Use of life tables in research of health inequalities

GREATLEAP

16 January 2026

online

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Outline

A. Theoretical part
1. Introduction
2. Measurement demographic events; period rates
3. Age, period and cohort: The Lexis diagram
4. Age-specific rates vs age-specific probabilities
5. The use of synthetic cohorts in period life tables
6. The period life table
7. Sullivan
8. Applications beyond mortality
9. A standard decomposition: Arriaga

B. Practical part in Excel
- A. Building a life table
- B. Using life table outcomes to answer questions
- C. Estimating healthy life expectancy
- D. Decomposing gaps between two life expectancies

Short questionnaire

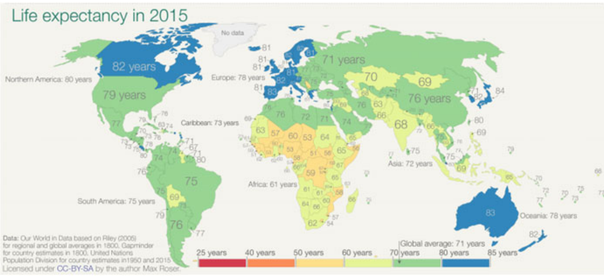
Before the start of the lecture, we kindly ask you to complete this **short questionnaire (3 questions)**. Its purpose is to better understand your prior knowledge and expectations regarding life tables, mortality analysis, and health inequalities.

Your responses will help the lecturer adapt the session to your background and place greater emphasis on concepts that may need clarification.

https://forms.gle/xfrYAv72BN1QBf6S6

1. Introduction

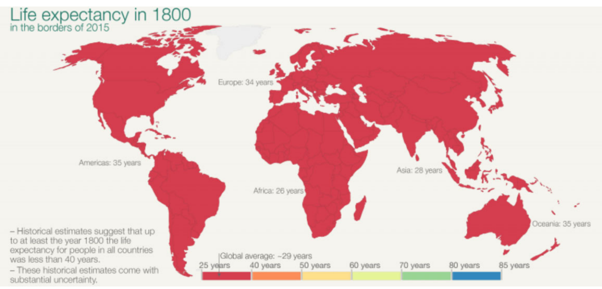
Life tables as a key tool for understanding cross-country health



Our World in Data 4

1. Introduction

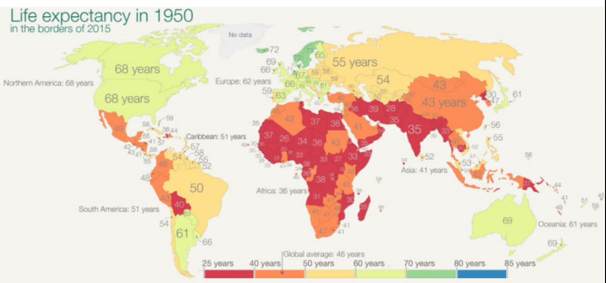
Substantial reduction in life expectancy across countries



Our World in Data 5

1. Introduction

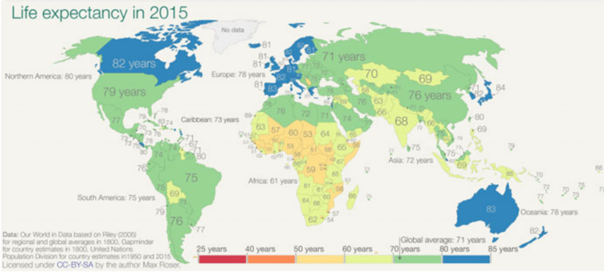
Substantial reduction in life expectancy across countries



Our World in Data 6

1. Introduction

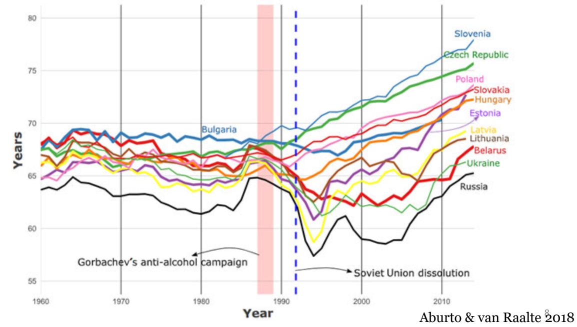
Substantial reduction in life expectancy across countries, persistent differences



