



The Burden of Disease in Los Angeles County

A Study of the Patterns of Morbidity and Mortality
in the County Population

Produced by

**The Los Angeles County Department of Health Services
and
The UCLA Center for Health Policy Research**

January 2000

Preface

We seek to improve health in the populations we serve but too often the health of these populations is judged by looking solely at the leading causes of death. Some of our greatest health problems, however, are chronic disabling conditions such as depression and arthritis that do not frequently appear in death statistics.

This report presents a new methodology for measuring the burden of disease and injury in populations. In so doing, the report advances our ability to understand the burden of ill health by incorporating the contributions of both premature death and disability. The analysis highlights the great disparities in health among the major racial and ethnic populations within Los Angeles and further highlights opportunities for targeted programs to reduce these disparities.

Information from this report will be particularly helpful to public and private organizations with a public health mission. The information will cause us to reevaluate priorities and reallocate resources. The findings should also be very valuable to Service Planning Area and community-based planning efforts. Finally, the results give us a new benchmark to evaluate our future progress in achieving public health goals.



Jonathan Fielding, MD, MPH

Director of Public Health and Health Officer

Executive Summary

Monitoring the health status of the population is one of the core functions of local health departments and other public health agencies. This report employs a new method — the Global Burden of Disease — to assess the total burden of disease and injury among Los Angeles County residents. This method combines premature mortality (measured using Years of Life Lost, or YLLs) and morbidity (measured using Years Lived with Disability, or YLDs) into a single measure of burden known as Disability Adjusted Life Years (DALYs). The goals of this report are to: (a) provide additional perspective on how to assess burden of disease and injury, and (b) advance the public discussion about how and where to allocate public health resources to most effectively address the diverse health needs of the County’s residents. The findings confirm previous results regarding the major health problems facing the County, while highlighting the significant impact of other public health problems that are often underestimated.

Major Findings

Chronic Illnesses, Drug and Alcohol Dependence, Violence, and Unintentional Injuries Produce a Substantial Burden of Disease. The most important finding of this report is that DALYs produce a substantially different ranking of disease burden within Los Angeles County than do mortality rates alone. Several conditions, including alcohol dependence, depression, drug dependence, and osteoarthritis have a significant burden of disease not adequately captured by mortality rates because of the large number of years of disability, or YLDs, associated with these conditions. Other conditions, including injuries from motor vehicle crashes, HIV/AIDS, and suicide, have a greater burden of illness

than measured solely by crude mortality rates due in large part to the considerable premature mortality, or high YLLs, associated with these conditions.

Burden of Disease Varies Considerably by Gender, Race/Ethnicity and Geographic Area. Our findings clearly demonstrate considerable differences in age-adjusted DALYs per 1,000 population by gender, race/ethnicity and geographic region within the county. The leading causes of DALYs also vary across these demographic groups. For example, homicide/violence is the second leading cause of DALYs in males while only the 24th ranked cause in females. African Americans and American Indians have the highest age-adjusted DALYs per 1,000 population of any ethnic group, while Latinos and Asian Americans have lower DALY rates than Whites. Most of these ethnic differences are attributable to differences in premature death as measured by the Years of Life Lost (YLLs per 1,000 population). However, African Americans and American Indians also have higher rates of disability as measured by Years Lived with Disability (YLDs per 1,000 population). Efforts to improve the health of each population must address both premature mortality and disability.

Implications for Los Angeles County

Matching Resources with Need. This report represents an important step in improving the County's ability to assess health needs more accurately at the population level. DALYs provide a means for identifying and ranking priorities based on total burden of disease. The results will be important in helping county government and many other private and public organizations better prioritize efforts to *improve* the public's health.

Acknowledgments

This report is the product of a collaborative effort between the Los Angeles County Department of Health Services and the UCLA Center for Health Policy Research. The County research team included Alex Ho, M.D., M.P.H., Paul Simon, M.D., M.P.H., Jonathan Fielding, M.D., M.P.H., Larry Portigal M.S., and Marc Strassburg, Dr. P.H. The UCLA team included Gerald F. Kominski, Ph.D., Jeffrey Luck, M.B.A., Ph.D., and Yee-Wei Lim, M.D.

We would like to thank Dr. Catherine Michaud at the Harvard School of Public Health who reviewed our preliminary analysis and who assisted us in using the Global Burden of Disease methodology.

Section 1: Report Overview

Monitoring the health status of the population is one of the core functions of local health departments and other public health agencies.¹ Developing a clear understanding of the sources of morbidity and mortality in the population is critically important for establishing health priorities, allocating resources, and planning services. In Los Angeles County, assuring the availability of health services and developing a public health infrastructure that meets the needs of all residents and maximizes the health of the total population is an enormous challenge. The county is home to over 9.6 million residents and is one of the most ethnically diverse jurisdictions in the United States. In addition, many county residents live in circumstances that make them especially vulnerable. For example, one-third of children in the county live in households with incomes below the federal poverty level.² In addition, an estimated one-third of adults and one-fourth of children have no health insurance and, therefore, have reduced access to health care services.³

This report employs a new method — the Global Burden of Disease — to assess the total burden of disease among county residents. This method combines premature mortality and morbidity into a single measure known as Disability Adjusted Life Years (DALYs). Sources of disease burden, as measured by DALYs, are viewed broadly in this report to include communicable diseases, chronic non-communicable diseases (such as coronary heart disease, cancer, and diabetes), mental illness, and injuries. The goal of the report is to: (a) provide additional perspective on how to assess burden of disease and injury, and (b) advance the public discussion about how and where to allocate public and private

health resources to most effectively address the diverse health needs of the County's residents.

The Global Burden of Disease methodology was originally developed by researchers at the Harvard University School of Public Health under the auspices of The World Health Organization (WHO) and The World Bank for international health needs assessment.⁴ It has been used broadly by WHO to identify health care and public health priorities throughout the world. This report represents one of several efforts currently underway to apply this methodology for health needs assessment in the United States.

