Supplementary Material

Sex and Gender Differences in Environmental Influences on Dementia Incidence in Germany, 2014-2019: An Observational Cohort Study Based on Health Claims Data

Supplementary Table 1. Descriptive overview of individual level covariates by sex at entry into the study, AOK data

Covariates	Persons at entry Q1 2015		Men at entry Q1 2015		Women at entry Q1 2015	
	Absolute	%	Absolute	%Col	Absolute	%Col
Sex:						
Males	33,792	38.89%				
Females	53,106	61.11%				
Age:						
70-74	23,256	26.76%	10,468	30.98%	12,788	24.09%
75-79	30,476	35.07%	12,643	37.41%	17,833	33.59%
80-84	18,842	21.68%	6,855	20.29%	11,987	22.58%
85-89	10,235	11.78%	2,992	8.85%	7,243	13.64%
90+	4,089	4.71%	834	2.47%	3,255	6.13%
Removal:						
No	86,416	99.45%	33,633	99.53%	52,783	99.43%
Yes	482	0.55%	159	0.47%	323	0.61%
Multi-morbidity score:						
No severe disease	20,001	23.02%	6,415	18.98%	13,586	25.59%
One severe disease	20,453	23.54%	6,983	20.66%	13,470	25.37%
Two severe diseases	17,619	20.28%	6,769	20.03%	10,850	20.44%
Three and more severe diseases	28,825	33.17%	13,625	40.32%	15,200	28.63%
Total	**86,898**	**100.00%**	**33,792**	**100.00%**	**53,088**	**100.00%**

Supplementary Table 2. Descriptive overview of macro level covariates by sex at entry into the study, AOK data

Covariates	Persons at entry Q1 2015		Men at entry Q1 2015		Women at entry Q1 2015	
	Absolute	%	Absolute	%Col	Absolute	%Col
AOK-share:						
First sextile (lowest)	8,516	9.80%	3,315	9.81%	5,201	9.80%
Second sextile	12,885	14.83%	5,049	14.94%	7,836	14.76%
Third sextile	12,118	13.95%	4,745	14.04%	7,373	13.89%
Fourth sextile	15,360	17.68%	5,925	17.53%	9,435	17.77%
Fifth sextile	15,776	18.15%	6,165	18.24%	9,611	18.10%
Sixth sextile (highest)	20,949	24.11%	8,070	23.88%	12,879	24.26%
Missing data/not in Germany	1,294	1.49%	523	1.55%	771	1.45%
Territory:						
West Germany	61,228	70.46%	23,814	70.47%	37,414	70.48%
East Germany/Berlin	24,395	28.07%	9,478	28.05%	14,917	28.10%
Missing data/not in Germany	1,275	1.47%	500	1.48%	775	1.46%
Average household income per person in € in 2014:						
First tertile (lowest)	33,057	38.04%	12,781	37.82%	20,276	38.19%
Second tertile	23,865	27.46%	9,227	27.31%	14,638	27.57%
Third tertile (highest)	28,666	32.99%	11,256	33.31%	17,410	32.79%
Missing data/not in Germany	1,310	1.51%	528	1.56%	782	1.47%
%Long-term unemployed persons in all unemployed persons in 2014:						
First tertile (lowest)	22,962	26.42%	8,946	26.47%	14,016	26.40%
Second tertile	32,089	36.93%	12,532	37.09%	19,557	36.84%
Third tertile (highest)	30,537	35.14%	11,786	34.88%	18,751	35.32%
Missing data/not in Germany	1,310	1.51%	528	1.56%	782	1.47%
%Persons aged 65+ with highest education in all persons 65+ in 2011:						
First tertile (lowest)	20,890	24.04%	7,988	23.64%	12,902	24.30%
Second tertile	31,620	36.39%	12,220	36.16%	19,400	36.54%
Third tertile (highest)	33,078	38.07%	13,056	38.64%	20,022	37.71%
Missing data/not in Germany	1,310	1.51%	528	1.56%	782	1.47%
Persons per sqkm of total area in 2014:						
First tertile (lowest)	25,357	29.18%	9,784	28.95%	15,573	29.33%
Second tertile	29,378	33.81%	11,484	33.98%	17,894	33.71%
Third tertile (highest)	30,853	35.50%	11,996	35.50%	18,857	35.52%
Missing data/not in Germany	1,310	1.51%	528	1.56%	782	1.47%
%Area in natural state in total area in 2016:						
First tertile (lowest)	31,946	36.76%	12,448	36.84%	19,498	36.73%
Second tertile	24,416	28.10%	9,537	28.22%	14,879	28.03%
Third tertile (highest)	29,226	33.63%	11,279	33.38%	17,947	33.81%
Missing data/not in Germany	1,310	1.51%	528	1.56%	782	1.47%
Remaining life expectancy at age 60 in 2014:						
First tertile (lowest)	24,334	28.00%	9,336	27.63%	14,998	28.25%
Second tertile	32,875	37.83%	12,787	37.84%	20,088	37.84%
Third tertile (highest)	28,379	32.66%	11,141	32.97%	17,238	32.47%
Missing data/not in Germany	1,310	1.51%	528	1.56%	782	1.47%
Total	**86,898**	**100.00%**	**33,792**	**100.00%**	**53,088**	**100.00%**

Supplementary Table 3. Incidence rates of dementia in 100 person-years (PY) by individual level covariates and sex, 2015-2019, AOK data

Covariates	Persons				Men				Women			
	Rate per 100 P-Y	95% confidence interval	Events	Person-Years	Rate per 100 P-Y	95% confidence interval	Events	Person-Years	Rate per 100 P-Y	95% confidence interval	Events	Person-Years
Sex:												
Males	3.8065	3.7039 - 3.9119	5,148	135,244								
Females	4.4157	4.3281 - 4.5050	9,575	216,840								
Age:												
70-74	1.7279	1.6093 - 1.8552	760	43,985	1.8223	1.6433 - 2.0209	359	19,700	1.6512	1.4973 - 1.8210	401	24,285
75-79	2.5070	2.4245 - 2.5924	3,428	136,736	2.6333	2.5039 - 2.7694	1,513	57,457	2.4155	2.3097 - 2.5262	1,915	79,279
80-84	4.3957	4.2672 - 4.5280	4,369	99,394	4.3174	4.1123 - 4.5327	1,622	37,569	4.4432	4.2801 - 4.6125	2,747	61,825
85-89	7.3882	7.1554 - 7.6286	3,747	50,716	7.4403	7.0266 - 7.8783	1,174	15,779	7.3647	7.0856 - 7.6549	2,573	34,937
90+	11.3817	10.9370 - 11.8444	2,419	21,254	10.1298	9.2629 - 11.0778	480	4,739	11.7408	11.2297 - 12.2752	1,939	16,515
Removal:												
No	3.9207	3.8557 - 3.9869	13,723	350,011	3.5955	3.4956 - 3.6983	4,837	134,528	4.1238	4.0389 - 4.2104	8,886	215,483
Yes	48.2509	45.3511 - 51.3361	1,000	2,073	0.4345	0.3888 - 0.4856	311	716	50.7831	47.1293 - 54.7202	689	1,357
Multi-morbidity score:												
No severe disease	1.8005	1.7002 - 1.9067	1,169	64,927	1.3898	1.2362 - 1.5626	280	20,146	1.9852	1.8589 - 2.1201	889	44,781
One severe disease	2.9189	2.7980 - 3.0451	2,146	73,520	0.0252	0.0233 - 0.0273	612	24,243	3.1130	2.9610 - 3.2727	1,534	49,278
Two severe diseases	3.7830	3.6414 - 3.9302	2,638	69,733	0.0304	0.0283 - 0.0326	781	25,716	4.2188	4.0312 - 4.4151	1,857	44,017
Three and more severe diseases	6.0944	5.9681 - 6.2233	8,770	143,904	0.0533	0.0516 - 0.0552	3,475	65,139	6.7226	6.5439 - 6.9061	5,295	78,765
AOK-share:												
First sextile (lowest)	4.3148	4.0985 - 4.5424	1,453	33,675	4.0611	3.7285 - 4.4235	526	12,952	4.4733	4.1944 - 4.7707	927	20,723
Second sextile	4.3699	4.1934 - 4.5538	2,261	51,741	3.9549	3.6899 - 4.2391	798	20,177	4.6351	4.4036 - 4.8788	1,463	31,563
Third sextile	4.2500	4.0717 - 4.4361	2,091	49,200	3.9709	3.6955 - 4.2667	744	18,737	4.4216	4.1917 - 4.6642	1,347	30,464
Fourth sextile	4.1150	3.9590 - 4.2771	2,573	62,528	3.5561	3.3250 - 3.8032	851	23,931	4.4615	4.2557 - 4.6773	1,722	38,597
Fifth sextile	4.0753	3.9228 - 4.2338	2,640	64,781	3.9039	3.6667 - 4.1566	977	25,026	4.1832	3.9869 - 4.3891	1,663	39,755
Sixth sextile (highest)	4.3676	4.2291 - 4.5108	3,695	84,600	3.8701	3.6612 - 4.0910	1,247	32,221	4.6737	4.4922 - 4.8626	2,448	52,378
Missing data/not in Germany	0.1798	0.0968 - 0.3343	10	5,560	0.2273	0.0946 - 0.5460	5	2,200	0.1488	0.0619 - 0.3575	5	3,360
Territory:												
West Germany	4.1287	4.0496 - 4.2094	10,258	248,456	3.8139	3.6920 - 3.9399	3,637	95,361	4.3248	4.2219 - 4.4302	6,621	153,094
East Germany/Berlin	4.5409	4.4096 - 4.6762	4,459	98,196	3.9935	3.7969 - 4.2002	1,508	37,762	4.8830	4.7099 - 5.0624	2,951	60,435
Missing data/not in Germany	0.1105	0.0496 - 0.2459	6	5,432	0.1414	0.0456 - 0.4386	3	2,121	0.0906	0.0292 - 0.2809	3	3,311
Total	**4.1817**	**4.1147 - 4.2498**	**14,723**	**352,084**	**3.8065**	**3.7039 - 3.9119**	**5,148**	**135,244**	**4.4157**	**4.3281 - 4.5050**	**9,575**	**216,840**

Supplementary Table 4. Incidence rates of dementia in 100 person-years (PY) by macro level covariates and sex, 2015-2019, AOK data

