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A multiple decrement life table model for orphan daughters in Turkey

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Abstract

The multiple decrement life table application in this study shows that, social insurances for surviving daughters in Turkey is considerably generous. When causes other than death are eliminated, expected benefit duration for surviving daughters, is higher than that is calculated for women pensioners who have earned their benefits after their career. Survivor pensioner daughters are encouraged to remain out of the labour force and receive their orphan's pensions, rather than start working. However, benefiting from the demographic dividend requires covering both men and women in the labour force.

Keywords: Multiple decrement life table, Survivor pensions, Orphan daughters.

Öz

Bu çalışmadaki çok-azalanlı yaşam tablosu uygulaması, ölüm aylığı alan yetim kız çocukları için sosyal sigortaların oldukça cömert olduğunu ortaya koymaktadır. Ölüm dışındaki ayrılış nedenleri analizden çıkarıldığında, Türkiye'de yetim kız çocukları için beklenen aylık ödeme süresi, kendi çalışmalarından kaynaklı emekliliğe hak kazanan kadın sigortalıların beklenen emekli aylığı alma sürelerinden fazladır. Yetim aylığı alan kız çocukları çalışmak yerine, iş gücü dışında kalarak yetim aylıklarını alma yönünde cesaretlendirilmektedir. Öte yandan, demografik fırsattan faydalanabilmek kadın ve erkeklerin birlikte iş gücüne dahil olmasından geçmektedir.

Anahtar sözcükler: *Çok azalanlı yaşam tablosu, Ölüm aylıkları, Yetim kız çocukları.*

1. Introduction

Life expectancies at all ages have risen due to the progress in quality of life, an increase in the number of people seeking health, and an increase in the availability and accessibility of sanitary and health services. Despite the difference in the phase of epidemiologic transition that countries are passing through, there is a worldwide trend in increased expected duration of life at old age, not only in the developed world but also in developing countries. According to the United Nations [1], life expectancy (LE) at birth has risen 10 to 25 years in different regions of the world. At individual level and for society as a whole, to live longer is a gift. However, if the prolonged life is in ill health, the process becomes burdensome for both

the individual and the country. At the individual level, the quality of life is low, while at the country level it is the public pressure on finance, which makes the process difficult. Longevity leads to a rise at the durations of retirement benefits, thus putting more pressure on the national budget. The expenditure on public pensions when measured as percentage of Gross Domestic Product, have risen 2.5% on average since 1990 [2]. Therefore, increased life span and low levels of mortality during retirement is more frequently discussed in academic and policy oriented literature.

Pay As You Go financed public pension systems sustain the expenditures of current pensioners from today's active working population. Similarly, future contributors will finance future pension payments to today's active contributors. Nevertheless, population ageing disrupts the balance between contributors and beneficiaries. Pension reforms become indispensable instruments for tackling the burden of population ageing. If there is not enough number of contributors to pay for the liabilities of pensioners, public pension systems face financial unsustainability and budget deficits. In case, that the country manages the demographic gift appropriately, a cumulative burden on labour, sustainable pensions and economic growth is avoidable until the opportunity window closes [3]. In this respect, Turkey anticipates a window of opportunity until 2040 [4]. Turkish pension system has a challenge for the next 20 years to solve current problems regarding; early retirement, generous rights for surviving women and meanwhile has to prepare for the contemporary issues for creating jobs during the 'gift'.

The popular opinion about 'retirement' in Turkey covers benefits that are transferred from deceased family members. Common people call their survivor benefits as their 'retirement'. Besides, long term insurance branch in Turkey covers old age, disability and survivor insurance. The contribution load is 20% of declared wage. The person is under the insurance umbrella for the aforementioned risks by paying the contribution that is calculated on actual earnings. Survivors of two different insured groups can get survivor pensions. Firstly, the deceased person who was receiving (or was entitled to receive) an old age or disability pension before death is under coverage. Secondly, active working people who have paid at least 900 Days of Contribution (DoC) with at least five Years of Service before death are covered. Spouses are directly eligible to benefits regardless of their own pensions or active salaries. Children under 18 (20 if pre-university student and 25 if university student), disabled sons sor daughters at any age, unmarried, divorced or widowed daughters who are not insured or receive any sort of social security benefits are also eligible [5]. 50% of the pension amount of the deceased is paid to the spouse whereas orphans receive 25%. Apart from these, surviving daughters receive two years accumulated value of suvivor pensions as at marriage date, as a marriage grant.

In addition to the old-age pension which is paid to the retired individual, Social Security Institution (SSI) provides death benefits to survivors of the deceased according to special conditions. Surviving spouses, children, mother and father may be eligible to death benefits. Benefits are also stopped, not only by a single decrement "death" but also by marriage, by working or by reaching a specific age. Therefore a multiple decrement process is on duty.

In Turkey, major life table (LT) studies rely on indirect methods on account of the poor death registration in the country. Incompleteness of death counts was estimated to be around 17% in 2005 by Hoşgör [6]. The dataset, that is used, is either Turkey Demographic and Health Survey-TDHS (see [7-11]), population census data of Turkish Statistical Institute-TurkStat ([12-14]) or burial records [15]. All the authors who have used the TDHS data, estimate adult mortality with "orphanhood" method which is popular in case that the death registration is poor. Taylan and Yapar [16] use address based population register system data of Turkey and obtain period LTs for 2009, 2010 and 2011.

There are examples of LTs which are constructed via direct techniques with deaths records of pensioners or employees of SSI. In 2005, Tuzgöl [17] constructed a life table for pensioners beyond age 30, with four years (2000-2003) of SSI administrative data. Death rates were graduated by the method proposed by Whittaker [18]. In addition, she had to borrow the rates from Turkish national data of TurkStat or apply specific constant increment coefficients for crude death rates for females beyond 90 (and males 75+

respectively). Other LT technique applications with SSI data in recent native literature include, multiple incerement-decrement LTs for the actively insured employees ([19-20]) and the 2008 SSI table which was prepared under Life and Annuity Life Table Construction Project of the Turkish Treasury [21]. LTs were constructed with data of mixed groups of insured persons (retirees, invalidity pensioners, active contributors) as units of analysis.

The aim of this study is to construct multiple decrement life tables for survivor pensioner daughters. SSI data on withdrawals from survivor benefits and mid-year beneficiaries for 2012 to 2016 is used as input data. Units of analysis for the multiple decrement LT application in this study are daughters thar are receiving survivor pensions. In the following parts of the study, age specific expected duration of survivor benefits of daughters are analysed with multiple decrement LT application.

2. Data and Methods

In this section, the steps of calculations and the assumptions that is used for producing different columns of the LTs.are highlighted.

2.1. Data sources and description of data

SSI is the major information source in Turkey for the life events for the retired, as the institution pays the monthly benefits to the pensioners. Main events that requires the cessation of benefits is tracked. Therefore SSI has data on, in-year deaths, withdrawals and mid-year number of beneficiaries, which is the key material when constructing LTs. In this study, withdrawals and pensioner figures for 2012 to 2016 is used to depict average pension payment durations of surviving daughters. LTs are modelled with big data. In total, 140,740 withdrawals and 2,403,655 daughters that are exposed to risk are covered. Information for event and exposure is loaded to SSI server and data is prepared by SAS Enterprise Guide.