DALYs represent an improvement in health needs assessment because they combine the impact of mortality and morbidity into a single measure of disease burden. Mortality rates are useful in identifying conditions with the worst health outcomes. However, conditions with low or moderate mortality rates may have a high burden of disease because of premature mortality or morbidity, or both. For example, intentional and unintentional injuries (e.g., injuries resulting from violence or motor vehicle crashes) most often involve younger individuals and thus have a higher burden of disease when premature death and equivalent years of life lost due to disability are taken into account. Chronic conditions such as arthritis and depression may have minimal impact on mortality but be a major source of chronic disability and, therefore, exact a great toll on the quality of life and economic productivity.

DALYs provide a common measure of disease burden that combines both the rate of mortality and the degree of morbidity for specific health conditions. This combined measure can then be used to compare total disease burden across

conditions to better plan health resource allocation and related program and policy efforts.

This report is organized as follows. Section 2 describes how DALYs are calculated and briefly discusses the strengths and weaknesses of this approach to combining mortality and morbidity into a single measure of disease burden. Section 3 presents data on total deaths (crude mortality), rates of premature mortality, and rates of DALYs for the entire county population to indicate how these different measures can lead to different rankings of disease burden. This chapter also presents data for different groups within the county, including separate tables by gender, race/ethnicity, and Service Planning Area (SPA). Section 4 summarizes our conclusions and discusses the policy implications of these findings.

Section 2: Methods

Background

This report provides data on the burden of disease in the Los Angeles County population based on DALYs. DALYs are a composite measure of the number of years of life lost due to premature mortality plus the number of years lived with disability, appropriately adjusted for level of disability. It is therefore a measure of disease burden that combines the contributions of both premature death and disability associated with individual health conditions. DALYs associated with individual conditions can then be summed across all conditions to produce a comprehensive estimate of disease burden in a given population.

DALYs are the sum of two components. The first, Years of Life Lost (YLLs), measures the number of years lost when a person dies prematurely. Thus, the younger the age at which death occurs, the greater the number of YLLs due to premature mortality. The second component, Years Lived with Disability (YLDs), measures the number of years of healthy life lost due to temporary or permanent disability. Thus, the more severe or the longer the duration of disability associated with a given health condition, the greater the number of YLDs.

The following pages describe in more specific detail how YLLs, YLDs, and DALYs were calculated for this report. The methods are based on those used by the Harvard University Burden of Disease Unit for their global projections.²

YLL Calculations

When a person dies, the number of YLLs attributable to that death is the decedent's remaining life expectancy, that is, the remaining number of years the person would have been expected to live. For example, a female infant who dies shortly after birth would lose all 82.5 years of life she would have been expected to live. A woman who dies at age 50 years would lose 34 years of expected life, because women who have already survived to age 50 have a life expectancy of 84 years. A woman who dies at age 75 years would lose only 12 years of expected life, because her life expectancy at age 75 is 87 years.

Data on life expectancy at every age are contained in life tables. These tables are calculated separately for males and females, because females live longer on average. The life tables used for this study have a life expectancy at birth of 82.5 years for females and 80.0 years for males. These tables, from Murray (1994),⁵ were chosen to match the life expectancies used in the global burden of disease (GBD) study and reflect the highest national life expectancies observed worldwide. Actual life expectancies at birth in the United States are lower: 79.1 years for females and 73.1 years for males. For economically disadvantaged groups, such as African-Americans, life expectancies are further reduced: 74.2 years for females and 66.1 years for males.⁶ We chose not to use U.S. population life expectancies in this analysis so as not to understate the disease burden in the County population relative to other regions of the world and to allow for more valid comparisons with other locales.

YLLs for the Los Angeles County population in 1997 were calculated from the 1997 vital statistics death records. These include deaths registered by the Los Angeles County Department of Health Services, as well as those registered by the

independent city health departments of Long Beach and Pasadena. Each death record contains information on the decedent's age at death, gender, race/ethnicity, residence address, and underlying cause of death.

The burden of disease method does not calculate YLLs individually for each death. Instead, each death is assigned to one of 19 age groupings (<1 year, 1 year, 2-4 years, 5-9 years, 10-15 years, ... , 80-84 years, 85+ years), and the midpoint of the age group is taken as the average age at death for every person in that group.

The GBD method combines deaths (and the resulting YLLs) into 140 broad categories of disease and injury (e.g., coronary heart disease, alcohol dependence, homicide/violence) based on the underlying cause of death. The cause of death on each vital statistics death certificate is denoted using codes defined by the International Classification of Diseases, Ninth Revision (ICD-9). For example, deaths due to lung and other respiratory tract cancers are assigned codes ranging from 162.3 to 162.9, depending on the specific site of the cancer. In this study, ICD-9 codes were used to group reported causes of death into 140 disease categories using a conversion table provided by the Harvard Burden of Disease Unit. These disease categories were then used to characterize disease burden in the county population.

YLD Calculations

Many conditions, such as cerebrovascular disease (stroke), cause significant disability as well as death. Other conditions, such as depression and other mental illness, are seldom listed as causes of death but may cause severe and prolonged disability. The calculation of YLDs takes into account the severity of disability due to a given disease as well as the average length of time the disability persists.

For example, Alzheimer's disease often causes severe disability but typically occurs late in life and is therefore of relatively short duration. In contrast, asthma frequently causes less severe disability but may begin in childhood and persist for a lifetime. The YLD measure counts the number of years of reduced health caused by living with a disabling condition, adjusted by the percentage of disability. For example, 2 years lived with 50% disability contributes 1 YLD to the overall burden of disease, as does 4 years lived with 25% disability. According to this definition of morbidity, 1 YLD is *equivalent* to 1 YLL; so 2 years lived with 50% disability are the same as 1 year of life lost due to premature death.

