

**DISABILITY AND DEATH PROBABILITY TABLES  
FOR INSURED WORKERS BORN IN 1996**

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**Introduction**

The Social Security program is not just a program for providing income during retirement. Workers who meet certain requirements for insured status may receive monthly cash benefits before retirement age if they have impairments resulting in disability.<sup>1</sup> Survivors may receive benefits after the death of an insured worker, retired worker, or a disabled worker. This note illustrates the likelihood that a young worker, while maintaining insured status, will become disabled or die, resulting in payment of disability or survivor benefits prior to becoming eligible for full retirement benefits. We make these illustrations using the intermediate assumptions of the 2016 Trustees Report. This note succeeds *Actuarial Note Number 2015.6*, which was based on the intermediate assumptions of the 2015 Trustees Report.

We make projections of the number of insured workers who die or become disabled each year for the next 75 years. These projections depend on the age-sex-specific projections of mortality and disability incidence, and age-sex-duration-specific projections of disabled-life mortality and recovery. Additional information regarding these projections is provided in annual reports of the Board of Trustees of the Old-Age and Survivors Insurance and Disability Insurance Trust Funds (Trustees Reports) and in actuarial studies.<sup>2</sup>

Using rates of death, recovery, and disability incidence from the intermediate assumptions, we present estimates of the probability that an illustrative worker will become disabled or die before reaching normal retirement age. We define an illustrative worker in this note as follows: (a) born in 1996, that is, belongs to the 1996 birth cohort; (b) becomes insured at age 20 in 2016; (c) maintains insured status thereafter; and (d) retires at Normal Retirement Age. Normal retirement age, the age at which full Social Security benefits can be received, is age 67 for our illustrative worker. Tables A and B compare these estimates using the 1996 birth cohort with those published in prior years. The projected probabilities of death before normal retirement age have

decreased between the 1966 and 1996 cohorts, reflecting in part the actual improvement in mortality experience between 1986 and 2016. The projected probability of becoming disabled before normal retirement age has decreased for insured men between the 1966 and 1996 cohorts, but has increased for insured women. For the 1996 birth cohort, we project that the probability of surviving from age 20 to normal retirement age without ever being disabled is 64 percent for males and 70 percent for females. Comparable probabilities projected for the 1966 birth cohort are 58 percent for males and 70 percent for females.

Table B shows the total projected probability of death as the sum of the probability of death while disabled and the probability of death while not disabled. Between the 1995 and 1996 cohorts, the projected probability of death before normal retirement age decreased slightly for males and stayed essentially the same for females. However, the projected probability of becoming disabled (as shown in Table A) decreased slightly between these cohorts.

**Assumptions and Methods**

Tables C and D show disability and death probabilities for insured males and females, respectively, who were born in 1996. We derive death and disability rates by sex and single year of age (20 through 67) for four population groups: total, active, disabled, and recovered. The active group is composed of insured workers who are alive and have never been disabled. The disabled group consists of workers who are currently entitled to receive a Social Security disabled worker benefit. The recovered group consists of insured workers who have had a prior disability, but are not currently entitled to receive a disabled worker benefit. All workers are assumed to be fully and disability insured at all times after reaching age 20.<sup>3</sup> For each age, we calculate deaths, entitlements to disability-worker-benefits, and recoveries from the disability rolls. For each population group (active, disabled, recovered, and total), we determine the number of persons alive at the beginning of the next year by adding

<sup>1</sup> Disabled means inability to engage in any substantial gainful activity as a result of physical or mental impairments.

<sup>2</sup> These publications may be found at: <http://www.ssa.gov/OACT/pubs.html>.

<sup>3</sup> Computing disability incidence rates by age using insured workers gives a larger probability of disability entitlement than if all workers were included in the calculations.

or subtracting the relevant components of change to the number of persons alive at the beginning of the year.

