likely only utilize one or a couple of these ATOD indicators as relevant to their strategic plan goal, technical support from the state can develop some or all of these indicators in order to have them available in support of local strategic plans and evaluation of community environmental prevention effects or outcomes. This guide is a compliment to the Collecting Data in Support of a Local Strategic Plan Using a Logic Model: A Guide for States in Support of Environmental Prevention which describes local measurements of intermediate variables and strategies which form a type of Management Information System (MIS). The MIS can be used by a local environmental prevention effort to Monitor and Modify (M&M) the local effort based upon changes in key intermediate variables which were defined in the local strategic plan for environmental prevention. See Guide to Strategic Planning for Environmental Prevention Using a Logic Model.

In addition, outcome indicators provide a measure for the community (and the state) which can be used as a compliment to self-reported substance use, i.e., these indicators can provide evidence of other benefits resulting from local environmental prevention as well as used to calculate the cost/benefits (in economic terms) of any effective local environmental prevention effort. For example, if underage drinking is reduced by an effective program, it is possible that this reduction will also result in fewer alcohol-involved traffic crashes for this age group (See example by Wagenaar, et al, 2000).

Wagenaar AC, Murray DM & Toomey TL. (2000). Communities mobilizing for change on alcohol (CMCA): Effects of a randomized trial on arrests and traffic crashes. Addiction, 95(2), 209-17.

Note: The current version of this guide has focused on alcohol-involved outcomes with only a brief introduction of outcomes for Tobacco and Drugs. Other ATOD outcomes will be more extensively developed in later versions of this guide.

B. Time Series Outcome Data for Local Communities

Using archival data which covers several years enables one to build a time series of the total counts on each outcome specified in this guide. A time series is composed of a series of simple counts or totals for each relevant outcome per time period in a community. The recommended minimum time period to utilize in developing historical totals is monthly. Thus a time series for a community would be composed of monthly totals over as long a historical period for which data is available.

Always begin with the oldest historical records available and work forward in time to the most recently available data. Time series data have a number of advantages for outcome evaluation. First, any outcome measures will vary from month to month, quarter to quarter, and year to year due to factors which have little or nothing to do with the local prevention program being evaluated. Such factors as historical trends, economics, population grown or decline, etc. can significant influence the number and pattern of any outcome measurements. Such factors must be accounted for in undertaking analyses to correctly attribute any effects (changes in the outcome) to the local environmental prevention effort.

Second, the longer the historical data available, the more informed a community can become about what has been the historical patterns of the outcome over a long term. This may be reflected in upward or downward trends as well as simple natural variation. In short the *more monthly totals which are available, the more useful information a community prevention effort will have.* Important management information for a local environmental prevention effort includes knowing the incident or number of cases of the outcome actually occurring in the community and determining if the outcome is increasing or decreasing prior to the intervention. For example, if an outcome measure, say alcohol-involved traffic crashes are increasing prior to the program and this upward continues during the time of the local prevention effort, it is possible that a simple pre and post set of measures would suggest that the prevention effort did not have any effect, when actually the upward trend is a result of factors other than the environmental prevention effort itself.

In general, the longer the time series available the better the ability of the statistical analyses to rule out other interpretations and the easier to detect real prevention effects in any changes in the outcome measure.

Following are recommendations concerning developing outcome data for local environmental prevention efforts:

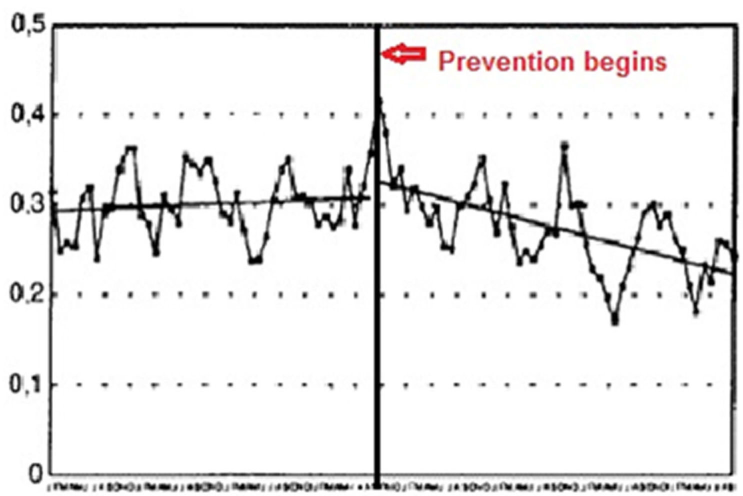
1. Utilize a monthly specific total for each outcome measurement. Even if there are few cases (even no cases) for any month, monthly totals can be aggregated upward later to longer time periods as needed including quarterly (every 3 months) or biannually (every 6 months). Annual data is difficult to use for outcome evaluation.

2. Prepare a time series of at least 4-5 years for each local geographical area with at least 12 months before the prevention intervention began. One rule of thumb for conducting statistical analyses of time series data, i.e., to identify correctly the effects of a prevention intervention, is to have (a) a minimum of 12 observations before and 12 observations after the prevention intervention has begun but also (b) a minimum of 50 observations in total. This means if there is only 12 months of pre-intervention data available, one needs an additional 48 months of data. This leads to the next recommendation.

3. Utilize the oldest available historical records or archives which cover the relevant outcomes, then work forward to the most recently available data. By taking advantage of as many pre-intervention historical monthly data, it can be possible to reduce the number of after intervention data necessary to a minimum of 12 months (assuming 48 months of pre-intervention data is available). Obviously, in practical terms the longer the total time series, the easier it can be to detect prevention effects.

4. Utilize the smallest relevant geographical unit for aggregating monthly totals. If the geographical areas for local prevention analyses are well known and specified in terms of prevention responsibilities, e.g., all individual counties, then those county specific codes can be used to create local totals by month. If the geographical areas for local prevention may well vary in the future or there is a need for smaller area analyses, e.g., by zip code or census tract, or neighborhood, then utilize the geographical area specific codes to provide data on the specific outcome(s). These monthly totals can also be aggregated to cover larger and larger geographical areas as needed.

An example of a time series plot of alcohol-involved crashes is shown below. This illustrates the pattern of the ratio of alcohol-involved injury crashes to non-alcohol involved injury crashes prior to the beginning of prevention and shows the effect of prevention (line which slopes downward. This illustrates the type of outcome this guide seeks to provide for local environmental prevention efforts.



Total monthly counts of outcome measurements have been discussed. While unadjusted totals can certainly be utilized (plotted) to demonstrate historical and recent trends and patterns, the plots and analyses for evaluation of the overall population level effects of the local environmental prevention effort can also be helped by utilizing adjusted monthly totals or even creating quarterly totals. This can achieve more stable **values,** i.e., the time series data have less variance (jump around less) and are better able to show trends. Possible adjustments of monthly value can include creating ratios in which the denominator is (a) population, e.g., total, over 21, under 21 years only, 18-25 years only , etc., or (b) total events, e.g., all crashes or all injuries, to a total count of alcohol-involved events (outcome). This ratio can be more stable. In addition, just as with the example above, straight lines can also be used on monthly (or quarterly) totals to demonstrate trends.

Monthly totals result from a number of factors which are not directly related to the local environmental prevention interventions including seasons and therefore plots of monthly total will most certainly show variations (in some cases wide variations) in plots of monthly totals for a community or local area. This is to be expected and if statistical analyses are being performed, e.g., ARIMA (interrupted time series analyses), such seasonal variations or historical trends can be account for. However, at this point, a useable plot of monthly totals for the community is most important. The creation of ratios for monthly totals (as described above) is one means to develop useful plots.

Another approach to create local area plots of outcomes is to utilize a **Moving Average**. This technique is to derive an average value per month (or time period) which smoothes out some of the variability over time. One popular technique is to calculate an average of three months for each monthly value, i.e., sum the monthly value prior, the current monthly value, and the monthly value following and divide by 3 (an average over three months). Thus if the total for June is 55, the total for July is 102, and the total for August is 23, this series of values is quite variable. Thus one can create a moving average for July by summing (55+102+23)/ 3 =180/3=60 . Then if the total for September is 69, then the moving average for August is (102+23+69)/3=194/3=64.6 . Continuing this process over the entire series of monthly total provides a much smoother plot for visual inspection. It is also possible (depending upon the situation) to create 6 month moving averages if necessary.

C. Accuracy and Evaluation of the Effects of a Local Environmental Prevention Effort

Local environmental prevention seeks to affect the specific outcome targeted in its strategic plan. However, there is no single valid measurement of this outcome as one can safely observe that **no** measurement of any alcohol-related outcome is totally accurate and that all measurements are, in the final analysis, estimates. In other words, the full extent of alcohol's involvement in any type of health or safety problem is NOT based on a consistently direct measurement of the blood alcohol concentration (BAC) of all individuals involved, whether the result of a traffic crash, fall, burn, drowning, or violent event. Even efforts to produce valid measurements of alcohol-involved harm for epidemiology are **estimates.**

This good news for local prevention is that a proper evaluation of population-level effects is practically possible and necessary and does NOT require a single valid or representative value for the entire population. Thus, **the same standards utilized in research or in epidemiology are not always necessary** for local environmental prevention outcome evaluation. For example, if alcohol-involved traffic crashes are the target outcome, there are (as will be shown in the following section) alternative ways to measure this outcome utilizing archival data, each with its own unique advantages and disadvantages. If the geographical area served by the environmental prevention effort has a small population, some types of crash indicators described will simply be too infrequent to be useful.

Further, because some alcohol-involved crashes are recognized and designated in crash records while others that are alcohol-involved are excluded or missed, any specific count does not provide a totally accurate count of problem magnitude. However, each may be useful in gauging trends over time in its own way.

Bottom Line : The most significant standard for local environmental prevention effects evaluation is to utilize the same outcome indicator over time in a consistent and unchanging fashion. This enables the local prevention effort to assess if the outcome is changing over time and then whether this change is the result of prevention strategies implemented. For example, effects can be estimated by determining the month(s) the outcome indicator changed, and if this change was associated in time with implementation and strength of environmental strategies. In practice, utilizing more than one outcome indicator increases ones confidence in attributing any observed outcome changes to the local environmental prevention effort. This guide is dedicated to supporting prevention evaluation by suggesting alternative means to utilize existing archival data to measure outcomes for local prevention.

II. Alcohol and Related Problems

Alcohol is a legal commodity for adults and can be a source of pleasure for moderate drinkers. Alcohol also contains as an active ingredient ethanol which is psychoactive and even at moderate levels can reduce the ability of a drinker to carry out complex tasks such as safely driving an automobile or making safe and reasonable choices about his/her behavior in risky situations as swimming or boating or climbing which can increase the risk of injury or even death.

Therefore, indicators of potential alcohol involvement in acute events such as traffic crashes or injuries or assaults can be used in the evaluation of a local community environmental prevention efforts when those efforts have the potential to reduce high risk drinking and associated harm.