The degree of disability due to a given condition is expressed as a disability weight, ranging from 0.0 for no disability to 1.0 for death. The disability weights underlying this study were based on a rating exercise conducted by Murray and Lopez (1996).⁴ They convened several panels of health professionals from different countries to quantify the severity of 22 "indicator" conditions (ranging from diarrhea to below-the-knee amputation to active psychosis) using a multiple-round decision process. Weights for remaining conditions were assigned by comparing them to the 22 conditions rated by the panels. Overall, disability weights were assigned to approximately 500 consequences (sequelae) of various diseases. These sequelae were aggregated into the same 140 disease categories used to group deaths in calculating YLLs.

The complete calculation of YLDs is complex. In brief, YLDs for a given disabling sequelae, and for a given age group, are the product of the disability weight, the expected duration of the disability, and the incidence of the disability (that is, the rate at which persons develop the disability during the year of analysis). Incidence rates differ between regions of the world; those used for this

study are for the Established Market Economies (EME) from Murray and Lopez (1996).⁴ YLDs for individual sequelae are summed across age groups and aggregated into the disease categories.

The developers of the GBD method have simplified the YLD calculation by using YLD-to-YLL ratios. This ratio method produces *estimates* of the amount of YLDs in a population based on *actual* rates of YLLs obtained from vital statistics. The ratios were developed based on a synthesis of published studies establishing the relationship between disability and mortality for a variety of diseases and injuries.

We used the GBD ratio method for calculating YLDs for diseases associated with a sufficient level of mortality (YLD/YLL ratio less than 10). That is, for diseases with a YLD/YLL ratio of less than 10, we multiplied the ratio by the YLLs obtained from county mortality data to obtain estimated YLDs. For conditions with no associated mortality or where the YLD/YLL ratio was equal to or greater than 10, YLDs were calculated by applying EME incidence rates to the demographic distribution of the county population. YLD calculations were performed separately by gender and age group for each of the 140 disease categories.

Summation and Weighting

The total number of DALYs associated with each disease category is the sum of the YLLs and YLDs for that disease. However, prior to this summation, two additional adjustments are applied to each measure – an age weighting factor and a discounting factor.

The age weighting factor quantifies the widely held perception that a year of life is valued more heavily at some ages than at others.⁴ Specifically, the value of the weighting factor rises rapidly from 0 at birth, peaks at age 22 years, and declines gradually thereafter. The application of this factor neither decreases or increases the total number of DALYs for the population being analyzed. It does give higher weight to DALYs during the most productive work years. Because this factor gives lower weight to DALYs at both ends of life, we conducted separate studies removing this age weighting factor, thus giving constant weight to DALYs regardless of age. Removing the age weighting had little effect on the final tables presented in this report.

The discounting factor quantifies the perception most people hold that a year of life is more valuable the closer it is to the present. This is analogous to the application of financial discount rates that value a current dollar more than a future dollar. The discounting factor applied is 3% per year, a rate used in many economic analyses. This means that a YLL one year into the future is valued at 3% less than a YLL in the current year; a YLL two years hence is discounted a further 3%, and so on.

Rate Calculations

Rates (per 1,000 population) are presented for YLLs, YLDs, and DALYs by gender, race/ethnicity, and geographic region (SPA). For purposes of comparison, these rates have been age-adjusted to account for variations in the age distributions across different sub-populations. The 1990 U.S. population was used as the standard for this age adjustment because it is the most widely used measure for developing age-adjusted population rates that are comparable across different regions of the country.

Section 3: Results

A total of 59,786 deaths were included in the analysis, accounting for 99.5% of all deaths reported among Los Angeles County residents in 1997. Two hundred eighty-six deaths were excluded because of insufficient information on the death report. The demographic characteristics of those who died in 1997 are shown in Table 1.

Heart disease accounted for the greatest number of deaths (n=14,378), followed by stroke (n=4,168), lung and other respiratory tract cancers (n=3,772), pneumonia (n=3,364), and emphysema (n=2,671). For the 20 conditions accounting for the greatest number of deaths, their respective ranks based on YLLs and DALYs are shown in Table 2a. Considerable variation is apparent in the ranking of conditions based on the number of deaths (crude mortality) versus YLLs and DALYs. For example, although pneumonia was the fourth leading cause of death based on crude mortality, it was only the 12th leading cause of premature death based on YLLs and only the 21st leading cause of premature death and disability based on DALYs.

Heart disease was also the leading cause of YLLs (66,494 years), followed by homicide and violence (35,572 years), lung and other respiratory tract cancers (27,414 years), stroke (21,601 years), and motor vehicle crashes (19,908 years) (Table 2b). As points of comparison, the crude mortality and DALYs rankings for the 20 listed conditions are also shown in the Table. Considerable variation in the rankings is again apparent. For example, because YLLs account for the impact of premature mortality, motor vehicle crashes moved up in ranking from 14th based

on crude mortality to fifth based on YLLs. Likewise, HIV/AIDS moved from 19th based on crude mortality to seventh based on YLLs.

The leading 20 causes of disease burden based on DALYs are shown in Table 2c. Heart disease was the leading cause of DALYs (72,886 years), followed by alcohol dependence (60,872 years), homicide and violence (45,548 years), depression (43,449), and diabetes (42,456 years). As indicated in the Table, many of the leading causes of disease burden on the DALYs list are ranked considerably lower based on crude mortality and YLLs. For example, alcohol dependence is ranked second based on DALYs, but only 29th based on YLLs and 39th based on crude mortality. Depression is ranked sixth based on DALYs, but 91st based on both YLLs and crude mortality. Osteoarthritis is ranked sixth based on DALYs but only 70th based on crude mortality and 80th based on YLLs. These disparities highlight the importance of these conditions as sources of disability and their relatively minimal impacts on mortality.

The relative contributions of premature mortality (YLLs) and disability (YLDs) for each of the 20 leading causes of DALYs are shown in Figure 1. Substantial variation is seen in the relative contributions of YLLs and YLDs across conditions. For example, a much greater portion of the burden associated with coronary heart disease and homicide/violence is attributable to YLLs than to YLDs. In contrast, most of the burden associated with alcohol dependence, depression, and osteoarthritis is attributable to YLDs.

