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# Life Expectancy and Productivity Loss Among Narcotics Addicts Thirty-Three Years After Index Treatment

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**ABSTRACT.** This study computed the life expectancy of a cohort of male narcotics addicts followed for 33 years and assessed the productivity lost as a result of premature mortality. The future life expectancy was constructed for the narcotics addicts and for a comparable cohort from the general U.S. population. The average future life expectancy of the cohort was 18.84 years compared to 33.48 years for comparable U.S. males ($t = 49.49$, $p < .00001$). As a result of this premature mortality, the estimated monetary value of lost productivity was greater than $174 million. The lives of heroin addicts were severely truncated at productive ages resulting in a loss of potential productivity that increases social and economic burdens. doi:10.1300/J069v25n04_04 *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com> © 2006 by The Haworth Press, Inc. All rights reserved.]*

**KEYWORDS.** Life expectancy, productivity loss, narcotics, addiction

## *INTRODUCTION*

Narcotics abuse remains a major drug problem in the United States. According to the 2003 National Survey on Drug Use and Health, an estimated 3,744,000 people used heroin at some point in their lifetime and 314,000 of them still used heroin during the 12 months prior to the time of survey. From 1995 through 2002, the annual number of new heroin users ranged from 121,000 to 164,000, which almost doubled the number at year 1988 (83,000). About 13,000 youths between the ages of 12 and 17 had used heroin at least once in the survey year. Most new users were age 18 or older (on average 75 percent), and most were male (on average 63 percent).[1] Addiction to heroin imposes heavy costs on individuals, families, and society as a whole. The focus of this paper is to assess the life expectancy of heroin addicts and the loss of productivity as a result of premature deaths occurring among the study sample.

Life expectancy as defined by the Centers for Disease Control is the number of years a person

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can expect to live based on past mortality trends.[2] This value may be obtained from generation life tables or current life tables. The better-known current life table used by most epidemiologists may be characterized as "cross-sectional." It considers a hypothetical cohort and assumes that they are subject to the age-specific death rates observed by an actual comparable population (by gender and age) during that year. Thus, for example, a current life table for 2005 expects that a hypothetical cohort throughout its lifetime would be subject to the age-specific death rates prevailing for an actual comparable population in 2005. In contrast, the generation, or "cohort" life table provide a longitudinal perspective. This method follows the mortality experience of an actual cohort from the moment of birth through consecutive calendar years until death. Consequently, this requires information on death rates over a very long period of time, which is not easy to get and, as a result, not very common.

In essence, life expectancy of a cohort obtained by current life tables has a projected value, whereas that obtained from generation life tables reflects the actual length of life experienced by an original cohort. The latter is the method we have chosen to calculate the average life expectancy in our long-term narcotics addict cohort (33 years after treatment) in comparison with that from a comparable cohort of the general U.S. population.

One may question the purpose of assessing life expectancy in a cohort. In recent times life expectancy has been studied with a view to identify risk factors such as smoking and lack of exercise, which reduce longevity and increase disability.[3-6] Similarly, longevity is reduced in heroin addicts primarily as a result of heroin overdose, liver disease, and homicide.[7] Chronic diseases such as cardiovascular disease and arthritis are also prevalent in long-term narcotics users, resulting in increased disability.[8,9]

One may also evaluate life expectancy in terms of the associated productivity lost due to premature mortality. The years 0-19 and 65+ may be considered as investment years and consumer years, respectively.[10] Ages 0-19 are the years when an individual is nurtured and educated by the family and society. When a person retires (years 65+), an end to economic productivity is assumed. In contrast, the 45 years between ages 19 and 65 are a period in which a person should be socially and economically productive. Each year by which a lifetime is shortened may contribute to a loss of earnings. Thus, it is pertinent to assess productivity loss when evaluating life expectancy and premature mortality in a high-risk cohort.

Many studies have examined the consequences of narcotics abuse in terms of morbidity, mortality, and criminal involvement. Although the number of longitudinal prospective studies of narcotic addiction has grown steadily, most are limited in addressing premature mortality. Some studies had small numbers of subjects in the original cohort,[11] others failed to report findings for dead addicts.[12-14] In general the death rates in these studies range from 1.24%-3.3% per year for the period of the individual studies.[13,15-25] However, no study that we are aware of has assessed the mortality profile of narcotics addicts in terms of life expectancy and its accompanying economic burden.

## METHODS

### Subjects

Since 1963, data have been collected over 33 years, at ten-year intervals, on a group of male narcotic addicts in California (n = 581).[8,26] The sample was randomly selected from admissions to the California Civil Addiction Program (CAP) during 1962-64. Established in 1961 by California legislation, CAP was a compulsory drug treatment program under the California Department of Corrections for narcotics-dependent criminal offenders committed under court order. The program consisted of an inpatient period followed by supervised community aftercare. Patients could be returned for further inpatient stays if there was evidence of relapse to addiction or other behaviors that violated conditions of aftercare. The program was the only major publicly funded treatment available to California addicts during the 1960s, although in the 1970s methadone maintenance became commonly available.