A-1 Alcohol-Involved Traffic Crashes

Introduction

Automobile crashes cause substantial death and injury to motor vehicle occupants and to pedestrians. They also result in property damage. These outcomes involve pain and suffering, added costs of medical care, police enforcement, insurance, and lost work. Automobile crashes are the leading cause of injury deaths in the United States.

In 2009, there were 10,839 fatalities in crashes involving a driver with a BAC of .08 or higher – 32 percent of total traffic fatalities for the year. Of the 10,839 people who died in alcohol-impaired-driving crashes in 2009, 7,281 (67%) were drivers with a BAC of .08 or higher. The remaining fatalities consisted of 2,891 (27%) motor vehicle occupants and 667 (6%) nonoccupants. In 2009, a total of 1,314 children age 14 and younger were killed in motor vehicle traffic crashes. Of those 1,314 fatalities, 181 (14%) occurred in alcohol-impaired driving crashes. Out of those 181 deaths, 92 (51%) were occupants of a vehicle with a driver who had a BAC level of .08 or higher, and another 27 children (15%) were pedestrians or pedalcyclists struck by drivers with a BAC of .08 or higher. The rate of alcohol impairment among drivers involved in fatal crashes in 2009 was four times higher at night than during the day (37% versus 9%). In 2009, 16 percent of all drivers involved in fatal crashes during the week were alcohol-impaired, compared to 31 percent on weekends. In 2009, 6,685 (56%) of the drivers involved in fatal crashes who had been drinking had a BAC of .15 or greater.

Recent trend data shows is a decline in alcohol-involved fatal crashes. For example, the National Highway Traffic Safety Administration found that the percent of alcohol-impaired driving fatalities has declined from 48 percent in 1982 to 32 percent in 2009. Alcohol-involved crashes are defined as those in which at least one of the drivers had been drinking at any level. However, the contribution of drinking to crashes is still very high.

Correcting for police underreporting of alcohol involvement, Miller, Lestina, & Spicer (1998) estimate that 15 percent of the nonfatal injury victims are in crashes involving a driver with BAC of at least 0.01 percent. Of alcohol involved crashes, they find that 80 percent of victims in fatal crashes and 95 percent of victims in non-fatal crashes involve a driver with BAC of at least 0.10 percent. Among fatal crashes occurring between the hours of 8:00 p.m. and 4:00 a.m., alcohol involvement, especially on weekends, may be as high as 80 percent (Fell & Nash, 1989), and alcohol is involved in most single-vehicle nighttime fatal crashes (Hereen, Smith, Moorlock, & Hingson, 1985; Ostrom & Eriksson, 1993

Drinking and Driving Impairment

One question which can arise is "why not simply use crashes in which at least one driver is clearly drinking or has been charged with a DUI"? The answer is that alcohol even in small quantities impairs any driver. Thus, alcohol increases the risk of crashes for drivers due to its effect on specific driving-related skills, well before the BAC level reaches the legal limit in every state. These skills may be divided into cognitive skills, such as information processing, and psychomotor skills (those involving eye-brain-hand coordination). Impairment can be inferred in terms of alcohol's concentration in the blood, i.e., blood alcohol concentration (BAC). A driver's eyes must focus briefly on important objects in the visual field and track them as they (and the vehicle) move. Alcohol can interfere with voluntary eye movements even with low to moderate BAC's (0.03 to 0.05 percent thus impairing the eye's ability to rapidly track a moving target Busloff, S.E. (1993) and Katoh (1988).

Steering is a complex psychomotor task in which alcohol effects on eye-to-hand reaction time are superimposed upon the visual effects described above. Significant impairment in steering ability may begin as low as approximately 0.035 percent BAC and rises as BAC increases (Linnoila, et al, 1980).

Alcohol-impaired drivers require more time to read a street sign or to respond to a traffic signal than unimpaired drivers; consequently, they tend to look at fewer sources of information. The most sensitive aspect of driving performance is the division of attention among component skills. Drivers must maintain their vehicles in the proper lane and direction (a tracking task) while monitoring the environment for vital safety information, such as other vehicles, traffic signals, and pedestrians. Therefore, alcohol-impaired drivers are less vigilant about safety. Results of numerous laboratory studies indicate that divided attention deficits occur as low as 0.02 percent BAC (Moskowitz and Burns, 1990).

Population level studies find a strong relationship between alcohol use and traffic crashes. For example, Gruenewald and Ponicki (1995) find that fatal crash rates vary closely with beer sales, less closely with spirits sales, and are relatively unaffected by wine sales. A similar pattern is found at the individual level (Perrine, Peck, & Fell, 1989).

Sources of Archival Traffic Crash Data: There exist two major sources for data concerning traffic crashes which can be used, The Fatal Accident Reporting System, National Highway Traffic Safety Administration, U.S. Department of Justice and the state and local crash records from each state.

The Fatal Accident Reporting System

The Fatal Accident Reporting System (FARS) tracks the numbers of crashes, injuries, and deaths in fatal crashes (NHTSA, 1995). Local police records are passed on to State administrators, and then sent to NHTSA where the data is entered to include time, date, and day of crash, characterization of the crash event (e.g., single vehicle involved), fatalities and injuries, alcohol involvement, and location information (e.g., designated street intersection). The data may be used to estimate single-vehicle fatal crashes, and BAC involved and police-reported fatal crashes. When BAC levels of drivers in fatal crashes are missing, they are estimated from a statistical algorithm by NHTSA that is available on request.

Measurement Considerations: FARS is generally considered the most accurate and complete source for fatal crash data. The strength of FARS is the direct measurement of the blood alcohol level of every dead driver which can be used to infer alcohol involvement in the crash. However, FARS data represents a substantial under estimate of the actual drinking and driving on the roadway. This results from the requirement that at least one driver in any traffic crash be dead. If all drivers survive the crash, then the crash is not included in the data base. In addition, for the purposes of evaluation, the number of crashes in which there are dead drivers to be tested is much smaller than the number of total traffic crashes. These smaller numbers become more problematic for prevention evaluation in geographical areas, such as communities or towns, where the actual number of such fatal driver crashes which occur is relative small and thus statistically unstable for estimating prevention strategy effects.

State and Local Traffic Crash Records

Although NHTSA estimates nonfatal crash rates through its General Estimates System (based on a sampling of police reports from about 20 States; NHTSA, 1992), no Federal agency compiles data on all injury crashes. State and local level databases do, however, typically contain both fatal and nonfatal crash data. One example is the California State-Wide Integrated Traffic Reporting System (SWITRS), which compiles data similar to FARS for every reported crash. Data can generally be obtained on the number of fatalities, injuries by police-reported severity, and property damage only (PDO) crashes.

Measurement Considerations: Some State level databases, such as SWITRS in California, provide high quality information on both fatal and nonfatal crashes. However, reporting requirements and police procedures for handling crashes vary across States and over time. For example, some States do not recode as fatalities those dying after leaving the scene. Variations in the way police report traffic crashes and specifically alcohol involvement in such crashes should be taken into consideration when utilizing state crash records.

Indicators of Alcohol-Involvement in Traffic Crashes

The ideal indicator would result from a consistent testing of all drivers for blood alcohol concentration (BAC) involved in every crash in every state. Unfortunately, consistent testing of the blood alcohol level of each driver involved in a crash does not occur. The closest reporting to this ideal is FARS. Unfortunately, this indicator is a substantial under estimate of the actual drinking and driving on the roadway. This results from the requirement that at least one driver in any traffic crash be dead. If all drivers survive the crash, then the crash is not included in the data base. In addition, for the purposes of evaluation, the number of crashes in which there are dead drivers to be tested is much smaller than the number of total traffic crashes in which at least one alcohol-impaired driver is involved. These smaller numbers become more problematic for prevention evaluation in geographical areas, such as communities or towns, where the actual number of such fatal driver crashes is often rare.

The field of drinking and driving prevention has explored a series of alternative indicators which have potentially high reliability and validity, typically based upon state and local crash records. One key element is the determination of factors in crashes which are highly indicative of alcohol-involvement. For example, An analysis of drivers (N=717) being treated in emergency rooms for injuries involving traffic crashes and their crash records by Waller et al (1997) found the following factors associated with alcohol-involved traffic crashes:

Single Vehicle: Slightly over 30 percent of all the crashes were single vehicle. Drivers testing positive for alcohol were much more likely to be in single vehicle crashes (66.7%, $p < .001$), but drug use was not associated with this crash variable.

Time of Day: Almost 28 percent of all crashes occurred at night. Alcohol positive drivers were more likely to have nighttime crashes (62.7%, $p < .001$), but drug use was not significantly related to this variable.

Weekday/Weekend: Most crashes occurred during the week, with only 29 percent occurring on weekends. For drivers with neither alcohol nor drugs, 24.8 percent of crashes occurred on weekends. Those testing positive for alcohol were much more likely to have weekend crashes (45.1%, $p < .001$).

As a result of such studies, a frequently used indicator is Single Vehicle Nighttime (SVN) crashes, i.e., crashes involving only one driver which occur between the hours of 8 pm and 4 am. Other indicators of alcohol-involved crashes which have been used include all nighttime crashes, crashes involving injuries, and weekend crashes which do have higher than average alcohol involvement than day time, week day, and non injury crashes.

There are a number of alternative measurements which are of potential value to outcome evaluation of local environmental prevention efforts.

Alcohol Involvement in Crashes Based on Police Reports

Many States now require State and local police to report possible alcohol involvement among drivers in traffic crashes. They may be based on BAC, breathalyzer, motor skills tests, or just observation. Fatal crash reports often include a statement by police at the scene of the crash about alcohol involvement. The investigating officer indicates on the crash report if alcohol and/or drugs are suspected. Waller (1971) utilized autopsies and BAC data compared with police recording of drinking by fatally injured drivers and pedestrians found that over 20 percent of the time, alcohol was not mentioned in the police report. When alcohol was mentioned, its presence was usually underestimated. The study found that alcohol was least likely to be reported among persons age 60 or older, pedestrians, nonresponsible fatalities, and drivers of new cars and was most often reported among younger persons, drivers responsible for two-vehicle crashes, and drivers of older cars.

Waller et al (1997) found that alcohol use was suspected in 19 percent of all the crashes, but the proportion varied according to the actual use of alcohol and drugs. Drivers who tested negative for both alcohol and drugs were rarely suspected of using alcohol (only 1% of the crashes). However, for drivers who tested positive for alcohol, officers correctly suspected alcohol 82 percent of the time ($p < .001$). There was also a trend for drug use to be associated with a higher probability of the officer suspecting alcohol ($p = .0014$). In addition, there was a tendency toward an alcohol/drug interaction in relation to the probability of the officer suspecting alcohol use, that is, the combination of alcohol plus drugs increased the likelihood of the officer suspecting alcohol (p = .0019). See Waller et al (1997).