Our World in Data 7

1. Introduction

Life tables as a key tool for understanding cross-country health trends



Aburto & van Raalte 2018 8

1. Introduction

Life tables as a key tool for understanding sex-diff health trends

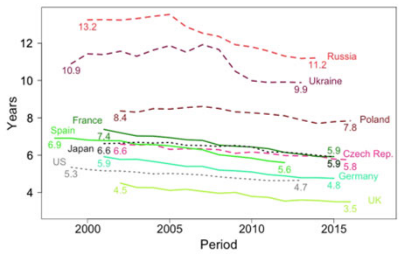


Fig. 2 Sex gap in life expectancy between females and males decreased over the last 15-year period in all the countries

Feraldi & Zarulli 2022 9

1. Introduction

1. Introduction

Table 5−1 FEMALE LIFE TABLE, UNITED STATES, 1979

Age Interval[a] (1)	Proportion Dying[b] (2)	Number Living at Beginning of Age Interval (of 100,000 born alive) (3)	Number Dying during of Age Interval (of 100,000 born alive) (4)	Person Years Lived: *In the age interval* (5)	Person Years Lived: *In this and all subsequent age intervals* (6)	Average Remaining Lifetime[c] (7)
x to x + n	${}_nq_x$	l_x	${}_nd_x$	${}_nL_x$	T_x	e_x
0−1	0.0116	100,000	1,163	98,985	7,763,813	77.6
1−5	.0023	98,837	228	394,812	7,664,828	77.6
5−10	.0013	98,609	129	492,696	7,270,016	73.7
10−15	.0012	98,480	117	492,137	6,777,320	68.8
15−20	.0027	98,363	265	491,198	6,285,183	63.9
20−25	.0032	98,098	316	489,713	5,793,985	59.1
25−30	.0035	97,782	343	488,081	5,304,272	54.2
30−35	.0043	97,439	415	486,222	4,816,191	49.4
35−40	.0063	97,024	611	483,697	4,329,969	44.6
40−45	.0100	96,413	962	479,815	3,846,272	39.9
45−50	.0159	95,451	1,519	473,681	3,366,457	35.3
50−55	.0250	93,932	2,349	464,121	2,892,776	30.8
55−60	.0371	91,583	3,401	449,859	2,428,655	26.5
60−65	.0573	88,182	5,051	428,972	1,978,796	22.4
65−70	.0800	83,131	6,648	399,975	1,549,824	18.6
70−75	.1242	76,483	9,499	359,941	1,149,849	15.0
75−80	.2082	66,984	13,945	301,370	789,908	11.8
80−85	.3105	53,039	16,467	224,239	488,538	9.2
85 and over	1.0000	36,572	36,572	264,299	264,299	7.2

[a]Period of life between two exact ages, stated in years.
[b]Proportion of persons alive at beginning of age interval who die during interval.
[c]Average number of years of life remaining at beginning of age interval.
Source: National Center for Health Statistics (1982), Table 3.

Yaukey 1985 11

2. Measurement demographic events, period rates

How to measure demographic events?

- Number of events or frequencies
- Ratios: x / y
- Proportions: x / (x+y)
- **Rates**:

$$\text{Rate} = \frac{\text{Number of Occurrences}}{\text{Person-years of Exposure to the Risk of Occurrence}}$$

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2. Measurement demographic events, period rates

Person-years of exposure to the risk:

- Number of persons in a population
- Typically approximated by mid-year population

3. Age, period and cohort,the Lexis diagram

The three time dimensions in demography:

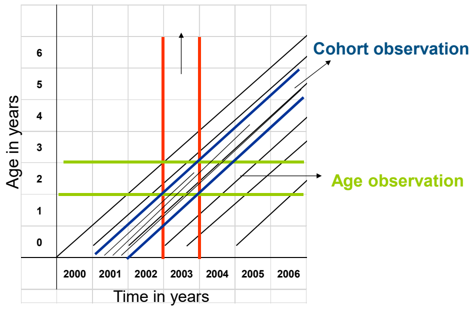
Age

Period

Birth cohort

3. Age, period and cohort, the Lexis diagram

Lexis diagram



3. Age, period and cohort, the Lexis diagram

Lexis diagram

Period-age observations

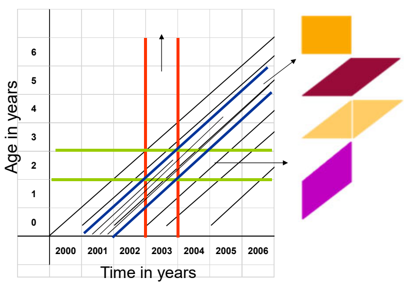
Cohort-age observations
(life table)

