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Using YPLL in Health Planning

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SYNOPSIS

Objective. The measurement of years of potential life lost before age 65 (YPLL) is one of the Health Outcome Indicators defined by the state of Florida to measure progress toward *Healthy People 2000* objectives. The authors describe the outcomes of their work with county health agencies to encourage use of the YPLL statistic.

Methods. Calculations of the 1993 YPLL rates for Florida counties with populations greater than 50,000 and of inter-county variability in YPLL rates were used to train county health agencies in the use of YPLL.

Results. Sixty-eight percent of all years of potential life lost in Florida in 1993 were attributed to 10 causes. While the total YPLL rates ranged from 3500 per 100,000 to 7000 per 100,000 across Florida counties, the leading causes differed substantially across counties. The YPLL measure was found to be useful in helping county health agencies plan programs to reduce premature mortality.

Conclusions. Federal, state, and county health units can use YPLL rates to help guide activities toward *Healthy People 2000* and to help identify new health problems that require forming new community alliances, but staff members must be trained to use the YPLL statistic appropriately. Causes that vary little across counties enable the implementation of statewide prevention approaches while causes that differ greatly by county will require locally designed interventions.

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In keeping with the Public Health Service Year *Healthy People 2000* objectives, the state of Florida developed 14 Health Outcome Indicators as part of a strategic health plan to be used by each county in setting goals and monitoring programs.¹⁻³ Outcome indicators were selected using criteria developed by the Florida Department of Health and Rehabilitative Services (since renamed the Florida Department of Health). According to these criteria, these indicators should be easy to understand, informative, and related to core public health program functions. They should also be useful in leading county health planners through a systematic planning process using their own data.⁴

Examples of these indicators include the rate of low birth weight infants born per year or the incidence of congenital syphilis per year. Beginning in 1991, each county was required by the Department of Health and Rehabilitative Services to set Year 2000 goals for the 14 Health Outcome Indicators.⁵ Since 1992 each county public health staff has met every one to three years with a Quality Assurance Team from the state health department; during these visits, the teams focus on specific indicators that reveal health problems in the county or have not been adequately addressed.

One of the 14 indicators is the measure *years of potential life lost before age 65 per 100,000 population* (YPLL). (In general, the YPLL indicator measures years of potential life lost before a selected age cut-off; in Florida, this cut-off is age 65.) This measure is used to emphasize premature mortality by estimating the average time a person would have lived had he or she not died prematurely. The advantage of YPLL over the more familiar health measure *crude mortality* is that the crude mortality rate will be weighted by the large number of deaths occurring in older people. YPLL allows us to selectively evaluate leading causes of mortality in younger age groups.

The availability of data on YPLL rates by county should enable county Public Health Units to identify categories of and risk factors for premature deaths in the populations they serve and possibly assist them in finding creative ways to improve the health status of those populations.

Calculating YPLL. A person dying at age 8 in a motor vehicle crash would represent 57 YPLL ($65 - 8 = 57$). The YPLL rate per 100,000 population is calculated as follows:

$$\frac{\sum \left(65 - \text{age at death} \right) \times \text{number of deaths at each age}}{\text{Number of people ages 65 and younger}} \times 100,000$$

According to this calculation, each death is weighted based on its distance from age 65. The YPLL calculation inherently emphasizes premature mortality by giving a larger computational weight to younger deaths and by not counting deaths among people ages 65 and older.⁶⁻¹¹

In 1993, Florida ranked 12th in the United States for total YPLL, and for the preceding five years it had ranked consistently in the top 10 states in YPLL.^{5,12}

The counties' experience. Despite the fact that YPLL has been one of Florida's Health Outcome Indicators since 1992, state Quality Assessment teams have found that counties seldom use the YPLL measure. When the Epidemiology Bureau of the Florida Department of Health and Rehabilitative Services explored reasons for this, it became clear that county Public Health Units often did not understand how the YPLL measure was calculated or how to interpret it. Therefore, to encourage the use of the YPLL in program planning, the Epidemiology Bureau has provided a set of standard and customized training materials to each county. These materials were developed collaboratively by the Florida Department of Health and Rehabilitative Services and the U.S. Centers for Disease Control and Prevention. The goal in providing customized training is to inspire interest about an outcome measure that county health agencies are required to use for quality assurance.