2.2. Description of age and 'daughter'

"Age at last birthday" which is also known as "age in completed years" or "actual age", takes the number of years completed alive by the person for a date of reference into account [22]. In this study, age is defined as "age at last birthday". Completed age at death is calculated by the exact date of death and the exact date of birth. Similarly, exact date of birth and mid-year data of pensioners (July 1) gives the age at mid-year for a specific year.

The daughter definition is made according to the current legislation. The surviving daughter of a deceased pensioner (or active contributor, with at least 1800 DoC -or 5 years of service with 900 DoC- for longterm insurances before death) is under coverage with specific additional conditions. The additional conditions are as follows:

- "The ones who have completed the age of 18, the age of 20 in case receiving education in high school or equivalent, or the age of 25 in case receiving higher education; or
- The ones who are found to be disabled by losing minimum 60% of working power based on Institution Health Committee decision (regardless of his or her marital status); or
- The daughters, whatever the ages are, not married, divorced or widow." (see [5]).

2.3. Multiple decrement processes

Let ${}_nD_x^i$ describe the number of decrements from cause i between age x to $x+n$, where ${}_nD_x$ is the number of deaths between age x and $x+n$ then, a "constant of proportionality" [23] reflecting decrements other than cause i between age x to $x+n$ is given by:

$$R^{-i} = \frac{{}_nD_x - {}_nD_x^i}{{}_nD_x}. \quad (1)$$

Probability of surviving ${}_np_x$, death probabilities ${}_nq_x$ and the average person years lived between age x and $x+n$, by those die in n years ${}_na_x$, the number of survivors l_x, are received from the all-cause LT. For the probability of surviving from x to $x+n$, where only decrements due to causes other than i between age x to $x+n$ is at force, is equal to:

$${}_n^*p_x^{-i} = \left[{}_np_x\right]^{R^{-i}}. \quad (2)$$

Similarly, one can calculate survivors at age $x+n$, with

$${}^*l_{x+n}^{-i} = {}^*l_x^{-i} \cdot {}_n^*p_x^{-i} \quad (3)$$

where the superscript $-i$ reflect the causes other than i that are in effect. In order to get the person years lived ${}_n^*L_x^{-i}$,

$${}_n^*L_x^{-i} = n.\ {}^*l_{x+n}^{-i} + {}_n^*a_x^{-i} \cdot {}_n^*d_x^{-i} \quad (4)$$

the average person years lived between age x and $x+n$, by those die due to causes other than i in the interval ${}_n^*a_x^{-i}$ and the number of pensioners that die between age x to $x+n$ is needed. For the first age group $x = 45$ and the last age $x = 84$ before the open ended interval, the approach proposed by Preston et al. [24] is used and ${}_n^*a_x^{-i}$ is obtained with the equation,

$${}_n^*a_x^{-i} = n + R^{-i}\frac{{}_nq_x}{{}_n^*q_x^{-i}}\left({}_na_x - n\right). \quad (5)$$

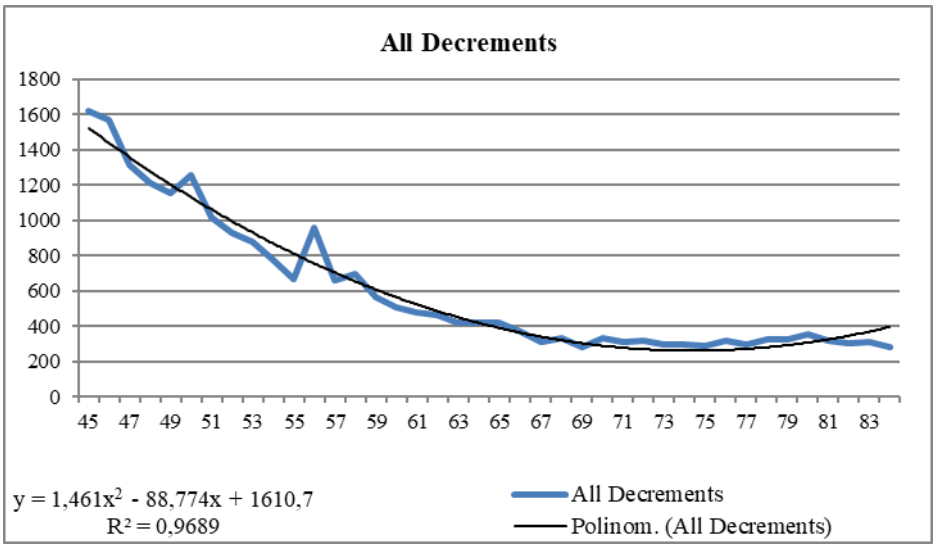

Figure 1. Distribution of all cause decrements that is needed to decide on the suitable ${}^{*}_{n}a_{x}^{-i}$.

Since all cause decrements support the assumption of second degree polynomial distribution with a R^2 of 97% (Figure 1), for the ages in between (x=46 to x=83), following Keyfitz [25], ${}^{*}_{n}a_{x}^{-i}$ is calculated by the equation;

$$ {}^{*}_{n}a_{x}^{-i} = \frac{\frac{-n}{24}\,{}^{*}_{n}d_{x-n}^{-i} + \frac{n}{2}\,{}^{*}_{n}d_{x}^{-i} + \frac{n}{24}\,{}^{*}_{n}d_{x+n}^{-i}}{{}^{*}_{n}d_{x+n}^{-i}}. \tag{6} $$

The LT functions for the open ended interval are as follows:

$$ {}^{*}_{\infty}a_{85}^{-i} = \frac{{}^{*}e_{85}^{0}}{R^{-i}} \tag{7} $$

Life expectancy at age x in the absence of cause i is, ${}^{*}e_{x}^{-i}$, and can be calculated by the following equations.

$$ {}^{*}T_{x}^{-i} = \sum_{\alpha=x}^{\infty} {}^{*}_{n}L_{\alpha}^{-i} \tag{8} $$

and

$$ {}^{*}e_{x}^{-i} = \frac{{}^{*}T_{x}^{-i}}{{}^{*}l_{x}^{-i}}. \tag{9} $$

3. Results

Figure 2 shows expected survivor benefit payment duration to daughters at selected ages when all causes are at force and when causes except death are eliminated. Life table details for all single ages are presented in Annex. Naturally, more decrements imply increased transition probability from the 'beneficiary' status and thus lower expected benefit duration. However, at each consecutive age, the

contribution of causes other than death diminishes. As daughters get older, it is less likely that they work or get married. That is visible with shorter difference between the bars in Figure 2. After 70, the principal cause that affects expected years to be spent as survivor pensioner, is death. Finally, the survivor pension has to cease for some reason and that is death of the beneficiary daughter.

