Actuarially speaking: an overview of life expectancy. What can we anticipate?1–3

Robert S Blacklow

ABSTRACT
A review of life expectancies of males in 1905, 1955, and 2005 reveals several striking findings. Life expectancies at birth have increased progressively during this 100-y period. For a man graduating in 1905, life expectancy at graduation was actually greater than that at birth. Blacks living into their 70s at that time subsequently had life expectancies that were actually greater than those of their white classmates. The present trend of progressively lengthening life span in all groups reflects the changing pattern of causes of death from formerly untreatable infectious diseases to chronic degenerative disorders. Predictions for the continuing lengthening of the life span of the class of 2005 and succeeding classes may be jeopardized by the alarming increase in obesity, which worsens the incidence of cardiovascular disorders and cancer, the 2 leading causes of death at this time, as well as of diabetes, musculoskeletal disorders, and other categories of disease. Am J Clin Nutr 2007;86(suppl):1560S–2S.

KEY WORDS Life expectancy, degenerative disorders, obesity, cardiovascular disease, cancer, college graduates, Harvard College

INTRODUCTION
In addressing the challenge of keeping the young-elderly healthy, let us begin with an overview of the life expectancies and causes of death over the years in an attempt to project what we can expect in the future. At this time of graduations and reunions, we begin by examining a 100-y period, comparing the life expectancies of the Harvard college class graduating in 2005 with those of the class of 1905, having its 50th reunion in 1955, and the class of 1955, having its 50th reunion in 2005. By using data obtained from the US Statistical Abstract (1) and the National Center for Health Statistics (2), one can make accurate assessments of life expectancy in 1905 and 1955 and reasonable estimates of life expectancy of the college class of 2005.

THE CLASS OF 1905
Born in the 1880s, the life expectancy of these individuals at birth was 41.7 y for white males and 43.5 y for white females; for black males, life expectancy was 30 y, and for black females it was 34 y, as shown in Table 1 (2). There was a dramatic increase in life expectancy for these groups at the time of their college graduation at ages 21–22 y, even though they were that much older. Much of the mortality in childhood, adolescence, and young adulthood in the late 19th century was due to the high rate of deaths from infections that could not be treated satisfactorily. These data show that if an individual lived beyond childhood, life expectancy actually increased over that at birth. This effect was true for all groups, male and female and black and white. There were, however, few black members of the class of 1905.

Another noteworthy point about these figures is that at their 50th reunion in 1955, when graduates were aged 70–72 y, life expectancy was actually greater for black males than for white males and for black females than for white females. This observation is all the more remarkable because at birth, life expectancy for blacks, as noted above, was 9–11 y lower than that for whites and at age 22 y was still 7 y less for blacks than for whites. It is likely that the increase in life expectancy of older blacks can be explained by the Darwinian principle of survival of the fittest. Huge disparities in socioeconomic status and in access to health care, as well as genetic differences in being spared the devastating consequences of sickle cell anemia, hypertension, and other disorders, meant that only the most healthy blacks would live to an advanced age. Perhaps they had also maintained strong immune systems and very low serum cholesterol concentrations with associated high HDL concentrations, but these suggested explanations remain speculative at this time.

THE CLASS OF 1955
For those individuals celebrating their 50th college reunion in 2005, life expectancy at birth in 1933–1934 was 61 y for white males, 65 y for white females, 52 y for black males, and 55 y for black females, as shown in Table 2 (3, 4). At the time of college graduation in 1955 in their early 20s, life expectancy for all groups was less than at birth by 6–10 y, with that of white females 5 y greater than that of white males. For black females, life expectancy was 6 y lower than that of white females but still 4 y higher than that of black males. By the time of the 50th reunion in 2005, life expectancy (as extrapolated from 2002 data) should be 13.6 y for white males, 16 y for white females, 12 y for black males, and 15 y for black females.

For the class of 1955, this disparity in life expectancy between blacks and whites, which was 8–9 y at birth, had decreased to 5–6 y by their early 20s, and in their early 70s today is only 1–2 y.

1 From the Harvard Medical School, Boston, MA.
2 Presented at the Harvard College 50th Reunion, held in Cambridge, MA, June 6–9, 2005.
3 Reprints not available. Address correspondence to RS Blacklow, Harvard Medical School, 643 Huntington Avenue, Boston, MA 02115. E-mail: robert_blacklow@hms.harvard.edu.
Within the past 100 y, the black-white differences in life expectancy have become progressively smaller, and total life expectancy has increased greatly for all groups.

THE CLASS OF 2005

Finally, the current college class graduating in 2005 had considerably greater life expectancy at birth than did either of the previous classes discussed here. White males born in 1983—an estimate of average birth date—had a life expectancy of 71.6 y, ≈10 y higher than those born 50 y earlier, as shown in Table 3 (4, 5). For white females, life expectancy at birth was 78.7 y, 12–14 y greater than for those born 50 y earlier. Solid gains were also made among blacks, up 12–15 y for males to 65.2 y and up 16–20 y for females to 73.5 y.

