Methods Protocol for the Human Life-Table Database

by Vladimir M. Shkolnikov

with assistance of Evgeny M. Andreev, Dmitri A. Jdanov, Jacques Vallin, France Meslé, Carl Boe, John R. Wilmoth, Sigrid Gellers-Barkmann

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1. Introduction

Life tables describe the extent to which a generation of people (the life table cohort) dies off with age. Life tables are the oldest and most important tool in demography. They are widely used for descriptive and analytical purposes in demography, public health, epidemiology, population geography, biology, and many other branches of science. In classic demography the life table is a model of mortality as a component of population reproduction. In epidemiology and public health, the life table is a way to describe a population's mortality and survival.

The Human Life-Table Database (HLD) is a collection of population life tables for a multitude of countries covering many years. Most of the HLD life tables are for national populations, which have been officially published by national statistical offices. Some of the HLD life tables refer to certain regional or ethnic sub-populations within countries. Some of the HLD life tables are non-official life tables produced by researchers.

The HLD is part of the Human Mortality Database (HMD), which is a joint project of the Department of Demography at the University of California at Berkeley, USA and the Max Planck Institute for Demographic Research (MPIDR) in Rostock, Germany. The HLD was designed to supplement the HMD and provide free and user-friendly access to mortality data which, for various reasons, cannot be included in the HMD. The HMD, the primary database of the project, provides high quality continuous data series based on official and detailed population statistics which are comparable across countries and time. It contains detailed data on deaths, populations, death rates by age, year of birth, and calendar year, complete life tables, and the original raw data from which the output data are derived. The HMD is by design limited to developed countries or areas with reliable population estimates and good quality vital statistics.

All data series in the HMD are continuously updated on a regular basis. The HLD, by contrast, has no strong data quality requirements and includes a broader variety of life tables, some of which might be less reliable than those published in the HMD.

The HLD provides life tables assembled from different sources: statistical and scientific publications, official reports, data collections compiled by individual researchers, and so on. Most of the tables are for national populations, but many tables cover regional or ethnic sub-populations within countries. The HLD is essentially a collection of mortality data produced by different organizations or individual researchers using different methods; thus we cannot guarantee comparability of data across time or populations. Moreover, in some cases we provide several alternative life tables for same population and year. Therefore, HLD users are advised to consider carefully which sections of the published HLD data are more appropriate for their research. We conduct only some basic checks (to exclude or correct obviously wrong data) and recalculate life table functions to provide data in a standardized and consistent format. Unlike the HMD, the HLD includes only period life tables.

At present, the HLD includes the following types of data:

- standardized complete life tables in text format;
- standardized abridged life tables in text format;
- references to statistical publications and other data sources;
- scanned copies of the original life tables as they appeared in the original publications.

Three scientific institutions are jointly developing the HLD: the Max Planck Institute for Demographic Research (MPIDR) in Rostock, Germany, the Department of Demography at the University of California at Berkeley, USA and the Institut national d'études démographiques (INED) in Paris, France. The MPIDR is responsible for maintaining the database. A large set of life tables were collected and given to the HLD by Dr. Väinö Kannisto, a former United Nations advisor on demographic and social statistics. Professor J.W.Vaupel, Founding Director of the MPIDR, provided general guidance on the HLD project.

2. Method of calculation

A life table is a rectangular matrix, showing changes in a standard set of life table functions (columns) across ages (rows). The conventional set of life table functions includes:

- probability of death $_nq_x$ within age interval [$x, x+n$);
- probability of survival l_x from birth to exact age x;
- deaths $_nd_x$ within the age interval [$x, x+n$);
- central death rate $_nM_x$ for the age interval [$x,x+n$);
- person-years $_nL_x$ lived within the elementary age interval [$x,x+n$);
- person-years T_x lived after the exact age x, and life expectancy e_x at exact age x.

The first three functions are frequency (or intensity) measures as they show intensity of events (deaths or survival). The last three are duration measures as they show amounts of lifetime and are measured in person-years.