Demographic Variation in DALYs

The relative burden (as measured in DALYs) of communicable diseases, non-communicable diseases, and injuries for the total county population and by

gender is shown in Figure 2. Overall, 80% of disease burden was associated with non-communicable diseases (e.g., coronary heart disease, cancer, and diabetes), 11% with injuries, and 9% with communicable diseases. Non-communicable diseases accounted for a higher percentage of the total burden in females (86%) than males (75%) while injuries accounted for a lower percentage in females (6%) than males (16%).

Age-adjusted rates (per 1,000 population) of YLLs, YLDs, and DALYs by gender, race/ethnicity, and SPA are shown in Table 3. The DALY rates were higher in men (118.8) than women (93.8). Most of this difference is attributable to a 50% higher rate of YLLs among men (66.6) than women (44.1). The DALY rates also varied by race/ethnicity. African Americans had the highest rate (190.3), followed by American Indians/Alaska Natives (149.2), Whites (112.5), Latinos (94.0), and Asians/Pacific Islanders (76.9). The rates of YLLs and YLDs were also highest in African Americans (106.4 and 83.9, respectively). The highest DALY rates by geographic region were in the South (166.7) and Antelope Valley (143.3) SPAs. These two SPAs also had the highest rates of YLLs and YLDs.

Significant differences in the ten leading causes of DALYs are also apparent by gender, race/ethnicity, and SPA, as shown in Table 4. For example, homicide/violence was the leading cause of DALYs in African Americans and the second leading cause in Latinos, but does not appear among the leading 10 causes in Whites and Asians/Pacific Islanders. Similarly, homicide/violence was the second leading cause of DALYs in men but does not appear among the leading 10 causes in women. Heart disease was the leading cause of DALYs in all SPAs except Antelope Valley and South, where alcohol dependence and homicide/violence, respectively, head the lists.

Section 4: Discussion and Policy Implications

Significance of DALYs for Los Angeles County

Chronic Illnesses, Drug and Alcohol Dependence, Violence, and Unintentional Injuries Produce a Substantial Burden of Disease. The most important finding of this report is that DALYs produce a substantially different ranking of disease burden within Los Angeles County than do mortality rates alone. Several conditions, including alcohol dependence, depression, drug dependence, and osteoarthritis have a significant burden of disease not adequately captured by mortality rates because of the large number of years of disability associated with these conditions. Other conditions, including injuries from motor vehicle crashes, HIV/AIDS, and suicide, have a greater burden of illness and injury than measured solely by crude mortality rates due in large part to the considerable premature mortality, or high YLLs, associated with these conditions.

Many of the 20 highest ranked conditions in Los Angeles County based on DALYs can be effectively addressed through a combination of public health efforts. Alcohol and other substance abuse, injuries from motor vehicle crashes, and HIV/AIDS are examples of conditions where mortality and disability can be reduced through education, health promotion activities, treatment services, and healthful policies. The disease burden of chronic conditions, such as depression, heart disease, diabetes, and arthritis, can also be effectively reduced through public health programs and improved access to medical care services and disease management.

The limitations of crude and even age-adjusted mortality rates for assessing community health needs are widely recognized. Years of life lost (YLLs) were viewed as a major innovation when they were first developed, and are a better measure of disease burden because they combine the effects of the crude mortality rate with average age at death to assess total years of premature mortality. DALYs represent a further improvement over YLLs alone because they combine YLLs with the other major component of disease burden - namely, years lived with disability (YLDs).

Burden of Disease Varies Considerably by Gender, Race/Ethnicity and Geographic Area. Our findings clearly demonstrate considerable differences in age-adjusted DALYs per 1,000 population by gender, race/ethnicity and geographic region within the county. The leading causes of DALYs also vary across these demographic groups. For example, homicide/violence is the second leading cause of DALYs in males while only the 24th ranked cause in females. African Americans and American Indians have the highest age-adjusted DALYs per 1,000 population of any ethnic group, while Latinos and Asian Americans have lower DALY rates than Whites. Most of these ethnic differences are attributable to differences in premature death as measured by the YLLs per 1,000 population. However, African Americans and American Indians also have higher rates of disability as measured by YLDs per 1,000 population. Efforts to improve the health of all populations must address both premature mortality and disability. In addition, the findings underscore the importance of addressing the markedly increased rate of premature mortality among African Americans in the County.

Geographically, the greatest differences in DALY rates are found in the Antelope Valley and the South SPAs, which have substantially higher rates than

the rest of the County, and in the Metro SPA, which has a slightly higher rate than the rest of the County. These higher rates may be explained by socioeconomic, racial/ethnic, or other demographic differences between these communities. Regardless of the underlying reasons for the differences, our findings indicate substantial geographic disparity in the burden of disease within the County.

Implications for Los Angeles County

Matching Resources with Need. The report represents an important step in improving the County's ability to assess health needs more accurately at the population level. DALYs provide a tool for refining health improvement priorities based on total burden of disease. The information provided by these methods, however, needs to be combined with data on the relative effectiveness and efficiency of different interventions to improve the public's health. The matching of priorities with resources to support these interventions includes not only the County, but public and private partners as well. Reducing the burden of disease among residents of Los Angeles requires a coordinated effort of public and private programs, policies, and priorities.

Another important next step is for the disability estimates provided in the report to undergo further validation and refinement. The county and state have a variety of data sources that can be used to measure directly certain types of disability, in contrast to the indirect method used in this report. However, developing direct population-based measures of all relevant disabilities and incorporating these measures into the DALY calculations for Los Angeles County would require a large-scale effort. Such refinements are an important research opportunity but other studies suggest that direct measurement of disability would have a limited impact on the findings reported here.⁸

For Los Angeles County, this better depiction of disease burden will be used to help allocate funding for public health services and programs. The DALYs analysis provides a broader picture of community health needs than traditional measures of mortality and morbidity. Further, this study shows substantial differences within the County by racial/ethnic group and by geographic area. We anticipate that this report will be valuable for planning countywide, at the level of the Service Planning Areas, and at the community level. Ultimately, the test of the incremental value of this method will be whether this information leads to a more rapid closing of the serious disparities in health among different ethnic and racial groups.