For those born in 1996, we develop cohort insured life tables for each sex, from age 20 to age 67. To calculate total deaths for the insured population, we apply the age-sex-specific mortality rates of the general population to the total population at the beginning of the year.<sup>4</sup>

We calculate deaths for the disabled population by applying age-sex-duration-specific<sup>5</sup> mortality rates to the disabled population at the beginning of the year. We assume that newly entitled disabled-worker beneficiaries, that is, those in duration 0, are exposed for half a year, since on average they become entitled at mid-year. We calculate deaths for those who have recovered from disability (“recovered deaths”) by applying the age-sex-specific mortality rates of the general population to the recovered population at the beginning of the year, with adjustments. To make these adjustments, we add half of the newly recovered population and subtract half of those newly disabled from the recovered population. Active deaths are the residual: we subtract the disabled deaths and recovered deaths from the total population deaths.

We develop cohort disability incidence rates for each sex, from age 20 to age 67, for those born in 1996. To calculate the number of new disabled-worker beneficiaries, we apply the age-sex-specific incidence rates to the active and recovered populations at the beginning of the year.

Finally, we develop rates of recovery from disability for each sex, from age 20 to age 67, for those born in 1996. To calculate the number of recoveries from the disabled population, we apply age-sex-duration-specific<sup>5</sup> recovery rates to the beginning of the year disabled popula-

tion. We assume that newly entitled disabled-worker beneficiaries (in duration 0) are exposed for half a year.

## Results

Table C provides tabulations which allow for the computation of various probabilities of survival, death, and disability for insured males born in 1996. Table D provides the same information for insured females born in 1996. For example, the probability that an insured female, age 25 in 2021, will survive to age 60 without ever becoming disabled is 79 percent. To get this result, we divide the number of active lives at age 60 (777,907) by the number of active lives at age 25 (989,860).

Table E uses the tabulations in tables C and D to derive various probabilities of disability, death, and survival for insured males and females born in 1996. We calculate the probability of survival without disability from age 20 to age  $x$  by dividing the active population at the beginning of the year at age  $x$  by the active population at the beginning of the year at age 20. The probability of dying or becoming disabled after age 20 and before age  $x$  is calculated as the complement, that is, 1 minus the probability of surviving without disability from age 20 to age  $x$ . For example, we project that an insured male worker who attained age 20 in 2016 has a 64 percent chance of surviving to age 67 without ever becoming disabled and a 36 percent chance of either dying or becoming disabled prior to age 67.

Table E also includes probabilities of an insured worker becoming disabled and of an insured worker dying while never disabled. These probabilities are shown from age 20 to age  $x$ . We calculate these values by dividing the total newly disabled and the total deaths from the active population prior to age  $x$ , respectively, by the active population alive at the beginning of the year at age 20. For example, we project that an insured female worker who attained age 20 in 2016 has a 19 percent chance of becoming disabled before age 60. In addition, the probability that she will die before age 60 without ever receiving Social Security disability benefits is only 3 percent.

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<sup>4</sup> Using general population mortality rates may slightly overstate death rates for the insured population because the group excluded, the uninsured, are likely to have higher death rates than the general population.

<sup>5</sup> Age is age at entitlement to a disabled-worker benefit. Duration refers to the complete number of years since entitlement to a disabled-worker benefit.

**Table A: Probability of Disability and Death for Illustrative Cases of Insured Workers**

Trustees Report Year <sup>1</sup> (Year of Attainment of Age 20)	Year of Birth	Probability of Disability Before NRA			Probability of Death While Never Disabled Before NRA			Probability of Survival to NRA With No Disability		
		Male	Female	Total <sup>2</sup>	Male	Female	Total <sup>2</sup>	Male	Female	Total <sup>2</sup>
1986	1966	0.322	0.240	0.281	0.095	0.060	0.077	0.583	0.700	0.642
2011	1991	0.276	0.260	0.268	0.091	0.049	0.070	0.633	0.691	0.662
2012	1992	0.276	0.264	0.270	0.090	0.048	0.069	0.634	0.688	0.661
2013	1993	0.275	0.264	0.270	0.085	0.044	0.065	0.639	0.692	0.666
2014	1994	0.277	0.263	0.270	0.082	0.042	0.062	0.641	0.695	0.668
2015	1995	0.279	0.265	0.272	0.078	0.040	0.059	0.643	0.695	0.669
2016	1996	0.277	0.262	0.270	0.078	0.041	0.059	0.645	0.697	0.671

<sup>1</sup> Calculations are based on the intermediate assumptions of that year's Trustees Report (alternative II-B for the 1986 Trustees Report).