Life tables differ with respect to the width of elementary age intervals. Whereas complete life tables are based on one-year age intervals, abridged life tables are based on wider age categories. Typically these age groups are: 0, 1-4, 5-9, 10-14, 20-24, etc.

The majority of the HLD life tables are *complete* life tables. Some users, however, might prefer abridged life tables as a shorter form. For this reason the HLD also presents abridged life tables calculated from the complete ones.

Complete life tables are rarely available for developing countries and for the historical populations of today's developed countries. However, it is possible to find abridged life tables for some of these. Therefore, for some populations and years HLD provides only abridged life tables calculated from *original abridged* life tables.

For a more detailed description of life tables and methods of constructing them, see the textbooks by Preston, Heuveline, Guillot (2001), Keyfitz (1985), and Chiang (1984).

The HLD relies primarily on published life tables. Life tables published in different countries and years represent a variety of methods for their calculation and formats of their presentation in print. They depend on both national and historical peculiarities as well as on the availability and quality of vital statistics. Therefore, the *original* life tables constitute a large and heterogeneous set of tables.

Usually not all of the standard life table functions (columns) described above are shown in the originally published life tables.

Almost all published life tables do include the column of life expectancies e_x. This shows how many years an average individual at exact age x can expect to live past this age. The life expectancy estimates correspond to age-specific intensities of death at age x and older ages observed in a given calendar year or calendar period. Columns q_x and l_x are also frequently published. However, columns d_x, M_x, L_x, T_x are often omitted in many publications. The absence of life table parameters in publications is an important disadvantage, because users might require some of these missing parameters. In addition, the absence of columns T_x and L_x causes difficulties in precise computation of e_x values.

Therefore, the output data in the HLD provides the user with all standard life table columns. In order to do this, the HLD includes only those life tables for which the originally published tables contain at least one of the frequency functions (l_x, d_x or q_x) and at least one the of duration function (T_x, L_x or e_x).

Figure 1 summarizes main steps of relief table calculation from the original data. There are different ways to calculate missing life table functions, depending on the type of life table (abridged or complete) and the availability of the life table functions in the original life tables, as illustrated by Figure 1. For original tables available as complete life tables, the HLD provides recalculated complete and abridged tables. If the original tables are available only in an abridged form, the HLD provides only recalculated abridged life tables. All HLD life tables include an additional column with the originally published life expectancy values.
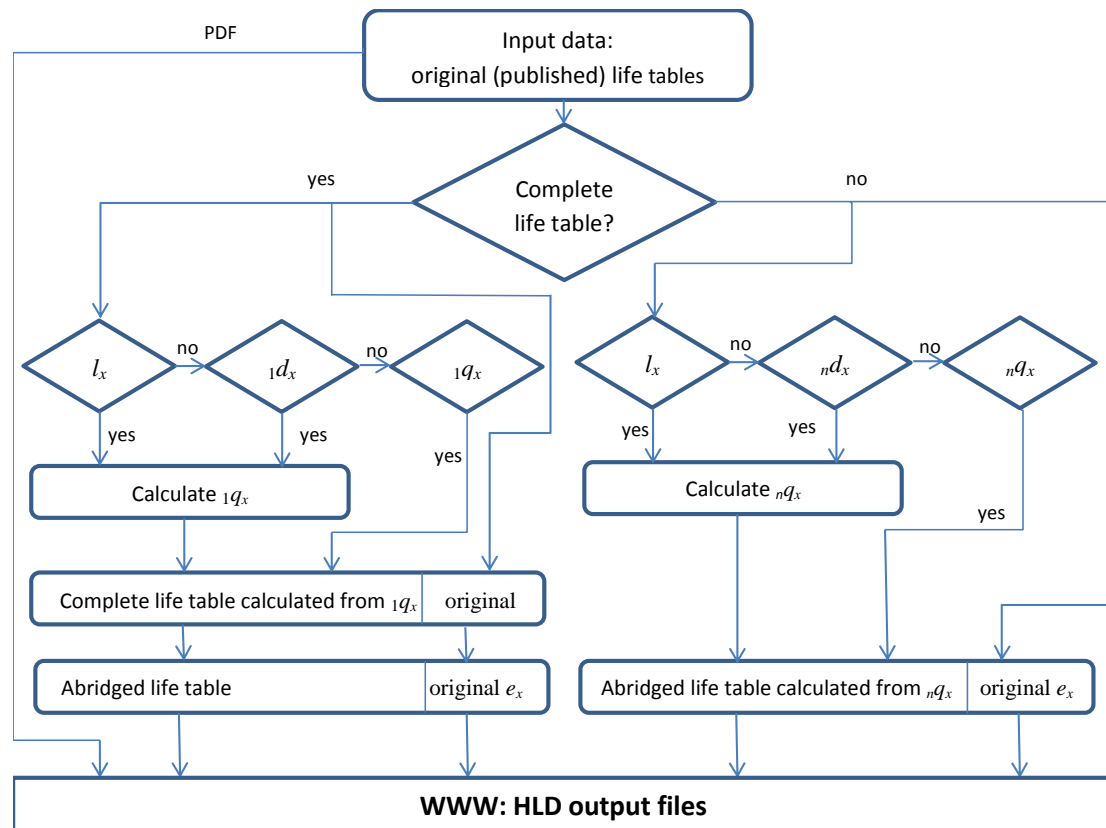
Figure 1. Life tables' calculations and data flows in the HLD