Covariates	Persons				Men				Women			
	Rate per 100 P-Y	95% confidence interval	Events	Person-Years	Rate per 100 P-Y	95% confidence interval	Events	Person-Years	Rate per 100 P-Y	95% confidence interval	Events	Person-Years
Average household income per person in € in 2014:												
First tertile (lowest)	4.5635	4.4499 - 4.6799	6,050	132,575	4.0661	3.8943 - 4.2454	2,062	50,713	4.8716	4.7227 - 5.0252	3,988	81,862
Second tertile	4.3056	4.1766 - 4.4385	4,155	96,503	4.0277	3.8277 - 4.2383	1,480	36,745	4.4764	4.3099 - 4.6493	2,675	59,758
Third tertile (highest)	3.8408	3.7303 - 3.9546	4,508	117,370	3.5144	3.3464 - 3.6908	1,601	45,556	4.0479	3.9034 - 4.1978	2,907	71,815
Missing data/not in Germany	0.1774	0.0955 - 0.3298	10	5,636	0.2242	0.0933 - 0.5386	5	2,230	0.1468	0.0611 - 0.3527	5	3,406
%Long-term unemployed persons in all unemployed persons in 2014:												
First tertile (lowest)	3.9576	3.8325 - 4.0868	3,723	94,071	3.5695	3.3806 - 3.7690	1,299	36,391	4.2025	4.0385 - 4.3732	2,424	57,680
Second tertile	4.3281	4.2163 - 4.4429	5,606	129,527	3.9944	3.8229 - 4.1737	1,993	49,894	4.5371	4.3916 - 4.6875	3,613	79,632
Third tertile (highest)	4.3826	4.2671 - 4.5012	5,384	122,850	3.9612	3.7848 - 4.1459	1,851	46,728	4.6412	4.4907 - 4.7968	3,533	76,122
Missing data/not in Germany	0.1774	0.0955 - 0.3298	10	5,636	0.2242	0.0933 - 0.5386	5	2,230	0.1468	0.0611 - 0.3527	5	3,406
%Persons aged 65+ with highest education in all persons 65+ in 2011:												
First tertile (lowest)	4.3588	4.2204 - 4.5017	3,689	84,634	4.1621	3.9449 - 4.3913	1,337	32,123	4.4791	4.3017 - 4.6638	2,352	52,511
Second tertile	4.2038	4.0931 - 4.3176	5,390	128,217	3.7178	3.5507 - 3.8927	1,817	48,874	4.5032	4.3580 - 4.6533	3,573	79,343
Third tertile (highest)	4.2171	4.1085 - 4.3287	5,634	133,598	3.8238	3.6594 - 3.9955	1,989	52,017	4.4680	4.3253 - 4.6154	3,645	81,581
Missing data/not in Germany	0.1774	0.0955 - 0.3298	10	5,636	0.2242	0.0933 - 0.5386	5	2,230	0.1468	0.0611 - 0.3527	5	3,406
Persons per sqkm of total area in 2014:												
First tertile (lowest)	4.3762	4.2499 - 4.5062	4,480	102,373	3.9178	3.7267 - 4.1187	1,536	39,206	4.6606	4.4953 - 4.8321	2,944	63,168
Second tertile	4.1441	4.0302 - 4.2611	4,952	119,496	3.8201	3.6457 - 4.0029	1,759	46,046	4.3471	4.1990 - 4.5006	3,193	73,451
Third tertile (highest)	4.2391	4.1263 - 4.3550	5,281	124,579	3.8691	3.6967 - 4.0496	1,848	47,763	4.4691	4.3221 - 4.6211	3,433	76,817
Missing data/not in Germany	0.1774	0.0955 - 0.3298	10	5,636	0.2242	0.0933 - 0.5386	5	2,230	0.1468	0.0611 - 0.3527	5	3,406
%Area in natural state in total area in 2016:												
First tertile (lowest)	4.1797	4.0698 - 4.2925	5,415	129,555	3.8414	3.6730 - 4.0176	1,911	49,747	4.3905	4.2475 - 4.5383	3,504	79,808
Second tertile	4.2784	4.1516 - 4.4091	4,243	99,172	3.9400	3.7462 - 4.1439	1,510	38,325	4.4916	4.3263 - 4.6632	2,733	60,847
Third tertile (highest)	4.2941	4.1773 - 4.4141	5,055	117,721	3.8316	3.6549 - 4.0169	1,722	44,942	4.5796	4.4267 - 4.7378	3,333	72,779
Missing data/not in Germany	0.1774	0.0955 - 0.3298	10	5,636	0.2242	0.0933 - 0.5386	5	2,230	0.1468	0.0611 - 0.3527	5	3,406
Remaining life expectancy at age 60 in 2014:												
First tertile (lowest)	4.4764	4.3455 - 4.6112	4,360	97,400	3.9953	3.7964 - 4.2045	1,474	36,894	4.7697	4.5989 - 4.9470	2,886	60,507
Second tertile	4.4246	4.3128 - 4.5392	5,870	132,668	4.0831	3.9113 - 4.2624	2,079	50,918	4.6373	4.4920 - 4.7873	3,791	81,751
Third tertile (highest)	3.8521	3.7409 - 3.9665	4,483	116,380	3.5175	3.3488 - 3.6947	1,590	45,202	4.0645	3.9191 - 4.2153	2,893	71,177
Missing data/not in Germany	0.1774	0.0955 - 0.3298	10	5,636	0.2242	0.0933 - 0.5386	5	2,230	0.1468	0.0611 - 0.3527	5	3,406
Total	**4.1817**	**4.1147 - 4.2498**	**14,723**	**352,084**	**3.8065**	**3.7039 - 3.9119**	**5,148**	**135,244**	**4.4157**	**4.3281 - 4.5050**	**9,575**	**216,840**

Supplementary Table 5. Individual level covariates: hazard ratios of the interaction effects with sex. Models 4a-4e controlled for all macro level covariates, but not adjusted for multi-morbidity, AOK data. *Hazard ratios of interaction effects depicted separately for men and women, bold = p<0.10

		Model 4a-4e							
		Men*				Women*			
Covariates		Hazard Ratio	Std. Error	p-value	95%-confidence interval	Hazard Ratio	Std. Error	p-value	95%-confidence interval
Age	70-74	1.00				1.00			
	75-79	**1.45**	**0.09**	**<0.001**	**1.29 - 1.62**	**1.45**	**0.08**	**<0.001**	**1.31 - 1.62**
	80-84	**2.36**	**0.14**	**<0.001**	**2.10 - 2.65**	**2.63**	**0.14**	**<0.001**	**2.37 - 2.92**
	85-89	**3.95**	**0.24**	**<0.001**	**3.51 - 4.45**	**4.18**	**0.22**	**<0.001**	**3.77 - 4.65**
	90+	**5.23**	**0.37**	**<0.001**	**4.56 - 6.00**	**6.46**	**0.35**	**<0.001**	**5.80 - 7.19**
Change of residence	No	1.00				1.00			
	Yes	**10.87**	**0.64**	**<0.001**	**9.69 - 12.20**	**9.85**	**0.39**	**<0.001**	**9.11 - 10.65**
AOK-share	First sextile (lowest)	1.00				1.00			
	Second sextile	0.98	0.06	0.751	0.88 - 1.10	1.03	0.05	0.457	0.95 - 1.13
	Third sextile	0.98	0.06	0.689	0.87 - 1.10	0.99	0.04	0.804	0.90 - 1.08
	Fourth sextile	**0.88**	**0.05**	**0.024**	**0.78 - 0.98**	0.99	0.04	0.797	0.90 - 1.08
	Fifth sextile	0.95	0.06	0.392	0.85 - 1.07	0.95	0.04	0.225	0.86 - 1.04
	Sixth sextile (highest)	***0.89***	***0.05***	***0.059***	***0.79 - 1.00***	0.96	0.05	0.449	0.87 - 1.06
	Missing data/not in Germany	-				-			
Territory	West Germany	1.00				1.00			
	East Germany/Berlin	0.94	0.04	0.164	0.86 - 1.03	0.98	0.04	0.570	0.91 - 1.06
	Missing data/not in Germany	-				-			

Supplementary Table 6. Macro-level covariates: Hazard ratios of the interaction effects with sex. Models 4f-4k controlled for age, sex, relocation, AOK-share, and territory, but not adjusted for multi-morbidity, AOK data. *Hazard ratios of interaction effects depicted separately for men and women, bold = p<0.10

		Model 4f-4k							
		Men*				Women*			
Covariates		Hazard Ratio	Std. Error	p-value	95%-confidence interval	Hazard Ratio	Std. Error	p-value	95%-confidence interval
Average household income per person in € in 2014	First tertile (lowest)	1.00				1.00			
	Second tertile	0.95	0.04	0.176	0.88 - 1.02	**0.90**	**0.03**	**0.002**	**0.85 - 0.96**
	Third tertile (highest)	**0.87**	**0.04**	**<0.001**	**0.80 - 0.94**	**0.87**	**0.03**	**<0.001**	**0.82 - 0.93**
	Missing data/not in Germany	-				-			
%Long-term unemployed persons (unemployed for one year and longer) in all unemployed persons in 2014	First tertile (lowest)	1.00				1.00			
	Second tertile	1.03	0.04	0.401	0.96 - 1.12	0.97	0.03	0.368	0.91 - 1.03
	Third tertile (highest)	1.02	0.04	0.677	0.94 - 1.10	0.99	0.03	0.825	0.93 - 1.06
	Missing data/not in Germany	-				-			
%Persons aged 65+ with highest education in all persons 65+ in 2011	First tertile (lowest)	1.00				1.00			
	Second tertile	**0.87**	**0.03**	**<0.001**	**0.81 - 0.94**	0.99	0.03	0.707	0.93 - 1.05
	Third tertile (highest)	**0.90**	**0.04**	**0.008**	**0.83 - 0.97**	0.97	0.03	0.373	0.91 - 1.04
	Missing data/not in Germany	-				-			
Persons per sqkm of total area in 2014	First tertile (lowest)	1.00				1.00			
	Second tertile	1.00	0.04	0.943	0.93 - 1.07	0.97	0.03	0.282	0.91 - 0.00
	Third tertile (highest)	1.00	0.04	0.928	0.93 - 1.09	0.97	0.03	0.415	0.91 - 0.00
	Missing data/not in Germany	-				-			
%Area in natural state in total area in 2016	First tertile (lowest)	1.00				1.00			
	Second tertile	1.00	0.04	0.948	0.93 - 1.08	0.98	0.03	0.582	0.93 - 1.04
	Third tertile (highest)	***0.94***	***0.03***	***0.096***	***0.88 - 1.01***	0.96	0.03	0.117	0.90 - 1.01
	Missing data/not in Germany	-				-			
Remaining life expectancy at age 60 in 2014	First tertile (lowest)	1.00				1.00			
	Second tertile	1.02	0.04	0.536	0.95 - 1.10	0.99	0.03	0.829	0.94 - 1.05
	Third tertile (highest)	***0.91***	***0.04***	***0.028***	***0.84 - 0.99***	**0.91**	**0.03**	**0.004**	**0.85 - 0.97**
	Missing data/not in Germany	-				-			

Supplementary Table 7. Individual level covariates: hazard ratios of the interaction effects with sex. Models 5a-5e controlled for all macro level covariates, and adjusted for multi-morbidity, AOK data. *Hazard ratios of interaction effects depicted separately for men and women, bold = p<0.10