<sup>2</sup> Totals are obtained by combining tables C and D. For example, the probability of death while never disabled before NRA equals 5.9 percent for the 1996 birth cohort  $(78,281 + 40,684) / (1,000,000 + 1,000,000)$ .

Notes: Probabilities are determined assuming all illustrative workers are disability insured throughout their working lives.

For a recent historical perspective, see Actuarial Study 123, Social Security Disability Insurance Program Worker Experience, at:

<http://www.ssa.gov/OACT/NOTES/actstud.html>.

**Table B: Probability of Death for Illustrative Cases of Insured Workers by Disabled Status**

Trustees Report Year <sup>1</sup> (Year of Attainment of Age 20)	Year of Birth	(A) = (B) + (C)			(B)			(C)		
		Probability of Death Before NRA			Probability of Death While Disabled Before NRA			Probability of Death While Not Disabled Before NRA <sup>2</sup>		
		Male	Female	Total <sup>3</sup>	Male	Female	Total <sup>3</sup>	Male	Female	Total <sup>3</sup>
1986	1966	0.221	0.129	0.175	0.121	0.067	0.094	0.100	0.062	0.081
2011	1991	0.155	0.096	0.125	0.061	0.045	0.053	0.094	0.050	0.072
2012	1992	0.153	0.095	0.124	0.061	0.045	0.053	0.092	0.049	0.071
2013	1993	0.149	0.090	0.119	0.061	0.045	0.053	0.088	0.045	0.066
2014	1994	0.145	0.088	0.116	0.061	0.045	0.053	0.084	0.043	0.064
2015	1995	0.143	0.087	0.115	0.063	0.045	0.054	0.080	0.042	0.061
2016	1996	0.142	0.087	0.115	0.062	0.045	0.053	0.081	0.042	0.061

<sup>1</sup> Calculations are based on the intermediate assumptions of that year's Trustees Report (alternative II-B for the 1986 Trustees Report).

<sup>2</sup> Includes workers who recovered from disabilities.

<sup>3</sup> Totals are obtained by combining tables C and D. For example, the probability of death while disabled before NRA equals 5.3 percent for the 1996 birth cohort  $(61,744 + 45,148) / (1,000,000 + 1,000,000)$ .

Notes: Probabilities are determined assuming all illustrative workers are disability insured throughout their working lives.

For a recent historical perspective, see Actuarial Study 123, Social Security Disability Insurance Program Worker Experience, at:

<http://www.ssa.gov/OACT/NOTES/actstud.html>.