2.1. Complete life tables

Methods for life table computation have been changing with time and are different in different countries. This concerns two major parts of the life table construction: calculation of the probabilities of death from the raw data on deaths and population at risk, and transition from the probabilities of death to the duration measures. The HLD does not deal with the first issue because it relies on the published values of $_1q_x$ (or l_x or $_1d_x$). However, the HLD does address the second issue by providing "recalculated" life tables, which are computed from only one frequency measure ($_1q_x$, l_x or $_1d_x$) in a completely uniform way for all populations and all years. Thus, all output life tables in the HLD are based on a standard methodology. This implies that historical or country-specific peculiarities of methods, originally used for the computation, are eliminated and that the life tables are comparable in respect to methods of their calculation.

A disadvantage of this approach is that the calculated values of life expectancy e_x may differ slightly from those originally published. Because of this, since May 1, 2017 HLD output tables contain two variables for life expectancy: the re-estimated life expectancy and the original life expectancy as it was published[1].

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[1] All older life tables included in the HLD before this date were first processed according to the first version of the Methods Protocol (Shkolnikov, 2002, available at http://www.lifetable.de/Docs/OldMethods.pdf). This means that all duration functions were recalculated from T_x or L_x. Thus, the life expectancy values presented as original ones may differ slightly from the published values (especially at old ages) due to the rounding error.

The HLD output life tables are computed from only one original frequency function l_x, $_1d_x$ or $_1q_x$, depending on availability. If more than one frequency function is available, we choose the function that allows us to reconstruct other life table functions with higher precision. The probability of survival from birth to exact age l_x is the most preferable frequency function, $_1d_x$ holds the second priority and $_1q_x$ is the last choice. A large majority of published life tables include information on the probability of survival l_x from birth to exact age x. In this case all other frequency functions are calculated as follows:

$$_1d_x = l_x - l_{x+1}, \quad x = 0,1,...,x_{\max} - 1, \tag{1}$$

$$_1q_x = {}_1d_x / l_x, \quad x = 0,1,...,x_{\max} - 1, \tag{2}$$

where $x_{\max}$ denotes maximum age in the original table. If $_1q_x$ is available from the published table instead of l_x, then l_x can be calculated from $_1q_x$:

$$l_0 = 100000,$$
$$l_{x+1} = l_x - l_x \cdot {}_1q_x, \quad x = 0,1,...,x_{\max} - 1 \tag{3}$$

and $_1d_x$ is calculated as in (2). If $_1d_x$ is available instead of l_x or $_1q_x$, then l_x can be calculated from $_1d_x$:

$$l_0 = 100000,$$
$$l_{x+1} = l_x - {}_1d_x, \quad x = 0,1,...,x_{\max} \tag{4}$$

Next, we define the age that is to be considered as being the last age ω (a lower age limit of the half-opened range of ages) in the output life table. Let age X be the last age for which the value of $_1q_X$ is not missing. If $_1q_X = 1$, then the last age is defined as $\omega = X$ and $_\infty d_\omega = l_X$. If $_1q_X < 1$, then the last age is defined as $\omega = X + 1$ and $_\infty d_\omega = {}_1q_X \cdot l_X$.