		Model 5a-5e							
		Men*				Women*			
Covariates		Hazard Ratio	Std. Error	p-value	95%-confidence interval	Hazard Ratio	Std. Error	p-value	95%-confidence interval
Age	70-74	1.00				1.00			
	75-79	**1.36**	**0.08**	**<0.001**	**1.21 - 1.52**	**1.36**	**0.07**	**<0.001**	**1.22 - 1.51**
	80-84	**2.08**	**0.12**	**<0.001**	**1.86 - 2.33**	**2.29**	**0.12**	**<0.001**	**2.06 - 2.54**
	85-89	**3.36**	**0.20**	**<0.001**	**2.98 - 3.78**	**3.48**	**0.19**	**<0.001**	**3.13 - 3.86**
	90+	**4.38**	**0.31**	**<0.001**	**3.82 - 5.03**	**5.22**	**0.29**	**<0.001**	**4.69 - 5.82**
Multi-morbidity score	No severe disease	1.00				1.00			
	One severe disease	**1.56**	**0.11**	**<0.001**	**1.35 - 1.79**	**1.33**	**0.06**	**<0.001**	**1.23 - 1.45**
	Two severe diseases	**1.76**	**0.12**	**<0.001**	**1.54 - 2.02**	**1.66**	**0.07**	**<0.001**	**1.54 - 1.80**
	Three and more severe diseases	**2.76**	**0.17**	**<0.001**	**2.45 - 3.12**	**2.34**	**0.09**	**<0.001**	**2.18 - 2.51**
Change of residence	No	1.00				1.00			
	Yes	**10.35**	**0.61**	**<0.001**	**9.22 - 11.61**	**9.19**	**0.37**	**<0.001**	**8.50 - 9.94**
AOK-share	First sextile (lowest)	1.00				1.00			
	Second sextile	0.98	0.06	0.773	0.88 - 1.10	1.04	0.05	0.418	0.95 - 1.13
	Third sextile	0.98	0.06	0.685	0.87 - 1.10	0.99	0.04	0.756	0.90 - 1.08
	Fourth sextile	**0.88**	**0.05**	**0.026**	**0.78 - 0.98**	0.99	0.04	0.804	0.91 - 1.08
	Fifth sextile	0.96	0.06	0.437	0.85 - 1.07	0.95	0.04	0.297	0.87 - 1.04
	Sixth sextile (highest)	***0.91***	***0.05***	***0.099***	***0.80 - 1.02***	0.97	0.05	0.493	0.88 - 1.07
	Missing data/not in Germany	-				-			
Territory	West Germany	1.00				1.00			
	East Germany/Berlin	**0.92**	**0.04**	**0.045**	**0.84 - 1.00**	***0.94***	***0.04***	***0.093***	***0.87 - 1.01***
	Missing data/not in Germany	-				-			

Supplementary Table 8. Macro-level covariates: hazard ratios of the interaction effects with sex. Models 5f-5k controlled for age, relocation, AOK-share, and territory, and multi-morbidity, AOK data. *Hazard ratios of interaction effects depicted separately for men and women, bold = p<0.10

		Model 5f-5k							
		Men*				Women*			
Covariates		Hazard Ratio	Std. Error	p-value	95%-confidence interval	Hazard Ratio	Std. Error	p-value	95%-confidence interval
Average household income per person in € in 2014	First tertile (lowest)	1.00				1.00			
	Second tertile	***0.93***	***0.04***	***0.091***	***0.86 - 1.01***	**0.90**	**0.03**	**0.002**	**0.85 - 0.96**
	Third tertile (highest)	**0.87**	**0.04**	**<0.001**	**0.80 - 0.94**	**0.87**	**0.03**	**<0.001**	**0.82 - 0.93**
	Missing data/not in Germany	-				-			
%Long-term unemployed persons (unemployed for one year and longer) in all unemployed persons in 2014	First tertile (lowest)	1.00				1.00			
	Second tertile	1.04	0.04	0.282	0.97 - 1.13	0.98	0.03	0.464	0.92 - 1.04
	Third tertile (highest)	1.03	0.04	0.524	0.95 - 1.11	1.01	0.03	0.860	0.94 - 1.07
	Missing data/not in Germany	-				-			
%Persons aged 65+ with highest education in all persons 65+ in 2011	First tertile (lowest)	1.00				1.00			
	Second tertile	**0.89**	**0.03**	**0.002**	**0.82 - 0.96**	1.00	0.03	0.966	0.94 - 1.06
	Third tertile (highest)	**0.91**	**0.04**	**0.015**	**0.83 - 0.98**	0.98	0.03	0.494	0.91 - 1.04
	Missing data/not in Germany	-				-			
Persons per sqkm of total area in 2014	First tertile (lowest)	1.00				1.00			
	Second tertile	1.00	0.04	0.942	0.93 - 1.08	0.99	0.03	0.624	0.93 - 1.04
	Third tertile (highest)	1.01	0.04	0.899	0.93 - 1.09	0.99	0.03	0.697	0.93 - 1.05
	Missing data/not in Germany	-				-			
%Area in natural state in total area in 2016	First tertile (lowest)	1.00				1.00			
	Second tertile	1.00	0.04	0.996	0.93 - 1.07	0.99	0.03	0.645	0.93 - 1.04
	Third tertile (highest)	0.95	0.03	0.126	0.88 - 1.02	0.96	0.03	0.168	0.91 - 1.02
	Missing data/not in Germany	-				-			
Remaining life expectancy at age 60 in 2014	First tertile (lowest)	1.00				1.00			
	Second tertile	1.03	0.04	0.405	0.96 - 1.11	1.01	0.03	0.776	0.95 - 1.06
	Third tertile (highest)	***0.93***	***0.04***	***0.082***	***0.86 - 1.01***	**0.93**	**0.03**	**0.026**	**0.87 - 0.99**
	Missing data/not in Germany	-				-			

Supplementary Table 9. Overview of studies cited in the background section: Age range of the study participants and time period of collection of external environmental variables

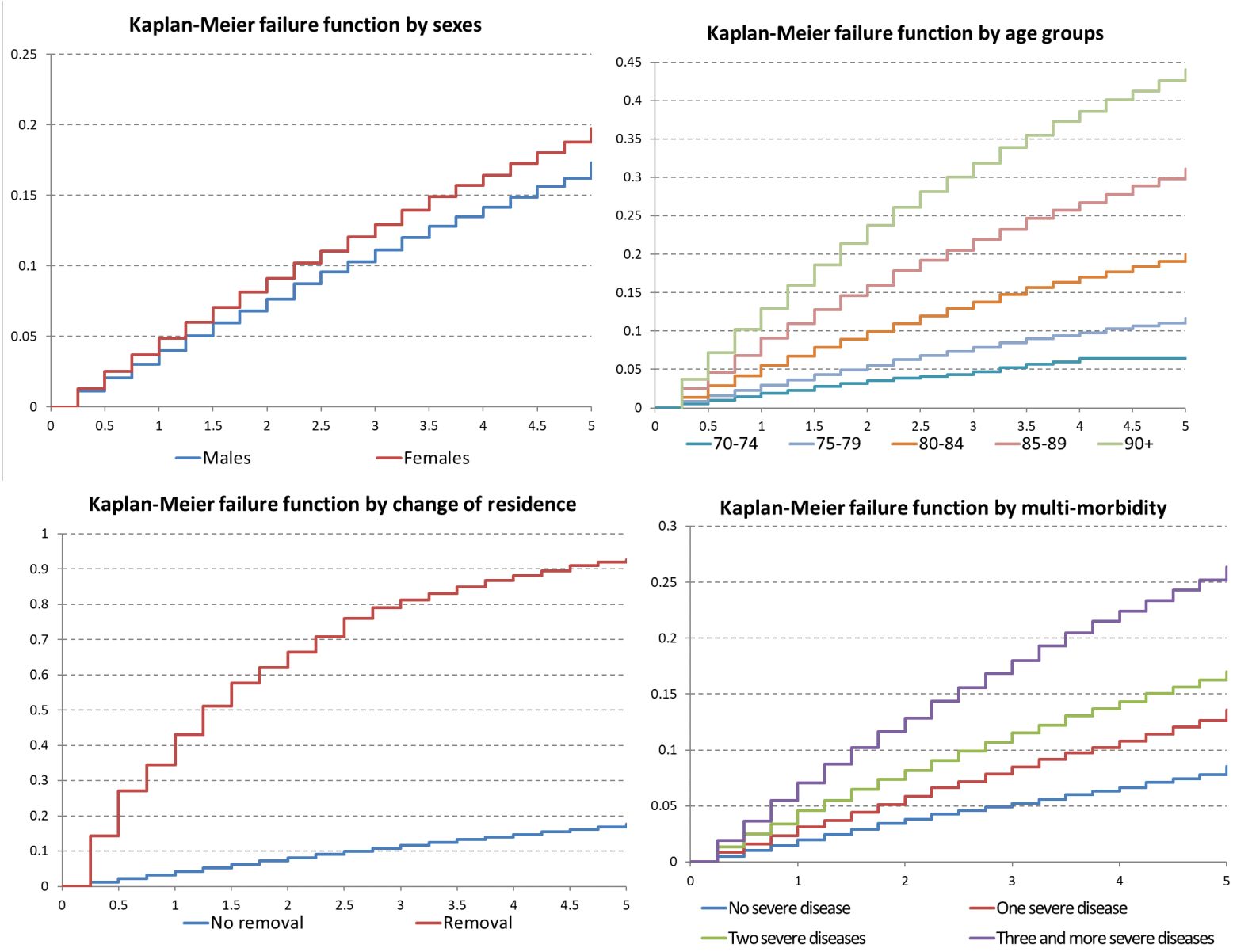
Study	Age	Baseline	Follow-up	External Variables
Clarke PJ, Weuve J, Barnes L, Evans DA, Mendes de Leon CF (2015) Cognitive decline and the neighborhood environment. *Ann Epidemiol* **25**, 849–854.	aged 65 and older	1993-1996	approximately 3-year intervals to 2011	sociodemographics: at baseline interview 1993-1996; neighborhood assessment: 2000-2003 kept constant, linked to respective age
Wu Y-T, Prina AM, Jones A, Matthews FE, Brayne C (2017) The Built Environment and Cognitive Disorders: Results From the Cognitive Function and Ageing Study II. *Am J Prev Med* **53**, 25–32.	aged 65 and older	2008-2011	none	sociodemographics: at baseline interview 2008-2011; environmental information 2005, 2007-2008, 2011 to the baseline interview
Wu Y-T, Prina AM, Jones AP, Barnes LE, Matthews FE, Brayne C (2015) Community environment, cognitive impairment and dementia in later life: results from the Cognitive Function and Ageing Study. Age Ageing 44, 1005–1011.	aged 74 and older	2001	10-year follow-up; 2001, 2002	sociodemographics: at baseline interview 1991-1994; environmental information was linked 2001; 2002
Keijzer C de, Tonne C, Basagaña X, Valentín A, Singh-Manoux A, Alonso J, Antó JM, Nieuwenhuijsen MJ, Sunyer J, Dadvand P (2018) Residential Surrounding Greenness and Cognitive Decline: A 10-Year Follow-up of the Whitehall II Cohort. *Environ Health Perspect* **126**, 77003.	45-68 years old	1997-1999	2002-2004, 2007-2009	demographics, socioeconomic status, lifestyle factors, greenness: each follow-up
Zhang W, Liu S, Sun F, Dong X (2019) Neighborhood social cohesion and cognitive function in U.S. Chinese older adults-findings from the PINE study. *Aging Ment Health* **23**, 1113–1121.	aged 60 and older	2011-2013	none	neighborhood socal cohesion: 2011-2013