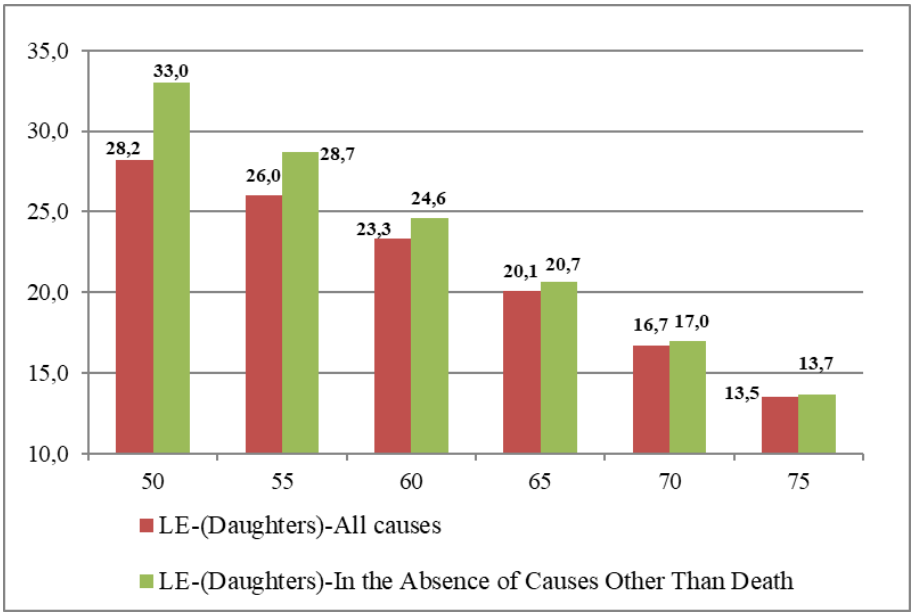

Figure 2. Expected duration of survivor benefits in years (Daughters).

In reality, all causes are at force according to the current legislation. The red bars in Figure 2 show that a 50 year surviving daughter is expected to reveice pension benefits during the remaining 28.2 years. Long benefit payment durations and generosity of the pension system in Turkey is visible. In other words, SSI is expected to pay pensions in the next 23.3 years to a 60 year old surviving daughter, under the assumption that daughters will be subject to transition rates during 2012-2016 in their remaning 'life'. But it is noteworthy that 'life' hereby represents duration that is spent as survivor beneficiary and life is not only continuable by being alive but also by not exiting to other causes.

Figure 3 is derived from Figure 2 and it represents the details of the difference between all cause and cause eliminated (causes other than death) LT application results. In Figure 3, the difference is decomposed by causes. Causes other than death have three categories; work, marriage and other. If deaths were the only cause, a 55 year old daughter would be expected to receive survivor benefits for the remaining 28.7 years. But work, marriage or other causes provide 2.7 years reduction in the average duration. Finding a job and starting to work and as a result losing the benefit is figured with 'Work'. It has the lowest contribution to the gap. 'Marriage' is the second reason in the ranking and finally the highest contribution to the gap is due to annulment, suspension, absence or other remaining reasons.

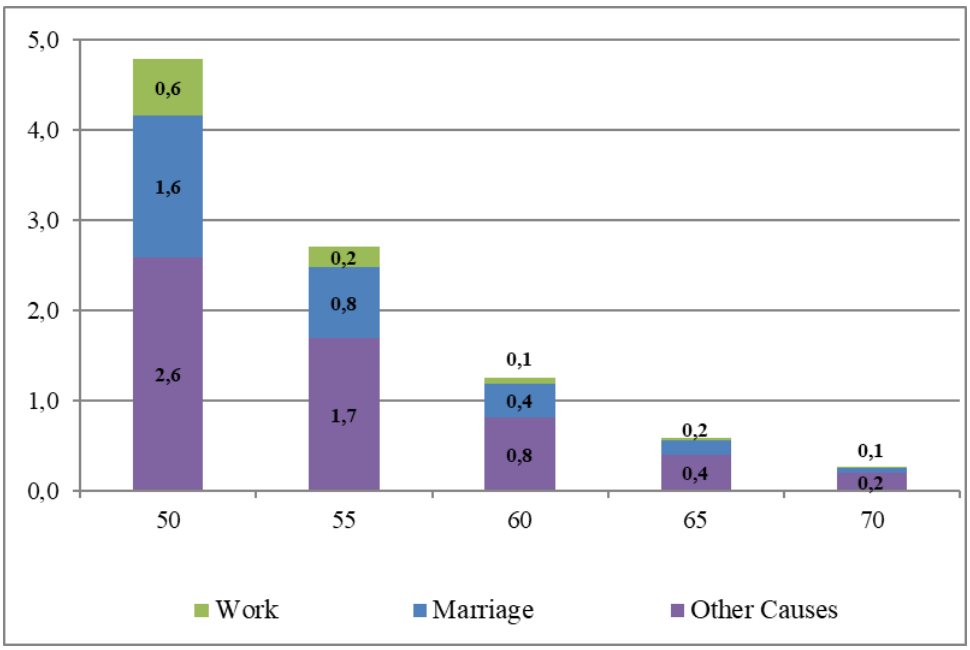

Figure 3. Relative contribution of causes other than death to the expected duration of survivor benefits.

The striking behaviour observed in recent years is the unregistered work of the surviving daughters in order not to lose the benefit that they get. Moreover, surviving daughters avoid marriage or if married, they get divorced and continue to live in the same household with the ex-husband. According to Figure 3, an additional duration can be gained by daughters (for instance 1.6+0.6=2.2 at age 50) if some life events are not declared to SSI. From the perspective of SSI, there is a potential abuse possibility which may increase the financial burden that is on the institution. Daughters, who get involved in such abuse are expected to continue being survivor pensioners considerably long.

The comparison of average benefit durations between orphan daughters and women old age pensioners is in Figure 4. Although survivor beneficiary daughters do not earn their own pension by working, but have a transfered pension, they are expected to get benefits less than max 6.5 years shorter (age 50) than an old age pensioner.

At all ages below 70, daughters receive benefits for durations that is equal to or considerably close to the average pension payment durations of women who have earned their benefits after life time working history. Weighted average durations are even 3.3 years higher for surviving daughters (26.9 years) when compared with women pensioners (26.6 years).