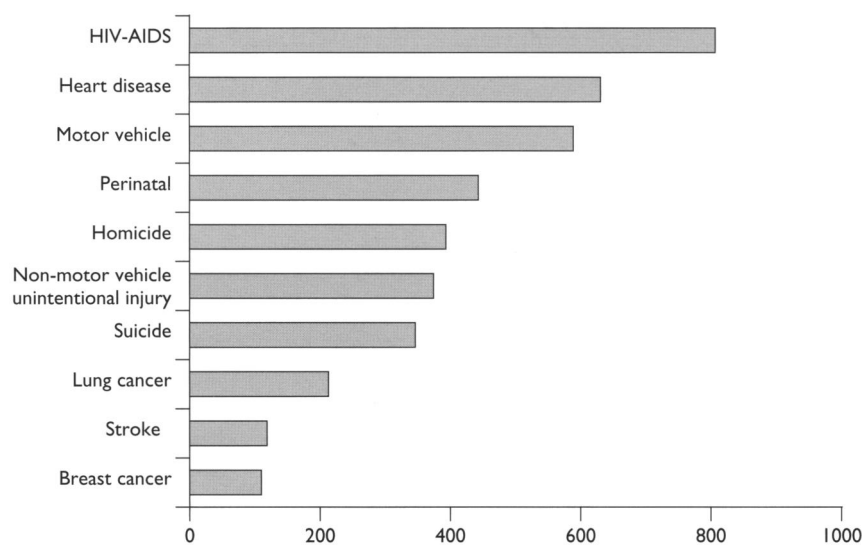
METHODS

We prepared a standard set of training materials to be used statewide, which included: a listing of the leading causes of YPLL for Florida and for the United States as a whole; a graph comparing the top 10 causes of YPLL in Florida and the top 10 causes of death according to crude mortality rates; and a graph depicting YPLL rates for the leading causes of death in Florida. For each county we also prepared a table comparing the leading causes that made up the total YPLL rate in the targeted county and in three or four other counties similar in size and demographic make-up.⁴

Staff members from the Epidemiology Bureau have accompanied the Quality Assessment teams on their regularly scheduled county visits to present these materials.

To quantify the variation in YPLL rates found among counties, we used the following formula to calculate the coefficient of variation (CV) for total YPLL rates by county and for cause-specific YPLL rates by county:

$$CV = \frac{\text{Standard deviation of the mean}}{\text{Mean}} \times 100$$

Figure 1. YPLL rates for leading causes of death, Florida, 1993

YPLL = years of potential life lost before age 65 per 100,000 population

67 counties and covers 95% of the state's population) to avoid excessive variation introduced by smaller numbers.

RESULTS

Our work with the counties led us to uncover new ways to interpret YPLL data that should be of use to county, state, and national health planners. Ultimately, these efforts led us to recommend that cause-specific YPLL be used instead of overall YPLL.

Major causes of YPLL. The per-county total YPLL rate for the 36 counties was fairly stable, ranging from 3500 per 100,000 population to 7000 per 100,000 population. When we looked at the causes

of death that made up the total YPLL rate, we found that 68% of YPLL for Florida were attributed to 10 major causes (Figure 1): HIV/AIDS, motor vehicle deaths and injuries, heart disease, perinatal causes, homicide, non-motor vehicle unintentional injury, suicide, lung cancer, stroke, and breast cancer.

Table 1. Top 10 causes of YPLL compared with top 10 causes of death according to crude mortality rates, Duval County, Florida, 1993

Rank	Crude mortality	YPLL
1	Heart disease	Homicide
2	Lung cancer	Heart disease
3	Stroke	HIV-AIDS
4	COPD	Perinatal conditions
5	Breast cancer	Non-motor vehicle injury
6	Pneumonia-influenza	Motor-vehicle injury
7	Colorectal cancer	Suicide
8	Diabetes	Lung cancer
9	HIV-AIDS	Stroke
10	Homicide	Cirrhosis

YPLL = years of potential life lost before age 65 per 100,000 population

COPD = chronic obstructive pulmonary disease

This measure—the standard deviation as a percentage of the mean—allowed us to compare the variability between cause-specific rates without having the magnitude of the rates influence the findings.^{6,7} Analysis for the state of Florida was restricted to larger counties (those with populations of 50,000 or more, which includes 36 of the

YPLL compared with crude mortality rates. Table 1 shows a comparison of the top 10 causes of YPLL for one Florida county, Duval County, which includes the city of Jacksonville, compared with the top 10 causes of mortality according to crude mortality rates, a measure more familiar to county public health workers. The distinction between YPLL and crude mortality rates appeared to be quite useful because it allowed YPLL to be compared with the more familiar health outcome measure, highlighting the differences between the two.