In the next step we calculate the person-years $_1L_x$ lived within the elementary age interval $[x,x+1)$. For the first year of life we apply a formula that is very similar to that used in the Coale-Demeny model life tables:

$$_1L_0 = \begin{cases} 0.35 \cdot l_0 + 0.65 \cdot l_1, {}_1q_0 > 0.1 \\ (0.05 + 3 \cdot {}_1q_0) \cdot l_0 + (0.95 - 3 \cdot {}_1q_0) \cdot l_0, q_0 \le 0.1 \end{cases} \tag{5}$$

For older ages, $_1L_x$ is computed by averaging neighboring values of l_x:

$$_1L_x = \frac{1}{2} \cdot (l_x + l_{x+1}), \quad x < \omega. \tag{6}$$

Number of person-years T_x lived after the exact age x is calculated as sum of $_1L_x$:

$$T_x = \sum_{x \le t \le \omega} {}_1L_t, \tag{7}$$

and life expectancy at age x is

$$e_x = T_x / l_x, \ \ x < \omega. \tag{8}$$

The life expectancy at age ω is estimated from the model table of correspondence between e_ω and e_0. In order to construct this table we used a long series of life tables of France and Sweden from two data sources:

1) The Swedish complete life table series for the period 1861-1995 and the French complete life tables series for the period 1899-1995 from the Berkeley Mortality Database[2].
2) A series of the French life tables for the period 1806-1898 included in the publication by Vallin and Meslé (2001).

Establishing the correspondence between e_ω and e_0 involves two steps.

Step 1. Calculation of the model life expectancy values at ages $\omega = 75, 76, ..., 107$ corresponding to life expectancy at birth ranges <35, 35-39, 40-44,... , ≥80 for women and <35, 35-39, 40-44,... , ≥75 for men by averaging the corresponding e_ω values from the Swedish and French life tables in data sources 1) and 2).

Step 2. Some of the values that experienced random fluctuations were smoothed by the splines and the values of e_ω were extrapolated up to age $\omega = 120$.

The final values of the model e_ω are shown in Appendix 1. These are used for closing the output life tables whenever e_ω cannot be computed directly from the original life table data.

The remaining duration functions at the last age group are computed as

$$_\infty L_\omega = T_\omega = l_\omega \cdot e_\omega.$$

Finally, we calculate central death rates m_x:

$$_1 m_x = {_1}d_x / L_x, \ \ x \le \omega, \tag{9}$$

$$_\infty m_\omega = 1 / e_\omega, \ \ x = \omega. \tag{9a}$$

2.2. Abridged life tables computed from recalculated complete life tables

If complete life tables are available, abridged tables are computed directly from the output complete tables. This process includes two steps. First, we extract values of l_x, T_x and e_x for $x = 0, 1, 5, 10, ..., \omega$ from the complete table. Second, we compute $_n L_x, \ _n q_x$ and $_n q_x$ as follows

$$_n L_x = T_x - T_{x+n} \ , \tag{10}$$

$$_n d_x = l_x - l_{x+n} \ , \tag{11}$$

$$_n q_x = {_n}d_x / l_x \ . \tag{12}$$

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[2] Available at http://demog.berkeley.edu/wilmoth/mortality

2.3. Abridged life tables recalculated from original abridged life tables

For some countries/time periods, complete life tables are unavailable, but abridged life tables do exist. In this case we do not reconstruct the complete life table, but instead recalculate the abridged life table. The calculation procedure is similar to that of complete life tables: all functions have to be calculated from one of the frequency functions (l_x, $_nd_x$ or $_nq_x$). As in the case of complete life tables, the first choice is l_x. If it is not available we use $_nd_x$. The probability of death within age interval $[x, x + n)$ is calculated according to equations (11) and (12).

