Drugs, Doctors and Style of Life

Matthew Tayback (The Johns Hopkins University School of Medicine Baltimore Maryland USA.)

The level of health of a population is determined by many factors of which three are the subject of this presentation; the knowledge and skill of the physician, the availability of thugs, and the style of life of members of the population under consideration.

Health, obviously, has a wide range of dimensions. We will consider a sensitive measure of health but, by no means, the sole measure, namely survivorship. Our approach is to examine first how the three factors, thugs, doctors, and style of life have interacted in the past to determine significantly the loss of life associated with the principal causes of death. With that as a background we will consider how these factors are likely to interact, in the future, to impact dramatically on current principal causes of mortality.

The evidence we consider will be within the geographic context of the United States. However the generalizations derived will be relevant to European countries, North America, and indeed to most nations which have undergone industrial development.

It is common knowledge that the principal causes of death in 1900 were pneumonia (inclu ding influenza), tuberculosis, and gastroenteritis. In each instance, the force of mortality ascribed to these entities has declined more than 90%.
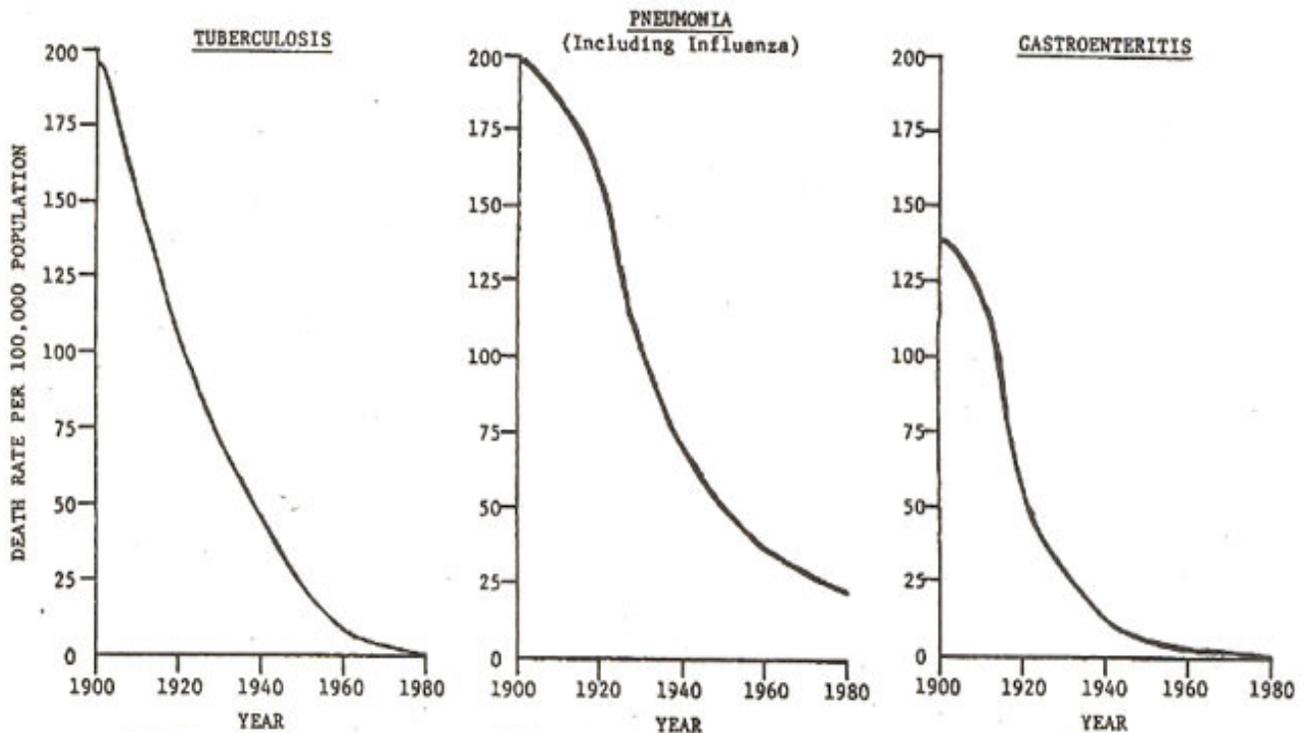

Fig. 1. Annual death rates per 100,000 population, united states, 1900-1980

In Figure 1, the time trend since 1900, is given for the crude death rates for each of these three broad disease entities.