The sample was limited to male subjects because of the small number of female commitments to the CAP. The sample consisted of white (36.5%), Hispanic (55.6%), and Afri-

can-American (7.9%) addicts. Mean age at admission in 1962-1964 was 25.4 years. At the 33-year follow-up, the attrition rate (e.g., refusal, failure to locate) was 9.5%. There was not statistically significantly difference in demographics between interviewed subjects and those lost to follow-up.

Subjects were followed at three ten-year intervals: 1974-75, 1985-86 and 1996-97 over a 33-year period. The survival status of these subjects at follow-up was determined as alive, dead, or unknown. Death certificates confirmed all deaths. Two hundred and eighty-two of the original 581 CAP subjects had died at the end of the 33-year follow-up period. To make a life table, deaths were categorized by year of birth in a five-year interval. Categories with less than 10 deaths were eliminated. As a result four categories remained: Group 1 with birth year 1925-29 (n = 28); Group 2 with birth year 1930-34 (n = 54); Group 3 with birth year 1935-39 (n = 73); and Group 4 with birth year 1940-44 (n = 98). This represented 90% of all deaths in the sample. For each category, a cohort of 100,000 males from the general U.S. population and the appropriate age-specific death rates for that time period was assembled for comparison. As the cohort of 100,000 attrited, the mortality rates per 100,000 were adjusted accordingly. The mortality trend of the narcotic addicts was then compared with the actual mortality trend in the general U.S. population during the same time period.

### *Life Tables*

Abridged generation life tables were constructed for each category of the cohort of narcotic addicts and the corresponding U.S. population. This life table typically contains data by 5- or 10-year age intervals. The life table was constructed in columns as shown in Appendix A (1).[28]

### *Statistical Analysis*

A t-test was conducted to determine if the difference was significant between the life expectancy of the cohort of narcotics addicts and the U.S. population.

### *Economic Evaluation*

Productivity loss was evaluated on the basis of the 'Present Value of Expected Lifetime Productivity, by Age, Gender, and Discount Rate, 1992' (Appendix B).[29]

A discount rate of 3% was chosen. The appropriate future lost productivity was computed for the cohort by multiplying the expected future lifetime productivity by the number of deaths in each age category. The sum of all categories yielded the total lost of expected lifetime earnings for the cohort.

## *RESULTS*

### *Demographics of the Cohort*

The average age of death was highest in the oldest birth cohort group (Group 1; 56.5 years) and decreased as the birth groups decreased in age (Group 4; 40.3 years). Hispanics represented the greatest proportion in all 4 groups, reaching a maximum of 65.3% in Group 4. Whites had a maximum of 42.7% in Group 3. The African American representation decreased in the groups with younger birth cohort, from 21.4% in Group 1 to 2% in Group 4 (Table 1).

We looked at drug use in the cohort in terms of heroin, marijuana, cocaine, alcohol, and tobacco. The mean age of first heroin use decreased across the groups from 22.0 years to 16.6 years. The younger cohort (Group 4) had an earlier age of initial heroin use. The proportion using marijuana was significantly greater in Group 4 (34.7%) whereas cocaine use was fairly consistent throughout all groups. Alcohol use was lowest in the oldest group (21.4%). About half of subjects in each group were smokers and tobacco use reached an average of 62.5% in Groups 3 and 4. Disability rate in the Group 2 was the highest (34.6%).

### *Life Expectancy of Narcotics Addicts and U.S. Population*

We reported the average future lifetime of the CAP sample of narcotics addicts and the general U.S. population in four categories of five-year intervals in accordance with their birth years. We then compared the two data

TABLE 1. Demographic characteristics of the cohort (N = 253§)

| Birth year | Group 1 1925-29 (n = 28) | Group 2 1930-34 (n = 54) | Group 3 1935-39 (n = 73) | Group 4 1940-44 (n = 98) |
|---|---|---|---|---|
| Average age at death | 56.5 | 50.4 | 45.3 | 40.3 |
| Ethnicity (%) | | | | |
| White | 25.0 | 38.2 | 42.7 | 32.7 |
| Hispanic | 53.6 | 49.1 | 52.0 | 65.3 |
| Black | 21.4 | 12.7 | 5.3 | 2.0 |
| Education, y | 8.4 | 10.7 | 10.6 | 10.4 |
| Drug use | | | | |
| Mean age of first heroin use | 22.0 | 19.7 | 17.7 | 16.6 |
| Marijuana use (%)* | 21.4 | 20.0 | 25.3 | 34.7 |
| Cocaine use (%)* | 25.0 | 18.2 | 24.0 | 25.7 |
| Alcohol use | | | | |
| Drunk in past 7 days (%) | 21.4 | 29.1 | 29.3 | 25.7 |
| Ever hospitalized for drinking (%) | 3.6 | 7.3 | 13.3 | 13.9 |
| Tobacco use (%) | 57.1 | 45.5 | 62.7 | 62.4 |
| Mean no. of packs smoked per day | 4.8 | 0.4 | 0.7 | 0.4 |
| Disabled (%) | 17.9 | 34.6 | 20.0 | 17.8 |

* Marijuana and cocaine use were defined as having used within one month of the latest follow-up interview.
§ Age groups with subjects <10 were not included in Table 1, resulting in a total number of 253 subjects which is less than the total 282 deaths of the study.

sets. Generation of the life tables can be viewed in Appendix A.

