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Issue Brief

Translating Research into Practice

YPLL: A Summary Measure of Premature Mortality Used in Measuring the Health of Communities

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Introduction

Choosing a measure for quantifying the health status of a population or for comparing health status across populations has long been debated. Historically, age-specific and age-adjusted mortality have been used to compare health status across populations. These measures provide a description of the death rates in a population but do not fully account for the burden of ***premature*** mortality, an important indicator of a population's health status. In fact, "since most deaths occur among persons in older age groups, crude and age-adjusted mortality data are dominated by the underlying disease processes of the elderly".[1] Another measure used is the years of potential life lost in a population in a given time period, or "YPLL."

In 1982, the Centers for Disease Control began to promote an increased focus on the importance of reducing unnecessary mortality by including YPLL in its standard set of tables of reported diseases.[2] Though YPLL is often used to determine the burden of premature death due to a particular cause within a population, it is also used to distinguish the burden of premature death in populations. For example, YPLL was the measure chosen to assess the health status of the population by Healthy People 2000 midcourse review, the UnitedHealth Foundation State Health Rankings[3] and, most recently, the Wisconsin County Health Rankings, 2003.[4]

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Research has suggested that public health or health policy practitioners may not understand how to interpret YPLL. For example, the Epidemiology Bureau in Florida investigated this issue and learned that county Public Health Units often did not understand how to interpret this measure.[5] Thus, the aim of this Issue Brief is to describe the process of calculating YPLL and explain the reasons for the use of this measure in assessing community health.

Years of Potential Life Lost: The Methods Behind the Measure

Years of potential life lost (YPLL) may be defined as the years of potential life lost due to premature death. In contrast to mortality measures, YPLL emphasizes the processes underlying premature mortality in a population.[6] By this method, deaths occurring at younger ages accrue more years of life lost than deaths occurring at later ages.[1] Years of potential life lost resulting from few deaths at young ages may exceed the years of potential life lost resulting from many deaths at older ages. YPLL is often calculated using age 65 as the cutoff , with grouped age of death, and is calculated as follows:

$$\text{YPLL} = \sum_{i=0}^{65} [(65 - i)] \text{ x } \text{d}_i$$

where 65 is the upper age limit established, i is the midpoint of the grouped year of age at death (e.g. 59.5 for age group 55-64) and d_i is the number of deaths at age i.

Table 1 provides an example of the YPLL calculated for a population. An index may be calculated to allow comparison of YPLL between subpopulations using the following calculation:

YPLL index = sum [(d_i) x (65 – i) x (age group weight) x 100,000)]

For example, in Wisconsin, the age group weight for a particular age group is calculated as the number of individuals in that age group in Wisconsin divided by the total Wisconsin population. Weighting the population in each county to the age structure in Wisconsin and reporting YPLL per 100,000 population allows the years of potential life lost to be compared between counties.

Years of Potential Life Lost: Which Approach is Best?

The selected age cutoff for YPLL estimates the number of years a person would have lived had they not died prematurely. Debate persists over how "premature" death is defined. Often YPLL-65 is chosen, thus defining premature death as death before age 65. However, the use of age 75 and perhaps age 85 might be encouraged. As length of life increases, not counting deaths at ages later than 65 discounts the burden of chronic disease in a population and, perhaps, reduces the variation seen between populations.[8] Because the burden of chronic disease is clearly an indicator of that population's health status, such an approach may be undesirable.

Another frequently used measure is YPLL-Life Expectancy, or YPLL(LE). Using this measure, death at any age contributes to the YPLL in a population because there is some life expectancy at every age. The life expectancy approach is a more complicated measure of YPLL in that life expectancy changes with age and with time. In addition, controversy exists over whether it is appropriate to use life expectancy at birth, or life expectancy at the time of death.[5] Both have been used.

Others have used modifications of the above approaches to YPLL, such as excluding infants less than one year of age. Often deaths among this age group may result from genetic causes that may not be modifiable. However, prematurity resulting from poor prenatal care is also a large contributor to deaths in this age group and may be an important source of variation in YPLL between populations.

Still others have used variations of YPLL that only counted years of life lost between ages 15 and 65. Thus, the maximum number of YPLL lost for an individual is 50 years. This measure incorporates a statement about the value of life at a particular age. It may be useful from an economic viewpoint, but it is not useful in differentiating the most healthy and least healthy populations overall.

Advantages of Using YPLL

By giving weight to each year of expected life lost, the YPLL measure values deaths at younger ages more. Reduction in the years of potential life lost is an important public health goal because it reflects a reduction in premature death[2]. Deaths at younger ages are more likely to be attributable to preventable causes and therefore subject to prevention and intervention. In addition, a reduction in premature death is also desirable from a social or economic standpoint.

Disadvantages of Using YPLL

YPLL may be a more difficult measure to understand, calculate and explain than commonly used methods of quantifying death such as age-adjusted mortality. Drawbacks of using YPLL may be identified regardless of the chosen age cutoff (e.g., 65, 75, 85, or life expectancy). YPLL that uses a set age (e.g., 65) does not count all deaths in a population. Deaths occurring after the selected age cutoff receive a value of "0" and do not contribute to the YPLL in a population. In addition, YPLL counts each year of life lost equally rather than each death equally; yet it is not clear that a death at one age should count more than a death at another age. For example, using $YPLL_{75}$, a death at age 55 counts twice as much as a death at age 65, and a death at age 35 counts 8 times as much as a death at age 70.

Conclusion

In conclusion, although several measures exist for quantifying the health status of a population no single measure is most appropriate. Each measure gives different weight to deaths at different ages, and therefore implies some value statement. The best approach is to clearly describe the methods and rationale for whatever measure is selected, and use this information in community health improvement efforts.

References

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Table 1. Example calculation of YPLL(65) for Wisconsin, 2000

Age Group	Average years of life lost in age group*	Number of deaths	YPLL for this age group**
< 1 year	64.5	457	29,476
1-14 years	56.5	216	12,204
15-24 years	45.5	568	25,844
25-34 years	35.5	567	20,128
35-44 years	25.5	1425	36,338
45-54 years	15.5	2588	40,114
55-64 years	5.5	3908	21,494
65+ years	0	36732	0
Total YPLL for the population			185,598

*Calculated by subtracting the median age of death in the age group, from 65.
**Calculated by multiplying average years of life lost times the number of deaths