

Multiple causes of death associated with dementia in Spain: educational differences and its impact on life expectancy

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Table 1S. Dementia-related diseases mentioned on the death certificate of other underlying causes of death (UCOD) by education. Ages 60+. Spain (2016-2017)

	Men						Women					
	Low education		High education		Total		Low education		High education		Total	
	N	%	N	%	N	%	n	%	n	%	n	%
All deaths	34296	11.53	6276	8.72	40572	10.98	73574	21.25	6210	16.33	79784	20.76
Dementia-related diseases	19646	99.58	3602	99.70	23248	99.60	45792	99.66	3913	99.85	49705	99.68
Parkinson's disease	1153	31.67	263	27.85	1416	30.88	1397	36.39	156	31.88	1553	35.88
Neoplasms	2360	2.61	472	1.74	2832	2.41	2954	4.73	288	2.49	3242	4.38
Circulatory system diseases	5211	6.38	959	5.02	6170	6.12	13002	11.13	1048	9.85	14050	11.02
<i>Cerebrovascular diseases</i>	<i>1498</i>	<i>8.45</i>	<i>269</i>	<i>7.24</i>	<i>1767</i>	<i>8.24</i>	<i>3682</i>	<i>13.44</i>	<i>276</i>	<i>10.6</i>	<i>3958</i>	<i>13.19</i>
<i>Ischaemic heart diseases</i>	<i>1413</i>	<i>5.40</i>	<i>289</i>	<i>4.08</i>	<i>1702</i>	<i>5.12</i>	<i>2533</i>	<i>10.99</i>	<i>223</i>	<i>9.91</i>	<i>2756</i>	<i>10.89</i>
<i>Remaining circulatory system diseases</i>	<i>2300</i>	<i>6.10</i>	<i>401</i>	<i>4.82</i>	<i>2701</i>	<i>5.87</i>	<i>6787</i>	<i>10.23</i>	<i>549</i>	<i>9.49</i>	<i>7336</i>	<i>10.17</i>
Diabetes mellitus	796	11.95	131	10.33	927	11.69	1717	17.26	91	15.53	1808	17.16
Chronic liver disease and cirrhosis	109	2.69	18	1.55	127	2.43	90	4.24	6	2.05	96	3.97
Respiratory system diseases	2665	6.05	381	4.81	3046	5.86	3304	8.49	268	6.84	3572	8.33
<i>Chronic lower respiratory diseases</i>	<i>1340</i>	<i>7.18</i>	<i>158</i>	<i>5.34</i>	<i>1498</i>	<i>6.93</i>	<i>902</i>	<i>12.68</i>	<i>73</i>	<i>7.86</i>	<i>975</i>	<i>12.12</i>
<i>Remaining respiratory system diseases</i>	<i>1325</i>	<i>5.22</i>	<i>223</i>	<i>4.50</i>	<i>1548</i>	<i>5.10</i>	<i>2402</i>	<i>7.55</i>	<i>195</i>	<i>6.52</i>	<i>2597</i>	<i>7.46</i>
COVID-19												
Other natural causes of death	2082	5.29	403	4.51	2485	5.15	4821	8.27	399	7.03	5220	8.16
External causes of death	276	3.51	45	2.45	321	3.31	498	6.29	40	4.39	538	6.09
<i>Accidental falls</i>	<i>98</i>	<i>4.81</i>	<i>15</i>	<i>3.03</i>	<i>113</i>	<i>4.46</i>	<i>195</i>	<i>7.84</i>	<i>17</i>	<i>6.64</i>	<i>212</i>	<i>7.73</i>
<i>Remaining external causes of death</i>	<i>178</i>	<i>3.06</i>	<i>30</i>	<i>2.24</i>	<i>208</i>	<i>2.90</i>	<i>303</i>	<i>5.58</i>	<i>23</i>	<i>3.50</i>	<i>326</i>	<i>5.36</i>

Source: Spanish National Statistics Institute (see also main text).

Table 2S. Dementia-related diseases mentioned on the death certificate of other underlying causes of death (UCOD) by education. Ages 60+. Spain (2018-2019)