The expectation of life represents the average number of years that a cohort would live if they were to experience throughout their lifetime the prevailing age-specific death rates. Thus the average life expectancy is a value which can be quantified when future mortality rates are known. The future life expectancy in year 1964-1969 of a narcotic addict entering the Civil Addict Program with birth years 1940-44 was 18.34 years. This differs greatly from that of a U.S. resident from the general population, which would have been 33.73 years–a difference of 15.39 years [Table 2 and Figure 1 (a)]. Likewise, the difference between population and addicts for those with birth year of 1935-39 was 14.97 years in the year of 1964-69 [Table 2 and Figure 1 (b)]. The difference for birth at 1930-34 was 14.16 years [Table 2 and Figure 1 (c)] and the disparity in life expectancy for those of birth year 1925-29 was 14.06 years [Table 2 and Figure 1 (d)]. The average future life expectancy for narcotic addicts was 18.84 years compared to 33.49 years for the general U.S. population, resulting in a difference of 14.65 years. This difference yielded a t-statistic of 49.49 which was significant at $p < 0.00001$. Thirty-three years after CAP admission, the average future lifetime by 1994-1998 was 2 years in comparison to 3.97 years for the general population of the same birth cohorts. This difference of 1.97 years was non-significant.

### *Productivity Loss*

The total loss of productivity for the cohort was $174 million (Table 3). In the present sample, productivity loss was greatest in the 35-39 age group with 33 deaths. Each of the deceased had projected earnings loss of $966,071, which yielded a total of $31.9 million. Deaths at ages 45-49 years (n = 48) had the second highest loss with $31.1 million, and 40-44 years (n = 37) ranked as third with $30.4 million. As expected, premature deaths among younger birth cohorts carried greater productivity loss in absolute terms than that for older age. For example, for the age group of 30-34 years (23 deaths), the total productivity loss was $24.7 million, which was greater than that for age group 50-54 ($20.4 million) although that group had almost twice as many deaths (n = 44).

## *DISCUSSION*

This unique longitudinal study examined extensive data on a cohort of narcotics addicts tracked over a very long period of time, assembling invaluable information regarding morbidity and mortality as a result of long-term narcotics addiction. Heroin addiction and its accompanying risky lifestyle give rise to numerous pathologies including both acute and chronic diseases,[9] contributing to a reduction in life expectancy of 14.65 years in this cohort. In our previous analysis, the leading causes of premature mortality among this cohort were heroin overdose, liver disease, accidents, and homicide.[7-8,26] Five subjects died from infectious diseases and 1.2% of living subjects in 1996-97 were diagnosed with HIV.[8] Other studies also showed that narcotics addiction is associated with serious health conditions, including fatal overdose, spontaneous abortion, collapsed