Measurement Considerations: Officer indication of alcohol involvement in traffic crashes is in most states almost always included, i.e., it has been estimated that only 5 percent of crash reports lack this indication. However, there is a general underreporting of alcohol involvement because of lack of testing, uncertainty from test results, and failure to report low levels of alcohol use. National estimates of the extent of police underreporting for the number of crashes and the alcohol-involvement of drivers are available in Blincoe (1996) and Miller and Blincoe (1994), but these rates are likely to vary across States. Mounce, et al (1988) in a direct comparison of fatal crashes in which BAC data were available, found that while 59% of fatal drivers had BAC>0.0, police reported alcohol involvement in only 23% of these cases and of the 1,649 drivers who had measurable levels of BAC, only 37% were coded as have alcohol involvement by police. *It should be noted that many of the direct comparisons were undertaken some years ago and that with the current emphasis on drinking and driving, the officer reports can be to closer to the actual percentage of drivers who had been drinking with an underestimate of drivers with BAC >0.0 but <0.08* .

Alcohol-Involvement in Fatal Crashes Based on BAC Tests

Many States require State and local police to determine the BAC level of drivers in fatal traffic crashes. Fatal crash reports forwarded to State and national governments, thus, often include the BAC of the driver.

Measurement Considerations: Reliable BAC testing of drivers in fatal crashes (where victims died at the scene) is becoming available in most States. The indicator is most reliable in States where most fatal crash drivers are tested. Care should be taken in making comparisons over time or across States, because of variations in the proportion of drivers tested and local crash handling procedures (Heeren, Smith, Moorlock, & Hingson, 1985; Zylman, 1974). Reports based on BAC tests for non-fatal crashes are generally prone to selective testing and greater variations in testing procedures.

Single-Vehicle Fatal Crashes

Single-vehicle fatal crashes are generally defined as crashes in which a single, noncommercial vehicle strikes a nonmoving object in its environment. Certain types of crashes may be excluded, such as bicycle- and motorcycle-involved crashes.

Measurement Considerations: Single-vehicle fatal crashes are generally fully reported to NHTSA and are not subject to problems of officer discretion in reporting (Fell & Nash, 1989). Because some alcohol-involved crashes are included and others that are alcohol-involved are excluded (e.g., those where a drinking driver causes a crash with other vehicles), this measure does not provide an accurate measure of problem magnitude, but it is useful in gauging trends over time. Because of the small number of occurrences, the index is suitable only for areas with at least the population of large cities (Saltz, Hennesey, & Gruenewald, 1992).

Single-Vehicle Nighttime Crashes

Single vehicle nighttime crashes are those involving only one driver which occur between the hours of 8 pm and 4 am. Even more sensitive to drinking and driving are these same crashes which occur only on Friday and Saturday nights. Although definitions of nighttime vary (8 p.m. to 4 a.m., Fell & Nash, 1989; 8 p.m. to 8 a.m., Gruenewald & Ponicki, 1995; 12 a.m. to 3 a.m., Zador, Lund, Fields, & Winberg, 1989), alcohol involvement in single-vehicle crashes appears to peak between the hours of 12 a.m. and 4 a.m. (Gruenewald & Ponicki, 1995; Zador et al., 1989). These crashes have been demonstrated to have high association with crashes in which the driver had been drinking. See Mounce, N., O. Pendleton, and O. Gonzales, (1988), and Richman (1985). Further, Heeren et al (1985) concluded that single vehicle nighttime (SVN) indicator was closely related to alcohol-related crashes involving drivers with known BACs. As a result of the assessment of the single vehicle nighttime crashes indicator, it has been used successful in a large number of studies to evaluate alcohol prevention and policy interventions. See reference list. The development of this indicator requires access to state and/or local crash data over time.

Nighttime fatal traffic crashes

Fatal crashes involving a single, noncommercial vehicle can have alcohol-involvement as high as 80 percent and if limited to night time crashes which occur during the weekend, can be utilized with even greater confidence.

Measurement Considerations: This indicator, though having a relative high associated with alcohol-involvement, will produce fewer events than other indicators. For example, Single-vehicle nighttime crashes are more common and thus provide more stable indices of drunken driving than single vehicle fatal crashes. Variations in local crash-handling procedures are likely to be small, unless the threshold for reporting crashes changes. Like single-vehicle fatal crashes, they include some crashes that do not involve alcohol and exclude some crashes that involve alcohol. Consequently, they are useful for tracking trends or changes in crashes, but not for measuring the exact level of the drinking and driving problem in any community.

Recommended Indicators in Order of Priority and Practical Usefulness for Local Outcome Evaluation

Minimum if Available:

Alcohol-involved Crashes: Crashes in which the officer notes that at least one driver had been drinking. This indicator from state and local traffic crash data is often easily available. Note: These crashes are based either upon the officer's judgment or BAC tests. These counts are likely an underestimate of the actual level of alcohol-involved traffic crashes at a local level and may be influenced by varying enforcement emphases on drinking and driving. These indicators are typically available in every state crash record and will likely produce higher numbers of crashes than fatal crash records. **Recommendation: compliment this measure with at least one of the indicators below.**

Alternatives (Use at least one depending upon population size)

Single vehicle nighttime crashes: Crashes involving only one non-commercial vehicle which occur between 8 pm and 4 am based upon state crash records. These types of crashes have been shown to be especially related to a drinking and driving. Even more sensitive to drinking and driving are these same crashes which occur only on Friday and Saturday nights. This indicator is even more sensitive if there are sufficient numbers of cases in the geographical area. *Voas, et al (2009) has recommended that for nonfatal crashes, a more accurate surrogate measure would be achieved by using only late nighttime (after-midnight) single-vehicle crashes* but this will yield fewer cases and potentially create problems in conducting statistical analyses.

Nighttime Injury crashes: Crashes which occur between 8 pm and 4 am and in which at least one person is injured based upon state crash records. These types of crashes often involve at least one drinking driver. When at least one person is injured in the crash, the crash is more likely to be serious and thus the risk of at least one drinking driver is increased.

Nighttime Crashes: Crashes which occur between 8 pm and 4 am based upon state crash records. Crashes which occur between these times often involve at least one drinking driver. Rogers (1995) found a remarkable similarity in the effect sizes of counts of fatal and serious injury crashes).

Fatal Traffic Crashes Involving Alcohol: Crashes in which at least one person is killed. Available from the Fatal Alcohol Reporting System (FARS) at the National Highway Traffic Administration as well as state or local vehicle crash records. *Note: Fatal crashes are infrequent enough to make them unstable (and perhaps unusable) at the local level, due to small general populations.*

Single Vehicle Fatal Crashes: Such crashes are those in which at least one driver was killed and involved only one vehicle based upon state and local traffic crash data. *Note: These crashes are infrequent enough to make them unstable (and perhaps unusable) at the local level, due to small general populations and the requirement of being a single vehicle creates even lower numbers of crashes.* FARS provides similar data but has an indication of alcohol's involvement (directly measure or estimated) and produces even smaller number of events than all single vehicle fatal crashes.

Recommended Steps:

Step 1: Identify the indicator(s) which is/are most appropriate to the geographical area or population and the defined outcome of the strategic plan. It is strongly recommended that more than one indicator be developed which enables confirming evidence of potential effect across two or more measures as well as allows the outcome evaluation to be less impacted by small sample sizes or changes in measurement over time which have little to do with the local prevention effort.

Step 2: Conduct a search of all available traffic crash records to identify and create a file of all traffic crashes which meet the criteria for each of the selected alternative measurements of alcohol-involved traffic crashes. *It is suggested that police officer reported "alcohol-involved" or "had been drinking" crashes also be included since these crashes are already specifically coded for alcohol and can be used as a comparison against any other surrogates.*

Step 3: Search through the data file resulting from Step 2 to develop monthly counts for each alcohol-involved traffic crash indicator for the smallest geographical area or the areas which are most appropriate to outcome evaluation of local environmental prevention efforts. Utilize the smallest relevant geographical unit for aggregating monthly totals. If the geographical areas for local prevention analyses are well known and specified in terms of prevention responsibilities, e.g., all counties, then those codes can be used to create local totals by month. If the geographical areas for local prevention may well vary in the future or there is a need for smaller area analyses, e.g., by zip code or census tract, or neighborhood, then utilize those codes which provide the smallest geographical area monthly totals for the specific outcome. These monthly totals can also be aggregated to cover larger and larger geographical areas as needed.

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A-2 Alcohol-Involved Injuries and Death

Introduction

In 2007 in the United States, injuries, including all causes of unintentional and violence-related injuries combined, accounted for 51% of all deaths among persons ages 1-44 years of age, that is, more deaths than non-communicable diseases and infectious diseases combined according to Centers for Disease Control. More than 180,000 deaths from injury each year, i.e., 1 person every 3 minutes. More than 2.8 million people hospitalized with injury each year. In 2007 29,757,000 persons were treated for nonfatal injuries in U.S. hospital emergency departments. The leading causes of death in order for all ages are, heart disease, cancer, stroke, Chronic lower respiratory diseases, and accidents (unintentional injuries). Injuries are the leading cause of death for persons under 45 years old.

Alcohol consumption can increase the risk of such acute events, e.g., injuries and death. As a result indicators of alcohol-involved death and injury can be important outcome measurements for local environmental prevention efforts, especially if these efforts target or can affect heavy drinking. Epidemiological studies of alcohol-involved accidental injury and deaths confirm that the present of alcohol in a person's blood can increase risks of both injury and/or death. This relationship is demonstrated in a recent review of international emergency room studies which found consistent and frequent evidence of alcohol-involvement in injury cases appearing in emergency rooms (Cherpitel, Ye, and Bond, 2005, and Cherpitel, 2007). Injury cases which appear in emergency rooms or hospital admissions for treatment can result from unintentional or accidental injuries or from intentional or violence-related injuries. The total for all alcohol-involved injuries (or deaths) is the sum of both types and would appear to be the most relevant outcome for environmental prevention efforts in which high-risk or binge drinking is the target. See discussion of emergency room studies of alcohol-involvement in injuries in Cherpitel, et al, 2009.

Note: If appropriate to the goals of the local prevention effort, then injuries can be separated into alcohol-involved unintentional injuries and death or intentional injuries or death. In this section, total injuries of all causes are discussed for possible utilizing in evaluating local environmental prevention with the provision for developing separate unintentional and intentional injuries if desired.

Unintentional or accidental injuries or deaths

Howland and Hingson (1987) in what was an early effort to summarize epidemiological studies concerning the role of alcohol in fires and burns concluded that in the greatest majority of cases alcohol exposure was more likely among those who died in fires ignited by cigarettes than those attributable to other causes. More recently Levy, et al (2002) analyzed Oklahoma hospital data in which a BAC level was collected and found of 5,107 cases studied, alcohol involvement was known for (93%), such that of these cases fire and burn cases with alcohol involvement (BAC>0.0) were 96%, scald and other burns (87%), submersions (94%) and spinal cord injuries (92%).

