

PRODUCTIVE YEARS OF LIFE LOST BY PRE-RETIREMENT DEATHS IN KOREA

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INTRODUCTION

This paper presents a new approach to measuring the impact of diseases on Korean society. Measurement of the impact of diseases is the first step in setting disease control program priorities. Korean investigators should try this new approach using better and more complete data to refine the preliminary estimates presented here and to make better estimates of the impact of important diseases on Korean society and economy.

The components of the burden of disease on society are fourfold:

- 1) MORBIDITY or days of work lost
- 2) DISABILITY, or permanent impairment that prevents full productive activity,
- 3) MORTALITY, productive years of life lost to society from pre-retirement death, and,
- 4) DIRECT costs of disease, doctors fees, drug costs, etc.

This article concentrates on mortality as the most important component of the burden of disease on society.

HISTORY

Although I referred to a "new" approach to measuring the burden of disease, the elements have been present,

discussed and, in some cases, actually used, to set priorities for disease control programs elsewhere. Sir John Petty, an English economist was one of the first to recognize the costs of premature death to society as a whole as well as to individuals and families.¹⁾ Pettinkoffer in his "Essay on the Health of a City," developed the concept of the costs to society of premature deaths.²⁾ Dr. Louis Dublin, Vice President of the Metropolitan Life Insurance Corporation, in his classic book "The Money Value of Man," collected and reviewed the earlier work on this subject and advanced a concrete theory as to how to place a monetary value on premature deaths in a society.³⁾ Dr. Burton Weisbrod pointed out that the age of death was as important as the cause of death in determining the impact of disease on society.⁴⁾ In 1966, Dr. Dorothy Rice of the National Center for Health Statistics, carried out an appraisal of the cost of various illnesses for the United States.⁵⁾ In this monumental task she calculated not only the indirect costs of productive years of life lost to mortality, but also estimates of days of life lost through morbidity and permanent disability also the direct costs of medical care. Dr. Rice's work has been periodically updated.⁶⁾

Despite all this work, primarily by non-physicians, most medical systems continue to use the "ten most important causes of death" as the basic criteria for deciding which diseases were the most important for society. Recently, the U.S. Public Health Service developed the concept of *Potential Years of Life Lost* (PYLL). They pub-

lished information on this measure in the Morbidity and Mortality Weekly Reports. The Pan American Health Organization, for the first time in their quadrennial report on Health Conditions in the Americas, has a small table including several countries estimates of the potential years of life lost due to premature death from various conditions.⁷⁾

WHY MORTALITY?

This article focuses attention on mortality rather than morbidity or disability primarily because pre-retirement mortality is the most important factor in most diseases' impact on society. The information from Brazil in Figure 1 shows the greatest burden of disease rests in the

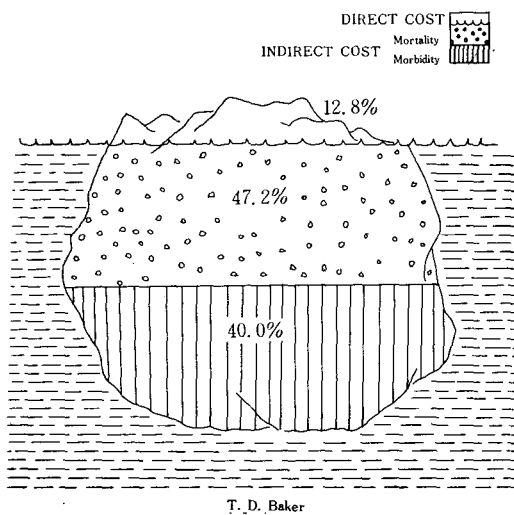


Fig. 1. Itabuna-Brazil, 1977
Proportion of total direct and indirect cost of illness

premature mortality rather than in direct costs or morbidity.⁸⁾ Secondly, this article focuses on mortality as data on morbidity and direct costs were not available. Korean investigators who are familiar with data on morbidity, disability and direct costs should produce more refined and accurate estimates of the total burden of various diseases on Korean society.