TABLE 2. Life expectancy for narcotic addicts and US population by birth year

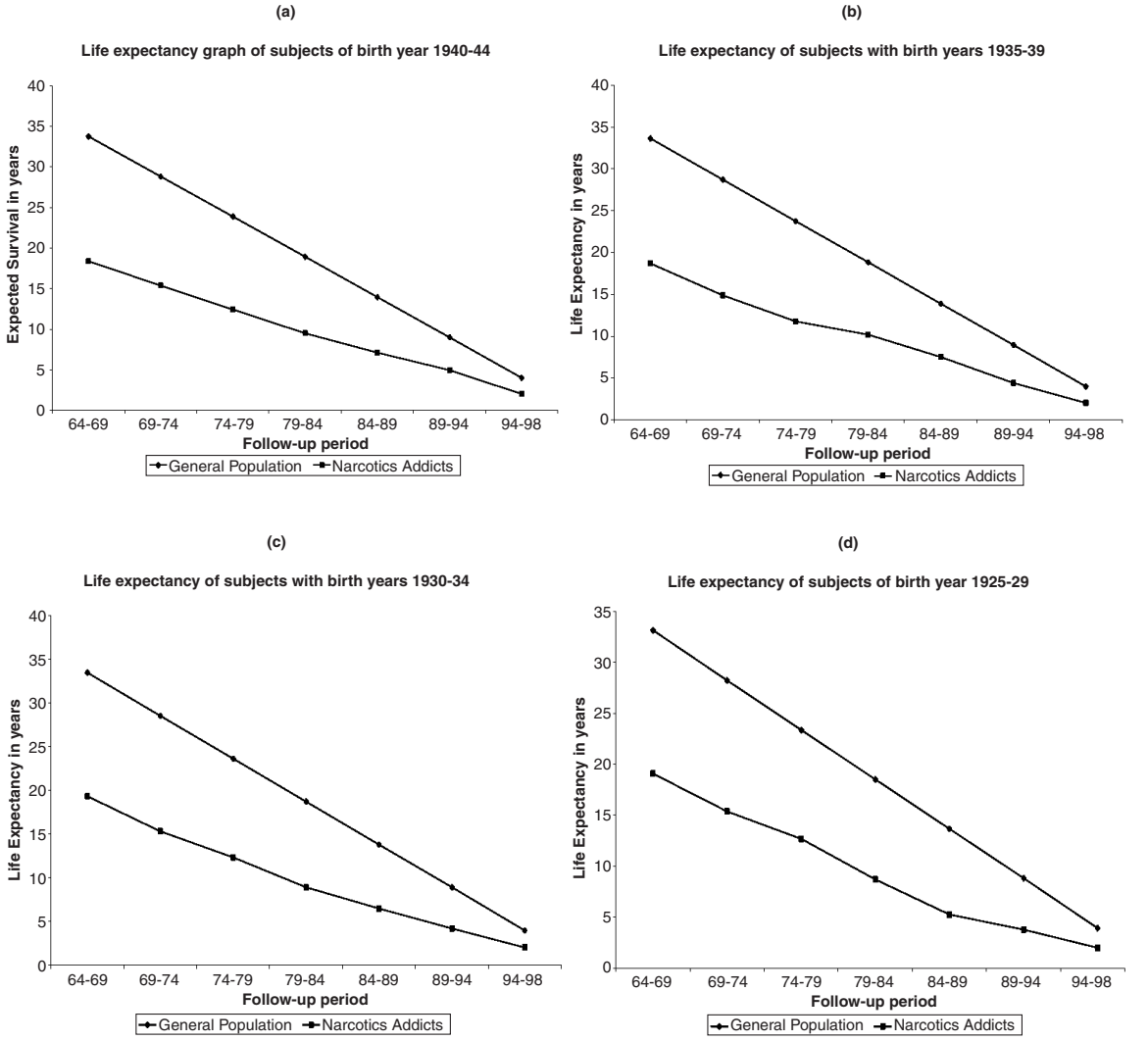
| Interval | Age | Number entering interval | Mortality rate | Average future lifetime | Number entering interval | Number deaths during interval | Average future lifetime |
|---|---|---|---|---|---|---|---|
| | | General population | | | Narcotics addicts | | |
| Birth Year 1940-44 | | | N = 100,000 | | | N = 98 | |
| 1964-69 | 20-24 | 100,000 | 183.6 | 33.73 | 98 | 11 | 18.34 |
| 1969-74 | 25-29 | 99,816 | 206.6 | 28.79 | 87 | 12 | 15.34 |
| 1974-79 | 30-34 | 99,610 | 210.97 | 23.84 | 75 | 13 | 12.40 |
| 1979-84 | 35-39 | 99,399 | 156.05 | 18.89 | 62 | 17 | 9.48 |
| 1984-89 | 40-44 | 99,243 | 324.51 | 13.92 | 45 | 17 | 7.11 |
| 1989-94 | 45-49 | 98,918 | 491.99 | 8.95 | 28 | 13 | 4.91 |
| 1994-98 | 50-54 | 98,426 | 725.22 | 3.98 | 15 | 15 | 2.00 |
| Birth Year 1935-39 | | | N = 100,000 | | | N = 73 | |
| 1964-69 | 25-29 | 100,000 | 180.9 | 33.63 | 73 | 5 | 18.66 |
| 1969-74 | 30-34 | 99,819 | 228.38 | 28.69 | 68 | 9 | 14.85 |
| 1974-79 | 35-39 | 99,591 | 282.83 | 23.75 | 59 | 16 | 11.74 |
| 1979-84 | 40-44 | 99,308 | 365.45 | 18.81 | 43 | 10 | 10.17 |
| 1984-89 | 45-49 | 98,942 | 510.52 | 13.87 | 33 | 9 | 7.50 |
| 1989-94 | 50-54 | 98,432 | 761.39 | 8.93 | 24 | 14 | 4.38 |
| 1994-98 | 55-59 | 97,671 | 1092.89 | 3.98 | 10 | 10 | 2.00 |
| Birth Year 1930-34 | | | N = 100,000 | | | N = 54 | |
| 1964-69 | 30-34 | 100,000 | 214.2 | 33.45 | 54 | 3 | 19.30 |
| 1969-74 | 35-39 | 99,786 | 321.71 | 28.52 | 51 | 7 | 15.28 |
| 1974-79 | 40-44 | 99,464 | 398.85 | 23.60 | 44 | 6 | 12.32 |
| 1979-84 | 45-49 | 99,065 | 588.82 | 18.69 | 38 | 11 | 8.87 |
| 1984-89 | 50-54 | 98,476 | 837.66 | 13.79 | 27 | 11 | 6.46 |
| 1989-94 | 55-59 | 97,639 | 1222.06 | 8.88 | 16 | 10 | 4.19 |
| 1994-98 | 60-64 | 96,417 | 1738.33 | 3.96 | 6 | 6 | 2.00 |
| Birth Year 1925-29 | | | N = 100,000 | | | N = 28 | |
| 1964-69 | 35-39 | 100,000 | 300.6 | 33.14 | 28 | 2 | 19.07 |
| 1969-74 | 40-44 | 99,699 | 490.52 | 28.24 | 26 | 4 | 15.35 |
| 1974-79 | 45-49 | 99,209 | 704.47 | 23.36 | 22 | 2 | 12.68 |
| 1979-84 | 50-54 | 98,504 | 943.2 | 18.51 | 20 | 4 | 8.70 |
| 1984-89 | 55-59 | 97,561 | 1330.04 | 13.67 | 16 | 9 | 5.25 |
| 1989-94 | 60-64 | 96,231 | 1869.08 | 8.82 | 7 | 5 | 3.79 |
| 1994-98 | 65-69 | 94,362 | 2555 | 3.95 | 2 | 2 | 2.00 |



