OHIO DEPARTMENT OF HEALTH
DATA METHODOLOGY STANDARDS FOR PUBLIC HEALTH PRACTICE

Age-adjustment Standard:
The year 2000 standard population should be used when calculating age-adjusted rates.

a. Overview / Summary of Standard

Beginning with 1999 data, the Ohio Department of Health (ODH) will start using the year 2000 population in its age-adjusted rates. This will be in accordance with a similar change being instituted at the National Center for Health Statistics (NCHS), the National Cancer Institute (NCI), and other health and statistical organizations. The year 2000 standard replaces the year 1940 standard population.

b. Rationale / Description of Problem

ODH programs publish mortality statistics and other health statistics in various formats including crude, age-specific, and age-adjusted rates. The age-adjusted rate is a weighted average of age-specific rates, where the weights represent standard population proportions by age**.** Age-adjusted rates are an important measure in health statistics: one can make meaningful comparisons between populations and over time even if the age distributions of those populations differ significantly.

NCHS decided to make the change from the year 1940 to year 2000 standard because the 1940 standard population differs from the present US population age structure. The use of a 1940 standard also appears dated. Further, different agencies were using different standards (e.g., NCI used a 1970 standard for cancer rates – they, too, have since changed to the 2000 standard). NCHS believes the adoption of the year 2000 standard will reduce confusion of users and burden on state agencies. ODH is changing at the same time as its national partners to be able to compare Ohio and County rates to national rates, which will be standardized to the year 2000 standard starting with 1999 data.

c. Guidelines for Implementation of the Standard

***Calculation of Age-Adjusted Rates*:** Age adjustment starts with age-specific rates calculated for multiple age groups. These age-specific rates are then multiplied against a vector (column) of age-specific weights (derived from the year 2000 standard population) and then summed to yield the age-adjusted rate. The aspects of rate calculation that are subject to variation are: 1. numerator (case) definition, 2. denominator (population-at-risk) definition, 3. choice of age-groups to use in calculating age-specific rates, and 4. population age-group weights (age standard). This Methodology Standard addresses the latter aspect of age-adjusted rate calculations by setting the population standard to the year 2000 standard.

Researchers should be aware that different programmatic demands will require varying the age-groups used in age-adjusted rate calculations (aspect #3 above). Table 1 of reference 1 below provides a master list of population weights from which customized age-group weights should be derived.

It is acceptable to customize age-adjustment to user's specific needs, so long as the reference population used to derive age-group weights is the year 2000 population standard. Researchers need to be mindful of methods used at the national level when known, because data users may want to compare Ohio rates to those from different settings. That is, the age groups used in age-adjustment may need to vary in order to be comparable with rates obtained externally. For example, NCHS publishes age-adjusted rates based on eleven (11) age groups across the entire life span (<1, 1-4, 5-14, 15-24 … 75-84, and 85+). This set of age groups is labeled "Distribution #1" in Table 2 of reference 1. In contrast, mortality rates provided by NCI have historically been based on eighteen (18) 5-year age groups. NCI will soon adopt a 19 age group method for calculating age-adjusted rates.

The population of interest for age-adjustment need not include the entire life span. Many of the distributions provided in reference 1 are for portions of the life span (e.g., Distribution #16 is for ages 45 and over). Whichever age groups researchers choose to use, the weights must add up to 1. Publications and tabulations with age-adjusted rates should clearly describe to the reader exactly which method was used.

d. Implications

Many rates will be much higher. Changing from the 1940 standard population to the year 2000 standard will affect the magnitude of age-adjusted death rates because the US population aged considerably during the intervening 60 years. Fertility rates and age-specific mortality rates have declined (especially for older Americans), creating a population with more older persons, especially those ages 35-45 and those 65 and over. The overall age-adjusted mortality rate using the 2000 standard population is much higher than when using the 1940 standard because the new method gives more weight to the older ages where mortality is higher.

Among the leading causes of death, those where risk increases sharply with age (chronic diseases in particular), will see the greatest increases. These causes include stroke, heart disease, cancer, COPD, pneumonia and influenza, diabetes, nephritis, septicemia, Alzheimer's disease, and atherosclerosis. This is because rates of these diseases are highest among older persons. In contrast, the causes that affect the age groups more uniformly are much less affected by the change. These causes include homicide, accidents, suicide, HIV infection, and chronic liver disease. Trends in rates for the leading causes will be relatively unchanged with the new standard. For example, the percentage decline in heart disease age-adjusted mortality is roughly the same with either standard applied.