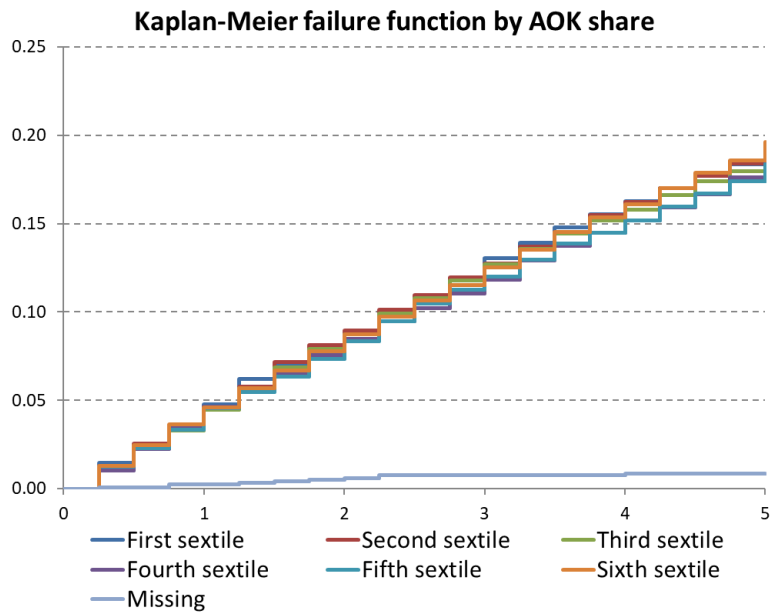
Wee LE, Yeo WX, Yang GR, Hannan N, Lim K, Chua C, Tan MY, Fong N, Yeap A, Chen L, Koh GC-H, Shen HM (2012) Individual and Area Level Socioeconomic Status and Its Association with Cognitive Function and Cognitive Impairment (Low MMSE) among Community-Dwelling Elderly in Singapore. Dement Geriatr Cogn Dis Extra 2, 529–542.	aged 60 and older	2012	none	socioeconomics: at baseline interview 2012; neighborhood socioeconomic status: 2009-2011 census data
Lang IA, Llewellyn DJ, Langa KM, Wallace RB, Huppert FA, Melzer D (2008) Neighborhood deprivation, individual socioeconomic status, and cognitive function in older people: analyses from the English Longitudinal Study of Ageing. J Am Geriatr Soc 56, 191–198.	aged 52 and older	2004	none	socioeconomics: 2004; deprivation: 2001 census data
Shih RA, Ghosh-Dastidar B, Margolis KL, Slaughter ME, Jewell A, Bird CE, Eibner C, Denburg NL, Ockene J, Messina CR, Espeland MA (2011) Neighborhood socioeconomic status and cognitive function in women. Am J Public Health 101, 1721–1728.	65-81 years old	1996-1999	none	demographics and lifestyle: at baseline 1996-1999; neighborhood socioeconomic status: mapping between 1990 and 2000 census data
Cadar D, Lassale C, Davies H, Llewellyn DJ, Batty GD, Steptoe A (2018) Individual and Area-Based Socioeconomic Factors Associated With Dementia Incidence in England: Evidence From a 12-Year Follow-up in the English Longitudinal Study of Ageing. JAMA Psychiatry 75, 723–732.	aged 65 and older	2002-2003 or 2008-2009 (refreshment sample)	7 waves from 2002-2003 to 2014-2015	socioeconomics: at baseline interview 2002-2003/2008-2009

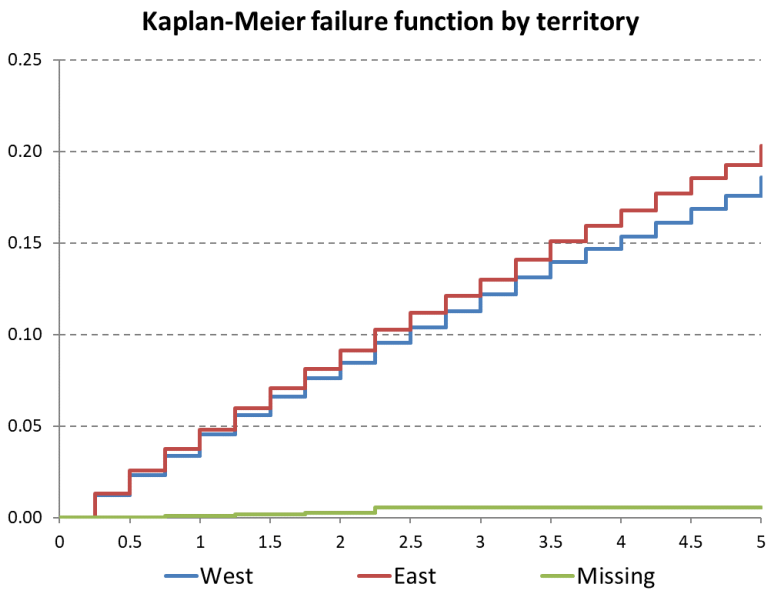
Ouvrard C, Meillon C, Dartigues J-F, Ávila-Funes JA, Amieva H (2020) Do Individual and Geographical Deprivation Have the Same Impact on the Risk of Dementia? A 25-Year Follow-up Study. J Gerontol B Psychol Sci Soc Sci 75, 218–227.	aged 65 and older	1988–1989 (visit 0 and visit 1)	visit 3 (3 years), visit 5, visit 8, visit 10, visit 13, visit 15, visit 17, visit 20, visit 22, visit 25 (25 years)	psychosocioeconomics: at baseline interview 1988-1989; deprivation index: 1999 and 2001 census data (visit 10 and 13)
McCann A, McNulty H, Rigby J, Hughes CF, Hoey L, Molloy AM, Cunningham CJ, Casey MC, Tracey F, O'Kane MJ, McCarroll K, Ward M, Moore K, Strain JJ, Moore A (2018) Effect of Area-Level Socioeconomic Deprivation on Risk of Cognitive Dysfunction in Older Adults. J Am Geriatr Soc 66, 1269–1275.	aged 60 and older	2008-2012	none	health and lifestyle: at baseline interview 2008-2012; deprivation: 2010, 2011 census data
Zuelsdorff M, Larson JL, Hunt JFV, Kim AJ, Koscik RL, Buckingham WR, Gleason CE, Johnson SC, Asthana S, Rissman RA, Bendlin BB, Kind AJH (2020) The Area Deprivation Index: A novel tool for harmonizable risk assessment in Alzheimer's disease research. Alzheimers Dement (N Y) 6, e12039.	middle-aged and older adults	2009 or after	none	2009 or after
Stafford M, Cummins S, Macintyre S, Ellaway A, Marmot M (2005) Gender differences in the associations between health and neighbourhood environment. Soc Sci Med 60, 1681–1692.	not given	1994-1999 and 1995-1998	not given	not given
Matheson FI, White HL, Moineddin R, Dunn JR, Glazier RH (2010) Neighbourhood chronic stress and gender inequalities in hypertension among Canadian	30-84	2001, 2003 and 2005 combined	none	deprivation index: 2001 census data

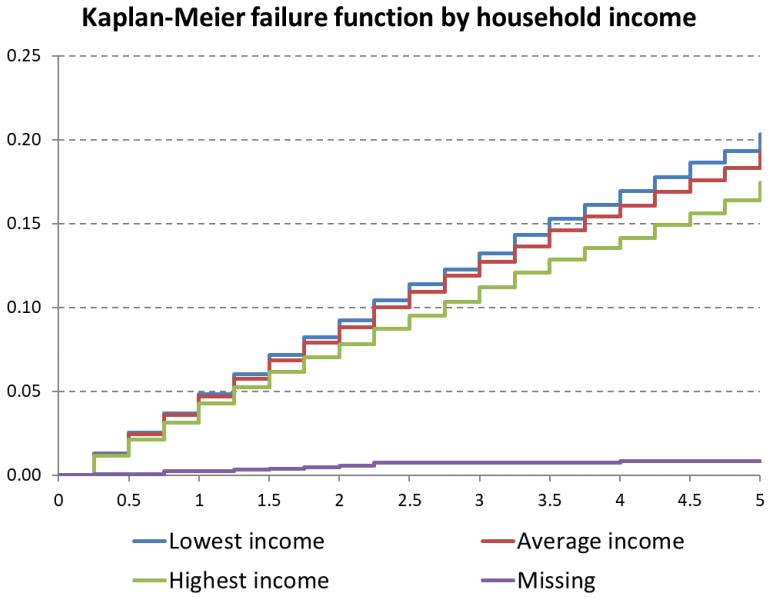
adults: a multilevel analysis. J Epidemiol Community Health 64, 705–713.				
Letellier N, Gutierrez L-A, Carrière I, Gabelle A, Dartigues J-F, Dufouil C, Helmer C, Cadot E, Berr C (2018) Sex-specific association between neighborhood characteristics and dementia: The Three-City cohort. Alzheimers Dement 14, 473–482.	aged 65 and above	1999-2001	12-year follow-up	individual socioeconomic status, other covariates, neighborhood socioeconomic status: at baseline 1999-2001
Letellier N, Carrière I, Gutierrez L-A, Gabelle A, Dartigues J-F, Dufouil C, Helmer C, Cadot E, Berr C (2019) Influence of activity space on the association between neighborhood characteristics and dementia risk: results from the 3-City study cohort. BMC Geriatr 19, 4.	aged 65 and above	1999-2001	at baseline 1999-2001	neighborhood socioeconomic status: at baseline 2001, census data from 1999