We will consider, first, the remarkable conquest of acute gastro-intestinal diseases. From the position of a leading cause of death in 1900 this set of conditions is, today, of little or no consequence. What were the interplay of factors? For a nation, this is difficult to state with certainty, we do have, however, a microcosm to throw some light on these forces.

A remarkable diary exists of detailed inputs and outputs during the period 1900 1920 in defined geographic area, Baltimore, in respect to time trends in mortality due to major causes.[1] The growth in physicians, hospital beds, volume of water available per capita, commencement of chlprination of water, filtration of water, and related elements which could impact on the population's health are recorded in detail. Within this period of 20 years, the loss of life due to gastro intestinal diseases was reduced by more than 60%. We can find only two factors to account for such a dramatic drop. During this period, the availability of piped water easily reached, increased significantly. The sanitary quality of the water as measured by F Coli determinations increased dramatically. These are changes in the environment, in the life style of the population, which produced substantial changes in the risk of death and disease due to gastroenteritis.

The period 1920 1940 is associated with a decline whose rate is equal to that in the period 1900 1920 but which does not represent, in absolute terms, the equivalent saving in human lives per 100,000 population. Unlike 1900- 1920, the emphasis during 1920 1940 involves a substantial concentration on food sanitation, including (1) all phases of milk production and distribution (2) food preparation in restaurants and (3) public education in respect to sanitary practices, at home, especially in food preparation and storage. The battle is substantially won by 1940. During the period 1940-1980 the era of effective antibiotic and chemotherapeutic intervention and the skill of the physician in the use of these interventions when added to the earlier environmental interventions completes the war against loss of life due to acute gastro-intestinal diseases.

The trend in tuberculosis mortality is an other example of massive reduction of a leading cause of mortality. The factors accounting for the decline on a national basis are no less difficult to establish than in the instance of acute gastro intestinal disease mortality. However, the trend line when set forth on a semi-logarithm axis clearly denotes three distinguishable periods, the major developments for which have been identified. (Figure 2).
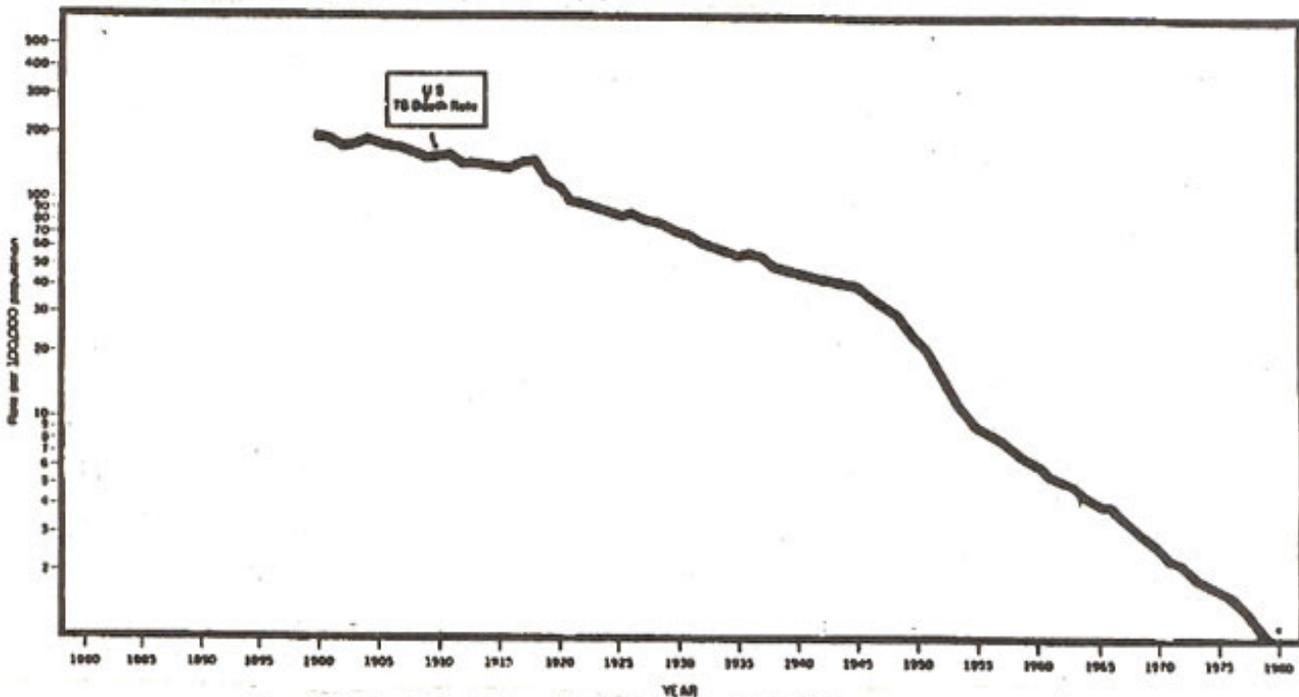