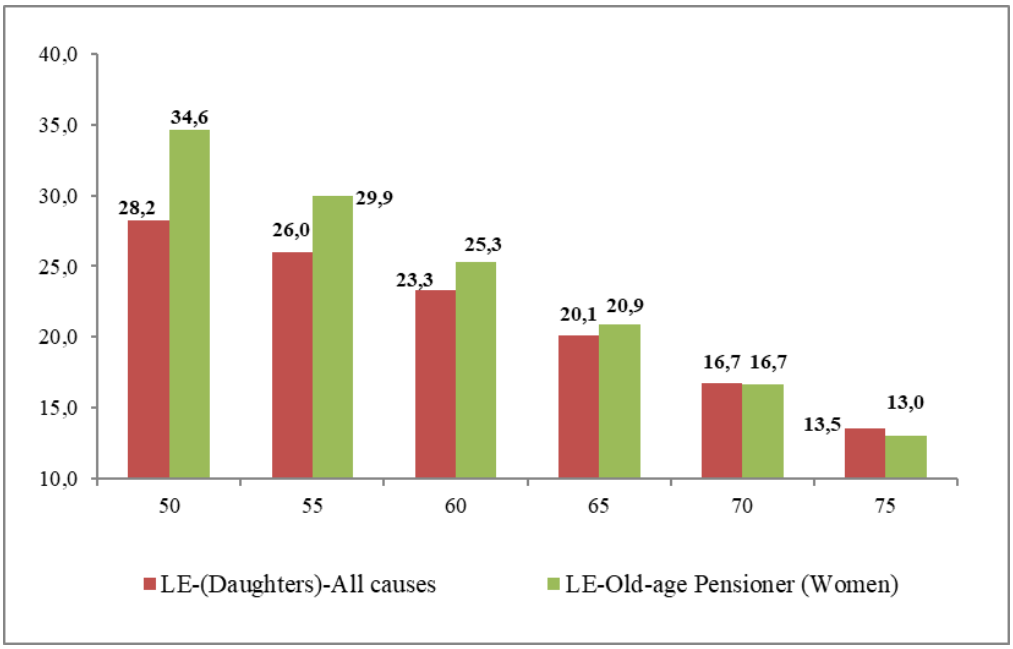

Figure 4. Expected duration of retirement benefits and survivor benefits.

4. Conclusion

The multiple decrement life table application in this study shows that, social insurances for surviving daughters in Turkey is generous. Weighted average of expected benefit payment duration to daughters, with number of beneficiaries as weights, is 26.9 years which is higher than the weighted average of 26.6 years calculated for women receiving old age pensions. Put it differently, the period SSI is expected to pay benefits to daughters that do not work, participate in the labour force, is more than the period that women pensioners are expected to receive as retirement pension.

Gruber and Wise [26] discuss whether social security has impacts on low labour force participation in the industiralized countries. They suggest that, social security contributed to the decline in participation rates via generous benefits at young ages, early retirement or easy pathways to disability insurance. In this sense, survivor benefit regime in Turkey is also generous that, non working daughters are encouraged to stay out of labour force and receive their pensions, rather than start working and lose their survivor benefits. However, the demographic window of opportunity is forecasted to end after 2040. To benefit from the dividend and develop sustainably, both men and women are needed in the economic production process. 2023 targets or benefiting from demographic dividend can not be possible by leaving half of the population outside the labour force. Therefore, encouraging survivor beneficiary daughters to earn their own pensions and offering incentives to those taking part in the labour force may be among suitable policy options.

An important posit hereby is the contradiction between government policies. Under main policy pillars of National Employment Strategy, policies to strenghten labour partcipation of women are discussed in the section “Increasing employment of those needing special policies” [27]. However, neither this section, nor the section on “strengthening links between employment and social protection” provides criticism for the existing generous survivor pensions system in the country.

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ANNEX. Multiple Decrement LTs

LT in the absence of causes other than death (Daughters)

