Appendix B:

How Small Areas Were Designated

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Utah Department of Health staff developed Utah's 61 small areas in 1997 in order to facilitate the reporting of health information at the community level. ZIP code area boundaries, singly or in combination, were used to define the small areas because they are the smallest commonly-used geographic units that are also identified in most health data sources. In addition, the U.S. Postal Service ZIP code areas roughly follow political boundaries. In some sparsely populated areas of the state, however, entire counties were used to define small areas.

The size of the small areas was established by looking at the incidence rates for a variety of health events and determining the population size that would be required to yield at least 20 events over a three- to five-year period. A numerator of 20 or greater was chosen because it produces relatively stable incidence estimates and simplifies the computation of confidence intervals. The investigators found that populations of 40,000 to 60,000 would suffice. However, some areas with smaller populations were designated as small areas when low population density, community identity, or other factors suggested that it was appropriate.

Because local health districts are the primary seat of community public health in Utah, the small areas were designed not to cross local health district boundaries. Whenever possible the small areas were designed to conform to established political boundaries of cities and towns. To guard against combining ZIP code areas with extremely different economic status, the investigators examined median per capita annual income levels of each ZIP code. In many cases, local representatives, including health officers and city officials, were asked to assist in designating small area boundaries based on their knowledge of community characteristics.

Population estimates for the small areas were obtained and several health measures were analyzed and compared. The 61 small areas had an average population size in 1997 of 33,500 persons (range 15,000 to 62,500). Due to local health district boundaries or input from local area residents, population sizes were under 20,000 for six areas. In four cases, a small area encompassed an entire local health district.

Difficulties in designating Utah's small areas using ZIP code

Because ZIP code boundaries are arbitrary geographic areas designed for the convenience of postal carriers, they do not always correspond to other more meaningful boundaries, such as those of cities or towns, school districts, neighborhoods or political voting districts. ZIP code areas may be heterogeneous with respect to important health-related demographic variables such as income, education, and household composition. Additionally, ZIP code boundaries are not stable. They are subdivided as the populations within them increase. And very importantly, ZIP code and small area boundaries may not match health event (e.g., a disease or exposure) boundaries.

However imperfect ZIP code areas may be, they are routinely included on many public health data records or can be gathered easily on surveys such as the BRFSS. Also, estimates of population size and other demographic characteristics are often available for ZIP code areas. These population estimates are especially important, as they are used as denominators in the calculation of disease and mortality rates.

Statistical issues in analyzing small area data

Rates calculated from few events or in a small population typically show relatively large fluctuations with small changes in the number of events. Such fluctuations create challenges for those trying to make valid interpretations. For instance, it is difficult to assess whether rates, such as the BRFSS measures included in this report, are either higher or lower than usual, or in relation to some standard such as the state rate. There are a number of statistical approaches for detecting significant differences that are discussed in the article by Haggard, et al.[48] For this report confidence intervals were used. Confidence intervals describe the precision of an estimate and take into account the variability of the measure, the sample size and the sampling method. Five years of data were combined to increase sample size in the small areas so as to improve the precision of the BRFSS estimates.

One limitation in the use of confidence intervals to identify areas that are significantly different from the state is the lack of independence of the small areas and the state. The state includes the small area, so it is not technically appropriate to compare a small area to the state that includes it because they are not independent samples. Another issue is that the state rate also has a confidence interval. For this report, we considered a small area differed from the state rate when its confidence interval did not include the state rate, not taking into consideration the confidence interval for the state rate itself.

In summary

Small area analysis has many uses in public health. It can assist in targeting health promotion efforts and examining health status in small areas. It can also help to identify environmental, health system, and demographic attributes that may be related to the health of a community.

Though the method described here is not perfect, it allows for the first time the presentation of BRFSS estimates by Utah's small areas.