Comparing YPLLs across counties. When we selected and compared specific leading causes of YPLL across different counties with similar population sizes, we found large differences in the contribution of certain YPLL causes to the total YPLL rates within a given county.

The county-specific training materials included

“Age-specific and crude mortality rates fail to emphasize the burden of loss.”

comparisons across groups of three counties that were similar in size. Figure 2 shows YPLL rates for four causes for three Florida counties, Broward (Ft. Lauderdale), Duval (Jacksonville), and Pasco (near Tampa). The rates for homicide and HIV-AIDS were substantially different, whereas the rates for lung cancer and heart disease were quite similar.

The higher the coefficient of variation (CV), the more the YPLL rate for the specific health problem differed between counties (Figure 3). For certain leading causes of YPLL (for example, HIV-AIDS and homicide), the CV was two to three times higher than the CV for the county total YPLL rates. In addition, the CV was large for the YPLL rates for diabetes, chronic lung disease, and perinatal conditions.

Differences in YPLL rates between counties were also examined using other kinds of data. For example, two adjacent counties in Florida's Panhandle had markedly different rates of breast cancer mortality; we helped the counties explore the possible reasons for this difference using a chart showing mortality by cancer stage at diagnosis for the two counties. Based on this analysis, county health staff concluded that the higher YPLL rate in Santa Rosa County might have resulted from the larger number of patients diagnosed at more advanced stages of the disease, perhaps due to differences in access to health care services.

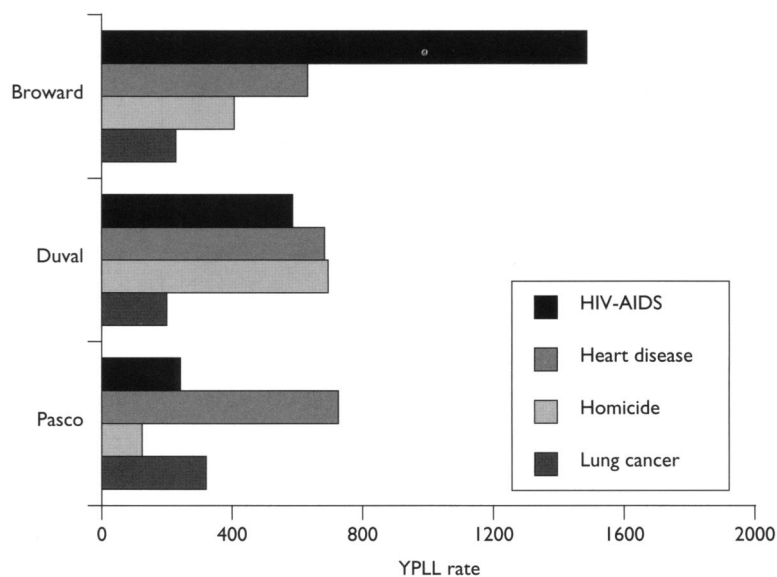
Other important county-to-county differences were identified by dividing larger YPLL categories into their major components. For example, instead of grouping all preventable cancers (breast, melanoma, cervical, and so on), it is better to examine

Table 2. Comparison of five leading causes of YPLL in two Florida counties, 1993

Rank	Broward	Pasco
1	HIV-AIDS	Heart disease
2	Perinatal conditions	Motor-vehicle injury
3	Heart disease	Suicide
4	Motor-vehicle injury	Non-motor vehicle injury
5	Homicide	Lung cancer

YPLL = years of potential life lost before age 65 per 100,000 population

Figure 2. Selected causes of YPLL, three Florida counties, 1993



YPLL = years of potential life lost before age 65 per 100,000 population

“The list of health problems that emerged from the YPLL analysis often included problems that the county health department was not accustomed to working with, such as homicide, suicide, and motor vehicle crashes.”