Double classified observations
(period, age, cohort)

Period-cohort observations

3. Age, period and cohort, the Lexis diagram

Lexis diagram



Period-age observations

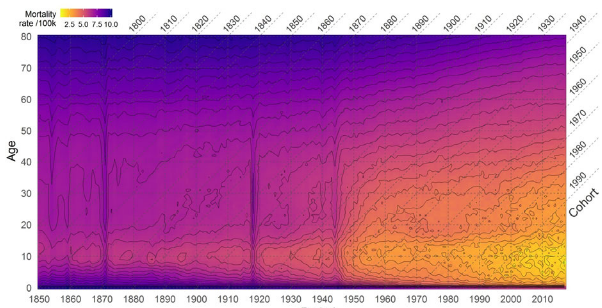
Cohort-age observations
(life table)

Double classified observations
(period, age, cohort)

Period-cohort observations

3. Age, period and cohort, the Lexis diagram

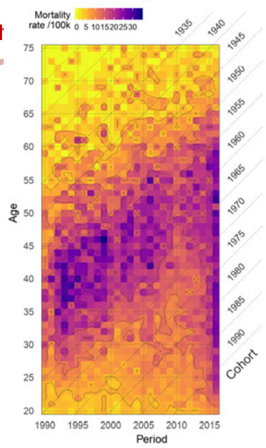
Lexis surface of all-cause mortality in France (1850-2017)



Source: Enrique Acosta

3. Age, period and col

Lexis surface of drug-related mortality rates for Hispanic males in the US, 1990-2016



Acosta & van Raalte 2019

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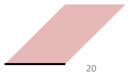
4. Age-specific rates vs. age-specific probabilities

Probabilities:

- Chance of an event
- Meaningful from a cohort perspective (for a specific age or time interval)

$$\text{Rate} = \frac{\text{Number of Occurrences}}{\text{Number of Person-years lived}}$$

$$\text{Probability} = \frac{\text{Number of Occurrences}}{\text{Number of Preceding Events or Trials}}$$



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4. Age-specific rates vs. age-specific probabilities

Cohorts and probabilities:

- Central to the analyses of longitudinal data
- Allow drawing individual implications under certain assumptions
- Complete individual information is needed

Construct probabilities from period data -> synthetic cohorts

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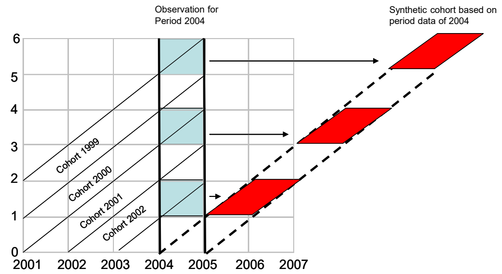
5. Synthetic cohorts

Translating rates to probabilities



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6. Period life tables

Data HMD

Key concepts:

- Mortality rates — m_x
- Average years lived for those dying — a_x
- Probability of dying — q_x
- Probability of surviving — p_x
- Survivorship — l_x
- Life table deaths — d_x
- Person-years lived within the age interval — L_x
- Cumulative person-years lived — T_x
- Life expectancy — e_x

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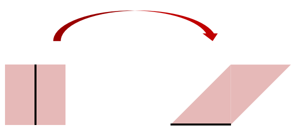
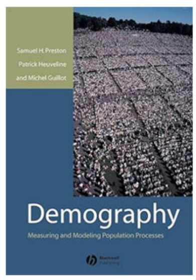
5. Synthetic cohorts

From rates to probabilities



$$q_x = \frac{n \cdot m_x}{1 + (n - a_x) \cdot m_x}$$

$$q_x = 1 - e^{-nm_x}$$



Preston et al. 2001, p.75

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6. Period life tables

Data HMD

Period Life Table for Spain, females, 2023

Age x	$_nm_x$	n	$_na_x$	$_nq_x$
0	0.002410	1	0.1	0.002405
1	0.000130	4	2.0	0.000520
5	0.000080	5	2.5	0.000400
10	0.000070	5	2.5	0.000350
15	0.000130	5	2.5	0.000650
20	0.000140	5	2.5	0.000700
25	0.000180	5	2.5	0.000900
30	0.000240	5	2.5	0.001199
35	0.000360	5	2.5	0.001798
40	0.000610	5	2.5	0.003045
45	0.000970	5	2.5	0.004838
50	0.001620	5	2.5	0.008067
55	0.002720	5	2.5	0.013508
60	0.004190	5	2.5	0.020733
65	0.006330	5	2.5	0.031157
70	0.009730	5	2.5	0.047495
75	0.017620	5	2.5	0.084383
80	0.03523	5	2.5	0.161891
85	0.08	5	2.5	0.318657
90	0.15	5	2.5	0.546934
95	0.27	5	2.5	0.799213
100	0.43	5	2.0	0.938311
105	0.61	5	1.5	0.973309
110	0.750140	∞		1.000000