Johnson and McGovern (2004) found that the blood alcohol concentration (BAC) of injury patients was positively associated with severity of falls such that there were lower incidences of severe falls among patients who had a lower BAC. They concluded that alcohol-related falls are more often associated with severe craniofacial injury and the severity of both limb and head injuries correlate directly with BAC level. Havard, et al (2008) found that efforts to intervene with alcohol-involved injury patients treated in an emergency room were not consistently successful, but that the ER represents a potential site for such intervention in patients who injury is associated with a heavy drinking event.

Intentional or violent injuries

Violence or intentional injury events are also associated with drinking by the perpetrator, the victim, or both. Thus, drinking on the part of the victim or a perpetrator can substantially the risk of intentional injury or death e.g., assaults or murder. Violent injuries or death are serious public health and safety problems and such events, especially more serious assaults involve drinking related to the impairment caused by drinking, i.e., a significant percentage of intentional injury or death involve drinking. For example, epidemiological studies of homicide victims have demonstrated that up to 50% of murder victims had been drinking at the time of death.

Cherpitel (1993) interviewed and breathalyzed a sample of 1770 adult ER patients in four hospitals in a single California suburb county. Among all males and females over 30, those with violence-related injuries were more likely than those with other injuries to have positive breathalyzer readings and to report drinking prior to the event, frequent heavy drinking, consequences of drinking, experiences associated with alcohol dependence and loss of control and prior treatment for an alcohol problem. Swahn, et al (2004) found that problem drinking adolescent drinkers who reported peer drinking were more likely to engage in physical fighting, being injured, and injuring others in fights than drinkers who did not report these drinking behaviors even after controlling for drinking frequency and binge drinking. Demetriades (2004) found that 42.7% of 931 trauma deaths tested alcohol or drug positive. Male victims were significantly more likely to have a positive screen than female patients (46.1% versus 26.7%, p = 0.0003). They concluded that there is a high rate of alcohol and illicit drug use in patients who die from trauma, especially penetrating trauma in men aged 15 to 50 years, who are Hispanic or African American. Victims with penetrating trauma and positive toxicology are considerably more likely to have no vital signs on admission than victims with negative toxicology.

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Alternative Indicators of Alcohol-Involved Injuries or Death Using Archive Records--Overview

If all admitted accidental injury cases resulting had a systematic and consistent blood testing to determine if alcohol was present during the time of the injury, then injuries with an alcohol positive measure (BAC >0.0) would be a clearly preferred indicator. However, in practice it is rare for blood testing to be done (or if done to be recorded in the hospital discharge record due to legal and confidentially issues) and thus the consistency of alcohol being mentioned in any set of hospital discharge records may be unknown. As a consequence, estimates based upon the measurement or indication of the presence (or absence) of alcohol or drugs in the individual patient records if they exist at all are likely to be a serious under reporting of alcohol involvement even if such measurements were consistently taken.

Note: while a victim of violence impaired by his/her drinking has increased risk of harm from others, it is highly likely the perpetrator may have also been drinking and thus also impaired. It is unlikely that any indication of the impairment level of the perpetrator will exist in the hospital records but data from violent or intentional injury patients can provide useful longitudinal data for local outcome evaluation. Of course, hospital treatment records only cover persons sufficiently injured to need medical care (either emergency room only or hospitalization) and there is no information about the drinking of the person(s) who inflicted the injury.

Intentional or assault injuries only: Since violent injuries and death can involve drinking by others including the person who is injured or killed intentionally, separating alcohol-involved unintentional injuries from the total may be relevant to the specific target outcome of the local environmental prevention effort. As a consequence some of the same alternatives described below are potential candidates for counts of intentional accidents only if there is a coding of reason for injury accident or violence which enables these records to be separated for independent analyses.

In one example of the potential of utilizing assault injuries only as part of an outcome evaluation of environmental prevention which produces changes in alcohol-availability (and high risk drinking), Ray, et al, (2008) performed a population-based case-crossover analysis of all persons aged 13 years and older hospitalized for assault injuries in Ontario from 1 April 2002 to 1 December 2004. On the day prior to each assault case's hospitalization, the volume of alcohol sold at the store in closest proximity to the victim's home was compared to the volume of alcohol sold at the same store earlier. Conditional logistic regression analysis was used to determine the associated relative risk (RR) of assault per 1,000 liter higher of daily alcohol. Of the 3,212 persons admitted to hospital for assault, nearly 25% were between the ages of 13 and 20, and 83% were male. A total of 1,150 assaults (36%) involved the use of a sharp or blunt weapon, and 1,532 (48%) arose during an unarmed brawl or fight. For every 1,000 liter more of alcohol sold per store per day, the relative risk of being hospitalized for assault was 1.13 (95% confidence interval [CI] 1.02–1.26). The risk was accentuated for males (1.18, 95% CI 1.05–1.33), youth aged 13 to 20 y (1.21, 95% CI 0.99–1.46), and those in urban areas (1.19, 95% CI 1.06–1.35). They concluded that the risk of being a victim of serious assault increases with alcohol sales, especially among young urban men. This study further confirms the potential of changes in local alcohol sales to be associated with changes in assaults requiring medical treatment. The results also provide empirical support for using hospitalized injuries as an indicator of potential alcohol-involved assault injuries in evaluating outcomes of community environmental prevention.

Alternative Measurement 1: Total Injury cases based upon hospital admissions (or discharges)

Acute (in the moment) injuries, especially for more serious injuries, have increased risk (no matter their cause) if the person injured had been drinking. Measures of injuries through hospital records can provide potentially useful indicators of potentially alcohol-related injuries in assessing the effect or impact of environmental prevention which is targeted toward reducing heavy high risk drinking. Non-fatal injuries occur more frequently than fatal injuries and thus indicators of non-fatal injuries increases the possibility of using counts of total injuries as an outcome indicator in lower population states or in communities.

Medical treatment is typically coded in hospitals using the International Classification of Diseases (ICD) and the type of treatment or condition needing treatment is the emphasis of ICD classification. While not consistently required across all states, the coding of medical condition is expressed in more than one diagnosis which enables the medical care professionals to provide what they consider to be the primary condition but also other aspects of the condition in secondary diagnosis fields. For example, a patient might received an ICD Code for internal bleeding as a primary diagnosis but also include a second (or later diagnosis) of 801.1 Fracture of skull_which shows that the internal bleeding resulted from an injury to the head. If further, there is an E Code for E810 motor vehicle, we have a more complete picture of a person with a serious head injury resulting from a motor vehicle crash, which the primary diagnosis alone would not provide.

Injury has been defined by Lawrence, et al (2007) as *any ill effect that results from trauma or poisoning unrelated to medical care* (but which requires some level of medical care). Within the basic ICD-9-CM, a second set of supplemental codes (E codes) can be used to specify the external causes of the injuries and provide additional essential information concerning an injury diagnosis. External causes of injury and poisoning codes (E codes) are intended to provide data for injury research and evaluation of injury prevention strategies. E codes capture how the injury or poisoning happened (cause), the intent (unintentional or accidental; or intentional, such as suicide or assault), and the place where the event occurred. Some major categories of E codes include: transport accidents, poisoning and adverse effects of drugs, medicinal substances and biological, accidental falls, accidents caused by fire and flames, accidents due to natural and environmental factors, late effects of accidents, assaults or self injury, assaults or purposely inflicted injury, and suicide or self inflicted injury.

Thus, if the state maintains a hospital discharge data set (Using ICD codes) and requires E codes, it is possible to identify injury admissions which are the result of an acute event. E codes are never to be recorded as principal diagnosis (first listed in the outpatient setting) and are not required for reporting to the Health Care Financing Administration.

Lawrence et al (2007) in assessing the use of hospital discharge records to identify injury cases found the quantity and quality of hospital discharge data varied markedly from state to state but concluded that such data can be a useful and reliable means to develop counts of injuries in which both the general ICD codes are utilized along with E codes. They analyzed hospital discharge records from 19 states to identify likely non-fatal hospitalized acute injury cases and concluded that it is important to scan secondary diagnosis fields for injury codes. In their study, states provided from 7 to 15 diagnosis fields and a typical state reported 9 or 10 diagnoses and 6 to 10 procedures. They found that about three-quarters were coded with a traditional injury diagnosis in the primary diagnosis field, and 90% had a traditional injury diagnosis somewhere in the first six diagnosis fields. *In addition, if an injury diagnosis code existed in the first three diagnosis fields, E codes were included in nearly 90% (88.1%) of records which suggests that medical personnel who indicate injury within the first three diagnostic fields are very likely to also include essential E codes as well.*

General ICD Injury Codes are: (ICD 800–994):

- 1.1 Fracture of skull (800–804)
- 1.2 Fracture of neck and trunk (805–809)
- 1.3 Fracture of upper limb (810–819)
- 1.4 Fracture of lower limb (820–829)
- 1.5 Dislocation (830–839)
- 1.6 Sprains and strains of joints and adjacent muscles (840–848)
- 1.7 Intracranial injury, excluding those with skull fracture (850–854)
- 1.8 Internal injury of thorax, abdomen, and pelvis (860–869)
- 1.9 Open wound of head, neck, and trunk (870–879)
- 1.10 Open wound of upper limb (880–887)
- 1.11 Open wound of lower limb (890–897)
- 1.12 Injury to blood vessels (900–904)
- 1.13 Late effects of injuries, poisonings, toxic effects, and other external causes (905–909)
- 1.14 Superficial injury (910–919)
- 1.15 Contusion with intact skin surface (920–924)
- 1.16 Crushing injury (925–929)
- 1.17 Effects of foreign body entering through Body orifice (930–939)
- 1.18 Burns (940–949)
- 1.19 Injury to nerves and spinal cord (950–957)
- 1.20 Certain traumatic complications and unspecified injuries (958–959)
- 1.21 Poisoning by drugs, medicinal and biological substances (960–979)
- 1.22 Toxic effects of substances chiefly nonmedicinal as to source (980–989)

- 1.23 Other and unspecified effects of external causes (990–995)
- 1.24 Complications of surgical and medical care, not elsewhere classified (996–999)

E Codes External causes of injury:

Specific codes are ICD-9 E880–E888 for falls, ICD-9 E890–E899 for fire injuries, and ICD-9 E910 for drownings. E Codes for Transport accidents (E800-E848) include accidents involving: aircraft and space craft (E840-E845), watercraft (E830-E838), motor vehicle (E810-E825), railway (E800-E807), other road vehicles (E826-E829) .