Figure 2 Death rate from tuberculosis, United States, 1880–1980

Over the period 19001945, the tuberculosis death rate declined from approximately 200 per 100,000 to 30, a reduction of 85%. Early in this period, identification of active cases through conventional diagnostic procedures and isolation in sanitoria are definitive, medically oriented moves which, no doubt, contributed to the historical decline in mortality. However most students of this remarkable trend

are sensitive to the fact that a decline in tuberculosis mortality had been under way since 1850 and was as rapid prior to 1900 as during 1900 1945 and took place in an interval when no sanitoria were available, no specific treatment known, and during which case finding was of little significance. It is of interest that the concern with sanitary quality of milk, as an important contributor to gastro-intestinal disease, led to the recognition of milk cattle as a reservoir of nonpulmonary tuberculosis and to a control measure which involved the removal of tuberculous cattle from milk producing herds. Basically the intervention, then, involved the identification of tuberculous cattle and their elimination. Obviously the pasteurization of milk was another non-clinical control measure of enormous effectiveness.

Since 1945, the final stage for the conquest + of tuberculosis was largely reserved to the use of highly effective drugs, antibiotic and chemotherapeutic agents, which when combined with available diagnostic skills has accounted for the conquest of tuberculosis as a significant cause of death.

A historical review of the trend in mortality due to pneumonia and influenza points to another combination of the factors of drugs, doctors and style of life. One cannot point to a defined factor which accounts for the observed decline in mortality due to pneumonia and influenza during the period 1900-193 5. However the removal of the debilitating effects of gastrointestinal disease, particularly among infants and pre-school age children, and an improvement in housing circumstances of the adult population appear to be the most likely explanation of the reduction.

The period, 1935 ot the present reflects a sharp drop in pneumonia mortality and this trend is associated with the discovery and use of the sulfonantides, the antibiotics, and chemotherapeu tic agents, as well as with the dramatic improvement in skills for supporting the acutely ill patient with appropriate nutrition and electrolyte intervention, and with respiratory support through oxygen.

We turn now to major causes of death which are experienced after the conquest of tubercul osis, gastro-intestinal diseases and pneumonia. These are the diseases of the heart, cancer in its many forms, and cerebrovascular disease.