veins, and, particularly in users who inject the drug, infectious diseases, including HIV/AIDS and hepatitis.[9] According to the Centers for Disease Control and Prevention (CDC), almost one-third of new AIDS cases are related directly or indirectly to injection drug use. Consequently, drug abuse is the fastest growing vector for the spread of HIV in the nation.[9] Thus, from a public health perspective, a life-threatening risk factor such as heroin abuse requires special attention. Heroin addiction and associated morbidities lead to premature death at a young age, which results in lost productivity.

The loss of a human life cannot be fully measured in financial terms alone, and the emotional impact on family and friends is beyond measurement. Our computation of lost productivity is a very conservative estimate, even at $174 million, because the estimate ignores cost of disability, medical costs, and societal costs such as criminal activity associated with heroin addiction. If these factors were taken into consideration, the approximations would dramatically increase. It was estimated that 14% of all drug-related emergency department (ED) episodes involved heroin; more alarming is that between 1991 and 1996, heroin-related ED episodes increased by 106% (from 35,898 to 73,846). Also, the direct and indirect costs associated with the spread of infectious diseases

FIGURE 1. Life expectancy




among drug users are among the fastest growing components of the economic costs of drug abuse.[9] The health costs of drug abuse are enormous and most likely will increase as chronic drug abusers seek medical attention for their increasingly severe drug-related health problems.

The study is based on male addicts committed to CAP during the 1960s, thus, our findings may only be generalizable to male heroin addicts with similar age and ethnic background. Nevertheless, when considering our cohort, it should be noticed that as the cohort progresses in years, their mortality rates became increasingly high when compared to that of the general U.S. population. With increasing age, chronic diseases became more prevalent in the study sample; whether the patterns and processes of chronic disease similarly progressed in the general population compared to those among long-term heroin addicts remains to be investigated.

It is important to ensure that drug abusers change behaviors that put them at risk for contracting disease. Drug abuse treatment, prevention, and community-based outreach programs have been demonstrated to be successful in reducing drug-related risk behaviors such as needle sharing, unsafe sexual practices, and the resultant risk of exposure to HIV/AIDS and other

TABLE 3. Expected productivity loss among heroin addicts (N = 282)

| Age of death | Expected lifetime productivity* | Heroin addicts N | Heroin addicts Loss of productivity§ |
|---|---|---|---|
| | 3% | | |
| 25-29 | $1,138,472 | 18 | $20,492,496 |
| 30-34 | 1,074,547 | 23 | 24,714,581 |
| 35-39 | 966,071 | 33 | 31,880,343 |
| 40-44 | 821,251 | 37 | 30,386,287 |
| 45-49 | 648,453 | 48 | 31,125,744 |
| 50-54 | 463,193 | 44 | 20,380,492 |
| 55-59 | 289,856 | 33 | 9,565,248 |
| 60-64 | 155,004 | 30 | 4,650,120 |
| 65-69 | 77,404 | 11 | 851,444 |
| 70-74 | 38,785 | 3 | 116,355 |
| 75-79 | 16,568 | 2 | 33,136 |
| Total | | 282 | 174,196,246 |

*Harwood H, Fountain D, Livermore G: The Economic Costs of Alcohol and Drug Abuse in the United States, 1992; The Lewin Group: NIH 98-4327 1998.
§ Loss of productivity = expected productivity × N.

infectious diseases.[9,30] For heroin-dependent individuals, methadone-maintenance treatment has been repeatedly shown to be effective in stabilizing and reintegrating addicts into society.[29-31] Although outpatient services cost approximately $5,000 per patient per year, it returns $4 to $7 in economic benefits in the form of gained productivity and decreased criminal activity for every $1 spent.[9,32] Reduced expenditures for health care would ensue from gains associated with successful treatment engagement and retention, thus increasing the total benefit accruing to treatment.

By quantifying the actual life expectancy of narcotics addicts, it becomes apparent that heroin abuse is a risk factor that gives rise to escalating social and economic burdens. Given the continued extensive heroin abuse problem, it is urgent that public resources be prioritized to expand drug abuse treatment programs and prevention programs. It is imperative that we immediately take these actions in order to achieve a healthier and safer society.