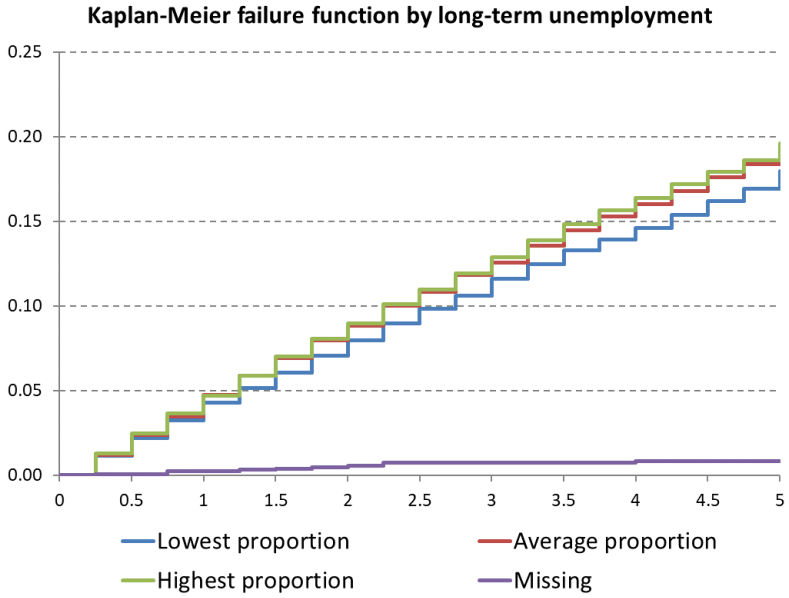
Supplementary Figure 1. Kaplan-Meier failure function by covariates, 2015-2019, AOK data

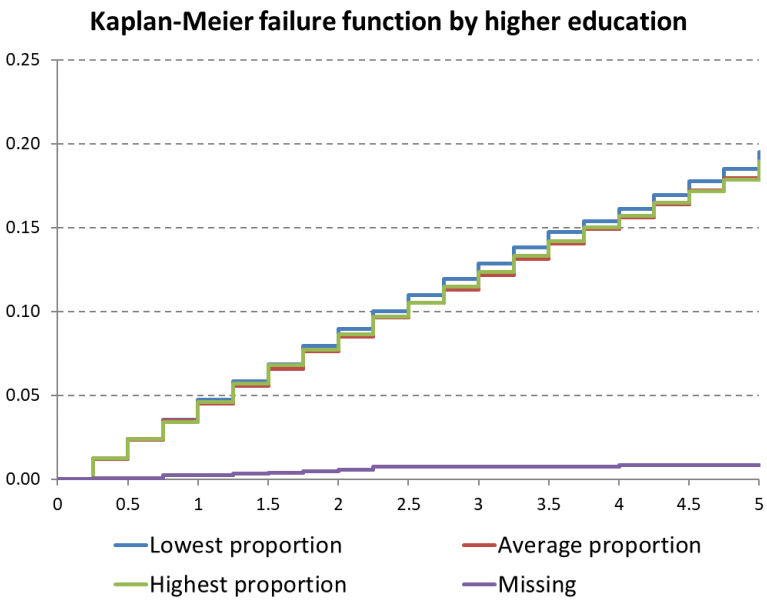


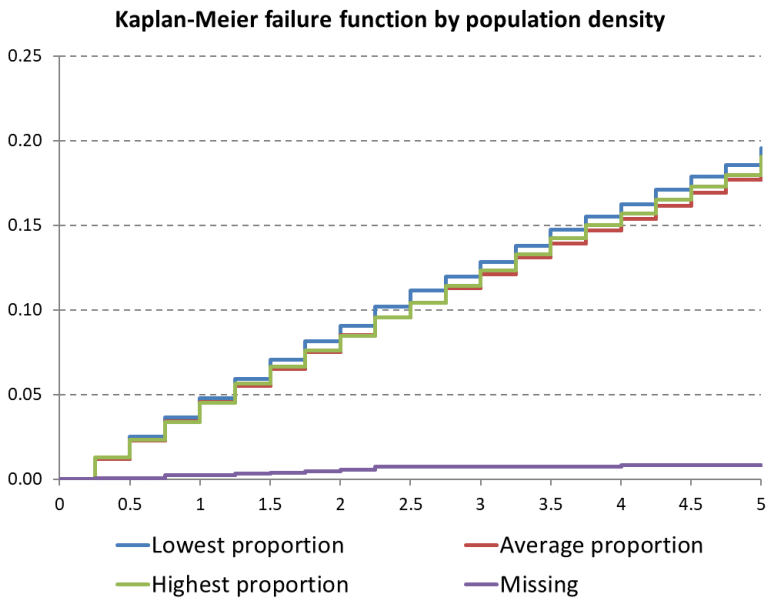

Kaplan-Meier failure function by AOK share
0.25
0.20
0.15
0.10
0.05
0.00
0
1
2
3
4
5
First sextile
Second sextile
Third sextile
Fourth sextile
Fifth sextile
Sixth sextile
Missing

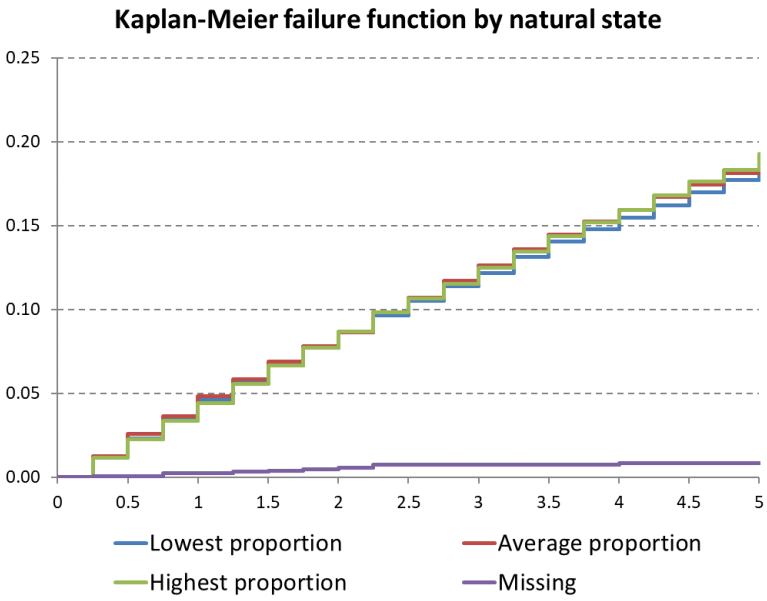

Kaplan-Meier failure function by territory
0.25
0.20
0.15
0.10
0.05
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
West
East
Missing

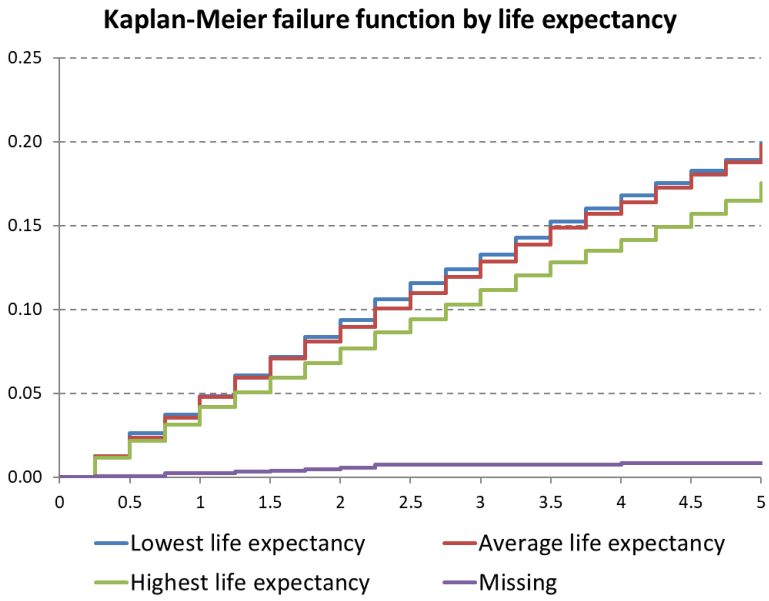

Kaplan-Meier failure function by household income
0.25
0.20
0.15
0.10
0.05
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Lowest income
Average income
Highest income
Missing


Kaplan-Meier failure function by long-term unemployment
0.25
0.20
0.15
0.10
0.05
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Lowest proportion
Average proportion
Highest proportion
Missing

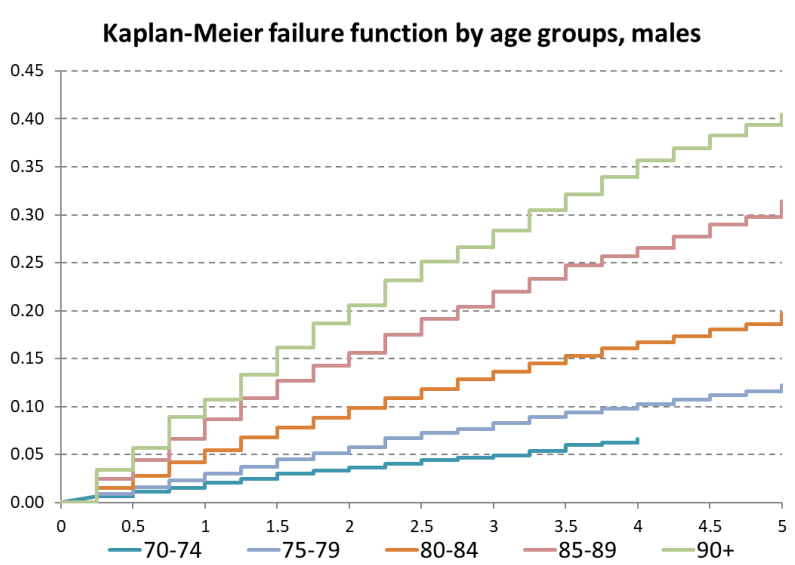

Kaplan-Meier failure function by higher education
0.25
0.20
0.15
0.10
0.05
0.00
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
Lowest proportion
Average proportion
Highest proportion
Missing

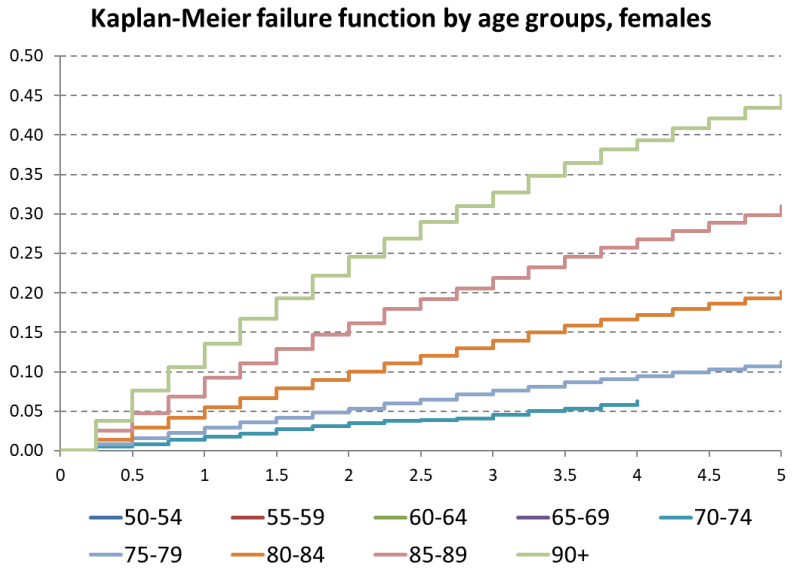

Kaplan-Meier failure function by population density
0.25
0.20
0.15
0.10
0.05
0.00
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
Lowest proportion
Average proportion
Highest proportion
Missing