Improving the County's Role in Health Needs Assessment. This study addresses one of the major recommendations outlined in the 1997 Breslow Report⁷ that reviewed the operations of Public Health Programs and Services of the County Department of Health Services. That report called for improved methods to assess the health needs of the County's population, based on the Institute of Medicine's definition of the three core functions of public health, which include assessment, policy development, and assurance.¹ This report contributes to the County's ability to more accurately assess the health needs of its residents.

Limitations of DALYs/Future Refinements. This study was designed to improve our understanding of the burden of disease and the health needs of the entire Los Angeles County population. Although the use of DALYs represents a substantial improvement over previous methods of assessing the burden of disease and injuries, there are several important limitations of the DALYs measure and its YLD component.

The YLDs presented in this report are based on age-specific rates of disability obtained from the scientific literature for a broad geographic area that includes the U.S., Canada, Japan, Western Europe, and Australia, rather than a direct measurement of disability for the County's population. If disability rates within the County are significantly different than the rates used in this analysis, the YLDs and DALYs reported here may be overstated or understated for specific health conditions. Research is currently underway at the Centers for Disease Control and Prevention to refine the YLD component of DALYs based on U.S. data. Future efforts by the County to use DALYs to assess disease burden should incorporate these refinements, and other possible refinements based on state or county-specific disability rates, where available.

A second major limitation of the YLDs relates to the disability weights assigned to specific conditions and the question of whose judgment should be considered in developing disability weights. The disability weights for YLDs used in this study were obtained from an international panel of health professionals. Although the developers of DALYs have directly addressed the validity of this approach, members of the disability community have raised objections concerning the use of disability weights obtained from a panel of non-disabled health professionals. Further refinement of disability weights is merited.

Recent research has shown that using a single set of disability weights across nations may not accurately account for cross-cultural differences in judgments about the degree of disability for various conditions.⁸ For example, mental illness may result in a higher burden of disease in societies or cultures that are less accepting of such conditions. Furthermore, international disability weights may not be appropriate in the U.S., which has a strong disability rights movement.

Several studies are underway in other countries to refine YLDs to account for cultural and societal variation in disability judgments. Based on the findings of these studies, however, such refinements are unlikely to produce substantial changes in the basic findings of this report.

A third limitation is that the DALYs estimates do not account for recent trends in disease incidence or patterns of illness. For example, with the recent advances in the treatment of HIV infection, the number of AIDS-related deaths in the County has dramatically declined over the past 2 years. This trend would be expected to reduce the YLL burden associated with HIV/AIDS. The effect of HIV treatment advances on the YLD component is more difficult to predict. For example, treatment advances could reduce YLDs by decreasing the severity of symptoms but increase YLDs by increasing the duration of illness.

A final limitation is that the report defines disease burden primarily in relation to disease outcomes and does not address the burden imposed by specific behaviors that profoundly influence health. For example, an analysis of national mortality statistics found that one-third of all deaths in the United States in 1990 were directly attributable to smoking, poor nutrition, or lack of physical activity.⁹ A more recent study by the Institute of Medicine identified the large number of deaths attributable to health care provider errors, which are not readily identified on vital statistics death records.¹⁰ These findings highlight the importance of considering the root causes of morbidity and mortality when designing and implementing health care services and public health programs.

References

- ¹ Institute of Medicine. *The Future of Public Health*. Washington DC: National Academy Press, 1988.
- ² United Way of Los Angeles and Los Angeles County Children's Planning Council. Los Angeles County Children's Score Card 1998. November, 1998.
- ³ Los Angeles County Department of Health Services. Los Angeles County Health Survey, 1997.
- ⁴ Murray CJ, and Lopez AD (eds.), *The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020*, Cambridge, MA: Harvard University Press on behalf of The World Health Organization and The World Bank, 1996.
- ⁵ Murray CJ. *Quantifying the burden of disease: the technical basis for disability-adjusted life years*. Bulletin of the World Health Organization 1994;72:429-445.
- ⁶ Pamuk E, Makuc D, Heck K, Reuben C, Lochner K. *Socioeconomic Status and Health Chartbook. Health, United States*, 1998. Hyattsville, Maryland: National Center for Health Statistics. 1998.
- ⁷ Breslow L, Luck J, et al., *Report of Review of Public Health Programs and Services, Los Angeles County Department of Health Services*, UCLA School of Public Health Technical Assistance Group, July 1997.
- ⁸ Ustun TB, Rehm J, et al., "Multiple-Informant Ranking of the Disabling Effects of Different Health Conditions in 14 Countries," *Lancet*, 1999;354:111-115.
- ⁹ McGinnis JM, Foege WH. Actual causes of death in the United States. *JAMA*, 1993;270:2207-2212.
- ¹⁰ Corrigan J, Kohn L, Donaldson M (eds.); *To Err Is Human: Building a Safer Health System*, Committee on Quality of Health Care in America, Institute of Medicine, 1999.

Table 1: Demographic characteristics of Los Angeles County residents who died in 1997.

	No.	(%)
Sex		
Male	30,144	(50.4)
Female	29,642	(49.6)
Race/ethnicity¹		
White	36,424	(60.9)
Latino	10,609	(17.8)
African American	8,344	(14.0)
Asian / Pacific Islander	4,130	(6.9)
American Indian / Alaska Native	144	(0.2)
Other	113	(0.2)
Residence (by Service Planning Area)¹		
Antelope Valley	1,902	(3.2)
San Fernando	12,956	(21.8)
San Gabriel	10,183	(17.1)
Metro	7,877	(13.2)
West	5,017	(8.4)
South	6,729	(11.3)
East	7,077	(11.9)
South Bay	7,721	(13.0)
Total	59,786	(100.0)

¹ Does not include decedents with unknown race/ethnicity (n=22) or residence (n=324).