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## APPENDIX A (1)

***Construction of Life Tables***

*Column 1:* Interval–This column indicates the time period in which the deaths occurred.

*Column 2:* Age Interval (x to x+n)–This column indicates the age interval of this category of the cohort during this time period.

*Column 3:* Number Entering Interval–This column shows the proportion of the category that was alive at the beginning of an indicated 5-year time period.

*Column 4:* Mortality Rate /Number of Deaths During Interval–This column represents the number of deaths during the time period. For the U.S. population the appropriate mortality rates were used.

*Column 5:* D/2–Dividing column 4 (that is the number of deaths during the interval) by 2 derives this column. This is due to the assumption that each person that dies lives on average 6 months of the year of death.

*Column 6:* Person Years Lived (PYL'd) in One Year–This represents the number of person-years lived (PYL'd) in one year of the interval. We define one person-year as one person living for one year hence ten people living one year is understood as ten person-years. This is computed by subtracting column 5 from column 3.

*Column 7:* PYL'd during Interval–This column represents the number of PYL'd during the interval hence column 6 multiplied by 5.

*Column 8:* PYL'd during Interval and all later years–This represents the sum of the PYL'd during that interval and all future years by the cohort.

*Column 9:* Average Future Lifetime–This represents the average future lifetime or life expectancy. This may be defined as the average number of years remaining to be lived by those surviving to that age on the basis of a given set of age-specific rates of dying. It was calculated by attaining the sum of total number of PYL'd from that time period forward (Column 8) and dividing it by the number of subjects entering the initial interval (Column 3).

**LIFE TABLE OF UNITED STATES RESIDENTS OF BIRTH YEAR 1940-44**
N = 100,000

| Interval | Age | Number entering interval | Mortality rate | D/2 | Person years lived during one year of interval | PYL'd in interval | PYL'd in interval and all remaining years | Average future lifetime |
|---|---|---|---|---|---|---|---|---|
| 1964-69 | 20-24 | 100,000 | 183.6 | 91.8 | 99,908 | 499541 | 3,373,101 | 33.73101 |
| 1969-74 | 25-29 | 99,816 | 206.6 | 103.3 | 99,713 | 498565.5 | 2,873,710 | 28.78996 |
| 1974-79 | 30-34 | 99,610 | 210.97 | 105.485 | 99,504 | 497521.58 | 2,375,144 | 23.84448 |
| 1979-84 | 35-39 | 99,399 | 156.05 | 78.025 | 99,321 | 496604.03 | 1,877,623 | 18.88979 |
| 1984-89 | 40-44 | 99,243 | 324.51 | 162.255 | 99,081 | 495402.63 | 1,381,019 | 13.91556 |
| 1989-94 | 45-49 | 98,918 | 491.99 | 245.995 | 98,672 | 493361.38 | 885,616 | 8.953008 |
| 1994-98 | 50-54 | 98,426 | 725.22 | 362.61 | 98,064 | 392254.68 | 392,187 | 3.984572 |

**LIFE TABLE OF NARCOTIC ADDICTS OF BIRTH YEAR 1940-1944**
N = 98

| Interval | Age | Number entering interval | Number deaths during interval | D/2 | Person Years Lived (PYL'd) in one year | PYL'd during interval | PYL'd during interval and all later years | Average future lifetime |
|---|---|---|---|---|---|---|---|---|
| 1964-69 | 20-24 | 98 | 11 | 5.5 | 92.5 | 462.5 | 1797.5 | 18.34184 |
| 1969-74 | 25-29 | 87 | 12 | 6 | 81 | 405 | 1335 | 15.34483 |
| 1974-79 | 30-34 | 75 | 13 | 6.5 | 68.5 | 342.5 | 930 | 12.4 |
| 1979-84 | 35-39 | 62 | 17 | 8.5 | 53.5 | 267.5 | 587.5 | 9.475806 |
| 1984-89 | 40-44 | 45 | 17 | 8.5 | 36.5 | 182.5 | 320 | 7.111111 |
| 1989-94 | 45-49 | 28 | 13 | 6.5 | 21.5 | 107.5 | 137.5 | 4.910714 |
| 1994-98 | 50-54 | 15 | 15 | 7.5 | 7.5 | 30 | 30 | 2 |

## APPENDIX A (2)

**LIFE TABLE OF UNITED STATES RESIDENTS OF BIRTH YEAR 1935-39**
N = 100,00

| Interval | Age | Number entering interval | Mortality rate | D/2 | Person Years Lived (PYL'd) in one Years | PYL'd during interval | PYL'd during interval and all later years | Average future lifetime |
|---|---|---|---|---|---|---|---|---|
| 1964-69 | 25-29 | 100,000 | 180.9 | 90.45 | 99,910 | 499547.75 | 3363133 | 33.63133 |
| 1969-74 | 30-34 | 99,819 | 228.38 | 114.19 | 99,705 | 498524.55 | 2863585 | 28.68775 |
| 1974-79 | 35-39 | 99,591 | 282.83 | 141.415 | 99,449 | 497246.53 | 2365061 | 23.7478 |
| 1979-84 | 40-44 | 99,308 | 365.45 | 182.725 | 99,125 | 495625.83 | 1867814 | 18.80832 |
| 1984-89 | 45-49 | 98,942 | 510.52 | 255.26 | 98,687 | 493435.9 | 1372188 | 13.86855 |
| 1989-94 | 50-54 | 98,432 | 761.39 | 380.695 | 98,051 | 490256.13 | 878752.5 | 8.927515 |
| 1994-98 | 55-59 | 97,671 | 1092.89 | 546.445 | 97,124 | 388496.34 | 388496.3 | 3.977621 |