Transition from $_nq_x$ to $_nL_x$ is central for the recalculation of an abridged life table. Formula (5) yields $_1L_0$ for the initial age group (age 0). For the second age group (1-4 years) another approximate relationship by Coale-Demeny (1983) is applied:

$$_4L_1 = k_1 l_1 + (1 - k_1) l_4,$$ (13)

where k_1

	Males	Females
$q_0 \leq 0.1$	$1.653 - 3.013 \cdot q_0$	$1.524 - 1.627 \cdot q_0$
$q_0 > 0.1$	1.352	1.361

Finally, for age groups 5-9, 10-14, ….

$$_5L_x = 2.5 \cdot (l_x + l_{x+5}), \ x > 1.$$ (14)

Formats of data presentation

The HLD provides recalculated complete and/or abridged life tables for every single data source. If the original publication includes more than one life table, the respective (single source) HLD data file includes recalculated versions of all of these life tables.

In addition to single source data files, the HLD provides pooled data files. They have the same format as single source data files, but include all life tables of a given population (country). The HLD life tables are presented in a tabular form as text files with comma-separated values. A detailed description of the HLD data files is given in Data Formats[3]. Images of published life tables are presented in the HLD in the portable document format (.pdf).

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[3]Available at http://www.lifetable.de/Docs/DataFormats.pdf and on every country page of the HLD web site.

REFERENCES

Chiang, C.L. 1984. *The Life Table and its Applications.* Malabar, Florida.

Coale, A.J. and Demeny, P. 1983. *Regional Model Life Tables and Stable Populations*. Second Edition. Academic Press, N.Y.-L.

Preston, S.H., Heuveline, P., and M.Guillot. 2001. *Demography. Measuring and Modelling Population Process.* Blackwell Publishers. Oxford, Malden, Massachusetts.

Shkolnikov, V.M.. 2002. Methodology Note on the Human Life-Table Database. Version 1. Available at http://www.lifetable.de/Docs/OldMethods.pdf

Vallin, J. and Meslé, F. 2001. Tables de mortalité françaises pour les XIX e et XX e siècles et projections pour le XXI e siècle. *Données statistiques. N°4-2001. INED.*

APPENDIX 1. Correspondence between levels of life expectancy at birth and last life expectancy e_ω.