Transport Accidents E800-E848

- E800–807 Railway accidents
- E810–819 Motor vehicle traffic accidents
- E820–825 Motor vehicle non-traffic accidents
- E826–829 Other road vehicle accidents
- E830–838 Water transport accidents
- E840–845 Air and space transport accidents
- E846–848 Vehicle accidents not elsewhere classifiable
- E849 Place of Occurrence

Accidental Poisoning E850-869

- E850–858 Accidental poisoning by drugs, medicinal substances, and biologicals
- E860–869 Accidental poisoning by other solid and liquid substances, gases, and vapors
- E880–888 Accidental falls
- E890–899 Accidents caused by fire and flames
- E900–909 Accidents due to natural and environmental factors
- E910–915 Accidents caused by submersion, suffocation, and foreign bodies
- E916–928 Other accidents
- E929 Late effects of accidental injury
- E950–959 Suicide and self-inflicted injury
- E960–969 Homicide and injury purposely inflicted by other persons

E Codes to Exclude

- E970–978 Legal intervention
- E980–989 Injury undetermined whether accidentally or purposely inflicted
- E979 Terrorism
- E870–876 Misadventures to patients during surgical and medical care
- E878–879 Surgical and medical procedures as the cause of abnormal reaction of patient or later complication, without mention of misadventure at the time of procedure.
- E930–949 Drugs, medicinal and biological substances causing adverse effects in therapeutic use
- E990–999 Injury resulting from operations of war

V codes – Supplementary classification of factors influencing health status and contact with health services

Steps to Develop Local Counts of Injuries based upon Hospital Discharge Records *(following Lawrence, et al 2007)*.

Hospital Discharge Data should processed in three general steps: (1) utilize the full state discharge dataset to construct a broadly defined injury dataset (cases meeting any of the criteria for identification as an injury, (2) a narrowly defined injury dataset from which non-injuries and duplicate records are removed, and (3) develop locally specific monthly counts of injuries using the available and most relevant geographical area or zip or census tract codes associated with the patient for the local environmental prevention area. Here, local counts from the third step are associated with residents from the target prevention area and not the location of treatment. Note: creating a monthly count of injury cases for each community provides the basic time series data on which appropriate outcome evaluation can be based. Later these monthly data can be further aggregated into larger time categories, e.g., quarterly, as necessary.

Step 1. Locate Injury Cases

Search hospital discharge records and select any record in which there is a potential indicator of an injury, i.e., identify and assign a *primary injury diagnosis* for each identified injury case, i.e., search all available diagnosis fields (at least three fields) and chose the first-listed injury diagnosis. *Do not rely solely on the primary diagnosis in the record for identifying injuries but utilize all available diagnostic data in the individual record.*

ICD Codes to use in identifying injury cases (among any of the available diagnosis fields): ICD-9 traditional injury codes 800–994 injury and poisoning as well as including ICD codes 363.31 solar retinopathy; 370.24 photokeratitis; 371.82 corneal disorder due to contact lens; 388.11 acoustic trauma (explosive) to ear; 760.5 maternal injury affecting fetus or newborn; 995.5 child maltreatment; and (g) 995.80–995.85 adult maltreatment.

ICD diagnoses to be excluded: late effect of complications of surgical and medical care [909.3], late effect of adverse effect of drug, medicinal or biological substance [909.5].

Record any available E codes from the case record: E800–E999 external causes of injury and poisoning including location (except location [E849], second-hand tobacco smoke [E869.4]; misadventures to patients during surgical and medical care [E870–E876]; surgical and medical procedures as the cause of abnormal reaction of patient or later complication, without mention of misadventure at the time of procedure [E8 8–E879]; drugs, medicinal and biological substances causing adverse effects in therapeutic use [E930–E949]).

Data Processing Notes: a) Process ICD codes – diagnoses,Vcodes, E codes, and procedures – as character data, rather than numeric. Treating them as numeric data can cause leading and trailing zeroes to be dropped. (b) Always sort E codes into separate fields from diagnoses in the patient record. This will typically require four or five E-code fields, plus a location (E849) field.

Step 2: Remove Duplicate and Invalid Injury records

Recheck and refine the created set of potential injury cases in order to remove invalid records and duplicates. Three categories of cases should be re-examined for validity: (1) those lacking any injury diagnosis but containing a E code; (2) those lacking an injury E code but containing a general injury code; and (3) those with often-abused E codes (falls, overexertion, unspecified). It may be helpful to look for local or unique patterns in diagnoses and E codes that correspond to non-injuries, and then delete the suspicious non-injury admissions from the final dataset.

Data Processing Notes: It is recommended: a) Set up conditional searches to eliminate inappropriate records, i.e., Develop automated validity checks for ICD codes and *automatically delete records with invalid codes and* (b) check and remove duplicate records. One technical challenge in using general injury codes, especially falls, is that the injury could be the result of a more serious existing medical condition, such as heart disease or diabetes which caused a heart attack or a blackout resulting in a falling injury.

As Lawrence, et al (2007) point out a common data problem that makes identification of injuries difficult is the use of injury codes when no injury occurred and that the most frequently misused E codes include falls (E880s) and overexertion (E927). For example, if someone falls after a stroke, the event may be coded as an injury even if no injury occurred. In some cases a heart attack can be coded as overexertion, even though this code is intended to be used with musculoskeletal injuries like strains and sprains.

Delete duplicate records when identified. If possible, also drop all cases that can be identified as non-acute, including admissions for late effects, chronic conditions, and rehabilitation.

Step 3. Create Monthly Injury Totals for Each Local Geographical Area

In this step, the final time series of injuries is developed for each local area. If the geographical areas are well known and specified in terms of prevention responsibilities, e.g., all counties, then those codes can be used to create local totals by month. If the geographical areas for prevention may well vary or there is a potential or need for finer or varying geographical analyses, e.g., by zip code or neighborhood, then utilize the codes which provide counts the *smallest* geographical area potentially needed. The monthly totals can be aggregated upwards into larger geographical units as needed later.

Advantages of Using Hospital Discharge Data: local counts for injuries can be based upon a relatively simply data search through hospital discharge data, i.e., data processing complexity is reduced as there is no need to search for surrogate indicators of potential alcohol involvement. The number of cases identified will be larger than the monthly counts in which other filters are applied.

Disadvantages of Using Hospital Discharge Data: While epidemiological evidence suggests that injuries (especially serious injuries) are likely to be associated with drinking on the part of the patient, counts of total injuries are not based upon a determination or estimation of Blood Alcohol Concentration nor acute events most associated with drinking.

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Measurement Alternative 2—Total Injury Counts Filtered for Alcohol Involvement

This indicator filters injury records based upon patient or injury event characteristics which have been shown to be highly associated with alcohol-involved injuries, using Hospital Discharge Records or Emergency Room Records or both (preferred),

This is an alternative to utilizing total monthly counts of overall injuries from Hospital Discharge Records or from Emergency Room cases (if available) or both is to develop a total injury filtered count from total injuries by patient or injury event characterisitcs. In this alternative, basic injury records (as described above resulting from Step 2) are further filtered by variables (within each individual record) which have been shown associated to alcohol involvement and thus the resulting injury counts are more likely to be alcohol-involved.

These filtered injury records create a more focused (and higher probability of alcohol-involvement) total count. Young, et al (2004) analyzed blood alcohol concentration (BAC) data from 28 emergency room facilities and found that cases which appeared for treatment between 10pm and 5.59am (46%), between 12am and 4.59am (56%), on Fridays, Saturdays or Sundays (26%) and also among injured persons who were male (28%), aged between 18 and 45 years (24%) or unmarried (24%) were most likely to be alcohol-related. Their results support a conclusion that injury records can be filtered to include only injury cases which come to the Emergency Room at nighttime (10 pm to 6 am or midnight to 5 am) only or also filter for weekends only (Friday, Saturday, and Sunday). The wider time frame likely includes 40-49% alcohol involvement and the more narrow time frame injuries are typically higher in alcohol involvement (50% or greater). Overall, when gender (male), and age (being under 45 years of age) and day of week (Friday, Saturday, Sunday) were added to time of day they raise alcohol involvement to 66% (10 pm to 7 am) and 75% (midnight to 5 am).

Advantages of Using Alcohol Filters: Filtering total injury counts with factors which have been shown to be associated with alcohol-involvement increases the general validity of the injury counts. The wider time band has the advantage of a higher volume of cases and hence more statistical power for evaluation while the latter has the advantage of greater specificity and hence less sensitivity to external bias but yields less numbers per month.

Disadvantages of Using the Alcohol Filters: Filtering total injury counts with factors which have been shown to be associated with alcohol-involvement will decrease the number of injuries per month and in geographical areas with small local populations, the number of alcohol-involved injury cases may be too small to be practical.

Measurement Alternative 3a—Alcohol-involved Injury Surrogate based upon Weights for Patient or Injury Event Characteristics. Using Hospital Discharge Records or Emergency Room Records or both (preferred)

The development of an alcohol-involved injury surrogate utilizes similar variables as the filtered approach (Alternative 2 above) but in this situation the surrogate creates an aggregate score for each case which reflects potential or likely alcohol-involvement for that case. In this process, the surrogate is an effort to narrow the total number of injuries cases identified in Alternatives 1 and 2 to a subset which possess characteristics or factors with a much higher probability that the resulting total monthly counts are alcohol-involved.

Treno, et al (1994) analyzed patients in California Trauma Centers to determine probabilities of alcohol-involvement. Since a blood alcohol concentration (BAC) was typically collected for patients who are serious enough to be triaged to a trauma center, it becomes possible to identify personal attributes which are more likely to be associated with being alcohol positive. The researchers used ICD-9-CM diagnosis codes that have a longer history and were available in more jurisdictions in California and found that individual variables representing demographic background, time of day, and day of week clearly were the most powerful predictors and alcohol-involved injuries. ICD-9-CM diagnostic codes reflecting physician assessment that the patient had a chronic alcohol problem did improve the fit of models. In contrast, ICD-9-CM diagnostic codes reflecting the specific nature of the injury, although statistically significant, explained little additional variability in alcohol involvement. Nevertheless, the overall model did accurately classify approximately 75% of those in the sample for whom blood alcohol concentration status information was available, suggesting its appropriateness for surrogate development. Treno, et al, (1994). developed z-scores for each personal attribute. For example, an elderly female injured in a fall would be assigned a probability of 0.027 based on a z-score estimate of -1.924. In contrast a young male injured on a weekend night in a single vehicle crash would be assigned a probability or weight of 0.529 based on a z-score estimate of 0.073. This effort to find an indicator for alcohol-involved injury was further developed and tested in three other papers, Treno, et al (1997), Treno (1999), and Treno and Holder (1997). Treno and Holder (1997) evaluated three alternatives means to develop estimates of number of alcohol-involved trauma events in a community, including emergency room patients who are given a BAC breathalyzer test, a community-wide survey to obtain self-reported trauma events involving alcohol, and a surrogate based upon hospital discharge data. The development of the alcohol-involved surrogate is described in Treno, et al (1994, 1996). Thus the equational form for the surrogate is based upon a probit analysis of personal attributes. That is gender, day of week of injury, time of day, and specific diagnostic categories are related to the likelihood of a patient having a positive BAC. As a result, the coefficients from the equation generated by these analyses can be used as a filter for weighting cases from the hospital discharge records. The Fitted Value for a case is calculated by:

FITTED VALUE = (-1.6884) + (FEMALE*- 0.35849) + ETOHIC*1.8429) + (DIED*0.080215) + (LOFSTAY*-0.000092714) + (AGE1520*-0.40646) + (AGE2134*0.028007) + (AGE5064*-0.16404) + (AGE65PLS*-0.55869) + (DG1*0.026629) + (DG2*-0.098261) + (DG3*-0.016968) + (DG4*0.034619) +(DG5*0.083979) +(DG6*-0.032051) + (DG7*-0.0073394) + (DG8*0.13815) + (DG9*0.18466) + (DG10*0.026607) + (DG11*-0.053692) + (DG12*-0.025169) + (DG14*0.095781) + (DG15*-0.060008) + (DG18*-0.040731) + (DG19*-0.0033648) + (DG20*-0.038923) + (DG24*0.066044) + (DGOTHER*0.039252) + (FRIDAY*0.080343) + (SATURDAY*0.25654) + (SUNDAY*0.20889) + 1.29221 .