Age	q	l	d	L	T	e	p	n	a	$_nq^i_x$	$_nq^j_x$	l_x	l^i_x	l^j_x	$_nd_x$	$_nd^i_x$	$_nd^j_x$	$_nL_x$	T_x	e_x	R^{-i}	$_np^{-i}_x$	$_na^{-i}_x$	$_nl^{-i}_x$	$_nd^{-i}_x$	$_nL^{-i}_x$	T^{-i}_x	e^{-i}_x
45	0,03312	100000	3312	98344	2901969	29,02	0,96688	1	0,5	0,03083	0,00229	100000	27931	72069	3312	3083	229	98344	2901969	29,02	0,06909	0,99768	0,5078	100000	232	99886	3749725	37,50
46	0,03092	96688	2990	95193	2803625	29,00	0,96908	1	0,5	0,02852	0,00241	96688	24847	71841	2990	2757	233	95193	2803625	29,00	0,07786	0,99756	0,5072	99768	244	99647	3649839	36,58
47	0,02868	93698	2687	92354	2708432	28,91	0,97132	1	0,5	0,02536	0,00332	93698	22090	71608	2687	2376	311	92354	2708432	28,91	0,11577	0,99664	0,5064	99524	335	99359	3550192	35,67
48	0,02650	91011	2412	89805	2616078	28,74	0,97350	1	0,5	0,02326	0,00324	91011	19714	71297	2412	2117	294	89805	2616078	28,74	0,12211	0,99673	0,4972	99189	325	99026	3450833	34,79
49	0,02447	88599	2168	87515	2526273	28,51	0,97553	1	0,5	0,02134	0,00313	88599	17597	71002	2168	1891	277	87515	2526273	28,51	0,12792	0,99684	0,5035	98864	313	98709	3351807	33,90
50	0,02267	86431	1959	85451	2438758	28,22	0,97733	1	0,5	0,01913	0,00353	86431	15706	70725	1959	1654	305	85451	2438758	28,22	0,15580	0,99643	0,5152	98552	351	98381	3253098	33,01
51	0,02112	84472	1784	83580	2353307	27,86	0,97888	1	0,5	0,01667	0,00445	84472	14052	70420	1784	1408	376	83580	2353307	27,86	0,21084	0,99551	0,5099	98200	441	97984	3154717	32,13
52	0,01987	82688	1643	81866	2269727	27,45	0,98013	1	0,5	0,01523	0,00463	82688	12644	70044	1643	1259	383	81866	2269727	27,45	0,23326	0,99533	0,5031	97759	456	97532	3056733	31,27
53	0,01891	81045	1533	80279	2187860	27,00	0,98109	1	0,5	0,01406	0,00485	81045	11385	69660	1533	1139	393	80279	2187860	27,00	0,25653	0,99511	0,5007	97303	475	97065	2959200	30,41
54	0,01827	79513	1453	78786	2107582	26,51	0,98173	1	0,5	0,01351	0,00476	79513	10245	69267	1453	1074	379	78786	2107582	26,51	0,26059	0,99521	0,5097	96827	464	96600	2862135	29,56
55	0,01861	78060	1453	77333	2028796	25,99	0,98139	1	0,5	0,01259	0,00602	78060	9171	68889	1453	983	470	77333	2028796	25,99	0,32340	0,99394	0,5043	96363	584	96074	2765535	28,70
56	0,01965	76607	1505	75854	1951462	25,47	0,98035	1	0,5	0,01421	0,00543	76607	8188	68419	1505	1089	416	75854	1951462	25,47	0,27651	0,99453	0,5127	95779	524	95524	2669462	27,87
57	0,01950	75102	1464	74370	1875608	24,97	0,98050	1	0,5	0,01173	0,00776	75102	7099	68003	1464	881	583	74370	1875608	24,97	0,39818	0,99219	0,5038	95255	744	94886	2573938	27,02
58	0,01866	73637	1374	72950	1801239	24,46	0,98134	1	0,5	0,01244	0,00622	73637	6218	67420	1374	916	458	72950	1801239	24,46	0,33333	0,99374	0,5012	94511	592	94216	2479051	26,23
59	0,01757	72263	1270	71629	1728288	23,92	0,98243	1	0,5	0,00951	0,00806	72263	5302	66962	1270	687	582	71629	1728288	23,92	0,45870	0,99190	0,5142	93920	760	93550	2384835	25,39
60	0,01657	70994	1177	70406	1656660	23,34	0,98343	1	0,5	0,00748	0,00909	70994	4615	66379	1177	531	645	70406	1656660	23,34	0,54851	0,99088	0,5050	93159	850	92739	2291285	24,60
61	0,01588	69817	1109	69263	1586254	22,72	0,98412	1	0,5	0,00657	0,00931	69817	4083	65734	1109	459	650	69263	1586254	22,72	0,58613	0,99066	0,4993	92309	862	91878	2198546	23,82
62	0,01556	68709	1069	68174	1516991	22,08	0,98444	1	0,5	0,00645	0,00911	68709	3625	65084	1069	443	626	68174	1516991	22,08	0,58568	0,99086	0,5006	91447	836	91030	2106668	23,04
63	0,01558	67639	1054	67112	1448817	21,42	0,98442	1	0,5	0,00595	0,00963	67639	3182	64458	1054	402	651	67112	1448817	21,42	0,61814	0,99034	0,5029	90611	875	90176	2015638	22,24
64	0,01584	66586	1054	66058	1381705	20,75	0,98416	1	0,5	0,00586	0,00997	66586	2779	63806	1054	390	664	66058	1381705	20,75	0,62972	0,99000	0,5075	89736	898	89294	1925462	21,46
65	0,01626	65531	1065	64999	1315646	20,08	0,98374	1	0,5	0,00462	0,01164	65531	2389	63142	1065	303	763	64999	1315646	20,08	0,71599	0,98833	0,5090	88839	1037	88330	1836168	20,67
66	0,01680	64466	1083	63924	1250648	19,40	0,98320	1	0,5	0,00405	0,01274	64466	2086	62380	1083	261	822	63924	1250648	19,40	0,75871	0,98723	0,5065	87802	1121	87249	1747839	19,91
67	0,01746	63383	1107	62830	1186723	18,72	0,98254	1	0,5	0,00351	0,01395	63383	1825	61558	1107	223	884	62830	1186723	18,72	0,79872	0,98603	0,5047	86681	1211	86081	1660590	19,16
68	0,01829	62276	1139	61707	1123894	18,05	0,98171	1	0,5	0,00359	0,01470	62276	1602	60674	1139	224	915	61707	1123894	18,05	0,80363	0,98528	0,5055	85470	1258	84847	1574509	18,42
69	0,01932	61137	1181	60547	1062187	17,37	0,98068	1	0,5	0,00300	0,01631	61137	1379	59759	1181	184	997	60547	1062187	17,37	0,84452	0,98366	0,5084	84211	1376	83535	1489662	17,69
70	0,02059	59956	1234	59339	1001640	16,71	0,97941	1	0,5	0,00205	0,01853	59956	1195	58761	1234	123	1111	59339	1001640	16,71	0,90030	0,98145	0,5060	82835	1537	82076	1406127	16,97
71	0,02212	58722	1299	58073	942301	16,05	0,97788	1	0,5	0,00249	0,01963	58722	1072	57650	1299	146	1153	58073	942301	16,05	0,88746	0,98035	0,5048	81298	1598	80507	1324051	16,29
72	0,02393	57423	1374	56736	884228	15,40	0,97607	1	0,5	0,00234	0,02159	57423	926	56498	1374	134	1240	56736	884228	15,40	0,90221	0,97839	0,5068	79701	1722	78851	1243544	15,60
73	0,02603	56049	1459	55320	827492	14,76	0,97397	1	0,5	0,00194	0,02409	56049	791	55258	1459	109	1350	55320	827492	14,76	0,92542	0,97589	0,5062	77978	1880	77050	1164692	14,94
74	0,02845	54590	1553	53814	772172	14,14	0,97155	1	0,5	0,00217	0,02627	54590	683	53908	1553	119	1434	53814	772172	14,14	0,92359	0,97370	0,5060	76098	2002	75109	1087642	14,29
75	0,03117	53037	1653	52211	718358	13,54	0,96883	1	0,5	0,00195	0,02923	53037	564	52474	1653	103	1550	52211	718358	13,54	0,93750	0,97075	0,5074	74096	2168	73029	1012533	13,67
76	0,03420	51384	1757	50505	666148	12,96	0,96580	1	0,5	0,00108	0,03313	51384	461	50924	1757	55	1702	50505	666148	12,96	0,96855	0,96685	0,5067	71929	2384	70753	939505	13,06
77	0,03753	49627	1862	48695	615642	12,41	0,96247	1	0,5	0,00088	0,03664	49627	405	49221	1862	44	1818	48695	615642	12,41	0,97643	0,96334	0,5053	69545	2549	68284	868752	12,49
78	0,04118	47764	1967	46781	566947	11,87	0,95882	1	0,5	0,00075	0,04043	47764	361	47403	1967	36	1931	46781	566947	11,87	0,98182	0,95956	0,5042	66995	2710	65652	800468	11,95
79	0,04527	45798	2073	44761	520166	11,36	0,95473	1	0,5	0,00139	0,04388	45798	326	45472	2073	64	2010	44761	520166	11,36	0,96933	0,95609	0,5050	64286	2823	62889	734816	11,43
80	0,05003	43724	2188	42631	475405	10,87	0,94997	1	0,5	0,00042	0,04961	43724	262	43462	2188	18	2169	42631	475405	10,87	0,99160	0,95038	0,5050	61463	3050	59954	671928	10,93
81	0,05584	41537	2319	40377	432774	10,42	0,94416	1	0,5	0,00122	0,05462	41537	244	41293	2319	51	2269	40377	432774	10,42	0,97813	0,94535	0,5049	58413	3192	56833	611974	10,48
82	0,06319	39218	2478	37978	392397	10,01	0,93681	1	0,5	0,00124	0,06196	39218	193	39025	2478	48	2430	37978	392397	10,01	0,98046	0,93800	0,5061	55221	3424	53530	555141	10,05
83	0,07269	36739	2671	35404	354419	9,65	0,92731	1	0,5	0,00141	0,07128	36739	144	36595	2671	52	2619	35404	354419	9,65	0,98058	0,92867	0,5072	51798	3695	49977	501611	9,68
84	0,08499	34069	2895	32621	319015	9,36	0,91501	1	0,5	0,00060	0,08439	34069	93	33976	2895	21	2875	32621	319015	9,36	0,99291	0,91559	0,5002	48103	4060	46073	451634	9,39
85	1,00000	31173	31173	286394	286394	9,19	0,00000			0,00231	0,99769	31173	72	31101	31173	72	31101	286394	286394	9,19	0,99769	0,00000	9,2085	44042	44042	405561	405561	9,21

LT in the absence of causes other than deaths&marriages (Daughters)