Males

Last age	Life expectancy at birth									
	-35	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+
75	5.97	6.17	6.37	6.57	6.78	6.98	7.18	7.60	8.43	9.48
76	5.64	5.82	6.01	6.19	6.37	6.56	6.74	7.13	7.93	8.94
77	5.32	5.49	5.66	5.82	5.99	6.16	6.32	6.69	7.45	8.40
78	5.02	5.17	5.32	5.47	5.62	5.77	5.92	6.27	6.99	7.91
79	4.74	4.87	5.01	5.14	5.27	5.41	5.54	5.87	6.55	7.42
80	4.47	4.59	4.71	4.83	4.95	5.06	5.18	5.49	6.13	6.95
81	4.21	4.32	4.42	4.53	4.63	4.74	4.84	5.12	5.73	6.52
82	3.97	4.06	4.15	4.24	4.33	4.43	4.52	4.78	5.36	6.11
83	3.74	3.82	3.90	3.98	4.06	4.14	4.22	4.46	5.00	5.71
84	3.52	3.59	3.66	3.73	3.80	3.87	3.94	4.16	4.67	5.33
85	3.32	3.38	3.44	3.50	3.56	3.62	3.68	3.88	4.36	4.99
86	3.12	3.18	3.23	3.28	3.33	3.38	3.43	3.62	4.07	4.66
87	2.92	2.97	3.03	3.08	3.13	3.18	3.23	3.40	3.80	4.31
88	2.73	2.78	2.83	2.89	2.94	3.00	3.05	3.20	3.54	3.98
89	2.55	2.61	2.66	2.72	2.77	2.83	2.88	3.02	3.31	3.68
90	2.39	2.45	2.50	2.56	2.61	2.67	2.73	2.85	3.09	3.39
91	2.24	2.30	2.36	2.41	2.47	2.53	2.58	2.69	2.88	3.13
92	2.09	2.15	2.21	2.27	2.33	2.39	2.45	2.55	2.71	2.91
93	1.95	2.02	2.08	2.14	2.20	2.26	2.32	2.41	2.54	2.70
94	1.84	1.90	1.96	2.02	2.08	2.14	2.20	2.28	2.39	2.51
95	1.72	1.78	1.84	1.90	1.97	2.03	2.09	2.16	2.24	2.33
96	1.62	1.69	1.75	1.81	1.88	1.94	2.00	2.07	2.13	2.19
97	1.50	1.56	1.63	1.69	1.75	1.81	1.87	1.94	2.00	2.06
98	1.38	1.44	1.50	1.56	1.62	1.68	1.74	1.80	1.86	1.93
99	1.26	1.32	1.38	1.44	1.50	1.55	1.61	1.67	1.73	1.79
100	1.19	1.24	1.29	1.35	1.40	1.45	1.50	1.56	1.61	1.66
101	1.12	1.16	1.21	1.26	1.30	1.35	1.39	1.44	1.49	1.53
102	1.09	1.13	1.16	1.19	1.23	1.26	1.29	1.33	1.36	1.39
103	1.04	1.07	1.10	1.13	1.16	1.19	1.21	1.24	1.27	1.30
104	0.99	1.02	1.04	1.07	1.10	1.13	1.15	1.18	1.21	1.24
105	0.94	0.96	0.99	1.02	1.04	1.07	1.09	1.12	1.14	1.17
106	0.89	0.91	0.93	0.96	0.98	1.01	1.03	1.06	1.08	1.11
107	0.83	0.86	0.88	0.90	0.93	0.95	0.97	0.99	1.02	1.04
108	0.78	0.80	0.82	0.85	0.87	0.89	0.91	0.93	0.95	0.98
109	0.73	0.75	0.77	0.79	0.81	0.83	0.85	0.87	0.89	0.91
110	0.68	0.70	0.71	0.73	0.75	0.77	0.79	0.81	0.83	0.85
111	0.63	0.64	0.66	0.68	0.69	0.71	0.73	0.75	0.76	0.78

112	0.57	0.59	0.60	0.62	0.64	0.65	0.67	0.68	0.70	0.72
113	0.52	0.54	0.55	0.56	0.58	0.59	0.61	0.62	0.64	0.65
114	0.47	0.48	0.49	0.51	0.52	0.53	0.55	0.56	0.57	0.59
115	0.42	0.43	0.44	0.45	0.46	0.47	0.49	0.50	0.51	0.52
116	0.36	0.37	0.38	0.40	0.41	0.42	0.43	0.44	0.45	0.46
117	0.31	0.32	0.33	0.34	0.35	0.36	0.36	0.37	0.38	0.39
118	0.26	0.27	0.27	0.28	0.29	0.30	0.30	0.31	0.32	0.33
119	0.21	0.21	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.26
120	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20