ODH will need to recalculate historic series. Age-adjusted death rates calculated before implementation of the year 2000 standard will not be comparable to rates produced for 1999 data. ODH has already recalculated many trend lines using the new standard.

Black-to-white rate ratios will be reduced. The year 2000 standard has implications for race and ethnic differentials in mortality. In particular, black/white mortality disparities will be smaller with the year 2000 standard. For example, in Ohio during 1996-1998 the ratio of black to white all causes mortality was 1.47 (47 percent higher for blacks than whites). This ratio reduces to 1.29 with the new standard. The explanation for this difference is that race ratios are not consistent across the age groups. Generally, the race ratios are largest for younger age groups and become smaller for older age groups. With the year 2000 standard these older age groups are given more weight and smaller race ratios result.

Life expectancy measures will be unaffected by the change. Life table measures are entirely free of assumptions about the structure of the populations being compared, and thus will not be affected.

e. References

1. Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected U.S. population. Healthy People Statistical Notes, no. 20. Hyattsville, Maryland: National Center for Health Statistics. January 2001. http://www.cdc.gov/nchs/products/pubs/pubd/hp2k/statnt/20-11.htm (go to NCHS, click on publications, then HP2000)

2. Robert N. Anderson and Harry M. Rosenberg, Age Standardization of Death Rates: Implementation of the Year 2000 Standard, National Vital Statistics Reports; Vol 47 no 3. Hyattsville, Maryland: National Center for Health Statistics, October 7, 1998.

3. Robert N. Anderson and Harry M. Rosenberg. Report of the Second Workshop on Age Adjustment, Vital and Health Statistics, Series 4, No. 30. National Center for Health Statistics, October 7, 1998.

f. For More Information

1. NCHS website at http://www.cdc.gov/nchs

2. NCHS mortality website at http://www.cdc.gov/nchs/about/major/dvs/mortdata.htm

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Table 1. Master list: 2000 U.S. projected population and age-adjustment weights

Age	Population in thousands	Adjustment weight
All ages	274,634	1.000000
Under 1 year	3,795	0.013818
1 year	3,759	0.013687
2-4 years	11,433	0.041630
5 years	3,896	0.014186
6-8 years	11,800	0.042966
9 years	4,224	0.015380
10-11 years	8,258	0.030069
12-14 years	11,799	0.042963
15-17 years	11,819	0.043035
18-19 years	8,001	0.029133
20-24 years	18,257	0.066478
25-29 years	17,722	0.064530
30-34 years	19,511	0.071044
35-39 years	22,180	0.080762
40-44 years	22,479	0.081851
45-49 years	19,806	0.072118
50-54 years	17,224	0.062716
55-59 years	13,307	0.048454
60-64 years	10,654	0.038793
65-69 years	9,410	0.034264
70-74 years	8,726	0.031773
75-79 years	7,415	0.027000
80-84 years	4,900	0.017842
85 years and over	4,259	0.015508

Note: When using the NCHS Master List to obtain additional age groups not shown in table 2, the age-adjustment weights should be recalculated using the appropriate denominator and must add to 1 (see “Calculation of Age-Adjustment Weights: Background, Process, and Procedures”).

Table 2, Distribution #1

Age	Population in thousands	Adjustment weight
All ages	274,634	1.000000
Under 1 year	3,795	0.013818
1-4 years	15,192	0.055317
5-14 years	39,977	0.145565
15-24 years	38,077	0.138646
25-34 years	37,233	0.135573
35-44 years	44,659	0.162613
45-54 years	37,030	0.134834
55-64 years	23,961	0.087247
65-74 years	18,136	0.066037
75-84 years	12,315	0.044842
85 years and over	4,259	0.015508

Source:

Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected U.S. population. Healthy People Statistical Notes, no. 20. Hyattsville, Maryland:

National Center for Health Statistics. January 2001.
http://www.cdc.gov/nchs/products/pubs/pubd/hp2k/statnt/20-11.htm (go to NCHS, click on publications, then HP2000)