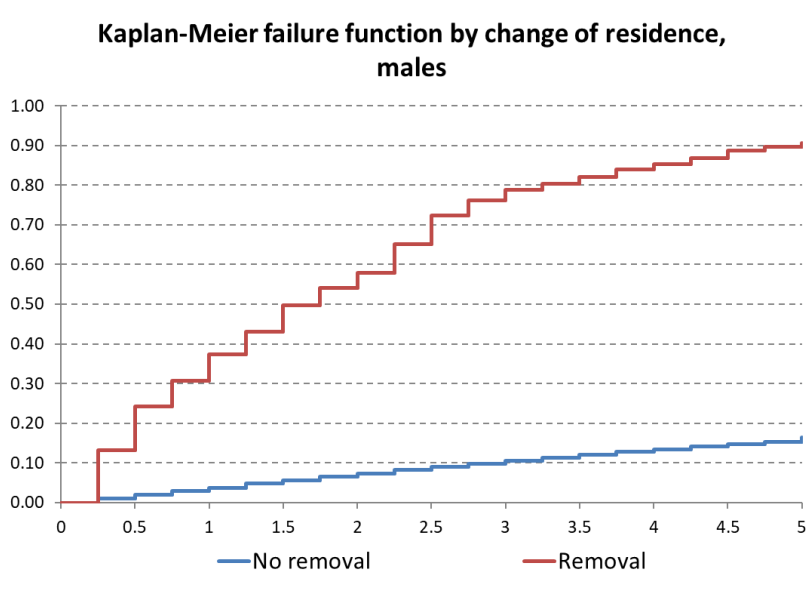

Kaplan-Meier failure function by natural state
0.25
0.20
0.15
0.10
0.05
0.00
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
Lowest proportion
Average proportion
Highest proportion
Missing

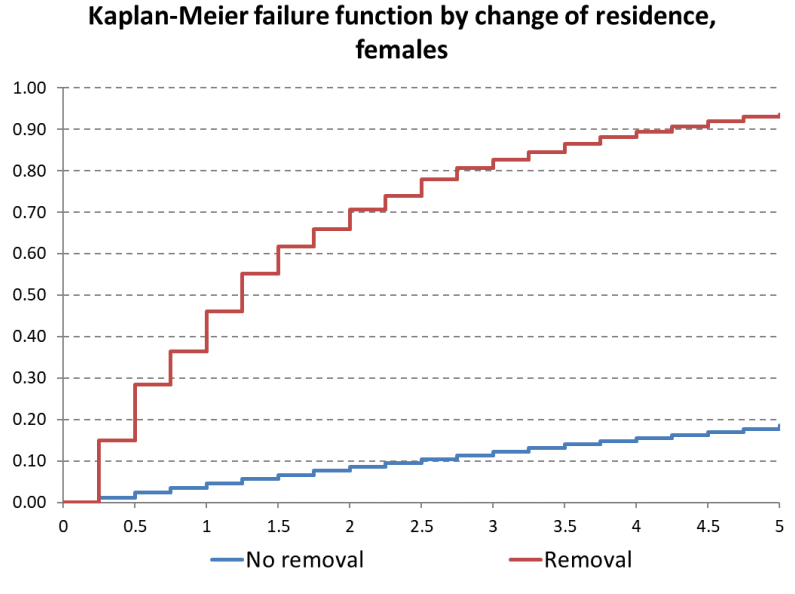

Kaplan-Meier failure function by life expectancy
0.25
0.20
0.15
0.10
0.05
0.00
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
Lowest life expectancy
Average life expectancy
Highest life expectancy
Missing

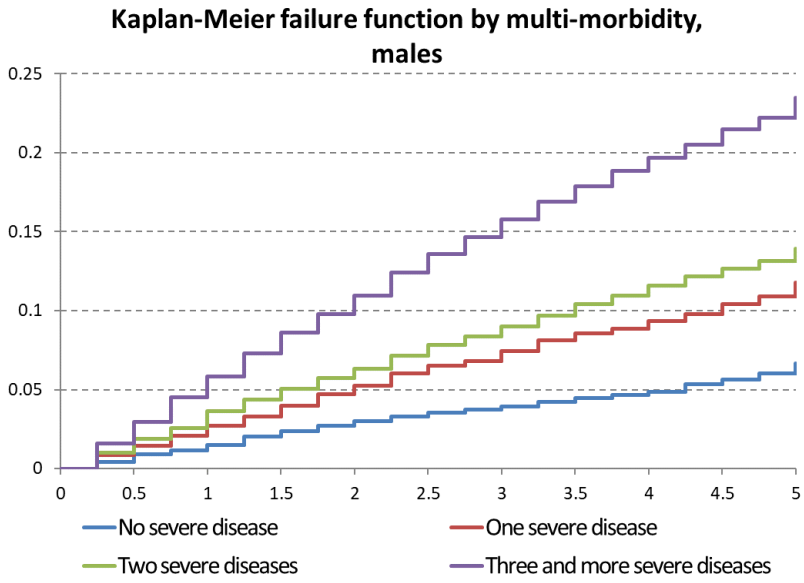
Supplementary Figure 2. Kaplan-Meier failure function by covariates and sexes, 2015-2019, AOK data

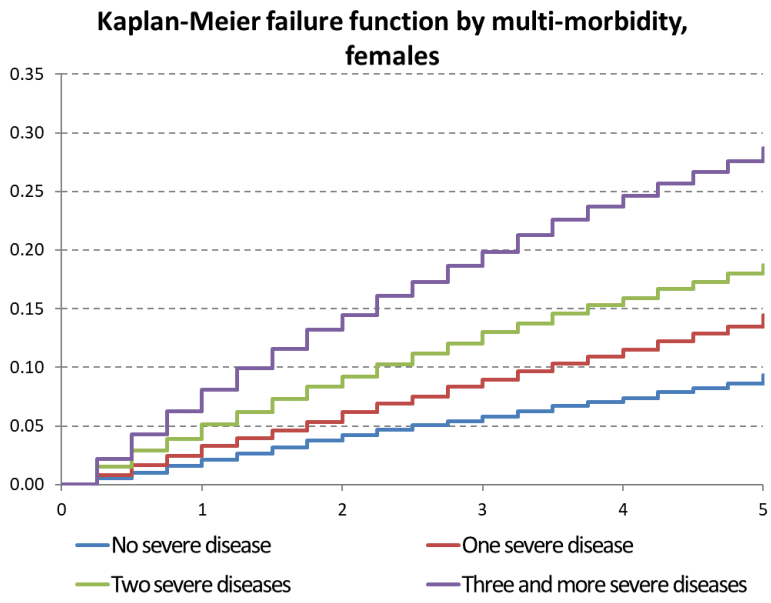


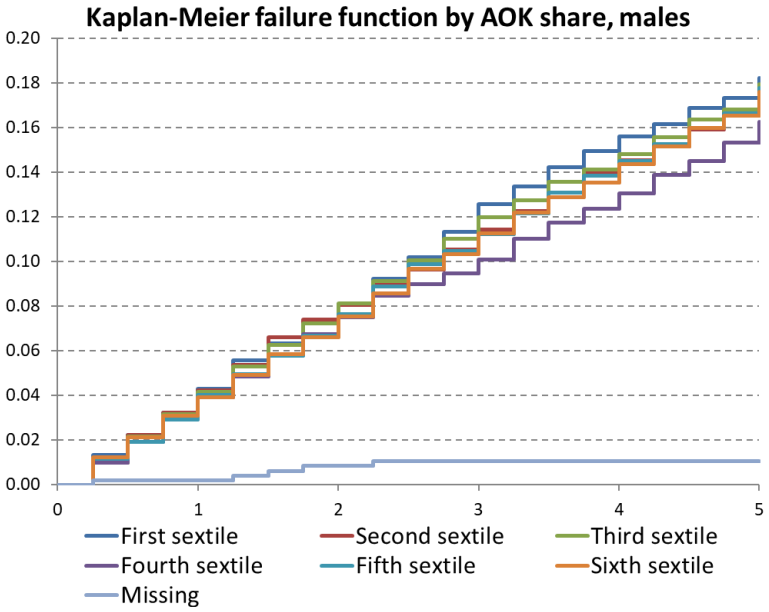


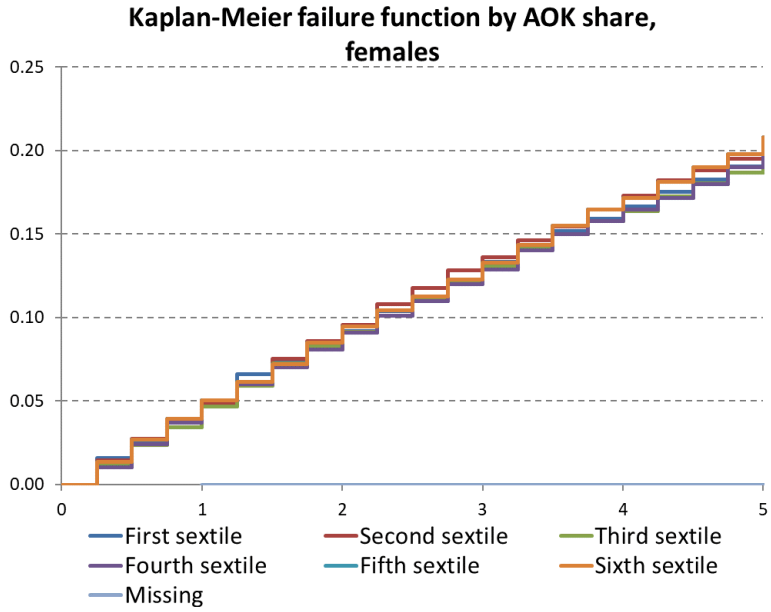




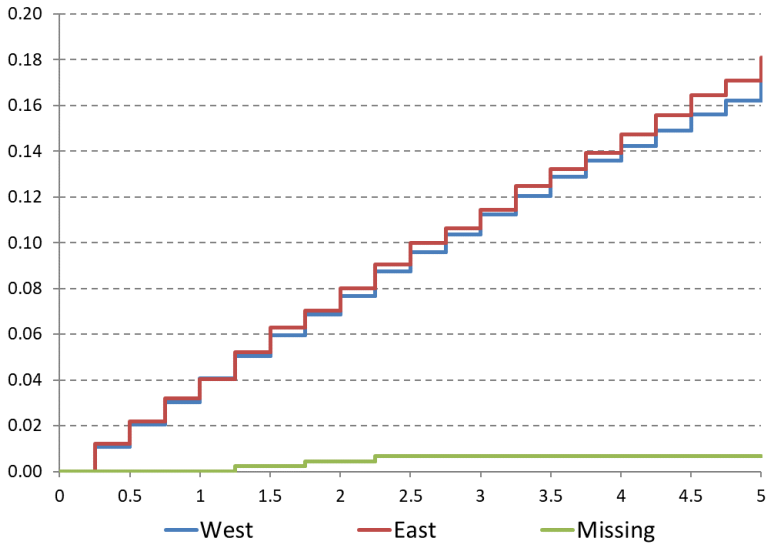

Kaplan-Meier failure function by multi-morbidity, males
0.25
0.2
0.15
0.1
0.05
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
No severe disease
One severe disease
Two severe diseases
Three and more severe diseases