Studies of risk factors, i.e. hypertension, excess weight for height, smoking, and hypercholesteroleniia, repeated in many areas of the world and including work by the Pakistap Medical Research Council[2] clearly indicate that there is a correlation between the multiple occurrence of these factors and the probability of ischernic heart disease. These risk factors can be controlled by individual behavior. Thus the decision to restrict smoking, the use of sodium and the total intake of cholesterol, while promoting the practice of exercise and the use of adequate intake of potassium, can have significant impact on the loss of life from coronary heart disease (CHD). Note for example, in Table 1,

Table I
Age Averaged Mortality Rate for Coronary Heart Disease
All Persons 35–74, 1969–1975
United States

Year	Chd Deaths Per 100,000
1969	865
1970	844
1971	827
1972	813
1973	794
1974	755
1975	717

Serum Cholesterol (mg/dl) 235 -- > 220

Diastolic Pressure (mm/Hg) 86.0 -- > 84.3

Cigarette Smoking (% smoking regularly)
55% -- > 40%

the substantial decline in age averaged mortality for persons 35-74, during te period 1969-1975. During an interval preceding 1968 and continuing through 1976, the following changes in mean risk factor status among male adults, aged 35-74, has been documented

Of the CHD change observed in this group of rpales, it is estimated that 50% could be ascribed to the reduction in cigarette smoking, 25% can be attributed to the reduction of serum cholesterol and the remainder of 25% may be the result of reduction in diastolic blood pressure, probably through drug and physician intervention.

Clearly then, in the instance of a major component of heart disease mortality, CHD, approximately 75% of the problem is mitigsted by changes in life style and 25% can be ascribed to the specific actions of

physicians and the effectiveness of appropriate drugs.

We turn now to the related problem of mortality due to cerebrovascular diseases (CVA). Remarkable decline in the age adjusted mortality rate ascribed to CVA has been documented.[3] Within the U.S., this rate has undergone a reduction of 41 percent over the 12 year period 1968-1980.This rate of decline has been marked especially, since 1972. Over the period 1960 -1980, we have obseryed a marked drop of elevated blood pressure among elderly U.S. residents, which is reflected in

Table II
Percnt Prealence of Elevated Blood Pressure * In us Residents Aged 65-74 Years by race and sex

| | Male | | Female | |
Survey	White	Black	White	Black
1960-62**	38	63	55	79
1970-74***	35	50	42	59
1976-1980****	25	28	26	43

*Systolic – 160 and /or diastolic – 95 mmHg.

**National Health Survey

*** Hanes 1

**** Hanes 2

Table II It is not unreasonable to postulate that increasing availability of medical care has lead to widespread discovery of hypertension which prior to 1970 resulted in moderately effective intervention, through diet and drugs.

Subsequent to 1970, with the availability of increasingly effective antihypertensive drugs, discovery of hypertension has led to highly effeclive intervention especially in regard to cerebra-vascular accidents, fatal and non-fatal, as end points of hypertension.

What principles can we learn from this review of the conquest of the leading causes of death in the first half of this century and the developing successful battle against the leading causes of the second half? First, through the creation of a plentiful and potable water supply, a sanitary source of food and a way of life which promotes the use of these resources, we free a population substantially from the problem of gastro-intestinal disease. In the instance of tuberculosis, long range improvement in the social-. economic circumstances of the population accounted for 75 percent of the eradication of death due to this disease, while the availability of remarkably effective drugs accounts for the final eradication. The interplay of drugs, doctors and style of life clearly is one where the latter factor predominated, in the early half of this century in industrially developed countries. However, can tuberculosis and gastro-

intestinal disease be controlled by concentrating on drugs and doctors and with minor consideration for massive attention to environmental and social factors9 The example of tuberculosis is intriguing. Widespread vaccination with BCG, although still debated relative to its effectiveness, is a doctordrug intervention. Intensive casefinding and intervention with effective chemotherapeutic agents can arrest active disease rapidly and render the bacteriologically positive carrier negative from an epidemiological basis. The organization of such an intervention can be complex, expensive, and burdensome. It is possible

The example of gastro-intestinal disease is somewhat different. In the absence of abundant, clean, and available water and of extensive effort at sanitary control of food and excreta, mortality due to diarrhea can be reduced, significantly, by oral or intravenous rehydration[4]. especially in infants and early age children. However, there is no reason to believe that morbidity and the basic epidemiology of diarrheal disease will be impacted.