Table 2a: Leading 20 causes of death in Los Angeles County based on number of deaths in 1997. (YLL and DALY ranks shown for comparison).

Rank	Cause	No. of deaths	YLL rank	DALY rank
1	Coronary Heart Disease	14,378	1	1
2	Stroke	4,168	4	7
3	Trachea/Bronchus/Lung Cancer	3,772	3	8
4	Pneumonia	3,364	12	21
5	Emphysema	2,671	11	9
6	Diabetes Mellitus	1,747	10	5
7	Colon Cancer	1,483	15	23
8	Homicide/ Violence	1,247	2	3
9	Breast Cancer	1,242	9	19
10	Hypertension	1,241	17	30
11	Cirrhosis	1,045	8	14
12	Alzheimer's/Other Dementia	1,000	30	12
13	Inflammatory Heart Disease	927	13	20
14	Motor Vehicle Crashes	888	5	10
15	Prostate Cancer	841	27	36
16	Lymphoma	804	16	29
17	Pancreatic Cancer	795	19	37
18	Suicide/Other Self-Inflicted Injury	785	6	16
19	HIV/AIDS	680	7	13
20	Leukemia	620	18	32

Table 2b: Leading 20 causes of premature death in Los Angeles County based on years of life lost (YLL) in 1997. (Crude mortality and DALY ranks shown for comparison).

Rank	Cause	YLL (years)	Crude mortality ¹ rank	DALY rank
1	Coronary Heart Disease	66,494	1	1
2	Homicide/ Violence	35,572	8	3
3	Trachea/Bronchus/Lung Cancer	27,414	3	8
4	Stroke	21,601	2	7
5	Motor Vehicle Crashes	19,908	14	10
6	Suicide/Other Self-Inflicted Injury	15,339	18	16
7	HIV/AIDS	14,939	19	13
8	Cirrhosis	14,123	11	14
9	Breast Cancer	13,288	9	19
10	Diabetes Mellitus	13,262	6	5
11	Emphysema	13,017	5	9
12	Pneumonia	12,977	4	21
13	Inflammatory Heart Disease	10,635	13	20
14	Drug Overdose/Other Intoxication	10,631	23	11
15	Colon Cancer	10,154	7	23
16	Lymphoma	8,029	16	29
17	Hypertension	7,122	10	30
18	Leukemia	6,479	20	32
19	Pancreatic Cancer	5,483	17	37
20	Endocrine/Metabolic Diseases	5,070	24	15

¹ Based on number of deaths.

Table 2c: Leading 20 causes of premature death and disability in Los Angeles County based on disability-adjusted life years (DALY) in 1997. (Crude mortality and YLL ranks shown for comparison).

Rank	Cause	DALYs (years)	Crude mortality ¹ rank	YLL rank
1	Coronary Heart Disease	72,886	1	1
2	Alcohol Dependence	60,872	39	29
3	Homicide/Violence	45,548	8	2
4	Depression	43,449	91	91
5	Diabetes Mellitus	42,456	6	10
6	Osteoarthritis	39,811	70	80
7	Stroke	33,351	2	4
8	Trachea/Bronchus/Lung Cancer	29,785	3	3
9	Emphysema	29,333	5	11
10	Motor Vehicle Crashes	29,040	14	5
11	Drug Overdose/Other Intoxication	28,508	23	14
12	Alzheimer's/Other Dementia	27,626	12	30
13	HIV/AIDS	20,649	19	7
14	Cirrhosis	18,263	11	8
15	Endocrine/Metabolic Diseases	17,541	24	20
16	Suicide/Other Self-Inflicted Injury	16,568	18	6
17	Drug Dependence	16,415	50	40
18	Asthma	16,326	44	42
19	Breast Cancer	15,379	9	9
20	Inflammatory Heart Disease	14,666	13	13

¹ Based on number of deaths.

Table 3. Age-adjusted rates (per 1,000 population) of YLLs, YLDs, and DALYs by demographic characteristic.

	RATE		
	YLLs	YLDs	DALYs
Sex			
Male	66.6	52.2	118.8
Female	44.1	52.7	93.8
Race/Ethnicity			
White	55.8	56.7	112.5
Black	106.4	83.9	190.3
Latino	43.4	50.7	94.0
Asian/PI	28.5	48.5	76.9
AI/AN	67.4	81.7	149.2
SPA			
1 Antelope Valley	69.4	73.9	143.3
2 San Fernando	51.2	55.4	106.6
3 San Gabriel	44.7	53.2	97.9
4 Metro	61.6	61.4	123.0
5 West	45.4	57.0	102.3
6 South	91.3	75.4	166.7
7 East	50.9	58.2	109.1
8 South Bay	45.5	55.4	100.9

Table 4. Leading causes of DALYs by sex, race/ethnicity, and SPA.

Sex

Male

Female

Rank	Cause	DALYs		Rank	Cause	DALYs	
		Years	Rate			Years	Rate
1	Coronary Heart Disease	42,560	8.87	1	Coronary Heart Disease	30,326	6.27
2	Homicide/Violence	40,555	8.45	2	Alcohol Dependence	26,196	5.42
3	Alcohol Dependence	34,676	7.23	3	Diabetes Mellitus	23,598	4.88
4	Drug Overdose/Other Intoxication	25,847	5.39	4	Depression	21,337	4.41
5	Depression	22,112	4.61	5	Osteoarthritis	19,828	4.10
6	Osteoarthritis	19,984	4.17	6	Stroke	17,388	3.60
7	Motor Vehicle Crashes	19,774	4.12	7	Alzheimer's/Other Dementia	16,987	3.51
8	Diabetes Mellitus	18,858	3.93	8	Breast Cancer	15,379	3.18
9	HIV/AIDS	17,596	3.67	9	Emphysema	14,843	3.07
10	Trachea/Bronchus/Lung Cancer	16,646	3.47	10	Trachea/Bronchus/Lung Cancer	13,139	2.72