Age	q	l	d	L	T	e	p	n	a	$_nq^i_x$	$_nq^j_x$	l_x	l^i_x	l^j_x	$_nd_x$	$_nd^i_x$	$_nd^j_x$	$_nL_x$	T_x	e_x	R^{-i}	$_np^{-i}_x$	$_na^{-i}_x$	$_nl^{-i}_x$	$_nd^{-i}_x$	$_nL^{-i}_x$	T^{-i}_x	e^{-i}_x
45	0,03312	100000	3312	98344	2901969	29,02	0,96688	1	0,5	0,01990	0,01322	100000	18771	81229	3312	1990	1322	98344	2901969	29,02	0,39914	0,98665	0,5050	100000	1335	99339	3439340	34,39
46	0,03092	96688	2990	95193	2803625	29,00	0,96908	1	0,5	0,01818	0,01275	96688	16781	79907	2990	1757	1233	95193	2803625	29,00	0,41225	0,98713	0,5046	98665	1269	98036	3340001	33,85
47	0,02868	93698	2687	92354	2708432	28,91	0,97132	1	0,5	0,01645	0,01223	93698	15024	78674	2687	1541	1146	92354	2708432	28,91	0,42650	0,98766	0,5041	97395	1201	96800	3241965	33,29
48	0,02650	91011	2412	89805	2616078	28,74	0,97350	1	0,5	0,01463	0,01187	91011	13483	77528	2412	1331	1080	89805	2616078	28,74	0,44802	0,98804	0,4949	96194	1150	95613	3145166	32,70
49	0,02447	88599	2168	87515	2526273	28,51	0,97553	1	0,5	0,01339	0,01108	88599	12151	76448	2168	1186	982	87515	2526273	28,51	0,45290	0,98884	0,4906	95043	1060	94503	3049553	32,09
50	0,02267	86431	1959	85451	2438758	28,22	0,97733	1	0,5	0,01304	0,00962	86431	10965	75466	1959	1127	832	85451	2438758	28,22	0,42448	0,99032	0,4969	93983	910	93525	2955050	31,44
51	0,02112	84472	1784	83580	2353307	27,86	0,97888	1	0,5	0,01051	0,01061	84472	9838	74634	1784	888	897	83580	2353307	27,86	0,50246	0,98933	0,5005	93073	993	92577	2861525	30,75
52	0,01987	82688	1643	81866	2269727	27,45	0,98013	1	0,5	0,00991	0,00995	82688	8950	73738	1643	820	823	81866	2269727	27,45	0,50108	0,99000	0,4959	92080	921	91615	2768948	30,07
53	0,01891	81045	1533	80279	2187860	27,00	0,98109	1	0,5	0,00906	0,00985	81045	8131	72915	1533	734	799	80279	2187860	27,00	0,52100	0,99010	0,4954	91159	902	90703	2677333	29,37
54	0,01827	79513	1453	78786	2107582	26,51	0,98173	1	0,5	0,00922	0,00905	79513	7397	72116	1453	733	720	78786	2107582	26,51	0,49551	0,99090	0,5014	90256	821	89847	2586629	28,66
55	0,01861	78060	1453	77333	2028796	25,99	0,98139	1	0,5	0,00827	0,01035	78060	6663	71396	1453	645	808	77333	2028796	25,99	0,55589	0,98961	0,4951	89435	929	88966	2496782	27,92
56	0,01965	76607	1505	75854	1951462	25,47	0,98035	1	0,5	0,01166	0,00798	76607	6018	70588	1505	893	612	75854	1951462	25,47	0,40644	0,99197	0,5054	88506	711	88155	2407816	27,21
57	0,01950	75102	1464	74370	1875608	24,97	0,98050	1	0,5	0,00791	0,01159	75102	5125	69977	1464	594	870	74370	1875608	24,97	0,59422	0,98837	0,5032	87795	1021	87288	2319662	26,42
58	0,01866	73637	1374	72950	1801239	24,46	0,98134	1	0,5	0,00961	0,00905	73637	4531	69107	1374	708	666	72950	1801239	24,46	0,48498	0,99091	0,4963	86774	789	86377	2232374	25,73
59	0,01757	72263	1270	71629	1728288	23,92	0,98243	1	0,5	0,00655	0,01102	72263	3823	68440	1270	473	797	71629	1728288	23,92	0,62742	0,98894	0,5082	85985	951	85517	2145997	24,96
60	0,01657	70994	1177	70406	1656660	23,34	0,98343	1	0,5	0,00512	0,01145	70994	3350	67644	1177	363	813	70406	1656660	23,34	0,69109	0,98852	0,4994	85034	976	84545	2060480	24,23
61	0,01588	69817	1109	69263	1586254	22,72	0,98412	1	0,5	0,00477	0,01111	69817	2987	66831	1109	333	776	69263	1586254	22,72	0,69958	0,98886	0,4977	84058	936	83587	1975935	23,51
62	0,01556	68709	1069	68174	1516991	22,08	0,98444	1	0,5	0,00446	0,01111	68709	2654	66055	1069	306	763	68174	1516991	22,08	0,71367	0,98887	0,5009	83121	925	82660	1892347	22,77
63	0,01558	67639	1054	67112	1448817	21,42	0,98442	1	0,5	0,00398	0,01160	67639	2347	65292	1054	269	785	67112	1448817	21,42	0,74463	0,98838	0,5002	82196	955	81719	1809688	22,02
64	0,01584	66586	1054	66058	1381705	20,75	0,98416	1	0,5	0,00441	0,01143	66586	2078	64507	1054	293	761	66058	1381705	20,75	0,72170	0,98855	0,5036	81241	931	80779	1727969	21,27
65	0,01626	65531	1065	64999	1315646	20,08	0,98374	1	0,5	0,00338	0,01288	65531	1785	63746	1065	221	844	64999	1315646	20,08	0,79236	0,98710	0,5076	80310	1036	79800	1647190	20,51
66	0,01680	64466	1083	63924	1250648	19,40	0,98320	1	0,5	0,00270	0,01410	64466	1564	62902	1083	174	909	63924	1250648	19,40	0,83914	0,98589	0,5055	79274	1119	78721	1567390	19,77
67	0,01746	63383	1107	62830	1186723	18,72	0,98254	1	0,5	0,00234	0,01512	63383	1390	61993	1107	149	958	62830	1186723	18,72	0,86581	0,98486	0,5036	78155	1183	77568	1488669	19,05
68	0,01829	62276	1139	61707	1123894	18,05	0,98171	1	0,5	0,00243	0,01586	62276	1241	61035	1139	151	988	61707	1123894	18,05	0,86707	0,98412	0,5048	76972	1222	76367	1411101	18,33
69	0,01932	61137	1181	60547	1062187	17,37	0,98068	1	0,5	0,00184	0,01747	61137	1090	60048	1181	113	1068	60547	1062187	17,37	0,90459	0,98251	0,5061	75750	1325	75096	1334734	17,62
70	0,02059	59956	1234	59339	1001640	16,71	0,97941	1	0,5	0,00155	0,01903	59956	977	58979	1234	93	1141	59339	1001640	16,71	0,92447	0,98095	0,5044	74425	1418	73723	1259638	16,92
71	0,02212	58722	1299	58073	942301	16,05	0,97788	1	0,5	0,00192	0,02020	58722	884	57838	1299	113	1186	58073	942301	16,05	0,91318	0,97978	0,5044	73008	1476	72276	1185915	16,24
72	0,02393	57423	1374	56736	884228	15,40	0,97607	1	0,5	0,00196	0,02196	57423	771	56652	1374	113	1261	56736	884228	15,40	0,91798	0,97802	0,5059	71532	1573	70755	1113639	15,57
73	0,02603	56049	1459	55320	827492	14,76	0,97397	1	0,5	0,00176	0,02427	56049	658	55391	1459	99	1360	55320	827492	14,76	0,93220	0,97571	0,5062	69959	1699	69120	1042884	14,91
74	0,02845	54590	1553	53814	772172	14,14	0,97155	1	0,5	0,00170	0,02675	54590	559	54031	1553	93	1460	53814	772172	14,14	0,94020	0,97323	0,5061	68260	1827	67357	973764	14,27
75	0,03117	53037	1653	52211	718358	13,54	0,96883	1	0,5	0,00162	0,02955	53037	466	52571	1653	86	1567	52211	718358	13,54	0,94792	0,97043	0,5067	66433	1965	65464	906407	13,64
76	0,03420	51384	1757	50505	666148	12,96	0,96580	1	0,5	0,00097	0,03323	51384	380	51004	1757	50	1708	50505	666148	12,96	0,97170	0,96675	0,5065	64468	2144	63410	840943	13,04
77	0,03753	49627	1862	48695	615642	12,41	0,96247	1	0,5	0,00063	0,03689	49627	331	49296	1862	31	1831	48695	615642	12,41	0,98316	0,96309	0,5053	62324	2300	61186	777533	12,48
78	0,04118	47764	1967	46781	566947	11,87	0,95882	1	0,5	0,00062	0,04055	47764	299	47465	1967	30	1937	46781	566947	11,87	0,98485	0,95943	0,5044	60024	2435	58818	716347	11,93
79	0,04527	45798	2073	44761	520166	11,36	0,95473	1	0,5	0,00083	0,04443	45798	269	45528	2073	38	2035	44761	520166	11,36	0,98160	0,95555	0,5049	57589	2560	56322	657529	11,42
80	0,05003	43724	2188	42631	475405	10,87	0,94997	1	0,5	0,00028	0,04975	43724	231	43493	2188	12	2175	42631	475405	10,87	0,99440	0,95024	0,5047	55029	2738	53673	601207	10,93
81	0,05584	41537	2319	40377	432774	10,42	0,94416	1	0,5	0,00105	0,05479	41537	219	41318	2319	43	2276	40377	432774	10,42	0,98125	0,94518	0,5047	52291	2867	50872	547534	10,47
82	0,06319	39218	2478	37978	392397	10,01	0,93681	1	0,5	0,00124	0,06196	39218	176	39042	2478	48	2430	37978	392397	10,01	0,98046	0,93800	0,5063	49425	3064	47912	496662	10,05
83	0,07269	36739	2671	35404	354419	9,65	0,92731	1	0,5	0,00094	0,07175	36739	127	36612	2671	35	2636	35404	354419	9,65	0,98706	0,92821	0,5071	46360	3328	44720	448751	9,68
84	0,08499	34069	2895	32621	319015	9,36	0,91501	1	0,5	0,00060	0,08439	34069	93	33976	2895	21	2875	32621	319015	9,36	0,99291	0,91559	0,5002	43032	3632	41217	404030	9,39
85	1,00000	31173	31173	286394	286394	9,19	0,00000			0,00231	0,99769	31173	72	31101	31173	72	31101	286394	286394	9,19	0,99769	0,00000	9,2085	39400	39400	362814	362814	9,21