6. Period life tables

Data HMD

Period Life Table for Spain, females, 2023

Age x	$_nm_x$	n	$_na_x$	$_nq_x$	$_np_x$
0	0.002410	1	0.1	0.002405	0.997595
1	0.000130	4	2.0	0.000520	0.999480
5	0.000080	5	2.5	0.000400	0.999600
10	0.000070	5	2.5	0.000350	0.999650
15	0.000130	5	2.5	0.000650	0.999350
20	0.000140	5	2.5	0.000700	0.999300
25	0.000180	5	2.5	0.000900	0.999100
30	0.000240	5	2.5	0.001199	0.998801
35	0.000360	5	2.5	0.001798	0.998202
40	0.000610	5	2.5	0.003045	0.996955
45	0.000970	5	2.5	0.004838	0.995162
50	0.001620	5	2.5	0.008067	0.991933
55	0.002720	5	2.5	0.013508	0.986492
60	0.004190	5	2.5	0.020733	0.979267
65	0.006330	5	2.5	0.031157	0.968843
70	0.009730	5	2.5	0.047495	0.952505
75	0.017620	5	2.5	0.084383	0.915617
80	0.03523	5	2.5	0.161891	0.838109
85	0.08	5	2.5	0.318657	0.681343
90	0.15	5	2.5	0.546934	0.453066
95	0.27	5	2.5	0.799213	0.200787
100	0.43	5	2.0	0.938311	0.061689
105	0.61	5	1.5	0.973309	0.026691
110	0.750140	∞		1.000000	0.000000

6. Period life tables

Data HMD

Period Life Table for Spain, females, 2023

Age x	$_nm_x$	n	$_na_x$	$_nq_x$	$_np_x$	l_x
0	0.002410	1	0.1	0.002405	0.997595	100,000
1	0.000130	4	2.0	0.000520	0.999480	99,760
5	0.000080	5	2.5	0.000400	0.999600	99,708
10	0.000070	5	2.5	0.000350	0.999650	99,668
15	0.000130	5	2.5	0.000650	0.999350	99,633
20	0.000140	5	2.5	0.000700	0.999300	99,568
25	0.000180	5	2.5	0.000900	0.999100	99,498
30	0.000240	5	2.5	0.001199	0.998801	99,409
35	0.000360	5	2.5	0.001798	0.998202	99,290
40	0.000610	5	2.5	0.003045	0.996955	99,111
45	0.000970	5	2.5	0.004838	0.995162	98,809
50	0.001620	5	2.5	0.008067	0.991933	98,331
55	0.002720	5	2.5	0.013508	0.986492	97,538
60	0.004190	5	2.5	0.020733	0.979267	96,220
65	0.006330	5	2.5	0.031157	0.968843	94,226
70	0.009730	5	2.5	0.047495	0.952505	91,290
75	0.017620	5	2.5	0.084383	0.915617	86,954
80	0.03523	5	2.5	0.161891	0.838109	79,617
85	0.08	5	2.5	0.318657	0.681343	66,727
90	0.15	5	2.5	0.546934	0.453066	45,464
95	0.27	5	2.5	0.799213	0.200787	20,598
100	0.43	5	2.0	0.938311	0.061689	4,136
105	0.61	5	1.5	0.973309	0.026691	255
110	0.750140	∞		1.000000	0.000000	7