	Men						Women					
	Low education		High education		Total		Low education		High education		Total	
	N	%	N	%	N	%	n	%	n	%	n	%
All deaths	34624	11.73	7292	8.98	41916	11.14	73416	21.17	6954	16.01	80370	20.60
Dementia-related diseases	20128	99.71	4244	99.71	24372	99.71	46528	99.71	4467	99.82	50995	99.72
Parkinson's disease	1108	30.52	320	29.40	1428	30.26	1401	35.98	190	35.99	1591	35.98
Neoplasms	2422	2.78	555	1.82	2977	2.53	2928	4.77	340	2.48	3268	4.35
Circulatory system diseases	5192	6.56	1043	5.03	6235	6.24	12369	11.02	1092	9.48	13461	10.88
<i>Cerebrovascular diseases</i>	<i>1450</i>	<i>8.62</i>	<i>298</i>	<i>7.40</i>	<i>1748</i>	<i>8.39</i>	<i>3418</i>	<i>13.19</i>	<i>286</i>	<i>10.39</i>	<i>3704</i>	<i>12.92</i>
<i>Ischaemic heart diseases</i>	<i>1398</i>	<i>5.80</i>	<i>300</i>	<i>4.12</i>	<i>1698</i>	<i>5.41</i>	<i>2233</i>	<i>10.06</i>	<i>186</i>	<i>7.83</i>	<i>2419</i>	<i>10.32</i>
<i>Remaining circulatory system diseases</i>	<i>2344</i>	<i>6.13</i>	<i>445</i>	<i>4.73</i>	<i>2789</i>	<i>5.86</i>	<i>6718</i>	<i>10.30</i>	<i>620</i>	<i>9.70</i>	<i>7338</i>	<i>10.25</i>
Diabetes mellitus	856	12.50	150	10.34	1006	12.12	1888	18.82	112	17.69	2000	18.76
Chronic liver disease and cirrhosis	116	2.99	20	1.61	136	2.65	118	5.67	16	4.56	134	5.51
Respiratory system diseases	2248	5.14	412	4.58	2660	5.05	2657	6.60	249	5.67	2906	6.51
<i>Chronic lower respiratory diseases</i>	<i>1231</i>	<i>7.31</i>	<i>200</i>	<i>6.52</i>	<i>1431</i>	<i>7.19</i>	<i>815</i>	<i>12.42</i>	<i>95</i>	<i>8.87</i>	<i>910</i>	<i>11.92</i>
<i>Remaining respiratory system diseases</i>	<i>1017</i>	<i>3.79</i>	<i>212</i>	<i>3.58</i>	<i>1229</i>	<i>3.75</i>	<i>1842</i>	<i>5.47</i>	<i>154</i>	<i>4.63</i>	<i>1996</i>	<i>5.39</i>
COVID-19												
Other natural causes of death	2319	5.44	489	4.58	2808	5.27	5065	8.12	446	6.58	5511	7.96
External causes of death	236	2.96	58	2.70	294	2.91	463	5.91	41	3.93	504	5.68
<i>Accidental falls</i>	<i>105</i>	<i>4.67</i>	<i>18</i>	<i>3.01</i>	<i>123</i>	<i>4.32</i>	<i>201</i>	<i>7.91</i>	<i>20</i>	<i>6.96</i>	<i>221</i>	<i>7.81</i>
<i>Remaining external causes of death</i>	<i>131</i>	<i>2.29</i>	<i>40</i>	<i>2.58</i>	<i>171</i>	<i>2.35</i>	<i>262</i>	<i>4.95</i>	<i>21</i>	<i>2.79</i>	<i>283</i>	<i>4.68</i>

Source: Calculations based on data from the Spanish National Statistics Institute (see also main text).

Table 3S. Dementia-related diseases mentioned on the death certificate of other underlying causes of death (UCOD) by education. Ages 60+. Spain (2020-2021)