**LIFE TABLE OF NARCOTIC ADDICTS OF BIRTH YEAR 1935-1939**
N = 73

| Interval | Age | Number entering interval | Number deaths during interval | D/2 | Person Years Lived (PYL'd) in one year | PYL'd during interval | PYL'd during interval and all later years | Average future lifetime |
|---|---|---|---|---|---|---|---|---|
| 1964-69 | 25-29 | 73 | 5 | 2.5 | 70.5 | 352.5 | 1362.5 | 18.66438 |
| 1969-74 | 30-34 | 68 | 9 | 4.5 | 63.5 | 317.5 | 1010 | 14.85294 |
| 1974-79 | 35-39 | 59 | 16 | 8 | 51 | 255 | 692.5 | 11.73729 |
| 1979-84 | 40-44 | 43 | 10 | 5 | 38 | 190 | 437.5 | 10.17442 |
| 1984-89 | 45-49 | 33 | 9 | 4.5 | 28.5 | 142.5 | 247.5 | 7.5 |
| 1989-94 | 50-54 | 24 | 14 | 7 | 17 | 85 | 105 | 4.375 |
| 1994-98 | 55-59 | 10 | 10 | 5 | 5 | 20 | 20 | 2 |

## APPENDIX A (3)

**LIFE TABLE OF UNITES STATES RESIDENTS BIRTH YEAR 1930-34**
N = 1000,000

| Interval | Age | Number entering interval | Mortality rate | D/2 | Person Years Lived (PYL'd) in one year | PYL'd during interval | PYL'd during interval and all later years | Average future lifetime |
|---|---|---|---|---|---|---|---|---|
| 1964-1969 | 30-34 | 100,000 | 214.2 | 107.1 | 99,893 | 499464.5 | 3345383 | 33.45383 |
| 1969-1974 | 35-39 | 99,786 | 321.71 | 160.855 | 99,625 | 498124.73 | 2845919 | 28.52028 |
| 1974-1979 | 40-44 | 99,464 | 398.85 | 199.425 | 99,265 | 496323.33 | 2347794 | 23.60444 |
| 1979-1984 | 45-49 | 99,065 | 588.82 | 294.41 | 98,771 | 493854.15 | 1851471 | 18.68941 |
| 1984-1989 | 50-54 | 98,476 | 837.66 | 418.83 | 98,058 | 490287.95 | 1357617 | 13.78621 |
| 1989-1994 | 55-59 | 97,639 | 1222.06 | 611.03 | 97,028 | 485138.65 | 867328.8 | 8.883038 |
| 1994-1998 | 60-64 | 96,417 | 1738.33 | 869.165 | 95,548 | 382190.14 | 382190.1 | 3.963941 |

**LIFE TABLE OF NARCOTIC ADDICTS OF BIRTH YEAR 1930-34**
N = 54

| Interval | Age | Number entering interval | Number deaths during interval | D/2 | Person Years Lived (PYL'd) in one year | PYL'd during interval | PYL'D during interval and all later years | Average future lifetime |
|---|---|---|---|---|---|---|---|---|
| 1964-1969 | 30-34 | 54 | 3 | 1.5 | 52.5 | 262.5 | 1042 | 19.2963 |
| 1969-1974 | 35-39 | 51 | 7 | 3.5 | 47.5 | 237.5 | 779.5 | 15.28431 |
| 1974-1979 | 39-40 | 44 | 6 | 3 | 41 | 205 | 542 | 12.31818 |
| 1979-1984 | 40-44 | 38 | 11 | 5.5 | 32.5 | 162.5 | 337 | 8.868421 |
| 1984-1989 | 45-49 | 27 | 11 | 5.5 | 21.5 | 107.5 | 174.5 | 6.462963 |
| 1989-1994 | 50-54 | 16 | 10 | 5 | 11 | 55 | 67 | 4.1875 |
| 1994-1998 | 55-59 | 6 | 6 | 3 | 3 | 12 | 12 | 2 |