In this -1.6884 equals a constant; FEMALE is a dummy variable for gender codes (0 for males and 1 for females), ETOHIC is a dummy variable for patient with ICD-9-CM diagnosis codes concerning chronic alcohol abuse; DIED is a dummy variable coded 1 for patients who have died; LOFSTAY is the measure of the number of hospital days, AGE2135 through AGE65PLS are dummy variables coded either 0 or 1 depending upon the injury victim's age, DG1 through DGOTHER are dummy variables corresponding to diagnoses as shown below in ICD-9-CM Diagnosis Group; and FRIDAY, SATURDAY, and SUNDAYS are days of week dummy variables. A constant of 1.29221 is added to account for the effect of time of day and injury severity which are not typically present in hospital discharge records. The constant was calculated by taking the coefficient of each dummy variable included in the probit model but excluded from the discharge data times its mean value and creating a summation of products to the z-score for each patient thus providing a constant that predicts the z-score for injury victims based on data included in the discharge data.

For example, the calculated value for a male aged 20 years who was injured on Saturday with an open wound would be assigned a z-score of -0.281 based upon the calculation: -1.688 -0.406 + 0.257 + 0.184 + 0.080 + 1.292 = -0.281.

The z-score is converted to a probability of alcohol involvement of 39% for that case .

Advantages of Utilizing an Injury Surrogate: Screening for specific alcohol-associated characteristics in injuries cases based upon hospital records provides a more focused and potentially more valid count of injuries than utilizing total injury cases or total filtered cases. Thus validity is likely increased.

Disadvantages of Utilizing an Injury Surrogate: Screening injury cases for factors and applying strength of association may introduce unknown biases since these elements were developed in prior research in one state which may or may not be generalizable to each specific state. In addition, the surrogate adds one additional step in data processing.

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Measurement Alternative 3b—Alcohol-involved Intentional/Violent Injury Only Surrogate

As with the previous Alternative 3A, alcohol-involved injury surrogate, it is possible to utilize a surrogate reflecting the estimated likelihood of alcohol along with any coding that the injury or acute death is a result of violence. A hospital (or ER) admissions for injury treatment which has no designation of alcohol involvement can contain attributes or features of the individual and the injury event which has been connected to accidental injury patients who had been drinking could be a useful surrogate or derived indicator.

As discussed under measurement alternative 2 above, one surrogate derived relative weights for characteristics of an individual injury record as a means of estimating the number of cases with high likely alcohol-involvement. Therefore, limiting the set of hospitalized injury records to only those in which the injury was coded as a result of violence, enables the potential use of this surrogate for outcome evaluation. Sheppard, et al (2008) utilized a surrogate approach by analyzing personal and injury characteristics in the State of Maryland Trauma Registry (N=2,189) and Hospital Discharge (N=1.625) data to calculate the relative strength of prediction of use of drug/alcohol use among adolescents ages 10-20 who are admitted for injury treatment resulting from assault. Alcohol and drug information was available for cases in the Trauma Registry of "alcohol and/or drug involvement or use" which refers to a positive alcohol/drug laboratory test at the time of admission. They found that age, sex, mechanism of injury, day of hospital admittance, and time of day were significant predictors of alcohol/drug use among adolescents who were assault victims.

References Concerning Development of Alcohol-Involved Intentional Injuries using Hospital Records

Monique A. Sheppard, Ph.D.1, Cecelia B. Snowden, Ph.D.1, Susan P. Baker, Sc.D.2, and Paul R. Jones (2008) Estimating Alcohol and Drug Involvement in Hospitalized Adolescents with Assault Injuries. *J Adolesc Health*. 2008 August ; 43(2): 165–171.

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Example References of Use of Alcohol-Involved Intentional Injuries as Outcome Measures

See Sheppard, et al (2008) above.

Measurement Alternative 4—Total Injury Deaths with positive BAC or alcohol-involvement—Based upon State Death Records

Acute death associated with drinking in the moment resulting from falls, burns, drowning, etc. and violence can be an indicator of alcohol-related harm of potential evaluation value for environmental prevention. Alcohol-involved mortality can be obtained from the state-death records for a specific local area, either based upon city or county coding or even zip-codes if available. Two challenges exist: whether there is sufficient coding of the BAC from the dead person to attribute alcohol's involvement and if there are enough cases of such coded deaths (monthly, quarterly, or even annually) to produce stable and useful indicators for evaluation

Smith, et al (1999) analyzed 65 published papers representing a a total of 7,459 unintentional injury deaths, 28,696 homicide cases, and 19,347 suicide cases conducting a metaanalysis to determine the percentage of deaths tested for blood alcohol concentration (BAC). They found BAC testing was highest among homicide cases (88.2%), followed by unintentional injury deaths (84.0%) and suicide cases (81.7%). Of these cases, The aggregate percentage determined to be intoxicated (BAC, ≥100 mg/dL) was highest among homicide cases (31.5%), followed by unintentional injury deaths (31.0%) and suicide cases (22.7%). Thus assessment of alcohol-involvement may not be consistently conducted or recorded in the death records.

Death Records: Use ICD codes which entered as cause(s) of death and are associated with acute events, e.g., falls, burns, etc, as well as homicide are essential to identify deaths which occur in the moment and not the result of long term drinking-related deaths, e.g., cirrhosis or throat cancers, etc. The next question is the state or local coroner's pattern of determining blood alcohol concentration is such acute death cases. For example, are all cases tested or only selective cases? Even if a selective testing is consistently conducted, these data may be useful as long as the testing is consistently applied over time and not on simply the preferences or decisions of different coroners or their staff. For example, it may be possible that all falls are tested but no burn victims are tested. Knowing existing testing patterns is essential in making valid practical use of death records.

Note: total alcohol-related mortality based upon ICD codes or cause of death codes which specify alcohol-involvement can not *be reliably used since in many cases this indicates typically longer term drinking and this total mortality count is dominated by death codes related to extended or long term drinking or use of alcohol, e.g., liver cirrhosis or alcohol psychosis which is unlikely to be sensitive to local environmental prevention, at least in the short term.* Therefore, it is essential that these deaths related to longer term drinking or even alcoholism be excluded. *ICD codes to remove include:*

- 291 - alcoholic psychoses
- 303 - alcohol dependence syndrome
- 305.0 - alcohol abuse
- 357.5 - alcoholic polyneuropathy
- 425.5 - alcoholic cardiomyopathy
- 535.3 - alcoholic gastritis
- 571 - chronic liver disease and cirrhosis
- 572.3 - portal hypertension

Advantages of Using Death Records: The empirical evidence of relatively high involvement of Alcohol in violent or acute deaths supports the possibility that these data may be used in detecting outcomes for a local environmental prevention effort. This is especially true if the measurement of alcohol in death records is consistently carried out over time in either the state or locality of interest.

Disadvantages of Using Death Records: If the pattern of BAC testing is inconsistent or irregular over time, then the use of death records is not recommended. Also in small populations the number of such deaths may be too few to provide useful time series data in carrying out outcome evaluation.

References Concerning Death Records and Alcohol-Involvement

Smith, Gordon, Charles C Branas andTed R Miller (1999) Fatal nontraffic injuries involving alcohol: A metaanalysis, Annals of Emergency Medicine Volume 33, Issue 6, June.659-668.

Alternative 4—Alcohol Involved Injury Morbidity using Attributable Fractions

Alcohol involvement could be estimated with hospital discharge data utilizing an "attributable fraction", i.e. the estimated percentage of such unintentional injuries which are likely to be alcohol involved. While potentially useful for making general population estimates of alcohol-involved injuries, attribution is based upon historical relationships of alcohol to general classes of injuries and death. Unfortunately, using attributed alcohol-involved injury or death indicators for evaluating prevention is impacted by the overall number of injuries in each of the ICD injury or cause of death classes. It is certainly possible that the number of injuries without alcohol involvement can increase even if those injuries historically linked to alcohol decreased (or remained the same) as a result of environmental prevention. Thus using attributed fractions to estimate alcohol-involvement in injuries and deaths is not recommended for measuring ATOD problems for evaluation of the effects of environmental prevention.

Recommended Indicators in Order of Priority and Practical Usefulness for Local Outcome Evaluation

Minimum

Total Injuries: Given the evidence of alcohol-involvement in a significant number of both unintentional and intentional injuries, this indicator provides the greatest number of cases for use in determining local effects on heavy drinking if hospital discharge data are available for analyses for each local area. This indicator will yield the largest number of monthly totals but will be include a notable number of cases in which drinking was not involved. This would be the most practical indicator for most local prevention efforts and perhaps the easiest total counts to develop for each community.

Alternatives

Alternative A: Total Alcohol-Involved Surrogate which filters Records: This indicator is to take advantage of the personal and injury event factors which are more associated with alcohol-involvement. While the specific filters can be uniquely selected and/or mixed (depending upon the characteristics of the state and communities), the recommended filters to be added in order of priority are:

1. Minimum: Time-of-Day (either 10 pm-7 am or midnight to 5 am) for Friday, Saturday, and Sunday.
2. Next: Males
3. Next: Age (Under 45 years old)

It is recommended that all three levels of filtering be utilized initially. This will produce the most valid total counts of likely alcohol-involvement for each community. If the monthly totals are too small, then drop filter 3, and then if the totals are still too small, drop filter 2.

Alternative B: Alcohol-involved Injury Surrogate based upon Weights for Patient or Injury Event Characteristics: This indicator has much to recommend it including the ability to assign relative weighting to the importance of patient or injury event characteristics. Thus this surrogate will most likely yield a slightly more valid count of alcohol-involved injury cases. This indicator can be based upon the weights provided in this section for each of the factors or attributes of the injury or the patient with the recognition that these weights may not be fully representative of the state or locality for which this surrogate is derived. This will yield a higher number of cases than utilizing injury death records alone and perhaps more cases than the injury surrogate which filters records, Alternative A above..