6. Period life tables

Data HMD

Period Life Table for Spain, females, 2023

Age x	$_nm_x$	n	$_na_x$	$_nq_x$	$_np_x$	l_x	$_nd_x$
0	0.002410	1	0.1	0.002405	0.997595	100,000	240
1	0.000130	4	2.0	0.000520	0.999480	99,760	52
5	0.000080	5	2.5	0.000400	0.999600	99,708	40
10	0.000070	5	2.5	0.000350	0.999650	99,668	35
15	0.000130	5	2.5	0.000650	0.999350	99,633	65
20	0.000140	5	2.5	0.000700	0.999300	99,568	70
25	0.000180	5	2.5	0.000900	0.999100	99,498	90
30	0.000240	5	2.5	0.001199	0.998801	99,409	119
35	0.000360	5	2.5	0.001798	0.998202	99,290	179
40	0.000610	5	2.5	0.003045	0.996955	99,111	302
45	0.000970	5	2.5	0.004838	0.995162	98,809	478
50	0.001620	5	2.5	0.008067	0.991933	98,331	793
55	0.002720	5	2.5	0.013508	0.986492	97,538	1,318
60	0.004190	5	2.5	0.020733	0.979267	96,220	1,995
65	0.006330	5	2.5	0.031157	0.968843	94,226	2,936
70	0.009730	5	2.5	0.047495	0.952505	91,290	4,336
75	0.017620	5	2.5	0.084383	0.915617	86,954	7,337
80	0.03523	5	2.5	0.161891	0.838109	79,617	12,889
85	0.08	5	2.5	0.318657	0.681343	66,727	21,263
90	0.15	5	2.5	0.546934	0.453066	45,464	24,866
95	0.27	5	2.5	0.799213	0.200787	20,598	16,462
100	0.43	5	2.0	0.938311	0.061689	4,136	3,881
105	0.61	5	1.5	0.973309	0.026691	255	248
110	0.750140	∞		1.000000	0.000000	7	7

6. Period life tables

Data HMD

Period Life Table for Spain, females, 2023

Age x	$_nm_x$	n	$_na_x$	$_nq_x$	$_np_x$	l_x	$_nd_x$	$_nL_x$
0	0.002410	1	0.1	0.002405	0.997595	100,000	240	99,791
1	0.000130	4	2.0	0.000520	0.999480	99,760	52	398,934
5	0.000080	5	2.5	0.000400	0.999600	99,708	40	498,439
10	0.000070	5	2.5	0.000350	0.999650	99,668	35	498,252
15	0.000130	5	2.5	0.000650	0.999350	99,633	65	498,003
20	0.000140	5	2.5	0.000700	0.999300	99,568	70	497,667
25	0.000180	5	2.5	0.000900	0.999100	99,498	90	497,269
30	0.000240	5	2.5	0.001199	0.998801	99,409	119	496,747
35	0.000360	5	2.5	0.001798	0.998202	99,290	179	496,002
40	0.000610	5	2.5	0.003045	0.996955	99,111	302	494,801
45	0.000970	5	2.5	0.004838	0.995162	98,809	478	492,852
50	0.001620	5	2.5	0.008067	0.991933	98,331	793	489,673
55	0.002720	5	2.5	0.013508	0.986492	97,538	1,318	484,396
60	0.004190	5	2.5	0.020733	0.979267	96,220	1,995	476,115
65	0.006330	5	2.5	0.031157	0.968843	94,226	2,936	463,788
70	0.009730	5	2.5	0.047495	0.952505	91,290	4,336	445,609
75	0.017620	5	2.5	0.084383	0.915617	86,954	7,337	416,426
80	0.03523	5	2.5	0.161891	0.838109	79,617	12,889	365,860
85	0.08	5	2.5	0.318657	0.681343	66,727	21,263	280,479
90	0.15	5	2.5	0.546934	0.453066	45,464	24,866	165,156
95	0.27	5	2.5	0.799213	0.200787	20,598	16,462	61,835
100	0.43	5	2.0	0.938311	0.061689	4,136	3,881	9,037
105	0.61	5	1.5	0.973309	0.026691	255	248	407
110	0.750140	∞		1.000000	0.000000	7	7	9