	Men						Women					
	Low education		High education		Total		Low education		High education		Total	
	N	%	N	%	n	%	n	%	n	%	n	%
All deaths	36716	11.33	8828	8.65	45544	10.69	79148	20.82	8627	15.69	87775	20.17
Dementia-related diseases	18286	99.70	4406	99.77	22692	99.71	43895	99.78	4805	99.69	48700	99.77
Parkinson's disease	1194	31.40	389	28.79	1583	30.71	1533	38.15	197	31.22	1730	37.21
Neoplasms	2460	2.91	639	1.91	3099	2.63	3126	5.11	436	2.73	3562	4.61
Circulatory system diseases	5263	6.74	1137	5.00	6400	6.35	12702	11.44	1232	9.62	13934	11.25
<i>Cerebrovascular diseases</i>	<i>1443</i>	<i>8.80</i>	<i>290</i>	<i>6.73</i>	<i>1733</i>	<i>8.37</i>	<i>3208</i>	<i>13.07</i>	<i>338</i>	<i>11.47</i>	<i>3546</i>	<i>12.90</i>
<i>Ischaemic heart diseases</i>	<i>1288</i>	<i>5.63</i>	<i>342</i>	<i>4.30</i>	<i>1630</i>	<i>5.29</i>	<i>2118</i>	<i>11.00</i>	<i>212</i>	<i>8.39</i>	<i>2330</i>	<i>10.69</i>
<i>Remaining circulatory system diseases</i>	<i>2532</i>	<i>6.53</i>	<i>505</i>	<i>4.82</i>	<i>3037</i>	<i>6.17</i>	<i>7376</i>	<i>10.98</i>	<i>682</i>	<i>9.29</i>	<i>8058</i>	<i>10.81</i>
Diabetes mellitus	998	13.07	178	9.75	1176	12.43	2320	20.83	135	17.04	2455	20.58
Chronic liver disease and cirrhosis	105	2.82	23	1.63	128	2.49	120	5.96	15	3.73	135	5.59
Respiratory system diseases	1758	5.13	304	3.80	2062	4.88	1812	6.36	191	4.96	2003	6.19
<i>Chronic lower respiratory diseases</i>	<i>1031</i>	<i>7.49</i>	<i>170</i>	<i>6.11</i>	<i>1201</i>	<i>7.26</i>	<i>719</i>	<i>12.99</i>	<i>83</i>	<i>7.84</i>	<i>802</i>	<i>12.17</i>
<i>Remaining respiratory system diseases</i>	<i>727</i>	<i>3.54</i>	<i>134</i>	<i>2.57</i>	<i>861</i>	<i>3.35</i>	<i>1092</i>	<i>4.76</i>	<i>109</i>	<i>3.87</i>	<i>1201</i>	<i>4.66</i>
COVID-19	3860	8.89	1066	7.30	4926	8.49	7508	16.66	964	14.90	8472	16.44
Other natural causes of death	2523	5.94	611	5.19	3134	5.77	5643	8.62	617	7.75	6260	8.52
External causes of death	268	3.37	76	3.05	344	3.30	490	6.27	34	2.81	524	5.80
<i>Accidental falls</i>	<i>118</i>	<i>4.91</i>	<i>36</i>	<i>4.92</i>	<i>154</i>	<i>4.91</i>	<i>238</i>	<i>8.18</i>	<i>15</i>	<i>4.26</i>	<i>253</i>	<i>7.76</i>
<i>Remaining external causes of death</i>	<i>151</i>	<i>2.71</i>	<i>39</i>	<i>2.26</i>	<i>190</i>	<i>2.60</i>	<i>252</i>	<i>5.13</i>	<i>19</i>	<i>2.21</i>	<i>271</i>	<i>4.70</i>

Source: Calculations based on data from the Spanish National Statistics Institute (see also main text).

Table 4S. Age-standardised mortality rate (ASMR) per 1,000 persons aged 60+ by sex and educational level for: All deaths, Dementia-related diseases (DRD) mentioned anywhere on the death certificate (MCOD Dementia), and the Underlying cause of death (UCOD) with DRD as a MCODE (also as a percentage of MCODE dementia). Spain (2016-2017)

	Men						Women					
	Low education		High education		Total		Low education		High education		Total	
	Rate	%	rate	%	Rate	%	rate	%	rate	%	rate	%
All deaths	48.76		43.19		48.73		31.26		27.23		32.43	
MCOD Dementia	6.14	100.00	5.31	100.00	6.17	100.00	6.59	100.00	5.50	100.00	6.84	100.00
UCOD, with MCODE Dementia-related dis.												
Dementia-related diseases	3.56	57.98	3.10	58.31	3.58	58.05	4.11	62.39	3.48	63.18	4.27	62.44
Parkinson's disease	0.19	3.03	0.19	3.56	0.19	3.12	0.12	1.84	0.13	2.28	0.13	1.88
Neoplasms	0.40	6.51	0.36	6.74	0.40	6.54	0.26	3.92	0.23	4.16	0.27	3.95
Circulatory system diseases	0.94	15.38	0.86	16.12	0.96	15.51	1.17	17.73	0.96	17.48	1.21	17.71
<i>Cerebrovascular diseases</i>	0.26	4.28	0.22	4.16	0.26	4.26	0.33	4.97	0.24	4.40	0.34	4.93
<i>Ischaemic heart diseases</i>	0.25	4.03	0.25	4.71	0.26	4.15	0.23	3.45	0.20	3.71	0.24	3.46
<i>Remaining circulatory system diseases</i>	0.43	7.06	0.39	7.26	0.44	7.10	0.61	9.32	0.52	9.38	0.64	9.32
Diabetes mellitus	0.13	2.15	0.10	1.95	0.13	2.11	0.15	2.30	0.08	1.45	0.15	2.23
Chronic liver disease and cirrhosis	0.02	0.27	0.01	0.26	0.02	0.26	0.01	0.12	0.00	0.08	0.01	0.12
Respiratory system diseases	0.48	7.81	0.34	6.37	0.47	7.59	0.30	4.52	0.25	4.46	0.31	4.52
<i>Chronic lower respiratory diseases</i>	0.24	3.86	0.13	2.51	0.23	3.67	0.08	1.23	0.06	1.09	0.08	1.22
<i>Remaining respiratory system diseases</i>	0.24	3.95	0.20	3.86	0.24	3.93	0.22	3.30	0.19	3.37	0.23	3.30
COVID-19												
Other natural causes of death	0.37	6.07	0.32	6.02	0.37	6.04	0.43	6.50	0.35	6.28	0.44	6.48
External causes of death	0.05	0.80	0.04	0.67	0.05	0.78	0.04	0.68	0.03	0.61	0.05	0.67
<i>Accidental falls</i>	0.02	0.29	0.01	0.22	0.02	0.28	0.02	0.27	0.01	0.27	0.02	0.27
<i>Remaining external causes of death</i>	0.03	0.51	0.02	0.45	0.03	0.50	0.03	0.41	0.02	0.34	0.03	0.41