Kaplan-Meier failure function by multi-morbidity, females
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0 1 2 3 4 5
No severe disease
One severe disease
Two severe diseases
Three and more severe diseases

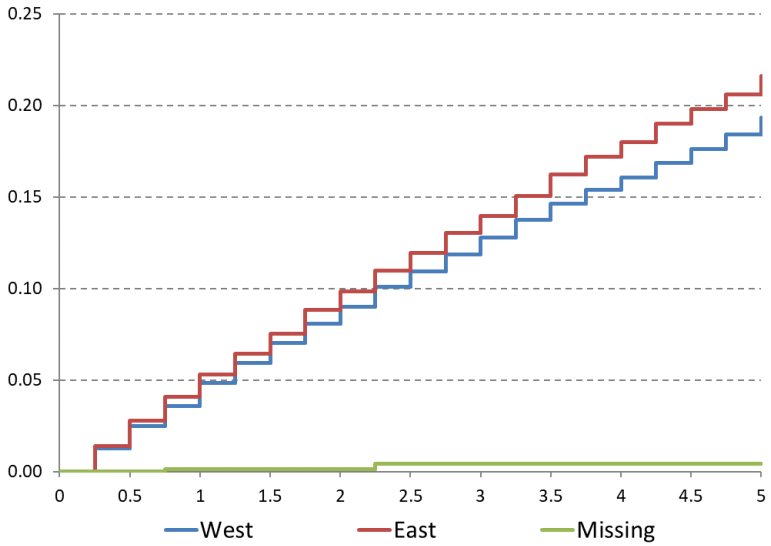

Kaplan-Meier failure function by AOK share, males
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0 1 2 3 4 5
First sextile
Second sextile
Third sextile
Fourth sextile
Fifth sextile
Sixth sextile
Missing


Kaplan-Meier failure function by AOK share, females
0.25
0.20
0.15
0.10
0.05
0.00
0 1 2 3 4 5
First sextile
Second sextile
Third sextile
Fourth sextile
Fifth sextile
Sixth sextile
Missing

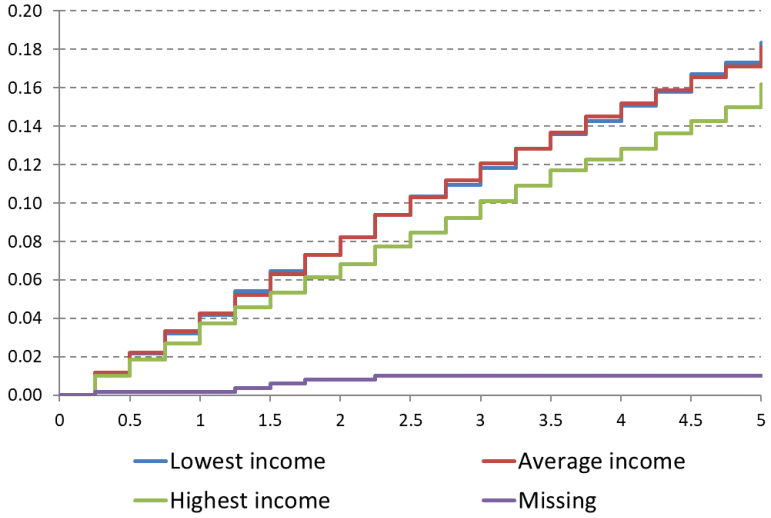
Kaplan-Meier failure function by territory, males



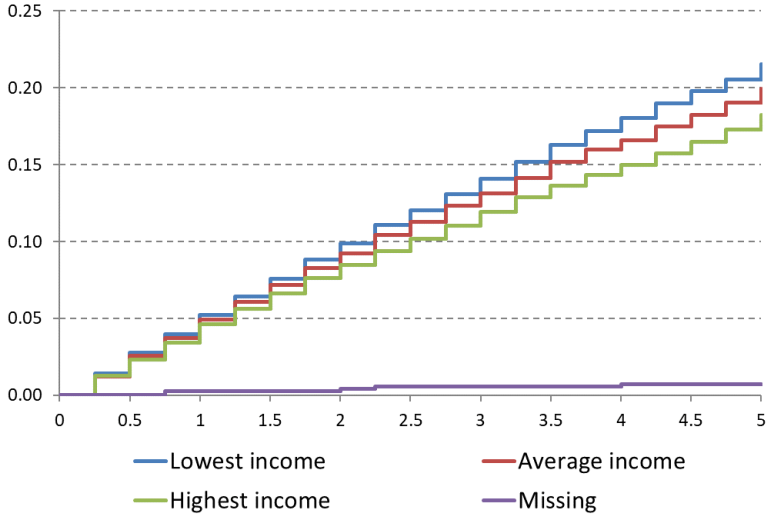
Kaplan-Meier failure function by territory, females



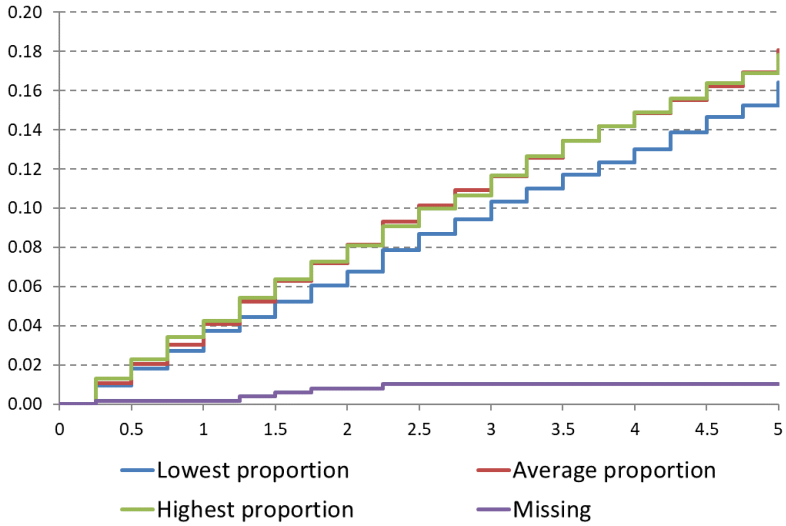
Kaplan-Meier failure function by household income, males



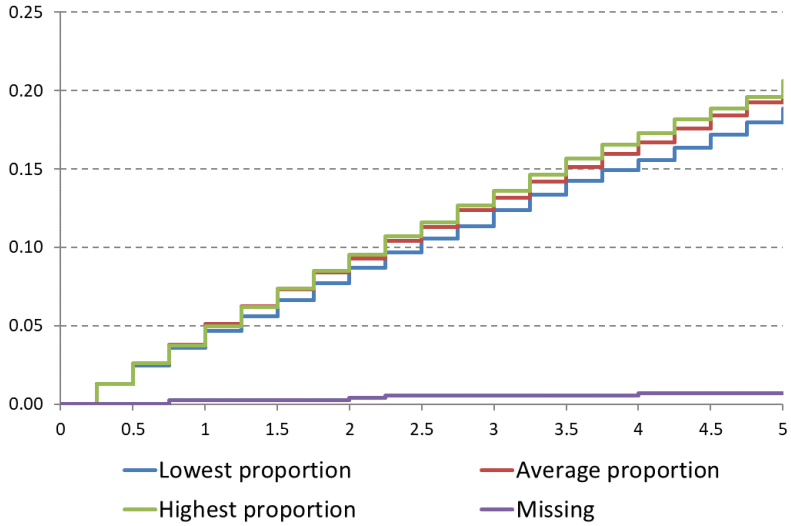
Kaplan-Meier failure function by household income, females



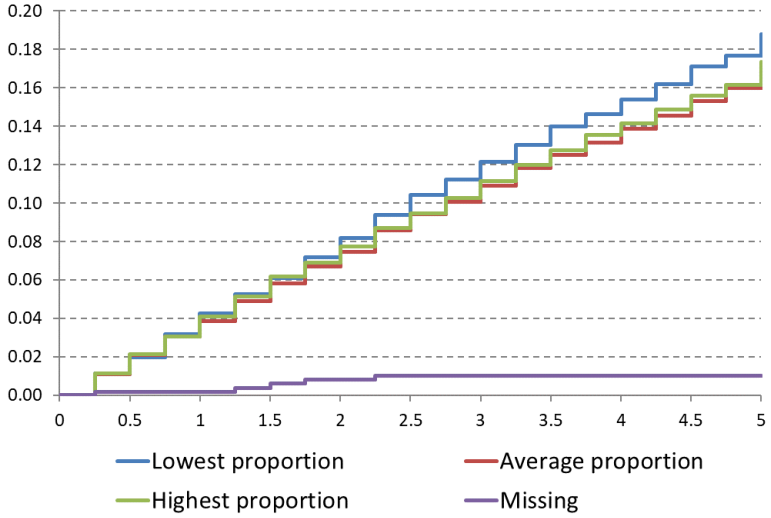
Kaplan-Meier failure function by long-term unemployment, males



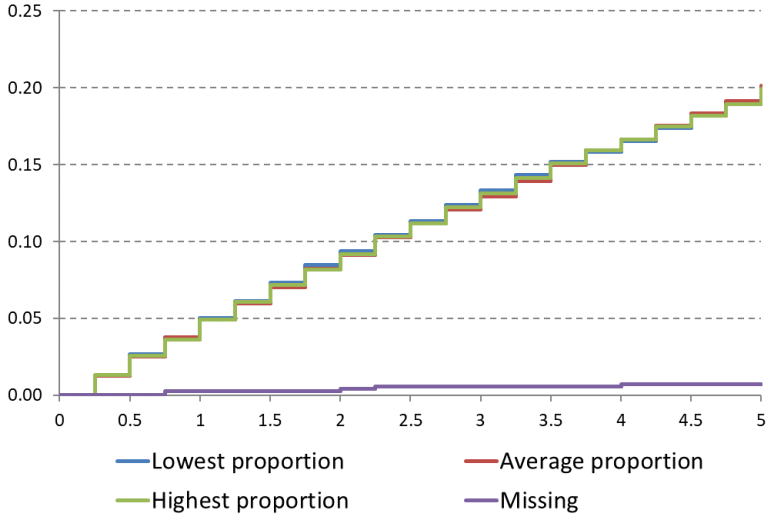
Kaplan-Meier failure function by long-term unemployment, females