At the time of their 2005 graduation from college in their early 20s, life expectancy for white males had increased to 56.4 y, 5 y longer than that 50 y ago. For white females, life expectancy also increased ≈5 y from 55.8 to 61.3 y. Black males increased their life expectancy similarly, with a 5-y gain from 45.5 to 50.8 y. The greatest gain, however, was for black females, whose life expectancies over a 50-y period increased some 8 y from 49.6 to 57.3 y.

FUTURE LIFE EXPECTANCY

The challenge for us now is to estimate reasonably accurately the life expectancy of the current class of 2005 and of subsequent classes through knowledge of the evolution of disease patterns and the nature of the changes in diet and lifestyle that have been evolving over the years. By extrapolating the data from 2002 and making no other assumptions, the life expectancies of all groups through knowledge of the evolution of disease patterns and the nature of the changes in diet and lifestyle that have been evolving over the years. By extrapolating the data from 2002 and making no other assumptions, the life expectancies of all groups would be that estimated in Table 3. All of these figures are much greater than those of 50 y ago.

But can we assume that present trends will continue with a progressive increase in life span? To address this question, it is necessary to first examine the major differences in causes of death over a 100-y period, as shown in Table 4 (6, 7). In 1905, cardiovascular-rental disease was the leading cause of death, but it was followed closely by a series of serious infections, the most deadly of which were tuberculosis, influenza, and pneumonia. Typhoid fever, diphtheria, and scarlet fever also killed major segments of the population. Persons died from cancer but deaths from malignant neoplasms were far exceeded by those from heart disease and various infections.

By 1955, cardiovascular disease remained the leading cause of death, but cancer attained the second spot. Influenza, pneumonia, and tuberculosis caused far fewer deaths in 1955 than earlier. For the first time, diabetes emerged as a leading cause of death. In the recent year of 2005, heart disease, cancer, and cerebrovascular disease, which are largely similar in prevalence to overall cardiovascular disease, were the major causes of death, followed by respiratory diseases, accidents of all varieties, and diabetes. It is evident that at this time, chronic degenerative diseases comprise the leading causes of death for older individuals in the United States.

With chronic diseases assuming greater significance in an aging population, one must take into account those factors that would increase the impact of chronic diseases, or, on the other hand, would tend to delay their emergence. Chief among these potentially adverse factors is obesity, which is increasing at an...
alarming rate in the United States as well as in Western Europe (8). Type 2 diabetes, formerly considered to be adult-onset diabetes, is now being diagnosed in teenagers and younger children (9). Larger and larger segments of the population are being classified as overweight or obese (10). There is no doubt that obesity, particularly central obesity, greatly increases the onset and progression of cardiovascular disease (11). With obesity, there is more cancer of the breast, prostate, endometrium, colon, and several other organs (12).

After cancer is discovered, diet influences the rate of recovery and the likelihood of recurrence. The recently concluded WINS Study (Women’s Intervention and Nutrition Study), a multi-institutional collaborative effort, showed that in women who have already had breast cancer, converting to a low-fat diet of any kind reduces the rate of recurrence by one-third (13).

With the rapid increase in obesity in the United States and in Western Europe, it is encouraging that major government and private organizations, including the National Institutes of Health, the Centers for Disease Control and Prevention, the American Cancer Society, the American Heart Association, and the American Institute for Cancer Research, are all targeting obesity as the major health problem to address today. With progressively increasing portion sizes to super-sized levels (14) and decreases in exercise and energy expenditure, particularly in schools (15), the stage is set for escalating obesity and its health consequences. This realization should serve as a wake-up call to us to address prevention and treatment of obesity as our nation’s top health concern.

It is noteworthy that statistics provided by the Harvard College Class of 1955 show that almost 78% had survived to the age of 71 y (16). These data do not include the 55 out of 1157 (4.8%) matriculants in September 1951 who are now listed as “lost,” which indicates that their whereabouts and living status are unknown to the University. It seems best to exclude these from the tabulations because some may be deceased and others alive but lost to follow-up. According to national statistics, an estimated 68–69% of males born in 1933–1934 would be expected to have survived to the present (1). Therefore, the Harvard College Class of 1955 has exceeded the national average of life expectancy by ≈10%.

This finding confirms the conclusions of many previous studies showing that over the years in both sexes and across various ethnic and racial groups, longer life expectancy has been observed for individuals with higher levels of education and income (17–19). The differences were larger for men than for women and were larger for the black population than for the white population (17, 18). Among older blacks and whites, the level of education, a measure of socioeconomic status, had a greater effect than did race on total life expectancy. This was true for males, females, whites, and blacks (19). The remainder of the symposium is devoted to how healthy young-elderly can continue to “beat the odds.”

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REFERENCES