each separately since the classification of YPLL causes is important. These classifications should relate to either specific causes or to specific risk factors such as smoking or alcohol use.^{13,14} In Duval County, intentional injuries are the leading YPLL contributor. To analyze this further, we divided intentional injuries into the two major components, homicide and suicide. Suicide YPLL rates are quite similar across Florida counties, whereas homicide YPLL rates vary greatly. Figure 4, showing the YPLL rates for intentional injuries in Broward, Duval, and Pasco Counties, illustrates that the larger category of intentional injuries yields less

information on underlying causes and risk factors than the separate classifications of homicide and suicide. In counties such as Duval County, the analysis illustrated in Figure 4 shows that programs to address unintentional injuries will need to focus primarily on homicide.

DISCUSSION

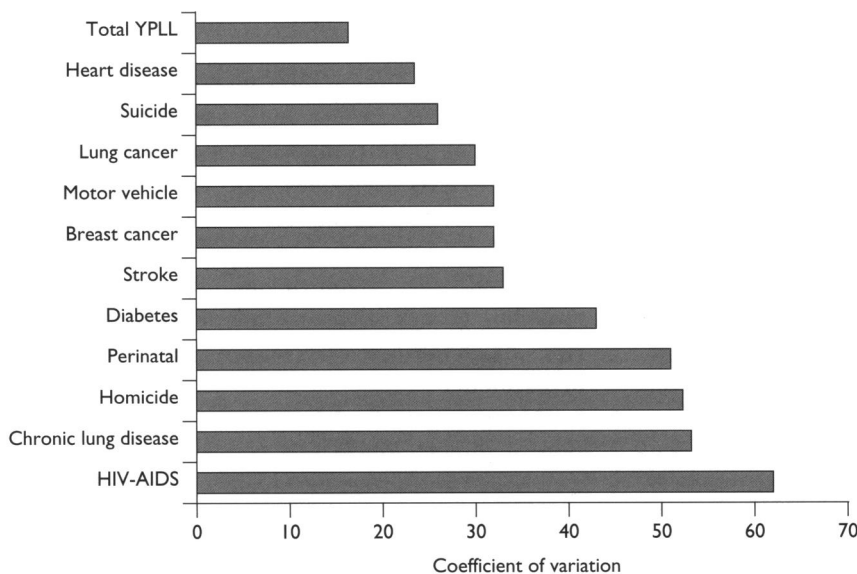
Usefulness at the county level. Our results led us to see that when county-level mortality data are presented as YPLLs, a different set of prevention or health service priorities can emerge. Using YPLLs in

addition to—crude mortality rates shifts the emphasis from deaths in older people to understanding what kills younger people.

If the goal is simply to emphasize deaths among younger people, then the more straightforward approach would be to present age-specific mortality rates. Age-specific mortality, however, like crude mortality, focuses on the occurrence of death and fails to quantify the burden of loss. The YPLL measure inherently incorporates age at death and therefore can serve as an index of the social and economic consequences of mortality.

The other advantage of

Figure 3. Coefficient of variation for selected causes of YPLL, Florida, 1993



YPLL = years of potential life lost before age 65 per 100,000 population

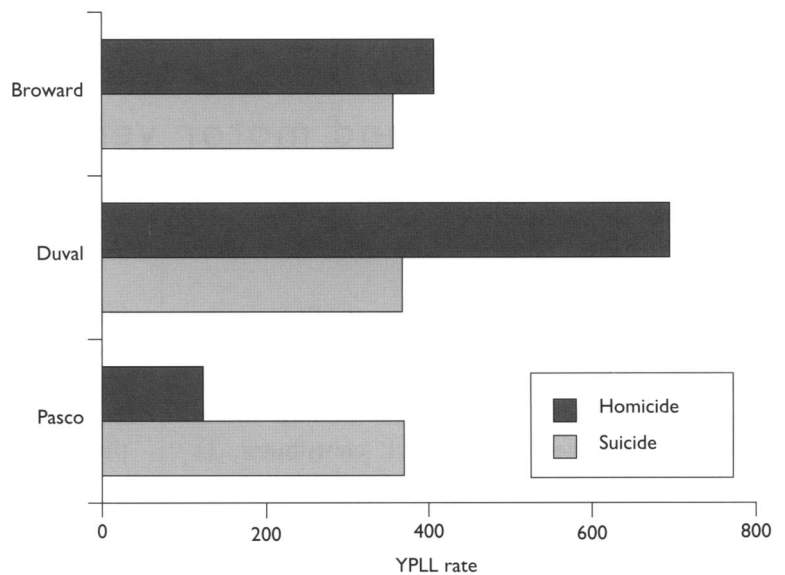
YPLL is that it is a summary statistic and is easier to display. Age-specific mortality will require selecting age groups for analysis and displaying longer tables of data that may become confusing for less sophisticated readers. The YPLL measure can facilitate a more coherent presentation of premature mortality. It is hoped that in using this measure, county health staff might begin to consider causes of premature mortality instead of simply crude mortality and want to look more deeply into these causes. The next step in this analysis would then be careful consideration of age-specific rates to determine time trends and other variability that might reflect underlying causes of death.