The approach to Productive Years of Life Lost is a very simple one—differing slightly from the Potential

Years of Life Lost in that productive years of life lost measures the working years lost from the age of death to an average *retirement* age, rather than to the average life expectancy at the age of death. The reasons for this are the focus on the economic impact of disease on society. The impact of disease on society results primarily from the loss of productive years of work life of the individual. Korean culture places great value on age and individual families may value the non-productive years of older members. There are also exceptions of useful years of work extending beyond the average age of retirement. The former Korean President, Sing-man Rhee is an example of working productively beyond the average retirement age. However, an average retirement age takes account of those who work beyond that age as well as those who cease to be productive below that age. This article assumes age 65 as the average retirement age. I do not know the Korean patterns of work life well enough to know which age would be most appropriate. Korean investigators can determine the most appropriate average retirement age and labor force entry age for Korea. Figure 2 illustrates productive years

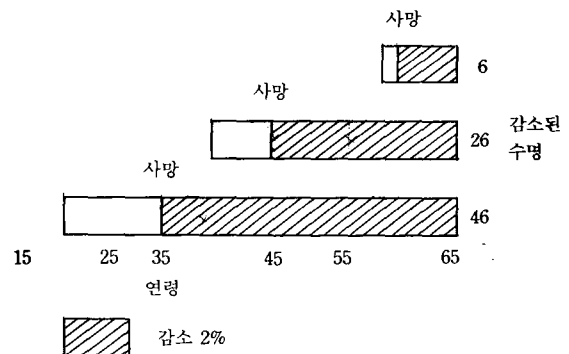


Fig. 2. Years of productive life lost

of life lost from deaths at various ages. If the *average* age of entering the work force is 15 years and the average age of retirement 65 years, then 50 years is the maximum loss to society. To measure the *societal* benefits from investing scarce health budget funds to combat diseases whose major impact is beyond the average reti-

rement age, we must distinguish between individual, family, benefits and benefits to society as a whole. It is reasonable for a *family* to provide the resources to prevent the death of a 70 year old, or even older family member. But, should *society* divert scarce resources from useful projects to what, in many cases, is not “prolonging life,” but as Dr. John A. D. Cooper, President of the AAMC says, merely “prolonging death”?

DISCOUNTING

The concept of discounting is difficult for some health professionals to understand. Perhaps this is because the concept comes from economics. Basically, it states that future earnings or future work is of less value than present earnings and present work. An example will help to clarify this concept. If a man expends his labor to build an irrigation system at this point in time (today), the benefits from this systems will be greater than if his time, labor and effort is spent building an irrigation system 10 years in the future. Therefore, the value of his labor today is greater than the value of his labor in 10 years, as the benefits of his labor will have 10 more years to accrue to siciety.

The exact percent used to discount future years of work, or, future earnings, is subject to judgment. Most economists use a rate of between 4 and 6% (Although the difference, 2%, seems small, 6% is actually 50% larger than 4%). Figure 3 shows that 50 productive years, age 15–65, reduced to 35 years. Lost at 2% dis-

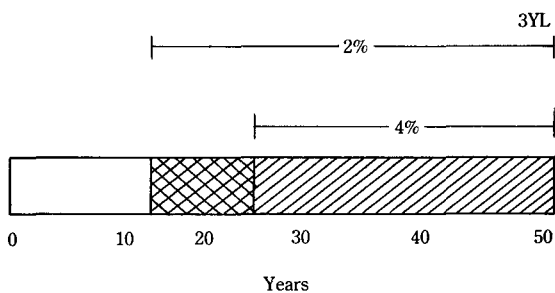


Fig. 3. Discounting

count and 25 years(1/2) lost at 4%. A higher discount rate gives higher priority to the problems of the working age population, while a lower discount rate gives higher priority to the disease problems of children. In our Korean example that follows we used a very conservative 2% discount rate.

PRELIMINARY ANALYSIS OF KOREAN DATA

Does is really make a difference to use productive years of life lost or to use total deaths? In Figure 4 we see the four leading causes of death in Korea. Figure 5 presents the four leading causes of loss of productive