To understand this issue clearly let us consider the etiological framework for death from diarrheal disease generally seen in infants and in children one and two years of age. (Figure 3)

Figure 3
Etiological Framework For Death Due to Diarrheal Disease Among Infants

Exposure to E. Coli - Rotavirus - Other Agents

Gastroenteritis

Diarrhea

Dehydration

Death

The introduction of rehydration, oral or intravenous, essentially is concerned with the final 2 steps in the etiological sequence, namely Diarrhea--> Dehydration --> Death. Oral rehydration is intended to prevent dehydration and in the presence of severe dehydration, the intervention of intravenous rehydration is intended to prevent death. Neither of these treatments will deal with the precipitating events producing diarrhea. In this regard it is of interest to note that in Pakistan, among approximately 3,750,000 infants born annually, 14,000,000 episodes of diarrhea can be expected in a given year. From a practical point of view, let us extend the science and practice of oral as widely as possible but not as a satisfactory alternative to environmental improvements but rather as a remarkable, temporary, holding action which can save lives immediately.

In respect to the current and futrue killers, heart disease, cancer and stroke, basic disease processes such as hypertension and arteriosclerosis are subject now to skillful intervention of the physician and his command over a wide range of effective cardiac and vascular drugs. The surgeon possesses an

equally powerful array of skills and equipment to restore the heart or vascular system damaged or embarrassed by arteriosclerosis. Nevertheless, the relationship between diet, smoking, and exercise, and the occurrence of CHD, CVA, and of bronchogenic, oral, gastric and colon cancers is a logical basis for the formulation and practice of preventive strategies. The physician and society have an obligation to promote appropriate individual life style decisions. SInce the diseases which are the subject of our future attention are not only chronic in their impact upon the individual but chronic, also, in their etiology, our task is as difficult but not unlike the earlier struggle to conquer acute commun cable diseases.

Consider, the example of osteoporosis. The etiological framework is shown in Figure 4.

Figure 4
Etiological Framework for Death and Disability Due To Osteoporosis

Loss of Bone Ca
Reduced Bone Density
Spinal Deformity and Hip Fracture
Disability and Death

Although we have no sound estimates of disability and death due to osteoporosis, a recently published study[5] indicates that in the United States, the annual frequency of admission to acute hospitals for fracture of the hip was 200,000 among older adults with a relative risk of female to male of 3: 1. Furthermore it is reported[6] that 1,300,000 fractures, vertebral, hip, and wrist are attributable to osteoporosis. The disease is of major consequence in an aging population.

The result of incisive studies on the impact upon bone density of estrogen replacement in post menopausal women and of the relative deficiency of calcium in the diets of older adults has resulted in a strategy of primary prevention for the significant condition of osteoporosis. The elements are: (1) estrogen replacement for post-menopausal women with high risk factors (2) calcium suplementation for adult females up to a daily intake of elemental calcium approximating 1500 mg (3) weight bearing exercise.

In this example of preventing a significant cause of disability and death among elderly women we have a further demonstration of the remarkable mixture, drugs, doctors and style of life as an enduring formula for enhancing the depth and breadth of human existence. Estrogen replacement requires first the existence of the thug, itself, and then the skill of the physician to determine when replacement is appropriate and when it is not appropriate. The change in dietary practice and in exercise behavior, clearly is a requirement for a change in life style. The three factors have been important in the past. They will be of equal significance in the future.

References

1. Howard W.T. Public health administration and the natural history of disease in Baltimore, Mary land, 1797-1920. Washington, Carnegie Institution, 1924.
2. Proceedings of the seminar on medical research on national health problems. Pakistan Medical Research Council, 1980, p. 10.
3. National Center for Health Statistics: Annual summary of births, deaths, etc. U.S. 1983. DHHS Pub. No. PHS 84-1120 (September 21, 1984).
4. Mobarak, A.B., et al. Diarrheal disease control study. Westinghous Health Systems, USA, 1980.
5. Farmer, M.E., White, L.R., Brody, J.A. and Bailey, K.R. Race and sex differences in hip fracture incidence Am. J. Public Health, 1984; 74: 1374.
6. National Institute of Health Consensus Development Conference Statement. April 1984.