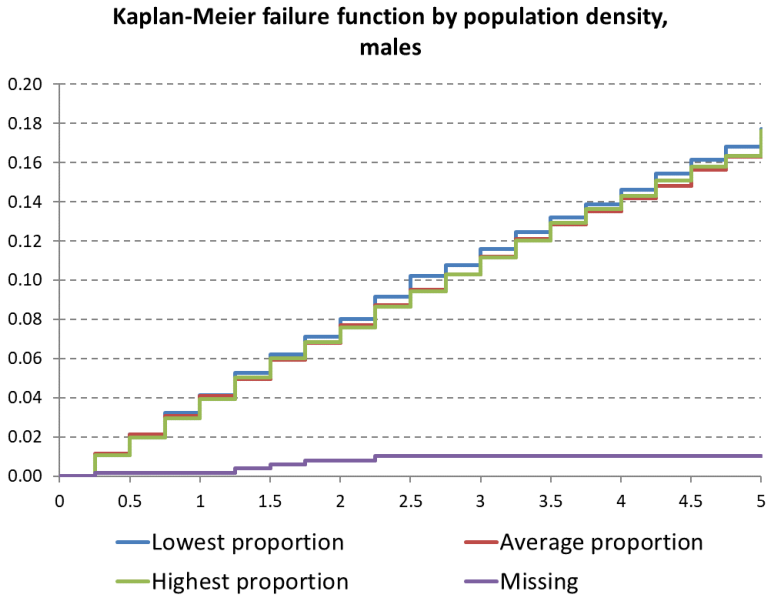


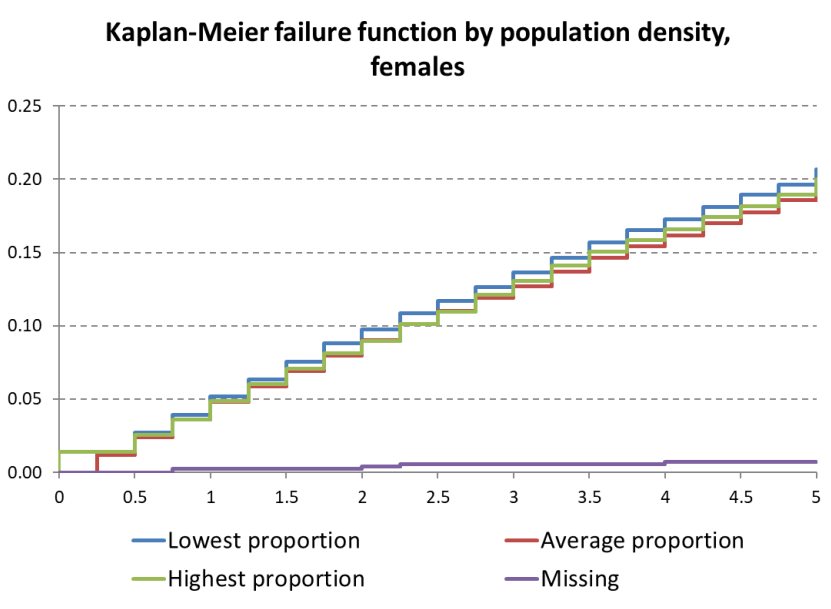
Kaplan-Meier failure function by higher education, males

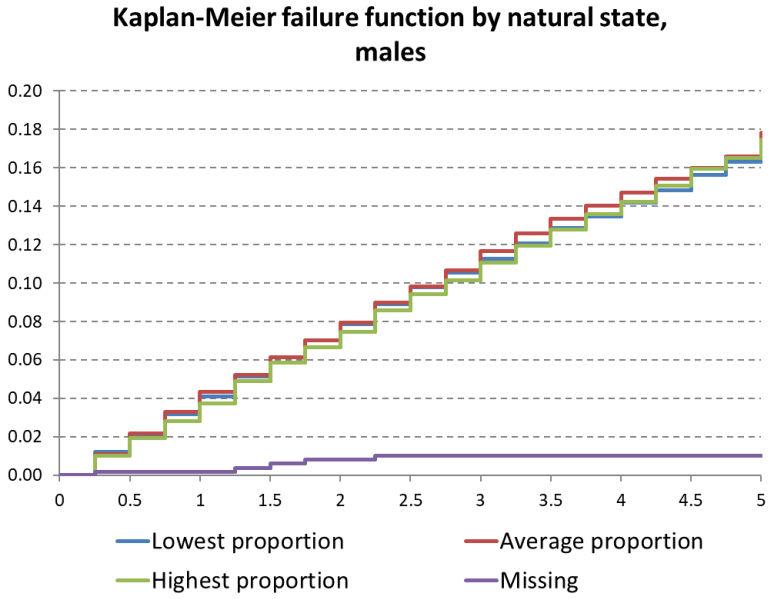


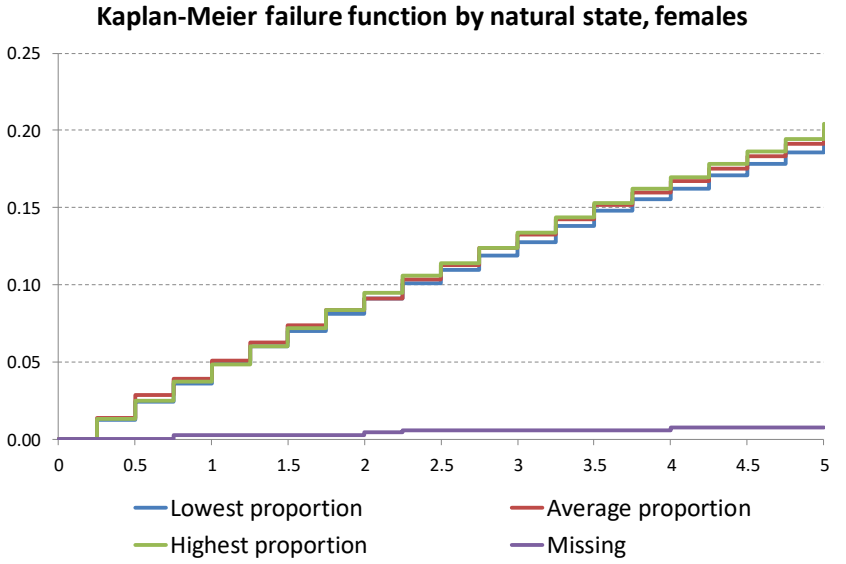
Kaplan-Meier failure function by higher education, females

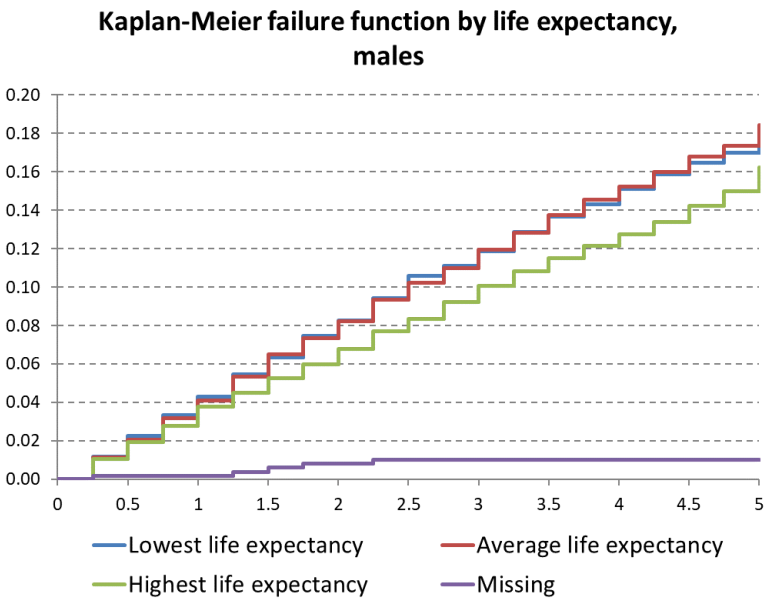


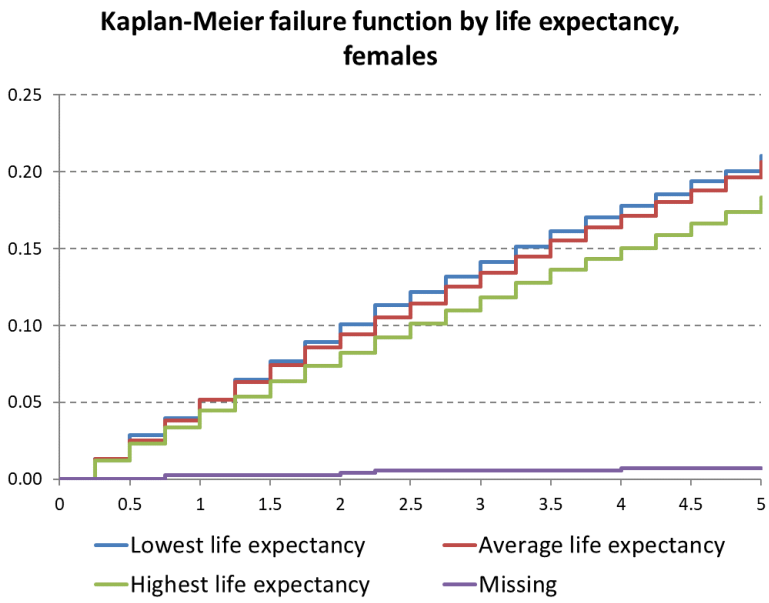

Kaplan-Meier failure function by population density, males
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Lowest proportion
Average proportion
Highest proportion
Missing


Kaplan-Meier failure function by population density, females
0.25
0.20
0.15
0.10
0.05
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Lowest proportion
Average proportion
Highest proportion
Missing


Kaplan-Meier failure function by natural state, males
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Lowest proportion
Average proportion
Highest proportion
Missing


Kaplan-Meier failure function by natural state, females
0.25
0.20
0.15
0.10
0.05
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Lowest proportion
Average proportion
Highest proportion
Missing


Kaplan-Meier failure function by life expectancy, males
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Lowest life expectancy
Average life expectancy
Highest life expectancy
Missing


Kaplan-Meier failure function by life expectancy, females
0.25
0.20
0.15
0.10
0.05
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Lowest life expectancy
Average life expectancy
Highest life expectancy
Missing