**Table D: Disability and Death Probabilities for the Female 1996 Birth Cohort**

Age x	Living At Beginning Of Year				Deaths								Newly Disabled							
					Total		Active		Disabled		Recovered		Total		Active		Recovered		Newly Recovered	
	Total	Active	Disabled	Recovered	x to x+1	20 to x+1	x to x+1	20 to x+1	x to x+1	20 to x+1	x to x+1	20 to x+1	x to x+1	20 to x+1	x to x+1	20 to x+1	x to x+1	20 to x+1		
20	1,000,000	1,000,000	0	0	348	348	343	343	5	5	0	0	1,518	1,518	1,518	1,518	0	0	3	3
21	999,652	998,139	1,510	3	384	732	369	712	15	20	0	0	1,581	3,099	1,581	3,099	0	0	11	14
22	999,268	996,189	3,065	14	417	1,149	393	1,105	24	44	0	0	1,673	4,772	1,673	4,772	0	0	22	36
23	998,851	994,123	4,692	36	443	1,592	409	1,514	34	78	0	0	1,717	6,489	1,717	6,489	0	0	35	71
24	998,408	991,997	6,340	71	466	2,058	421	1,935	45	123	0	0	1,716	8,205	1,716	8,205	0	0	61	132
25	997,942	989,860	7,950	132	489	2,547	430	2,365	59	182	0	0	1,519	9,724	1,519	9,724	0	0	136	268
26	997,453	987,911	9,274	268	513	3,060	443	2,808	70	252	0	0	1,382	11,106	1,382	11,106	0	0	219	487
27	996,940	986,086	10,367	487	538	3,598	459	3,267	79	331	0	0	1,459	12,565	1,458	12,564	1	1	258	745
28	996,402	984,169	11,489	744	563	4,161	476	3,743	86	417	1	1	1,535	14,100	1,534	14,098	1	2	287	1,032
29	995,839	982,159	12,651	1,029	590	4,751	494	4,237	95	512	1	2	1,613	15,713	1,611	15,709	2	4	303	1,335
30	995,249	980,054	13,866	1,329	618	5,369	500	4,737	117	629	1	3	1,845	17,558	1,843	17,552	2	6	342	1,677
31	994,631	977,711	15,252	1,668	647	6,016	508	5,245	138	767	1	4	2,124	19,682	2,120	19,672	4	10	381	2,058
32	993,984	975,083	16,857	2,044	673	6,689	515	5,760	156	923	2	6	2,309	21,991	2,304	21,976	5	15	400	2,458
33	993,311	972,264	18,610	2,437	697	7,386	513	6,273	182	1,105	2	8	2,524	24,515	2,518	24,494	6	21	418	2,876
34	992,614	969,233	20,534	2,847	721	8,107	511	6,784	208	1,313	2	10	2,749	27,264	2,741	27,235	8	29	436	3,312
35	991,893	965,981	22,639	3,273	749	8,856	516	7,300	230	1,543	3	13	2,929	30,193	2,919	30,154	10	39	462	3,774
36	991,144	962,546	24,876	3,722	783	9,639	519	7,819	261	1,804	3	16	3,084	33,277	3,072	33,226	12	51	479	4,253
37	990,361	958,955	27,220	4,186	820	10,459	527	8,346	289	2,093	4	20	3,285	36,562	3,271	36,497	14	65	514	4,767
38	989,541	955,157	29,702	4,682	858	11,317	535	8,881	319	2,412	4	24	3,481	40,043	3,464	39,961	17	82	529	5,296
39	988,683	951,158	32,335	5,190	901	12,218	538	9,419	358	2,770	5	29	3,702	43,745	3,682	43,643	20	102	547	5,843
40	987,782	946,938	35,132	5,712	948	13,166	555	9,974	387	3,157	6	35	3,922	47,667	3,898	47,541	24	126	596	6,439
41	986,834	942,485	38,071	6,278	1,008	14,174	591	10,565	410	3,567	7	42	4,147	51,814	4,120	51,661	27	153	625	7,064
42	985,826	937,774	41,183	6,869	1,089	15,263	617	11,182	464	4,031	8	50	4,372	56,186	4,340	56,001	32	185	637	7,701
43	984,737	932,817	44,454	7,466	1,195	16,458	676	11,858	510	4,541	9	59	4,615	60,801	4,578	60,579	37	222	656	8,357