Females

Last age	Life expectancy at birth										
	-35	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80+
75	6.02	6.30	6.58	6.86	7.14	7.42	7.70	7.98	8.57	10.10	11.94
76	5.71	5.96	6.21	6.47	6.72	6.97	7.23	7.48	8.04	9.49	11.24
77	5.39	5.63	5.86	6.09	6.32	6.55	6.78	7.01	7.53	8.91	10.57
78	5.10	5.31	5.52	5.73	5.94	6.15	6.36	6.56	7.05	8.35	9.92
79	4.82	5.01	5.20	5.39	5.57	5.76	5.95	6.14	6.59	7.81	9.29
80	4.55	4.72	4.89	5.06	5.23	5.40	5.57	5.74	6.16	7.30	8.69
81	4.30	4.45	4.60	4.76	4.91	5.06	5.21	5.36	5.75	6.81	8.11
82	4.05	4.19	4.32	4.46	4.60	4.73	4.87	5.01	5.36	6.35	7.57
83	3.82	3.94	4.06	4.19	4.31	4.43	4.55	4.68	5.00	5.92	7.05
84	3.59	3.70	3.81	3.92	4.04	4.15	4.26	4.37	4.67	5.52	6.55
85	3.38	3.48	3.58	3.68	3.78	3.88	3.98	4.08	4.35	5.14	6.09
86	3.18	3.27	3.36	3.45	3.54	3.63	3.72	3.81	4.06	4.78	5.66
87	2.96	3.05	3.15	3.24	3.33	3.42	3.51	3.60	3.83	4.44	5.18
88	2.76	2.86	2.95	3.04	3.13	3.23	3.32	3.41	3.61	4.12	4.74
89	2.58	2.67	2.76	2.86	2.95	3.04	3.13	3.23	3.40	3.83	4.34
90	2.41	2.50	2.59	2.68	2.78	2.87	2.96	3.05	3.21	3.56	3.98
91	2.25	2.34	2.43	2.52	2.62	2.71	2.80	2.89	3.03	3.32	3.65
92	2.10	2.19	2.28	2.37	2.46	2.55	2.64	2.73	2.86	3.09	3.35
93	1.96	2.05	2.14	2.23	2.32	2.41	2.50	2.59	2.70	2.89	3.10
94	1.82	1.91	2.00	2.09	2.18	2.27	2.36	2.45	2.56	2.70	2.87
95	1.70	1.79	1.88	1.97	2.06	2.15	2.23	2.32	2.42	2.53	2.66
96	1.60	1.69	1.77	1.86	1.95	2.03	2.12	2.21	2.30	2.40	2.51
97	1.50	1.59	1.67	1.75	1.84	1.92	2.01	2.09	2.18	2.27	2.36
98	1.40	1.48	1.57	1.65	1.73	1.81	1.89	1.97	2.06	2.14	2.22
99	1.31	1.39	1.47	1.54	1.62	1.70	1.78	1.85	1.93	2.01	2.08
100	1.22	1.29	1.37	1.44	1.51	1.59	1.66	1.73	1.80	1.88	1.95
101	1.13	1.20	1.27	1.34	1.40	1.47	1.54	1.61	1.68	1.75	1.81
102	1.08	1.14	1.21	1.28	1.34	1.41	1.47	1.54	1.60	1.67	1.73
103	1.03	1.09	1.15	1.21	1.28	1.34	1.40	1.46	1.53	1.59	1.65
104	0.98	1.04	1.09	1.15	1.21	1.27	1.33	1.39	1.45	1.51	1.57

105	0.92	0.98	1.04	1.09	1.15	1.20	1.26	1.32	1.37	1.43	1.48
106	0.87	0.93	0.98	1.03	1.09	1.14	1.19	1.24	1.30	1.35	1.40
107	0.82	0.87	0.92	0.97	1.02	1.07	1.12	1.17	1.22	1.27	1.32
108	0.77	0.82	0.86	0.91	0.96	1.00	1.05	1.10	1.14	1.19	1.24
109	0.72	0.76	0.81	0.85	0.89	0.94	0.98	1.02	1.07	1.11	1.15
110	0.67	0.71	0.75	0.79	0.83	0.87	0.91	0.95	0.99	1.03	1.07
111	0.62	0.65	0.69	0.73	0.77	0.80	0.84	0.88	0.92	0.95	0.99
112	0.57	0.60	0.63	0.67	0.70	0.74	0.77	0.80	0.84	0.87	0.91
113	0.51	0.54	0.58	0.61	0.64	0.67	0.70	0.73	0.76	0.79	0.82
114	0.46	0.49	0.52	0.55	0.57	0.60	0.63	0.66	0.69	0.71	0.74
115	0.41	0.44	0.46	0.49	0.51	0.54	0.56	0.59	0.61	0.64	0.66
116	0.36	0.38	0.40	0.43	0.45	0.47	0.49	0.51	0.53	0.56	0.58
117	0.31	0.33	0.35	0.36	0.38	0.40	0.42	0.44	0.46	0.48	0.49
118	0.26	0.27	0.29	0.30	0.32	0.33	0.35	0.37	0.38	0.40	0.41
119	0.21	0.22	0.23	0.24	0.26	0.27	0.28	0.29	0.31	0.32	0.33
120	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25