Table 4. (Continued)**Race/Ethnicity****White**

Rank	Cause	DALYs	
		Years	Rate
1	Coronary Heart Disease	44,010	13.63
2	Emphysema	20,411	6.32
3	Alcohol Dependence	19,933	6.18
4	Trachea/Bronchus/Lung Cancer	19,073	5.91
5	Alzheimer's/Other Dementia	18,533	5.74
6	Diabetes Mellitus	15,287	4.74
7	Osteoarthritis	15,174	4.70
8	Stroke	14,931	4.63
9	Depression	14,369	4.45
10	Drug Overdose/Other Intoxication	14,268	4.42

Black

Rank	Cause	DALYs	
		Years	Rate
1	Homicide/Violence	14,264	15.79
2	Coronary Heart Disease	11,380	12.60
3	Diabetes Mellitus	9,737	10.78
4	Alcohol Dependence	6,966	7.71
5	Stroke	6,950	7.69
6	Trachea/Bronchus/Lung Cancer	5,526	6.12
7	HIV/AIDS	5,514	6.10
8	Asthma	4,712	5.22
9	Emphysema	4,388	4.86
10	Depression	4,151	4.59

Latino

Rank	Cause	DALYs	
		Years	Rate
1	Alcohol Dependence	28,305	6.70
2	Homicide/Violence	23,927	5.67
3	Depression	18,530	4.39
4	Diabetes Mellitus	15,116	3.58
5	Osteoarthritis	14,864	3.52
6	Motor Vehicle Crashes	14,222	3.37
7	Coronary Heart Disease	12,207	2.89
8	Drug Overdose/Other Intoxication	9,542	2.26
9	Stroke	8,873	2.10
10	Cirrhosis	7,994	1.89

Asian/PI

Rank	Cause	DALYs	
		Years	Rate
1	Alcohol Dependence	8,345	6.78
2	Depression	6,151	5.00
3	Osteoarthritis	5,758	4.68
4	Coronary Heart Disease	5,219	4.24
5	Stroke	4,290	3.49
6	Diabetes Mellitus	4,118	3.35
7	Alzheimer's/Other Dementia	3,864	3.14
8	Emphysema	3,015	2.45
9	Motor Vehicle Crashes	2,745	2.23
10	Unintended Firearm Injury	2,487	2.02

Table 4. (Continued)

Race/Ethnicity (continued)

AI/AN

Rank	Cause	DALYs	
		Years	Rate
1	Coronary Heart Disease	636	12.99
2	Alcohol Dependence	450	9.19
3	Asthma	387	7.90
4	Drug Overdose/Other Intoxication	385	7.86
5	Motor Vehicle Crashes	381	7.78
6	Diabetes Mellitus	368	7.51
7	Homicide/Violence	325	6.64
8	Cirrhosis	314	6.41
9	Depression	248	5.06
10	Osteoarthritis	244	4.98

Table 4. (Continued)**SPA****1 Antelope Valley**

Rank	Cause	DALYs	
		Years	Rate
1	Alcohol Dependence	2,397	8.00
2	Coronary Heart Disease	2,319	7.74
3	Motor Vehicle Crashes	1,694	5.65
4	Emphysema	1,583	5.28
5	Diabetes Mellitus	1,562	5.21
6	Stroke	1,491	4.98
7	Depression	1,361	4.54
8	Endocrine/Metabolic Diseases	1,355	4.52
9	Osteoarthritis	1,254	4.18
10	Trachea/Bronchus/Lung Cancer	1,249	4.17

2 San Fernando

Rank	Cause	DALYs	
		Years	Rate
1	Coronary Heart Disease	15,837	8.37
2	Alcohol Dependence	12,357	6.53
3	Depression	8,673	4.58
4	Osteoarthritis	8,318	4.40
5	Diabetes Mellitus	7,737	4.09
6	Alzheimer's/Other Dementia	7,167	3.79
7	Emphysema	7,066	3.74
8	Trachea/Bronchus/Lung Cancer	7,013	3.71
9	Stroke	6,973	3.69
10	Motor Vehicle Crashes	6,343	3.35

3 San Gabriel

Rank	Cause	DALYs	
		Years	Rate
1	Coronary Heart Disease	12,855	6.83
2	Alcohol Dependence	11,697	6.21
3	Depression	8,772	4.66
4	Osteoarthritis	7,780	4.13
5	Emphysema	6,702	3.56
6	Alzheimer's/Other Dementia	6,405	3.40
7	Diabetes Mellitus	6,265	3.33
8	Stroke	5,719	3.04
9	Motor Vehicle Crashes	5,201	2.76
10	Homicide/Violence	5,082	2.70

4 Metro

Rank	Cause	DALYs	
		Years	Rate
1	Coronary Heart Disease	9,091	8.03
2	Alcohol Dependence	7,724	6.82
3	Homicide/Violence	6,588	5.82
4	HIV/AIDS	6,215	5.49
5	Drug Overdose/Other Intoxication	5,276	4.66
6	Diabetes Mellitus	5,203	4.60
7	Depression	4,952	4.37
8	Osteoarthritis	4,692	4.14
9	Alzheimer's/Other Dementia	4,588	4.05
10	Stroke	4,367	3.86