## APPENDIX A (4)

**LIFE TABLE OF UNITED STATES RESIDENTS OF BIRTH YEAR 1925-29**
N = 100,000

| Interval | Age | Number entering interval | Mortality rate | D/2 | Person Years Lived (PYL'd) in one year | PYL'd during interval | PYL'd during interval and all later years | Average future lifetime |
|---|---|---|---|---|---|---|---|---|
| 1964-69 | 35-39 | 100,000 | 300.6 | 150.3 | 99,850 | 499248.5 | 3314269 | 33.14269 |
| 1969-74 | 40-44 | 99,699 | 490.52 | 245.26 | 99,454 | 497270.7 | 2815020 | 28.23508 |
| 1974-79 | 45-49 | 99,209 | 704.47 | 352.235 | 98,857 | 494283.23 | 2317750 | 23.36232 |
| 1979-84 | 50-54 | 98,504 | 943.2 | 471.6 | 98,033 | 490164.05 | 1823467 | 18.51152 |
| 1984-89 | 55-59 | 97,561 | 1330.04 | 665.02 | 96,896 | 484480.95 | 1333302 | 13.66632 |
| 1989-94 | 60-64 | 96,231 | 1869.08 | 934.54 | 95,297 | 476483.15 | 848821.5 | 8.82065 |
| 1994-98 | 65-69 | 94,362 | 2555 | 1277.5 | 93,085 | 372338.36 | 372338.4 | 3.945847 |

**LIFE TABLE OF NARCOTIC ADDICTS OF BIRTH YEAR 1925-29**
N = 28

| Interval | Age | Number entering interval | Number deaths during interval | D/2 | Person Years Lived (PYL'd) in one year | PYL'd during interval | PYL'd during interval and all later years | Average future lifetime |
|---|---|---|---|---|---|---|---|---|
| 1964-69 | 35-39 | 28 | 2 | 1 | 27 | 135 | 534 | 19.07143 |
| 1969-74 | 40-44 | 26 | 4 | 2 | 24 | 120 | 399 | 15.34615 |
| 1974-79 | 45-49 | 22 | 2 | 1 | 21 | 105 | 279 | 12.68182 |
| 1979-84 | 50-54 | 20 | 4 | 2 | 18 | 90 | 174 | 8.7 |
| 1984-89 | 54-59 | 16 | 9 | 4.5 | 11.5 | 57.5 | 84 | 5.25 |
| 1989-94 | 60-64 | 7 | 5 | 2.5 | 4.5 | 22.5 | 26.5 | 3.785714 |
| 1994-98 | 65-69 | 2 | 2 | 1 | 1 | 4 | 4 | 2 |

## APPENDIX B. Present Value of Expected Lifetime Productivity, by Age, Gender, and Discount Rate, 1992

| | Discount Rate | | | | | | |
|---|---|---|---|---|---|---|---|
| | Males | | | | Females | | |
| **Age** | **2%** | **3%** | **4%** | **6%** | **2%** | **3%** | **4%** |
| Under 1 | $174,844 | $796,868 | $540,496 | $266,965 | $935,418 | $640,454 | $438,501 |
| 1-4 | 1,207,409 | 839,078 | 583,109 | 302,060 | 960,870 | 674,044 | 472,838 |
| 5-9 | 1,264,125 | 917,724 | 666,246 | 376,014 | 1,005,589 | 736,918 | 540,030 |
| 10-14 | 1,329,488 | 1,013,187 | 772,138 | 479,322 | 1,057,268 | 813,330 | 625,674 |
| 15-19 | 1,383,643 | 1,102,512 | 878,501 | 593,485 | 1,090,748 | 875,812 | 703,230 |
| 20-24 | 1,392,669 | 1,150,311 | 950,129 | 684,166 | 1,074,606 | 891,211 | 739,115 |
| 25-29 | 1,339,809 | 1,138,472 | 967,391 | 730,411 | 1,005,998 | 854,739 | 726,223 |
| 30-34 | 1,234,571 | 1,074,547 | 935,265 | 734,474 | 903,020 | 782,758 | 678,513 |
| 35-39 | 1,086,645 | 966,071 | 858,876 | 698,385 | 780,158 | 688,551 | 607,701 |
| 40-44 | 906,233 | 821,251 | 744,239 | 624,795 | 645,701 | 579,387 | 519,884 |
| 45-49 | 703,411 | 648,453 | 597,788 | 516,717 | 507,196 | 462,055 | 420,932 |
| 50-54 | 495,242 | 463,193 | 433,218 | 383,990 | 372,678 | 344,084 | 317,684 |
| 55-59 | 306,461 | 289,856 | 274,150 | 247,882 | 251,866 | 235,173 | 219,586 |
| 60-64 | 162,855 | 155,004 | 147,532 | 134,871 | 154,264 | 145,280 | 136,819 |
| 65-69 | 81,016 | 77,404 | 73,953 | 67,993 | 86,717 | 82,194 | 77,907 |
| 70-74 | 40,266 | 38,785 | 37,359 | 34,865 | 46,380 | 44,265 | 42,247 |
| 75-79 | 17,167 | 16,568 | 15,989 | 14,985 | 23,260 | 22,372 | 21,517 |
| 80-84 | 8,412 | 8,181 | 7,957 | 7,543 | 10,999 | 10,673 | 10,357 |
| 85 & over | 2,450 | 2,421 | 2,392 | 2,335 | 2,659 | 2,627 | 2,595 |

Source: Rice (1997), personal communication. The values for 3 percent were calculated as the geometric mean and 4-percent rates, respectively, for males and females.[24]