6. Period life tables

Data HMD

Period Life Table for Spain, females, 2023

Age x	$_nm_x$	n	$_na_x$	$_nq_x$	$_np_x$	l_x	$_nd_x$	$_nL_x$	T_x
0	0.002410	1	0.1	0.002405	0.997595	100,000	240	99,791	8,627,547
1	0.000130	4	2.0	0.000520	0.999480	99,760	52	398,934	8,527,756
5	0.000080	5	2.5	0.000400	0.999600	99,708	40	498,439	8,128,821
10	0.000070	5	2.5	0.000350	0.999650	99,668	35	498,252	7,630,383
15	0.000130	5	2.5	0.000650	0.999350	99,633	65	498,003	7,132,131
20	0.000140	5	2.5	0.000700	0.999300	99,568	70	497,667	6,634,129
25	0.000180	5	2.5	0.000900	0.999100	99,498	90	497,269	6,136,462
30	0.000240	5	2.5	0.001199	0.998801	99,409	119	496,747	5,639,193
35	0.000360	5	2.5	0.001798	0.998202	99,290	179	496,002	5,142,447
40	0.000610	5	2.5	0.003045	0.996955	99,111	302	494,801	4,646,444
45	0.000970	5	2.5	0.004838	0.995162	98,809	478	492,852	4,151,643
50	0.001620	5	2.5	0.008067	0.991933	98,331	793	489,673	3,658,791
55	0.002720	5	2.5	0.013508	0.986492	97,538	1,318	484,396	3,169,118
60	0.004190	5	2.5	0.020733	0.979267	96,220	1,995	476,115	2,684,722
65	0.006330	5	2.5	0.031157	0.968843	94,226	2,936	463,788	2,208,607
70	0.009730	5	2.5	0.047495	0.952505	91,290	4,336	445,609	1,744,819
75	0.017620	5	2.5	0.084383	0.915617	86,954	7,337	416,426	1,299,209
80	0.03523	5	2.5	0.161891	0.838109	79,617	12,889	365,860	882,783
85	0.08	5	2.5	0.318657	0.681343	66,727	21,263	280,479	516,923
90	0.15	5	2.5	0.546934	0.453066	45,464	24,866	165,156	236,444
95	0.27	5	2.5	0.799213	0.200787	20,598	16,462	61,835	71,288
100	0.43	5	2.0	0.938311	0.061689	4,136	3,881	9,037	9,453
105	0.61	5	1.5	0.973309	0.026691	255	248	407	416
110	0.750140	∞		1.000000	0.000000	7	7	9	9

6. Period life tables

Data HMD

Period Life Table for Spain, females, 2023

Age x	$_nm_x$	n	$_na_x$	$_nq_x$	$_np_x$	l_x	$_nd_x$	$_nL_x$	T_x	e_x
0	0.002410	1	0.1	0.002405	0.997595	100,000	240	99,791	8,627,547	86.275
1	0.000130	4	2.0	0.000520	0.999480	99,760	52	398,934	8,527,756	85.483
5	0.000080	5	2.5	0.000400	0.999600	99,708	40	498,439	8,128,821	81.527
10	0.000070	5	2.5	0.000350	0.999650	99,668	35	498,252	7,630,383	76.558
15	0.000130	5	2.5	0.000650	0.999350	99,633	65	498,003	7,132,131	71.584
20	0.000140	5	2.5	0.000700	0.999300	99,568	70	497,667	6,634,129	66.629
25	0.000180	5	2.5	0.000900	0.999100	99,498	90	497,269	6,136,462	61.674
30	0.000240	5	2.5	0.001199	0.998801	99,409	119	496,747	5,639,193	56.727
35	0.000360	5	2.5	0.001798	0.998202	99,290	179	496,002	5,142,447	51.792
40	0.000610	5	2.5	0.003045	0.996955	99,111	302	494,801	4,646,444	46.881
45	0.000970	5	2.5	0.004838	0.995162	98,809	478	492,852	4,151,643	42.017
50	0.001620	5	2.5	0.008067	0.991933	98,331	793	489,673	3,658,791	37.209
55	0.002720	5	2.5	0.013508	0.986492	97,538	1,318	484,396	3,169,118	32.491
60	0.004190	5	2.5	0.020733	0.979267	96,220	1,995	476,115	2,684,722	27.902
65	0.006330	5	2.5	0.031157	0.968843	94,226	2,936	463,788	2,208,607	23.440
70	0.009730	5	2.5	0.047495	0.952505	91,290	4,336	445,609	1,744,819	19.113
75	0.017620	5	2.5	0.084383	0.915617	86,954	7,337	416,426	1,299,209	14.941
80	0.03523	5	2.5	0.161891	0.838109	79,617	12,889	365,860	882,783	11.088
85	0.08	5	2.5	0.318657	0.681343	66,727	21,263	280,479	516,923	7.747
90	0.15	5	2.5	0.546934	0.453066	45,464	24,866	165,156	236,444	5.201
95	0.27	5	2.5	0.799213	0.200787	20,598	16,462	61,835	71,288	3.461
100	0.43	5	2.0	0.938311	0.061689	4,136	3,881	9,037	9,453	2.286
105	0.61	5	1.5	0.973309	0.026691	255	248	407	416	1.629
110	0.750140	∞		1.000000	0.000000	7	7	9	9	1.333

6. Period life tables

Data HMD

L_x estimation (person-years lived between ages x and x+n):