Alternative C: Total Alcohol-Involved Acute Deaths: This indicator is useful when the blood alcohol concentration (BAC) of acute death cases is analyzed and recorded. Even when the BAC testing is not applied to every acute case, if the selection of specific cases for blood analyses, e.g., all cases under 40 years old, is consistently applied, the this monthly count can be utilized. This indicator has the advantage of being based upon the BAC testing of acute death cases and thus alcohol involvement need not be inferred. However, this will yield total monthly totals than any of the other indicators.

A-3 Alcohol-Involved Violent Events and Death

Another means to estimate and track alcohol-involved violent events or intentional violence including homicide within a community is to utilize police reports of violent events or violent deaths in which alcohol has a high probability of being involved. These violent events are an alternative to separating alcohol-involved intentional or violent injuries from total injuries using hospital records. A major difference is the source of the data. Using hospital records, intentional injuries are those (a) requiring some form of medical treatment, and (b) instances where the person presents themselves for treatment or is taken to a hospital for treatment. Reports to police include many assaults or violent events which do not subsequently seek medical treatment, for a number of reasons including lack of insurance, criminal behavior, or not requiring medical treatment. Thus using police records are an unique alternative means to measure alcohol-involved violence.

U.S. Department of Justice estimated that almost four in 10 violent crimes involve alcohol, according to the crime victim. And about four in 10 criminal offenders report that they were using alcohol at the time of their offense. Bureau of Justice Statistics, US Department of Justice, 1998. In 2005, there were 5.2 million victims of violence, 27% of which perceived the use of alcohol or drugs by their attacker. Bureau of Justice Statistics, US Department of Justice, 2005. Published studies suggest that as many as 86% of homicide offenders, 37% of assault offenders, 60% of sexual offenders, up to 57% of men and 27% of women involved in marital violence, and 13% of child abusers were drinking at the time of the offense. National Institute on Alcohol Abuse and Alcoholism, 1997.

Note: Rape or sexual assault, most often on females, is also highly associated with drinking on the part of the victim as well as the perpetrator. Unfortunately counts of rape are siubstantially under reported due to at least two factors: (a) Rape is substantially under reported (Estimated that only one in six rapes are reported. (b) Coding varies across jurisdictions and thus states define rape in different ways, e.g.,, aggravated sexual assault versus rape.

Measurement alternative 1: Total assaults

Assaults are those events reported to police in the geographical area of the environmental prevention effort. Studies suggest that a notable number of assault victims have been drinking. In this instance the victim is potentially impaired and thus has a reduced ability to defend themselves or make more self-protecting decisions. Cusens and Shepherd (2005) conclude that there is a demonstrated link between alcohol intoxication and injury in assault, mediated by individual, contextual and cultural factors and that community violence prevention can utilize plastic glasses and bottles in licensed premises, limit alcohol drink price incentives and target policing of established on the basis of existing police and accident and emergency data.

Wallin et al (2003) used interrupted time series modeling (ARIMA) to analyze all monthly assaults reported to police in Stockholm during the period of January 1994 to September 2000 and found that during the intervention period of a community environmental prevention effort targeting over-serving in licensed establishments that violent crimes decreased significantly by 29% compared to the control area. They concluded that this effect results from a combination of nation of policy changes initiated by the project, including community mobilization, training in responsible beverage service for servers and stricter enforcement of existing alcohol serving laws.

Advantages of Using Reported Assaults: These violent events represent a much larger number of total assaults than those requiring hospital treatment and may be more available or easier to obtain than hospital treated assault injuries. If counts of assaults are available for locally defined areas, these totals may also be more practical for evaluating local environmental prevention efforts in small populations. Total assaults can be utilized as a reasonable indicator of alcohol-involved assaults based upon empirical evidence of frequent involvement of drinking in such events.

Disadvantages of Using Reported Assaults: While assaults reported to police are routinely available, there are two limitations for these data for purposes of an indicator. First, self reported assaults are an under estimate of the total number of actual assaults, especially domestic assaults, and second, there are no systematic determinations if the victim (or the perpetrator) had been drinking and local patterns of assaults may bias the results.

References Concerning Reported Assaults and Alcohol-Involvement

Swahn, Monica H.; Thomas R Simon, Bart J Hammig, Janet L. Guerrero (2004) Alcohol-consumption behaviors and risk for physical fighting and injuries among adolescent drinkers **Addictive Behaviors** Volume 29, Issue 5, July, Pages 959-963

Data Source for Assaults: Alternative 1

The Uniform Crime Reports (UCR) are published by the United States Department of Justice Federal Bureau of Investigation (FBI) Uniform Crime Reporting (UCR) Program. The UCR Program is a nationwide, cooperative statistical effort of over 18,000 city, university and college, county, state, tribal, federal, and other law enforcement agencies who voluntarily report data on crimes brought to their attention. Since 1930, the FBI has administered the UCR Program.Uniform Crime States reported by a state include rates of violence and could be broken down according to local geographical areas. The UCR defines assaults in a number of ways as shown in Exhibit A.

Exhibit A

ASSAULT (in general) (4) Definition:

An unlawful attack by one person upon another. Aggravated Assault: Definition: An unlawful attack by one person upon another for the purpose of inflicting severe or aggravated bodily injury. The UCR Program considers a weapon to be a commonly known weapon (a gun, knife, club, etc.) or any other item which, although not usually thought of as a weapon, becomes one in the commission of a crime. The categories of Aggravated Assault (4a–4d) include assaults or attempts to kill or murder; poisoning; assault with a dangerous or deadly weapon; maiming; mayhem; assault with explosives; and assault with disease (as in cases when the offender is aware that he/she is infected with a deadly disease and deliberately attempts to inflict the disease by biting, spitting, etc.). All assaults by one person upon another with the intent to kill, maim, or inflict severe bodily injury with the use of any dangerous weapon are classified as Aggravated Assault. It is not necessary that injury result from an aggravated assault when a gun, knife, or other weapon that could cause serious personal injury is used.

Aggravated Assault—Firearm (4a) The category Aggravated Assault—Firearm (4a) includes all assaults in which a firearm of any type is used or is threatened to be used. Assaults with revolvers, automatic pistols, shotguns, zip guns, rifles, etc. are included in this category.

Aggravated Assault—Knife or Cutting Instrument (4b) The category Aggravated Assault—Knife or Cutting Instrument (4b) includes assaults wherein weapons such as knives, razors, hatchets, axes, cleavers, scissors, glass, broken bottles, and ice picks are used as cutting or stabbing objects or their use is threatened.

Aggravated Assault—Other Dangerous Weapon (4c) The category Aggravated Assault—Other Dangerous Weapon (4c) includes assaults resulting from the use or threatened use of any object as a weapon in which serious injury does or could result. The weapons in this category include, but are not limited to, Mace, pepper spray, clubs, bricks, jack handles, tire irons, bottles, or other blunt instruments used to club or beat victims. Attacks by explosives, acid, lye, poison, scalding, burnings, etc. are also included in this category.

Aggravated Assault—Hands, Fists, Feet, Etc.—Aggravated Injury (4d) includes only the attacks using personal weapons such as hands, arms, feet, fists, and teeth, that result in serious or aggravated injury. Reporting agencies must consider the seriousness of the injury as the primary factor in establishing whether the assault is aggravated or simple. They must classify the assault as aggravated if the personal injury is serious, for example, there are broken bones, internal injuries, or stitches required. On the other hand, they must classify the offense as simple assault if the injuries are not serious (abrasions, minor lacerations, or contusions) and require no more than usual first-aid treatment.

Other Assaults—Simple, Not Aggravated (4e) The category Other Assaults—Simple, Not Aggravated (4e) includes all assaults which do not involve the use of a firearm, knife, cutting instrument, or other dangerous weapon and in which the victim did not sustain serious or aggravated injuries. Simple assault is not a Part I offense—it is a Part II offense but is collected under 4e as a quality control matter and for the purpose of looking at total

Exhibit A Footnotes

The following scenarios illustrate incidents known to law enforcement that reporting agencies must classify as Other Assaults—Simple, Not Aggravated (4e):

1. Several bar patrons were watching a football game on television. The supporters of the two teams exchanged heated words that led to a fist fight. The bartender called the police. None of the participants cooperated, so the police could not determine who started the fight. The police arrested six patrons who had suffered bruises and minor cuts and charged them with affray.

2. A married couple was arguing about financial problems. The husband slapped his wife and left the house. The wife followed him, and they continued their argument. The police responded to a call by a neighbor. The wife told them that her husband slapped her. The police arrested the husband for domestic violence.

3. An employee of a local retail establishment received numerous e-mail messages at work from her ex-boyfriend, against whom she had a restraining order. The e-mail messages contained sexually offensive material and threats of violence to the employee; she turned them over to the police.

4. Police responded to a reported fight at a residence. Upon arrival, they discovered a man with a bruise around one eye. The man said that his son, aged 17, had struck him during an argument. The boy admitted to striking his father and apologized. The police documented the incident but did not arrest anyone at the scene because the father did not wish to press charges.

5. Two men were waiting in a line to enter a nightclub. One man tried to bully the other man into giving up his place in line by threatening to punch him in the face. Refusing to be intimidated, the man reported the threat to the nightclub's bouncer who called the police. The police cited the bully but did not arrest anyone at the scene.

The UCR does not include simple assaults in part 1 and minor assaults, verbal assaults and other such crimes, which can account for between 50% and 90% of violent crimes in other countries, are not recorded. For example, in many instances, police agencies can downgrade a burglary to vandalism if the suspect damages a door or window to gain entry, however entry wasn't gained.

NOTE: NHTSA funds a subset of states which link hospital discharge data and Uniform Crime Data which enables a cross check of alcohol involvement. Currently there is a contract to Pacific Institute for Research and Evaluation with NHTSA to document reliability of reporting (contract report coming in the near future).

References concerning Uniform Crime Reporting

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Example References of Utilization of Total Assaults as an Outcome Measure

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Wallin, Eva; Thor Norstrom, Sven Andreasson (2003) Alcohol Prevention Targeting Licensed Premises: A Study of Effects on Violence, Journal of Studies on Alcohol**, 64(2):270-7**

Data source for Assaults: Alternative 2

National Incident-Based Reporting System (**NIBRS**) of the U.S. Department of Justice is an incident-based reporting system used by law enforcement agencies in the United States for collecting and reporting data on crimes. NIBRS is an alternative to the NCR but does not include all law enforcement agencies and has been operating since 1988 when it was approved. Local, state and federal agencies generate NIBRS data from their records management systems. Data is collected on every incident and arrest in the Group A offense category. These Group A offenses are 46 specific crimes grouped in 22 offense categories. Specific facts about these offenses are gathered and reported in the NIBRS system. In addition to the Group A offenses, eleven Group B offenses are reported with only the arrest information.