Some of the variation in YPLL rates between counties was expected, such as that seen for HIV-AIDS and homicide. Further investigation is warranted, however, into the large CVs by county for diabetes, cirrhosis, and chronic obstructive pulmonary disease. The extent to which these variations represent reporting differences in the incidence or prevalence of these diseases or are due to actual variation in population demographics and prevalence of risk behaviors is unclear. Important differences could reflect differences in access to or quality of care or differences in the way causes of death are assigned by attending physicians.

Usefulness at state and national levels. For agencies at the state and national levels, the causes of YPLL that show less variation across counties (certain preventable cancers, heart disease, and stroke, for example) are more likely to be amenable to uniform state or national program planning and technical assistance, whereas those causes with large variation (such as HIV-AIDS and homicide) may require locally designed interventions. We found that the list of health problems that emerged from this YPLL analysis often included problems that the county health department was not accustomed to working with, such as homicide, suicide, and motor vehicle crashes.

In planning this type of analysis, the grouping of

Figure 4. Major contributors of intentional injury, selected Florida counties, 1993



YPLL = years of potential life lost before age 65 per 100,000 population

causes of death requires careful consideration. Subdividing broad categories such as intentional injury is important, for example, because the risk factors for the two major causes of intentional injury are not the same. Similarly, it may be important to separately examine major groups of cancers (such as tobacco-related cancers and screening-sensitive cancers). A focus on premature mortality and a commitment to address it effectively may help local health agencies form alliances with other community groups concerned with safety, substance abuse, lifestyle issues, or the accessibility of diagnostic and treatment services—including groups such as Mothers Against Drunk Driving, neighborhood associations, and police and fire departments.

Many county health agencies focus on the provision of direct clinical services, such as prenatal and well-baby care; screening services, such as Pap smears and mammograms; and medical care for the indigent. The emphasis on medical care may not address the leading causes of premature mortality at all. Understanding the causes of YPLL leads to increased emphasis on community action and prevention—a role unique to public health.

TRY YOUR HAND AT YPLLs

Calculate the total YPLL rate last year for this community of 10,000 people, of whom 8000 are 65 years of age or younger:

One child died at age six months due to a respiratory infection and another at 10 months due to a congenital heart defect. Three children died at age three years, two from unintentional injury and one from pneumonia. An 8-year-old died by drowning, a 30-year-old died of AIDS, and a 35-year-old died in a fall. Six people died of heart disease at the age of 55. Six people died of various cancers at age 60. Twelve people died of stroke after the age of 65. (Note: by convention all children younger than one year are counted as 0.5 years.)

Answer:

$$65 - 0.5 = 64.5. \text{ So, } 3 \times 64.5 = 129$$

$$65 - 3 = 62. \text{ Thus, } 3 \times 62 = 186$$

$$65 - 8 = 57 \text{ and } 1 \times 57 = 57$$

$$65 - 30 = 35 \text{ and } 1 \times 35 = 35$$

$$65 - 35 = 30 \text{ and } 1 \times 30 = 30$$

$$65 - 55 = 10 \text{ and } 6 \times 10 = 60$$

$$65 - 5 = 5 \text{ and } 6 \times 5 = 30$$

The total YPLL is 527. (Twelve of the deaths described were not counted since they were over the cut-off age of 65 years.)

The YPLL rate is $527 \text{ per } 8000 \times 100,000 = 6587.5$ for the year.

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