LT in the absence of causes other than deaths&marriages&work (Daughters)

Age	q	l	d	L	T	e	p	n	a	${}_nq^i_x$	${}_nq^j_x$	l_x	l^i_x	l^j_x	${}_nd_x$	${}_nd^i_x$	${}_nd^j_x$	${}_nL_x$	T_x	e_x	R^{-i}	${}_np^{-i}_x$	${}_na^{-i}_x$	${}_nl^{-i}_x$	${}_nd^{-i}_x$	${}_nL^{-i}_x$	T^{-i}_x	e^{-i}_x
45	0,03312	100000	3312	98344	2901969	29,02	0,96688	1	0,5	0,01126	0,02186	100000	13630	86370	3312	1126	2186	98344	2901969	29,02	0,66009	0,97801	0,5028	100000	2199	98907	3272779	32,73
46	0,03092	96688	2990	95193	2803625	29,00	0,96908	1	0,5	0,01103	0,01989	96688	12504	84184	2990	1067	1923	95193	2803625	29,00	0,64327	0,98000	0,5028	97801	1956	96829	3173872	32,45
47	0,02868	93698	2687	92354	2708432	28,91	0,97132	1	0,5	0,00946	0,01922	93698	11437	82261	2687	886	1801	92354	2708432	28,91	0,67022	0,98068	0,5024	95845	1851	94924	3077043	32,10
48	0,02650	91011	2412	89805	2616078	28,74	0,97350	1	0,5	0,00905	0,01745	91011	10551	80460	2412	824	1588	89805	2616078	28,74	0,65842	0,98247	0,4925	93994	1647	93158	2982120	31,73
49	0,02447	88599	2168	87515	2526273	28,51	0,97553	1	0,5	0,00772	0,01675	88599	9727	78872	2168	684	1484	87515	2526273	28,51	0,68453	0,98318	0,4888	92346	1553	91552	2888962	31,28
50	0,02267	86431	1959	85451	2438758	28,22	0,97733	1	0,5	0,00917	0,01349	86431	9043	77388	1959	793	1166	85451	2438758	28,22	0,59539	0,98644	0,4890	90793	1231	90164	2797410	30,81
51	0,02112	84472	1784	83580	2353307	27,86	0,97888	1	0,5	0,00747	0,01365	84472	8251	76221	1784	631	1153	83580	2353307	27,86	0,64631	0,98630	0,4976	89562	1227	88946	2707245	30,23
52	0,01987	82688	1643	81866	2269727	27,45	0,98013	1	0,5	0,00678	0,01309	82688	7620	75068	1643	561	1082	81866	2269727	27,45	0,65875	0,98687	0,4938	88335	1160	87748	2618299	29,64
53	0,01891	81045	1533	80279	2187860	27,00	0,98109	1	0,5	0,00685	0,01206	81045	7059	73986	1533	555	978	80279	2187860	27,00	0,63791	0,98789	0,4913	87175	1055	86638	2530551	29,03
54	0,01827	79513	1453	78786	2107582	26,51	0,98173	1	0,5	0,00741	0,01086	79513	6504	73008	1453	589	864	78786	2107582	26,51	0,59435	0,98910	0,4993	86120	939	85650	2443913	28,38
55	0,01861	78060	1453	77333	2028796	25,99	0,98139	1	0,5	0,00643	0,01218	78060	5915	72145	1453	502	950	77333	2028796	25,99	0,65425	0,98778	0,4938	85181	1041	84654	2358263	27,69
56	0,01965	76607	1505	75854	1951462	25,47	0,98035	1	0,5	0,01037	0,00927	76607	5412	71194	1505	795	710	75854	1951462	25,47	0,47193	0,99068	0,5013	84141	784	83750	2273608	27,02
57	0,01950	75102	1464	74370	1875608	24,97	0,98050	1	0,5	0,00676	0,01274	75102	4618	70484	1464	507	957	74370	1875608	24,97	0,65350	0,98721	0,5020	83356	1066	82826	2189859	26,27
58	0,01866	73637	1374	72950	1801239	24,46	0,98134	1	0,5	0,00854	0,01012	73637	4110	69527	1374	629	745	72950	1801239	24,46	0,54220	0,98984	0,4949	82291	836	81868	2107033	25,60
59	0,01757	72263	1270	71629	1728288	23,92	0,98243	1	0,5	0,00577	0,01179	72263	3481	68782	1270	417	852	71629	1728288	23,92	0,67135	0,98817	0,5069	81455	964	80979	2025165	24,86
60	0,01657	70994	1177	70406	1656660	23,34	0,98343	1	0,5	0,00423	0,01234	70994	3064	67930	1177	301	876	70406	1656660	23,34	0,74455	0,98763	0,4982	80491	995	79992	1944185	24,15
61	0,01588	69817	1109	69263	1586254	22,72	0,98412	1	0,5	0,00434	0,01154	69817	2763	67054	1109	303	806	69263	1586254	22,72	0,72689	0,98843	0,4954	79496	920	79032	1864194	23,45
62	0,01556	68709	1069	68174	1516991	22,08	0,98444	1	0,5	0,00422	0,01134	68709	2461	66248	1069	290	779	68174	1516991	22,08	0,72885	0,98863	0,5008	78576	893	78130	1785162	22,72
63	0,01558	67639	1054	67112	1448817	21,42	0,98442	1	0,5	0,00353	0,01204	67639	2171	65469	1054	239	815	67112	1448817	21,42	0,77327	0,98793	0,5001	77683	937	77214	1707032	21,97