44	983,542	927,563	47,903	8,076	1,324	17,782	748	12,606	565	5,106	11	70	4,841	65,642	4,799	65,378	42	264	660	9,017
45	982,218	922,016	51,519	8,683	1,459	19,241	821	13,427	625	5,731	13	83	5,192	70,834	5,144	70,522	48	312	702	9,719
46	980,759	916,051	55,384	9,324	1,597	20,838	884	14,311	697	6,428	16	99	5,553	76,387	5,497	76,019	56	368	755	10,474
47	979,162	909,670	59,485	10,007	1,746	22,584	965	15,276	763	7,191	18	117	5,771	82,158	5,708	81,727	63	431	757	11,231
48	977,416	902,997	63,736	10,683	1,905	24,489	1,041	16,317	843	8,034	21	138	5,967	88,125	5,897	87,624	70	501	754	11,985
49	975,511	896,059	68,106	11,346	2,071	26,560	1,104	17,421	942	8,976	25	163	6,141	94,266	6,064	93,688	77	578	717	12,702
50	973,440	888,891	72,588	11,961	2,246	28,806	1,227	18,648	991	9,967	28	191	7,399	101,665	7,301	100,989	98	676	744	13,446
51	971,194	880,363	78,252	12,579	2,418	31,224	1,291	19,939	1,095	11,062	32	223	8,860	110,525	8,735	109,724	125	801	735	14,181
52	968,776	870,337	85,282	13,157	2,572	33,796	1,299	21,238	1,237	12,299	36	259	8,896	119,421	8,764	118,488	132	933	726	14,907
53	966,204	860,274	92,215	13,715	2,702	36,498	1,320	22,558	1,343	13,642	39	298	8,767	128,188	8,629	127,117	138	1,071	724	15,631
54	963,502	850,325	98,915	14,262	2,814	39,312	1,290	23,848	1,482	15,124	42	340	8,965	137,153	8,817	135,934	148	1,219	659	16,290
55	960,688	840,218	105,739	14,731	2,953	42,265	1,366	25,214	1,541	16,665	46	386	10,085	147,238	9,911	145,845	174	1,393	683	16,973
56	957,735	828,941	113,600	15,194	3,107	45,372	1,430	26,644	1,627	18,292	50	436	11,452	158,690	11,246	157,091	206	1,599	686	17,659
57	954,628	816,265	122,739	15,624	3,227	48,599	1,406	28,050	1,767	20,059	54	490	11,588	170,278	11,370	168,461	218	1,817	643	18,302
58	951,401	803,489	131,917	15,995	3,299	51,898	1,269	29,319	1,974	22,033	56	546	11,621	181,899	11,394	179,855	227	2,044	634	18,936
59	948,102	790,826	140,930	16,346	3,355	55,253	1,088	30,407	2,209	24,242	58	604	12,076	193,975	11,831	191,686	245	2,289	601	19,537
60	944,747	777,907	150,196	16,644	3,410	58,663	1,035	31,442	2,314	26,556	61	665	11,993	205,968	11,742	203,428	251	2,540	673	20,210
61	941,337	765,130	159,202	17,005	3,534	62,197	968	32,410	2,501	29,057	65	730	11,983	217,951	11,722	215,150	261	2,801	727	20,937
62	937,803	752,440	167,957	17,406	3,803	66,000	972	33,382	2,760	31,817	71	801	12,267	230,218	11,990	227,140	277	3,078	647	21,584
63	934,000	739,478	176,817	17,705	4,263	70,263	1,127	34,509	3,055	34,872	81	882	11,754	241,972	11,479	238,619	275	3,353	526	22,110
64	929,737	726,872	184,990	17,875	4,872	75,135	1,446	35,955	3,332	38,204	94	976	9,971	251,943	9,732	248,351	239	3,592	465	22,575
65	924,865	715,694	191,164	18,007	5,590	80,725	2,101	38,056	3,380	41,584	109	1,085	7,969	259,912	7,773	256,124	196	3,788	358	22,933
66	919,275	705,820	195,395	18,060	6,317	87,042	2,628	40,684	3,564	45,148	125	1,210	6,013	265,925	5,863	261,987	150	3,938	294	23,227
67	912,958	697,329	197,550	18,079																

