Background Note #3 For Innovations Workshop

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Medical innovations are valued in large part for their contribution to increasing life expectancy. There is no doubt that some innovations have resulted in large reductions in deaths from infectious diseases, infant mortality, and cardiovascular mortality. Overall, life expectancy in the U.S. has been rising for more than a century as can be seen in Figure 1, which is based on period life tables.[1]

One consequence of the decline in infant and child mortality is to dramatically increase the proportion of a birth cohort that lives until age 25 (see Figure 2). Given the age-specific mortality at the beginning of the 20th century, only 75 percent of newborns could expect to reach age 25. By the middle of the century, almost 95 percent would reach 25. Given current age-specific mortality, that figure is approaching 100 percent asymptotically. The proportion of cohort reaching 65 has also increased dramatically from 40 percent at the beginning of the 20th century to almost 70 percent by mid-century to over 80 percent at present.

A significant effect of the change in survivorship and the increase in life expectancy at age 65 is to drastically alter the ages at which an increase in life expectancy is realized. I have looked at the increase in life expectancy at birth implied by the life tables in overlapping 20 year intervals since 1900 and decomposed the additional years into the percentage lived from birth to 24, from 25 to 64, and from 65 on. The change in the distribution has been enormous (see Figure 3).

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[1]Period life tables are based on the age-specific mortality rates prevailing in a specific year.

Over the first two decades of the 20th century almost 30 percent of the additional years of life were realized under age 25, over 50 percent at ages 25-64, and only 20 percent at ages 65 and above. By the end of the century, only a small fraction of additional years were realized under age 25, a bit over 20 percent at ages 25-64, and the great majority of additional years, about 75 percent, were realized at ages 65 and above.

Implications for innovative activity. Unless some catastrophe reverses the trends shown in Figures 1, 2, and 3, the thrust of innovative activity will shift (and is already shifting) toward diseases of old age. Further gains in life expectancy at birth will largely be realized at age 65 and above. That is where the market is; that is where innovations aimed at extending life will be sought. The only other possibility is a shift toward innovations that improve the quality of life. There will presumably be a substantial market for quality-enhancing innovations among Americans under age 65 as well as those who are older. Estimation of the value of such innovations is much more difficult than estimation of the value of innovations that increase life expectancy.

Implications for the economy and society. Further gains in survivorship to age 65 will result in nearly all the gains of life expectancy at birth being realized at age 65 and above. This population is highly dependent on annual expenditures by the Federal government – for Medicare, Medicaid, and Social Security Retirement. The burden will be great. It will be borne mostly by the non-elderly who are still in the work force, and may lead to a reconsideration of the social value of further gains in life expectancy.

One way to ameliorate the economic problem would be a substantial increase in the age of retirement. To even move a bit in this direction will require substantial legislative changes, especially with respect to employer-sponsored health insurance and Medicare. But if millions of elderly stay on the job, most organizations will have difficulty bringing younger workers into senior positions. I see nothing in the current political discussion that even hints at an understanding of these problems, to say nothing of a willingness to try to solve them.

Figure 1: Life Expectancy at Birth and at Ages 25 and 65, Selected Years 1900-2004