- If a_x is known => $L_x = a_x * d_x$
- If a_x is unknown =>

$$_{\infty}m_x = \frac{_{\infty}d_x}{_{\infty}L_x} \longrightarrow {_{\infty}L_x} = \frac{_{\infty}d_x}{_{\infty}m_x} \longrightarrow {_{\infty}L_x} = \frac{l_x}{_{\infty}m_x}$$

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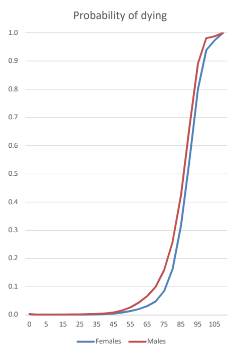
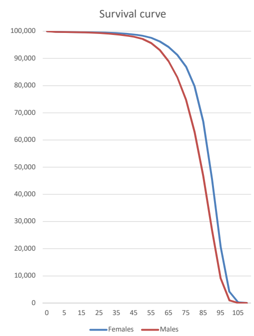
6. Period life tables

Data HMD





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7. Sullivan

The Sullivan method is one of the most practical and elegant ways to calculate Healthy Life Expectancy (HLE)

Underlying assumption: The observed health prevalence applies to everyone who survives to that age — so we **weight the life table's Lx** by the health prevalence

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7. Sullivan

Period Life Table for Spain, females, 2023

Age x	$_nm_x$	n	$_na_x$	$_nq_x$	$_np_x$	l_x	$_nd_x$	$_nL_x$	T_x	e_x	Obesity prevalence	$_nL_x^*$	T_x^*	e_x^*
0	0.002410	1	0.1	0.002405	0.997595	100,000	240	99,791	8,627,547	86.275		99,791	8,161,446	81.614
1	0.000130	4	2.0	0.000520	0.999480	99,760	52	398,934	8,527,756	85.483		398,934	8,061,655	80.811
5	0.000080	5	2.5	0.000400	0.999600	99,708	40	498,439	8,128,821	81.527		498,439	7,662,720	76.852
10	0.000070	5	2.5	0.000350	0.999650	99,668	35	498,252	7,630,383	76.558		498,252	7,164,282	71.882
15	0.000130	5	2.5	0.000650	0.999350	99,633	65	498,003	7,132,131	71.584		498,003	6,666,030	66.906
20	0.000140	5	2.5	0.000700	0.999300	99,568	70	497,667	6,634,129	66.629		497,667	6,168,028	61.948
25	0.000180	5	2.5	0.000900	0.999100	99,498	90	497,269	6,136,462	61.674	0.105	445,304	5,670,361	56.989
30	0.000240	5	2.5	0.001199	0.998801	99,409	119	496,747	5,639,193	56.727	0.105	444,837	5,225,057	52.561
35	0.000360	5	2.5	0.001798	0.998202	99,290	179	496,002	5,142,447	51.792	0.073	459,695	4,780,220	48.144
40	0.000610	5	2.5	0.003045	0.996955	99,111	302	494,801	4,646,444	46.881	0.073	458,582	4,320,525	43.593
45	0.000970	5	2.5	0.004838	0.995162	98,809	478	492,852	4,151,643	42.017	0.074	456,233	3,861,943	39.085
50	0.001620	5	2.5	0.008067	0.991933	98,331	793	489,673	3,658,791	37.209	0.074	453,291	3,405,711	34.635
55	0.002720	5	2.5	0.013508	0.986492	97,538	1,318	484,396	3,169,118	32.491	0.064	453,298	2,952,420	30.269
60	0.004190	5	2.5	0.020733	0.979267	96,220	1,995	476,115	2,684,722	27.902	0.064	445,548	2,499,122	25.973
65	0.006330	5	2.5	0.031157	0.968843	94,226	2,936	463,788	2,208,607	23.440	0.060	436,193	2,053,574	21.794
70	0.009730	5	2.5	0.047495	0.952505	91,290	4,336	445,609	1,744,819	19.113	0.060	419,096	1,617,381	17.717
75	0.017620	5	2.5	0.084383	0.915617	86,954	7,337	416,426	1,299,209	14.941	0.068	387,943	1,198,285	13.781
80	0.03523	5	2.5	0.161891	0.838109	79,617	12,889	365,860	882,783	11.088	0.068	340,835	810,342	10.178
85	0.08	5	2.5	0.318657	0.681343	66,727	21,263	280,479	516,923	7.747	0.106	250,636	469,508	7.036
90	0.15	5	2.5	0.546934	0.453066	45,464	24,866	165,156	236,444	5.201	0.106	147,584	218,872	4.814
95	0.27	5	2.5	0.799213	0.200787	20,598	16,462	61,835	71,288	3.461		61,835	71,288	3.461
100	0.43	5	2.0	0.938311	0.061689	4,136	3,881	9,037	9,453	2.286		9,037	9,453	2.286
105	0.61	5	1.5	0.973309	0.026691	255	248	407	416	1.629		407	416	1.629
110	0.750140	∞		1.000000	0.000000	7	7	9	9	1.333		9	9	1.333