There are similarities and differences between NIBRS and UCR. The general concepts, such as jurisdictional rules, of collecting and reporting UCR data are the same as in NIBRs. However, NIBRs goes into much greater detail than the summary-based UCR system. NIBRs includes 46 Group A offenses whereas UCR only has eight offenses classified as Part I offenses. In NIBRs, the definition of rape has been expanded to include male victims. UCR defines rape as "the carnal knowledge of a female forcibly and against her will". Sex attacks against males are to be classified as either assaults or "other sex offenses", depending on the nature of the crime and the extent of the injury.

UCR has only two crime categories: Crimes Against Persons (e.g., murder, rape, assault) and Crimes Against Property (e.g., robbery, burglary, larceny). NIBRs adds a third category titled Crimes Against Society for activities such as drug or narcotic offenses and other activities prohibited by society's rules. Finally, agencies submit UCR data in written documents that must then be hand entered into a computer system for statistical analysis. NIBRs data are submitted electronically in the form of ASCII text files. These files are then processed without the need for a person to input the data (except at the originating agency's initial filing of the report into their computer system).

Agencies and state Programs are constantly developing, testing, or implementing the NIBRS. For example, in 2004, 5,271 law enforcement agencies contributed NIBRS data to the UCR Program, representing only 20 percent of the U.S. population. While all states are not certified, the number of states certified and participating in NIBRS will increase over time.**In order to determine if a specific state contributes to the NIBRS, contact state or local law enforcement.**

Papers on NIBRS are available at the UCR Program's Web site at www.fbi.gov/ucr/ucr.htm. In addition, NIBRS information is available from the UCR Program at: Criminal Justice Information Services Division, Federal Bureau of Investigation, 1000 Custer Hollow Road, Module D3, Clarksburg, West Virginia 26306-0154; telephone (304) 625-4995; facsimile (304) 625-5394; e-mail cjis_comm@leo.gov. (E-mail requesters must include the requester's contact information such as name, address, and telephone number.)

Assaults in NIBRS are defined as an unlawful physical attack or threat of attack. Assaults may be classified as aggravated or simple. Rape, attempted rape, and sexual assaults are excluded from this category, as well as robbery and attempted robbery. The severity of assaults ranges from minor threats to incidents which are nearly fatal. Assaults are included in Group A offenses, ones for which NIBRS collects extensive data on. Assault Offenses include Aggravated Assault, Simple Assault, and Intimidation.

Aggravated assault: Attack or attempted attack with a weapon, regardless of whether or not an injury occurred and attack without a weapon then serious injury results

- With injury - An attack without a weapon when serious injury results or an attack with a weapon involving any injury. Serious injury includes broken bones, lost teeth, internal injuries, loss of consciousness, and any unspecified injury requiring two or more days of hospitalization

- Threatened with a weapon - Threat or attempted attack by an offender armed with a gun, knife, or other object used as a weapon, not resulting in victim injury

Simple assault: Attack without a weapon resulting either in no injury, minor injury (for example, bruises, black eyes, cuts, scratches or swelling) or in undetermined injury requiring less than 2 days of hospitalization. Also includes attempted assault without a weapon

- With minor injury - An attack without a weapon resulting in such injuries as bruises, black eyes, cuts or in undetermined injury requiring less than 2 days of hospitalization

- Without injury - An attempted assault without a weapon not resulting in injury.

Advantages of Using the UIBRS: More details are provided concerning the assault and provide more potential information which can be used to identify assaults more likely to be alcohol-involved.

Disadvantages of Using the UIBRS: The coverage of U.S. states is not 100% and thus these data may not be available for many states. Within a participating state, every enforcement jurisdiction may not be reporting to UIBRS and thus a data concerning a specific locality may not be available. Compared to the UCR, the historical data available could be limited, depending upon the year in which a state joined and begin to send its data.

Measurement Alternative 2: Homicides

Alcohol can contribute to the risk of homicide both for the victim as well as the perpetrator. Of all psychoactive substances, alcohol is the one whose use has been most clearly shown to increase aggression. (Boyum and Kleiman, 1995). According to the National Victimization Survey (NCVS), in 1999, based on victims perceptions, 1.2 million violent crimes occurred each year in which victims were certain that the offender had been drinking (*National Crime Victimization Survey*, 1999). Parker and Rebhun (1995) reviewed research concerning the presence alcohol in vicitim of homicides and found up to 50% of homicide victims could be alcohol positive. Smith, Branas, and Miller (1999) based upon an extensive meta-anlysis of published research found in a total of 7,459 unintentional injury deaths, 28,696 homicide cases, and 19,347 suicide cases the aggregate percentage tested for blood alcohol concentration (BAC) was highest among homicide cases (88.2%), followed by unintentional injury deaths (84.0%) and suicide cases (81.7%). The aggregate percentage determined to be intoxicated (BAC, ≥100 mg/dL) was highest among homicide cases (31.5%), followed by unintentional injury deaths (31.0%) and suicide cases (22.7%).

Wells and Graham (2003) found that both drinking and contextual factors are important in distinguishing between alcohol-related aggression and non-alcohol-related aggression and that alcohol intoxication is an important predictor of aggression severity. In addition, young adult males are more likely than other demographic groups to be involved in alcohol-related homicides and assaults. (Collins and Messerschmidt (1993).

Norstrom (1998) found that homicides were significantly associated with retail sales of spirits; the attributable fraction was estimated at about 50%. In a relatively recent paper, Norström and Ramstedt (2005) reviewed published research from 1995 to February 2005, and found across studies a significant relationship between alcohol consumption, on one hand, and mortality from accidents and homicide as well as all-cause mortality on the other hand. This is confirmed in a study by Pridemore (2004) concludes that there is a high correspondence between the daily distribution of alcohol and homicide deaths provides indirect evidence for the connection between them and provides further support of an association between alcohol consumption and homicide rates.

Advantages of Using Homicides: If cases of homicide in a state or local area have a systematic and consistent blood testing to determine if alcohol was present during the time of the death and recorded in the coroner records, then this indicator has much to recommend it. With available BAC data, there are good indication if the homicide victim had been drinking, and total homicides can be a valid indicator for alcohol involved intentional deaths. However, given the strong relationship from prior studies of a likely involvement of alcohol in homicide victims, it is possible to use this indicator even if BAC testing results are not available. This is especially true if there is good evidence that the recording of homicides in a local area has not been altered and is relatively consistent over time.

Disadvantages of Using Homicides: If blood testing is rarely done, the indication of alcohol being mentioned in the death record is not consistent. As a consequence, homicide records with our without blood alcohol testing may represent a serious under reporting of alcohol involved deaths. The number of homicides is typically related to the overall population such that local areas with small populations may have too few homicides to provide reasonably stable data over time to be practically useful in small population communities.

Data Source: Alternative 1

Uniform Crime Statistics (Federal Bureau of Investigation) provide data on annual number of homicides**.** Alternatively alcohol involvement may be estimated for these intentional deaths, especially if BAC is tested and recorded.

Criminal Homicide—Murder and Nonnegligent Manslaughter (1a) Definition: The willful (nonnegligent) killing of one human being by another. As a general rule, any death caused by injuries received in a fight, argument, quarrel, assault, or commission of a crime is classified as Murder and Nonnegligent Manslaughter (1a). The following scenarios illustrate incidents known to law enforcement that reporting agencies must classify as Criminal Homicide—Murder and Nonnegligent Manslaughter (1a):

1. A berserk gunman shot and killed three pedestrians. The police subdued the offender and placed him under arrest.

2. A neighbor discovered an infant who had been beaten. The neighbor rushed the infant to the hospital. The infant later died as a direct result of the injuries. Investigation revealed that the mother was responsible. The mother was not considered mentally competent, and the district attorney did not wish to prosecute.

3. A man shot and killed his neighbor in an argument over the location of their property line. The police arrested the man and charged him with murder.

4. A husband and wife had an argument. The wife shot the husband and severely wounded him. He grabbed the gun and shot and killed her. The husband survived his wounds. The police subsequently arrested him.

5. A man was in a fight on the second floor of a building. During the fight, he was knocked through a window and fell to his death. No arrest was made.

6. While attempting to break up a fight, a man was struck over the head with an ashtray by one of the combatants. During the incident, a pre-existing aneurysm burst in the man's head, causing his death. No arrest was made.

7. A psychiatrist counseling a young female patient performed a criminal abortion on her. She died of peritonitis resulting from the operation. The psychiatrist fled the state and is still wanted for the crime.

8. A teller chased a robber from a bank. The robber fired at him. His shot missed the teller but killed a woman walking on the street. The police did not locate the robber.

9. While playing cards, two men got into an argument. The first man attacked the second with a broken bottle. The second man pulled a gun and killed the first. The police arrested the shooter; he claimed self-defense. The police found no other witnesses.

10. A felon fleeing in her car attempted to get through a police roadblock. As a result, she struck and killed two police officers.

Suicides, traffic fatalities, and fetal deaths are excluded from the UCR Program; however, some accidental deaths are classified as Criminal Homicide—Manslaughter by Negligence (lb). Attempts and assaults to murder must be classified as aggravated assaults. Source: Uniform Crime Reporting Handbook, 200416

Justifiable Homicide: Certain willful killings must be classified as justifiable or excusable. In UCR, Justifiable Homicide is defined as and limited to: The killing of a felon by a peace officer in the line of duty.

Data Alternative 2

National Violent Death Reporting System at Centers for Disease Control. This is a death registry which includes drug and alcohol levels in cases of violent death. Miller () found that Tests for alcohol were conducted for 73.8% of decedents, and drug tests for amphetamines, antidepressants, cocaine, marijuana, and opiates were conducted for 52.5%, 43.2%, 55.8%, 36.5%, and 54.1% of decedents, respectively. Among decedents who tested positive for alcohol (33.4%), 59.1% had a blood alcohol concentration (BAC) of >0.08 g/dL (the legal limit in the majority of states). Opiates, including heroin and prescription pain killers, were identified in 26.2% of cases tested for these substances (antidepressants [23.5%], cocaine [13.5%], marijuana [11.1%], and amphetamines [4.6%])

References about Alcohol-Involvement in Homicides

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Example References Utilizing Homicides as an Outcome Measure

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Recommended Indicators in Order of Priority and Practical Usefulness for Local Outcome Evaluation

Minimum

Assault totals—Uniform Crime Reports: These reported assaults are not a total census of all assaults, as many go unreported. However, these counts are not dependent upon police enforcement action, e.g., when someone is arrested for assault. While individuals can be arrested for assault, the recommended indicator is reported assaults.

Alternatives

Alternative A: Homicides: Uniform Crime Reports: while a large number of homicides do involve alcohol (victim or perpetrator), the indicator may be relatively unstable in a time series in geographical areas with smaller populations.