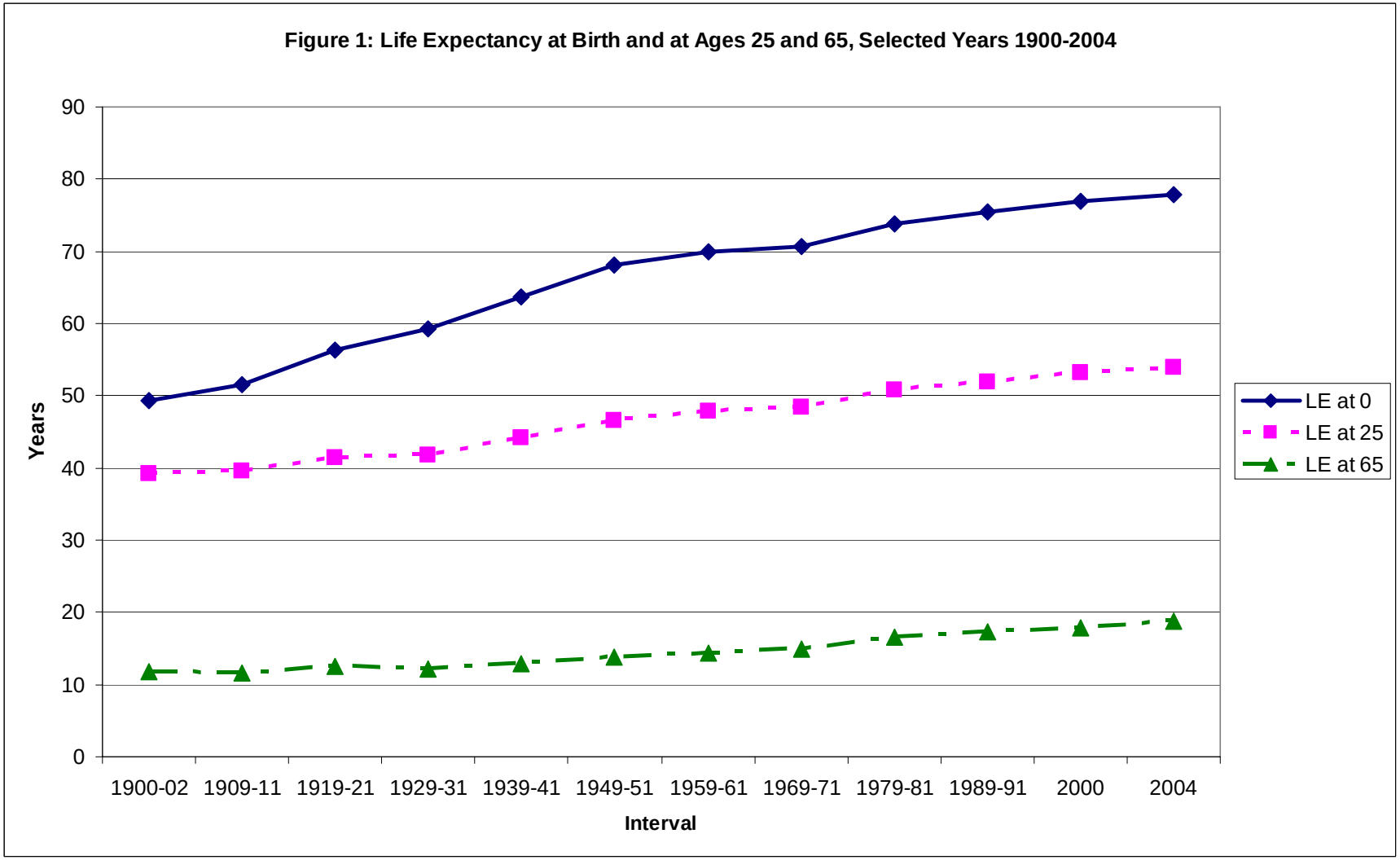

Figure 2: Percent of Birth Cohort Surviving to Ages 25 and 65, Selected Years 1900-2004

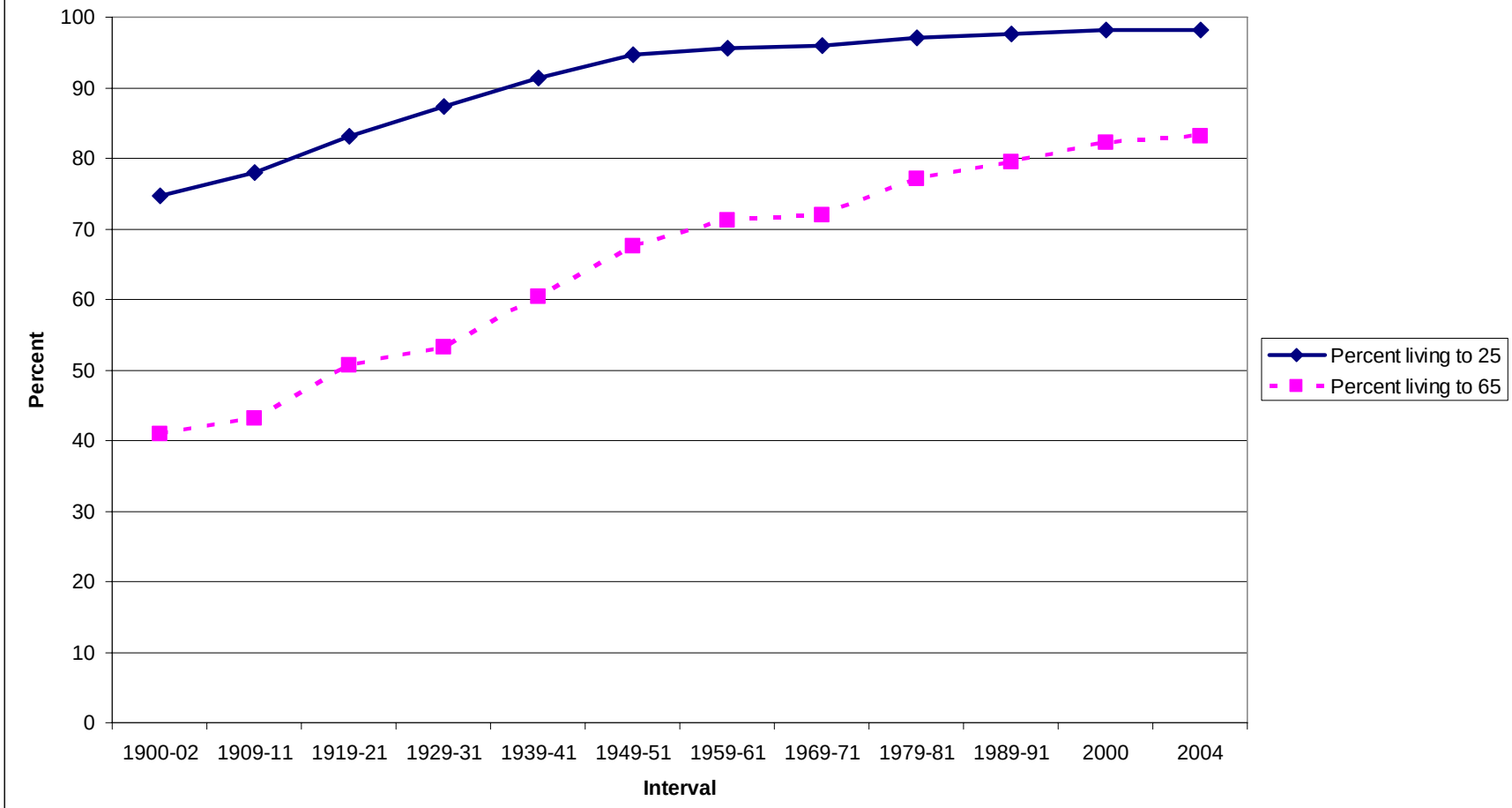

Figure 3: Gains in Life Expectancy During Overlapping Twenty-Year Intervals Decomposed Into Percent Realized Under Age 25, From 25 to 64, and 65+