64	0,01584	66586	1054	66058	1381705	20,75	0,98416	1	0,5	0,00418	0,01165	66586	1932	64654	1054	279	776	66058	1381705	20,75	0,73585	0,98832	0,5029	76746	896	76300	1629818	21,24
65	0,01626	65531	1065	64999	1315646	20,08	0,98374	1	0,5	0,00310	0,01315	65531	1653	63878	1065	203	862	64999	1315646	20,08	0,80907	0,98683	0,5072	75849	999	75357	1553517	20,48
66	0,01680	64466	1083	63924	1250648	19,40	0,98320	1	0,5	0,00252	0,01428	64466	1450	63016	1083	163	920	63924	1250648	19,40	0,84987	0,98571	0,5047	74850	1070	74320	1478160	19,75
67	0,01746	63383	1107	62830	1186723	18,72	0,98254	1	0,5	0,00229	0,01517	63383	1287	62096	1107	145	962	62830	1186723	18,72	0,86901	0,98481	0,5036	73780	1121	73224	1403840	19,03
68	0,01829	62276	1139	61707	1123894	18,05	0,98171	1	0,5	0,00227	0,01602	62276	1142	61134	1139	141	998	61707	1123894	18,05	0,87613	0,98396	0,5048	72659	1166	72082	1330616	18,31
69	0,01932	61137	1181	60547	1062187	17,37	0,98068	1	0,5	0,00177	0,01754	61137	1001	60136	1181	109	1073	60547	1062187	17,37	0,90813	0,98244	0,5059	71494	1255	70874	1258534	17,60
70	0,02059	59956	1234	59339	1001640	16,71	0,97941	1	0,5	0,00149	0,01909	59956	893	59064	1234	89	1145	59339	1001640	16,71	0,92749	0,98089	0,5044	70238	1342	69573	1187661	16,91
71	0,02212	58722	1299	58073	942301	16,05	0,97788	1	0,5	0,00185	0,02027	58722	803	57919	1299	109	1190	58073	942301	16,05	0,91640	0,97971	0,5042	68896	1398	68203	1118087	16,23
72	0,02393	57423	1374	56736	884228	15,40	0,97607	1	0,5	0,00196	0,02196	57423	695	56729	1374	113	1261	56736	884228	15,40	0,91798	0,97802	0,5059	67499	1484	66766	1049884	15,55
73	0,02603	56049	1459	55320	827492	14,76	0,97397	1	0,5	0,00168	0,02435	56049	582	55467	1459	94	1365	55320	827492	14,76	0,93559	0,97562	0,5064	66015	1609	65221	983118	14,89
74	0,02845	54590	1553	53814	772172	14,14	0,97155	1	0,5	0,00161	0,02684	54590	488	54102	1553	88	1465	53814	772172	14,14	0,94352	0,97314	0,5060	64406	1730	63551	917898	14,25
75	0,03117	53037	1653	52211	718358	13,54	0,96883	1	0,5	0,00152	0,02966	53037	400	52637	1653	80	1573	52211	718358	13,54	0,95139	0,97032	0,5065	62676	1860	61758	854347	13,63
76	0,03420	51384	1757	50505	666148	12,96	0,96580	1	0,5	0,00097	0,03323	51384	320	51064	1757	50	1708	50505	666148	12,96	0,97170	0,96675	0,5064	60815	2022	59817	792589	13,03
77	0,03753	49627	1862	48695	615642	12,41	0,96247	1	0,5	0,00063	0,03689	49627	270	49356	1862	31	1831	48695	615642	12,41	0,98316	0,96309	0,5053	58793	2170	57720	732772	12,46
78	0,04118	47764	1967	46781	566947	11,87	0,95882	1	0,5	0,00062	0,04055	47764	239	47525	1967	30	1937	46781	566947	11,87	0,98485	0,95943	0,5046	56623	2297	55485	675052	11,92
79	0,04527	45798	2073	44761	520166	11,36	0,95473	1	0,5	0,00069	0,04457	45798	209	45588	2073	32	2041	44761	520166	11,36	0,98466	0,95541	0,5050	54326	2422	53127	619567	11,40
80	0,05003	43724	2188	42631	475405	10,87	0,94997	1	0,5	0,00014	0,04989	43724	177	43547	2188	6	2181	42631	475405	10,87	0,99720	0,95011	0,5047	51904	2590	50621	566440	10,91
81	0,05584	41537	2319	40377	432774	10,42	0,94416	1	0,5	0,00087	0,05496	41537	171	41366	2319	36	2283	40377	432774	10,42	0,98438	0,94501	0,5047	49314	2712	47971	515818	10,46
82	0,06319	39218	2478	37978	392397	10,01	0,93681	1	0,5	0,00103	0,06216	39218	135	39083	2478	40	2438	37978	392397	10,01	0,98371	0,93780	0,5063	46603	2899	45172	467847	10,04
83	0,07269	36739	2671	35404	354419	9,65	0,92731	1	0,5	0,00071	0,07199	36739	94	36645	2671	26	2645	35404	354419	9,65	0,99029	0,92799	0,5069	43704	3147	42152	422675	9,67
84	0,08499	34069	2895	32621	319015	9,36	0,91501	1	0,5	0,00060	0,08439	34069	69	34000	2895	21	2875	32621	319015	9,36	0,99291	0,91559	0,5002	40557	3423	38846	380523	9,38
85	1,00000	31173	31173	286394	286394	9,19	0,00000			0,00154	0,99846	31173	48	31125	31173	48	31125	286394	286394	9,19	0,99846	0,00000	9,2014	37133	37133	341678	341678	9,20