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8. Applications beyond mortality

Demography (2017)
DOI 10.1007/s1352

Healthy Gr
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Rachel Margoli

Published online: 10

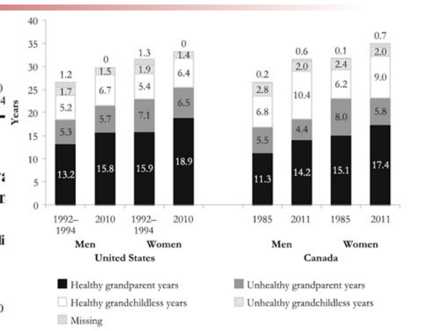

Fig. 2 Remaining years of life expectancy in each grandparent/health state at age 50, over time, by sex and country: United States 1992–1994 and 2010, and Canada 1985 and 2011. Grandchildren from biological and nonbiological children are included

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8. Applications beyond mortality

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Research Article

The Paid and U
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Received: February 21, 2021; Editorial De

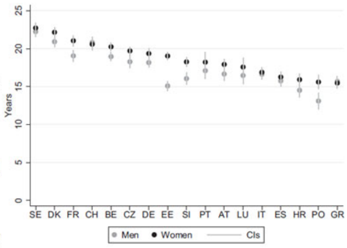

Figure 2. Working life expectancy at age 50 (paid and unpaid), by gender and country. AT = Austria; BE = Belgium; CH = Switzerland; CZ = Czech Republic; DE = Germany; DK = Denmark; EE = Estonia; ES = Spain; FR = France; GR = Greece; HR = Croatia; IT = Italy; LU = Luxemburg; PO = Poland; PT = Portugal; SE = Sweden; SI = Slovenia. Source: Survey of Health and Retirement in Europe 2015.

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“To erase an inequality you have to know its drivers”

“if you measure an inequality then you **HAVE TO** decompose it”

Tim Riffe

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9. A standard decomposition: Arriaga

DEMOGRAPHY© Volume 21, Number 1 February 1984

MEASURING AND EXPLAINING THE CHANGE IN LIFE EXPECTANCIES

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Abstract—A set of new indices for interpreting change in life expectancies, as well as a technique for explaining change in life expectancies by change in mortality at each age group are presented in the paper. The indices, as well as the new technique for explaining the differences in life expectancies, have been tested and examples using United States life tables are presented. The technique for explaining life expectancy differentials can be used for analyzing change in mortality or mortality differentials by sex, ethnicity, region, or any other subpopulations. The technique can be applied to life expectancies at birth or temporary life expectancies between any desirable ages.

Arriaga 1984

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9. An stantard decomposition: Arriaga

1. Decompose the contribution of each age group

$$C_x^{(2\to1)} = \frac{l_x^{(2)}\left(e_x^{(1)} - e_x^{(2)}\right) - l_{x+n}^{(2)}\left(e_{x+n}^{(1)} - e_{x+n}^{(2)}\right)}{100000}$$

$$C_x^{(1\to2)} = \frac{l_x^{(2)}\left(e_x^{(2)} - e_x^{(1)}\right) - l_{x+n}^{(2)}\left(e_{x+n}^{(2)} - e_{x+n}^{(1)}\right)}{100000}$$

2. Distribute age-specific contribution across causes of death, proportionally

Arriaga 1984

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B. Hands-on

1. Using a set of age- and sex-specific mortality rates (m_x) and a_x compute the life table columns: q_x, p_x, l_x, d_x, L_x, T_x and e_x.
2. Create some plots for the survival curve (l), the probabilities of death (q) for males and females. Compare the results

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B. Hands-on

3. Using age and sex-specific obesity prevalence provided in the Excel file apply the Sullivan method to estimate obesity-free life expectancy. Compare these results with conventional life expectancy and discuss them.
4. Illustration of an easy example that decomposes the sex gap in life expectancy into age- and cause (cancer or other causes) specific contributions

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Thank you for your attention!

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