**Table E: Probabilities of Disability, Death, and Survival for Insured Workers Attaining Age 20 in 2016  
(1996 Birth Cohort)**

Males Attaining Age 20 in 2016					Females Attaining Age 20 in 2016				
Age x	Probability of Survival With No Disability From Age 20 To Age x	Probability of Disability From Age 20 To Age x	Probability of Death While Never Disabled From Age 20 To Age x	Probability of Death or Disability From Age 20 To Age x	Age x	Probability of Survival With No Disability From Age 20 To Age x	Probability of Disability From Age 20 To Age x	Probability of Death While Never Disabled From Age 20 To Age x	Probability of Death or Disability From Age 20 To Age x
21	99.7	0.2	0.1	0.3	21	99.8	0.2	0.0	0.2
22	99.3	0.5	0.2	0.7	22	99.6	0.3	0.1	0.4
23	98.9	0.7	0.3	1.1	23	99.4	0.5	0.1	0.6
24	98.6	1.0	0.4	1.4	24	99.2	0.6	0.2	0.8
25	98.2	1.3	0.5	1.8	25	99.0	0.8	0.2	1.0
26	97.8	1.5	0.7	2.2	26	98.8	1.0	0.2	1.2
27	97.6	1.7	0.8	2.4	27	98.6	1.1	0.3	1.4
28	97.3	1.8	0.9	2.7	28	98.4	1.3	0.3	1.6
29	97.0	2.0	1.0	3.0	29	98.2	1.4	0.4	1.8
30	96.7	2.2	1.1	3.3	30	98.0	1.6	0.4	2.0
31	96.4	2.4	1.2	3.6	31	97.8	1.8	0.5	2.2
32	96.0	2.6	1.4	4.0	32	97.5	2.0	0.5	2.5
33	95.7	2.8	1.5	4.3	33	97.2	2.2	0.6	2.8
34	95.3	3.1	1.6	4.7	34	96.9	2.4	0.6	3.1
35	95.0	3.3	1.7	5.0	35	96.6	2.7	0.7	3.4
36	94.6	3.6	1.8	5.4	36	96.3	3.0	0.7	3.7
37	94.2	3.9	1.9	5.8	37	95.9	3.3	0.8	4.1
38	93.8	4.2	2.0	6.2	38	95.5	3.6	0.8	4.5
39	93.4	4.5	2.1	6.6	39	95.1	4.0	0.9	4.9
40	92.9	4.8	2.2	7.1	40	94.7	4.4	0.9	5.3
41	92.5	5.2	2.3	7.5	41	94.2	4.8	1.0	5.8
42	92.0	5.6	2.4	8.0	42	93.8	5.2	1.1	6.2
43	91.5	6.0	2.5	8.5	43	93.3	5.6	1.1	6.7
44	90.9	6.4	2.7	9.1	44	92.8	6.1	1.2	7.2
45	90.4	6.8	2.8	9.6	45	92.2	6.5	1.3	7.8
46	89.8	7.3	2.9	10.2	46	91.6	7.1	1.3	8.4
47	89.1	7.8	3.1	10.9	47	91.0	7.6	1.4	9.0
48	88.4	8.3	3.2	11.6	48	90.3	8.2	1.5	9.7
49	87.7	8.9	3.4	12.3	49	89.6	8.8	1.6	10.4
50	87.0	9.4	3.6	13.0	50	88.9	9.4	1.7	11.1
51	86.1	10.1	3.8	13.9	51	88.0	10.1	1.9	12.0
52	85.1	10.9	4.0	14.9	52	87.0	11.0	2.0	13.0
53	84.0	11.8	4.2	16.0	53	86.0	11.8	2.1	14.0
54	82.9	12.6	4.5	17.1	54	85.0	12.7	2.3	15.0
55	81.8	13.5	4.7	18.2	55	84.0	13.6	2.4	16.0
56	80.6	14.5	5.0	19.4	56	82.9	14.6	2.5	17.1
57	79.1	15.7	5.3	20.9	57	81.6	15.7	2.7	18.4
58	77.6	16.9	5.5	22.4	58	80.3	16.8	2.8	19.7
59	76.1	18.1	5.8	23.9	59	79.1	18.0	2.9	20.9
60	74.6	19.4	6.1	25.4	60	77.8	19.2	3.0	22.2
61	73.0	20.8	6.3	27.0	61	76.5	20.3	3.1	23.5
62	71.3	22.2	6.5	28.7	62	75.2	21.5	3.2	24.8
63	69.6	23.7	6.7	30.4	63	73.9	22.7	3.3	26.1
64	68.0	25.1	6.9	32.0	64	72.7	23.9	3.5	27.3
65	66.6	26.3	7.2	33.4	65	71.6	24.8	3.6	28.4
66	65.4	27.1	7.5	34.6	66	70.6	25.6	3.8	29.4
67	64.5	27.7	7.8	35.5	67	69.7	26.2	4.1	30.3

Note: Totals do not necessarily equal the sums of rounded components.