Table 4. (Continued)**SPA (continued)****5 West****6 South**

Rank	Cause	DALYs		Rank	Cause	DALYs	
		Years	Rate			Years	Rate
1	Coronary Heart Disease	5,694	9.11	1	Homicide/Violence	12,099	12.65
2	Alcohol Dependence	4,056	6.49	2	Coronary Heart Disease	8,536	8.92
3	Alzheimer's/Other Dementia	3,256	5.21	3	Diabetes Mellitus	7,286	7.62
4	Osteoarthritis	3,029	4.84	4	Alcohol Dependence	6,750	7.06
5	Depression	2,918	4.67	5	Stroke	5,213	5.45
6	Drug Overdose/Other Intoxication	2,620	4.19	6	Depression	4,016	4.20
7	Stroke	2,499	4.00	7	Motor Vehicle Crashes	3,675	3.84
8	Emphysema	2,472	3.95	8	Trachea/Bronchus/Lung Cancer	3,618	3.78
9	Diabetes Mellitus	2,463	3.94	9	Emphysema	3,240	3.39
10	Trachea/Bronchus/Lung Cancer	2,417	3.87	10	Osteoarthritis	3,236	3.38

7 East**8 South Bay**

Rank	Cause	DALYs		Rank	Cause	DALYs	
		Years	Rate			Years	Rate
1	Coronary Heart Disease	9,259	6.91	1	Coronary Heart Disease	9,784	6.50
2	Alcohol Dependence	9,158	6.83	2	Alcohol Dependence	9,371	6.22
3	Diabetes Mellitus	7,697	5.74	3	Diabetes Mellitus	7,549	5.01
4	Homicide/Violence	6,337	4.73	4	Depression	6,746	4.48
5	Depression	6,012	4.49	5	Homicide/Violence	6,737	4.47
6	Osteoarthritis	5,083	3.79	6	Osteoarthritis	6,418	4.26
7	Alzheimer's/Other Dementia	4,471	3.34	7	Alzheimer's/Other Dementia	6,209	4.12
8	Emphysema	4,288	3.20	8	Emphysema	5,115	3.40
9	Stroke	3,749	2.80	9	Stroke	4,920	3.27
10	Drug Overdose/Other Intoxication	3,659	2.73	10	Trachea/Bronchus/Lung Cancer	4,269	2.83

Figure 1. Years of life lost (YLL) and years lived with disability (YLD) for the 20 leading causes of DALYs.

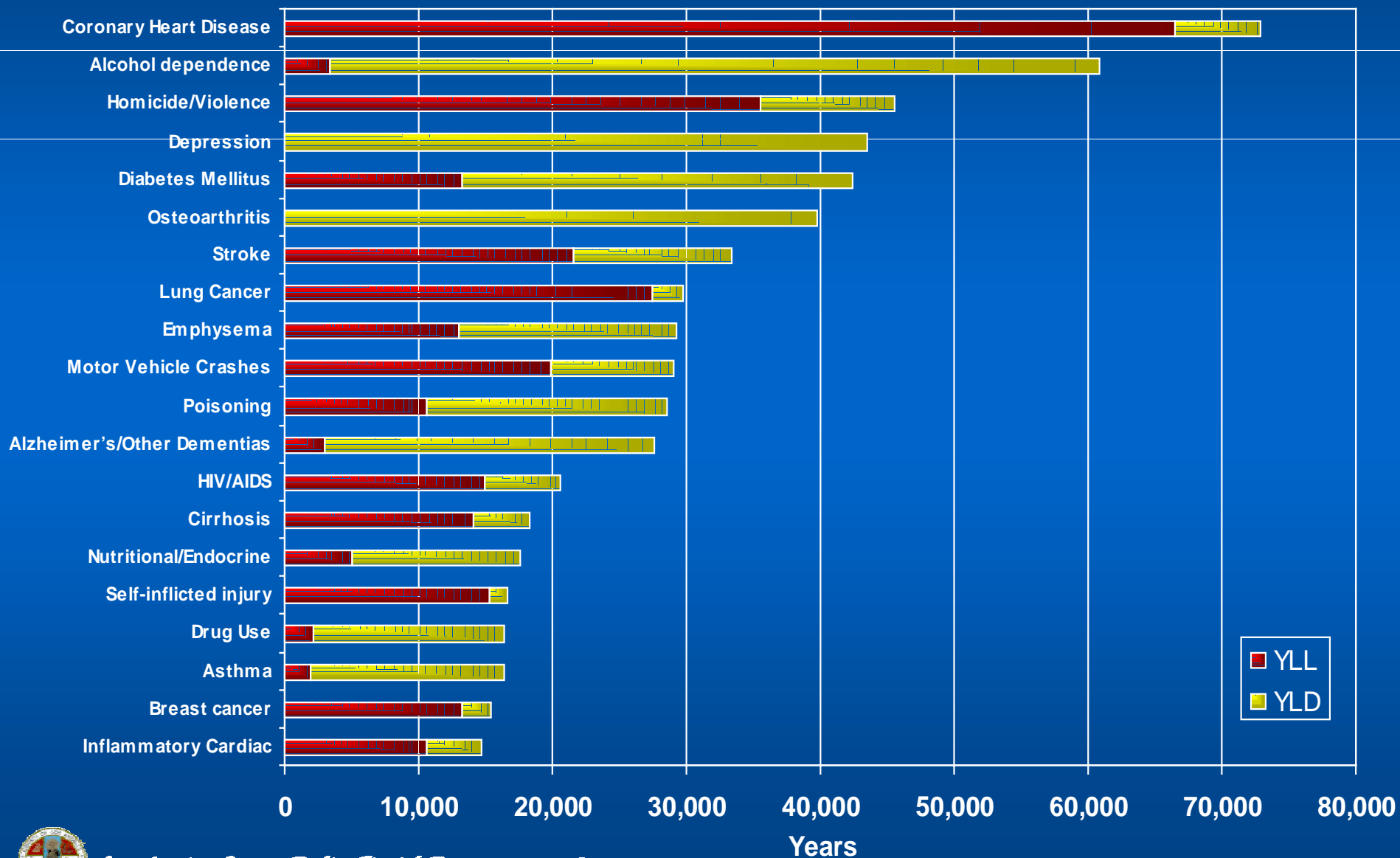


Figure 2.

Relative burden (based on DALYs) of communicable diseases, non-communicable diseases, and injuries in the total county population and by gender.