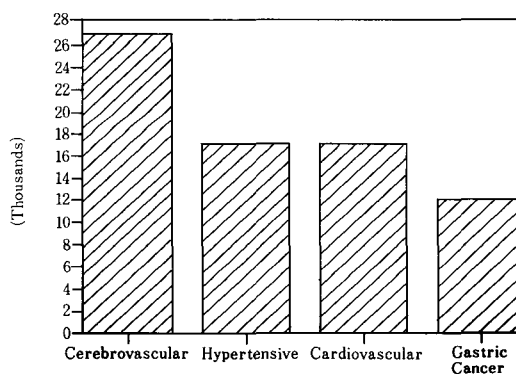


Fig. 4. Total deaths

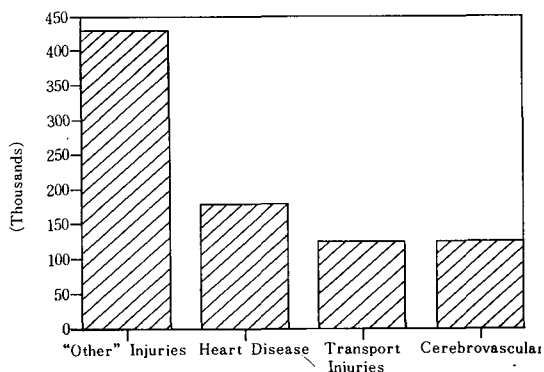


Fig. 5. Productive years of life lost 2% Discount

years of life in Korea. As many of readers would guess in changing from total deaths to productive years lost; the diseases that primarily affect old age drop down in importance and those that affect children and young adults move up in importance as reflects the economic importance of disease problems to society.

Table 1 shows that Korean mortality patterns by age

Table 1. Canada, Costa Rica, and U.S.⁸⁾

Total Deaths		Potential Years Lost	
Rank	1 Heart	Rank	1 Injury
	2 Cancer		2 Cancer
	3 Stroke		3 Heart
	4 Injury		4 Suicide

and cause are not unique in showing major shifts in changing from leading causes of death to discounted productive years lost. Korean investigators should measure the losses from suicide using data not available to me.

By misplaced emphasis on the deaths occurring in the elderly, we can distort our health program priorities. As the famous economist John Maynard Keynes says, "In the long run, we will all be dead," and indeed, in old age we must eventually die from one cause or another.

What are the potential uses of these results? First, they will give us an opportunity to place disease problems in proper perspective. However, this is in no sense the total information needed for setting program priorities, for program priorities depend as much on the feasibility of programs to control various diseases as they do on the importance of disease. If there is a disease that is low in priority, but has a cheap, easy and effective control measure, it should be given high priority among programs. For example, diphtheria, tetanus, and pertussis do not even appear in the four most important causes of death in Korea, yet we would be remiss as public health officials if we did not give DPT immunization a high priority.

A detailed review of the years of life lost method

using Canadian data, shows similar results to our Korean approximations.⁹⁾

SUMMARY

The current use of leading causes of death is an outmoded, misleading counterproductive measure of importance of disease. The "new" concept of productive years of life discounted to the future and combined with morbidity, disability, and direct cost measures will give a much more meaningful, useful measure of the magnitude of disease problems in Korea. I am looking forward to seeing refinements and improvements on this technique carried out by some readers of this paper.

REFERENCES

1. Petty, Sir William. *Political Arithmetick, or a Discourse Concerning the Extent, and Value of Lands, People, Buildings, etc.* Printed for Robert Clavel, London, 1699
2. Pettinkoffer, Max. *The Value of Health to a City.* 1873, Reprinted, Johns Hopkins Press, Baltimore, Maryland, 1941
3. Dublin, Louis I, and Lotka AJ. *The Money Value of Man.* The Ronald Press, New York, 1946
4. Weisbrod, Barton A. *Economics of Public Health.* University of Pennsylvania Press, Philadelphia, 1961
5. Rice, Dorothy P. *Estimating the Cost of Illness.* Health Economics Series No. 6, Public Health Service Publication No. 947-6, USGPO, Washington, 1966
6. Rice, Dorothy P, Hodgson TA. *The Economic Cost of Illness, a Replication and Update.* Health Care Finance Review, 7 fall 1985
7. *Quadrennial Report, Health Conditions in the Americas,* Scientific Publication No. 500, PAHO, Washington, D.C. 1986
8. deCodes, Jose. *Measuring the Economic Impact of Illness in the Municipio of Itabuna, Bahia, Brazil* (Doctoral thesis, Department of International Health, The Johns Hopkins University, School of Hygiene and Public Health, 1979.)
9. Romeder JM, McWhinnie JR. *Potential Years of Life Lost Between Ages 1 & 70: An Indicator of Premature Mortality for Health Planning.* International Journal of Epidemiology, Vol. 6, No. 2, 1977