Source: Calculations based on data from the Spanish National Statistics Institute (see also main text).

Table 5S. Age-standardised mortality rate (ASMR) per 1,000 persons aged 60+ by sex and educational level for: All deaths, Dementia-related diseases (DRD) mentioned anywhere on the death certificate (MCOD Dementia), and the Underlying cause of death (UCOD) with DRD as a MCODE (also as a percentage of MCODE dementia). Spain (2018-2019)

	Men						Women					
	Low education		High education		Total		Low education		High education		Total	
	rate	%	rate	%	Rate	%	rate	%	rate	%	rate	%
All deaths	48.58		42.17		47.30		31.15		26.63		31.47	
MCOD Dementia	6.10	100.00	5.32	100.00	6.01	100.00	6.49	100.00	5.37	100.00	6.56	100.00
UCOD, with MCODE Dementia-related dis.												
Dementia-related diseases	3.58	58.75	3.17	59.46	3.54	58.86	4.12	63.52	3.47	64.62	4.17	63.58
Parkinson's disease	0.18	2.92	0.20	3.83	0.18	3.06	0.12	1.88	0.14	2.54	0.13	1.94
Neoplasms	0.40	6.63	0.36	6.79	0.40	6.66	0.26	3.93	0.24	4.47	0.26	3.98
Circulatory system diseases	0.93	15.31	0.80	14.94	0.92	15.27	1.09	16.84	0.87	16.21	1.10	16.81
<i>Cerebrovascular diseases</i>	0.25	4.11	0.21	3.93	0.24	4.08	0.30	4.63	0.22	4.02	0.30	4.58
<i>Ischaemic heart diseases</i>	0.25	4.06	0.22	4.05	0.24	4.07	0.20	3.04	0.15	2.72	0.20	3.02
<i>Remaining circulatory system diseases</i>	0.44	7.14	0.37	6.96	0.43	7.12	0.60	9.18	0.51	9.46	0.60	9.21
Diabetes mellitus	0.15	2.39	0.10	1.92	0.14	2.32	0.16	2.54	0.08	1.58	0.16	2.46
Chronic liver disease and cirrhosis	0.02	0.29	0.01	0.21	0.02	0.27	0.01	0.16	0.01	0.18	0.01	0.16
Respiratory system diseases	0.39	6.43	0.30	5.61	0.38	6.31	0.23	3.61	0.19	3.50	0.24	3.61
<i>Chronic lower respiratory diseases</i>	0.21	3.48	0.14	2.65	0.20	3.35	0.07	1.10	0.07	1.31	0.07	1.13
<i>Remaining respiratory system diseases</i>	0.18	2.95	0.16	2.96	0.18	2.96	0.16	2.51	0.12	2.19	0.16	2.48
COVID-19												
Other natural causes of death	0.40	6.63	0.34	6.42	0.39	6.57	0.45	6.89	0.34	6.28	0.45	6.82
External causes of death	0.04	0.67	0.04	0.80	0.04	0.68	0.04	0.63	0.03	0.60	0.04	0.63
<i>Accidental falls</i>	0.02	0.30	0.01	0.26	0.02	0.29	0.02	0.28	0.02	0.32	0.02	0.28
<i>Remaining external causes of death</i>	0.02	0.37	0.03	0.53	0.02	0.39	0.02	0.36	0.02	0.29	0.02	0.35

Source: Calculations based on data from the Spanish National Statistics Institute (see also main text).

Table 6S. Age-standardised mortality rate (ASMR) per 1,000 persons aged 60+ by sex and educational level for: All deaths, Dementia-related diseases (DRD) mentioned anywhere on the death certificate (MCOD Dementia), and the Underlying cause of death (UCOD) with DRD as a MCODE (also as a percentage of MCODE dementia). Spain (2020-2021)

	Men						Women					
	Low education		High education		Total		Low education		High education		Total	
	Rate	%	rate	%	Rate	%	rate	%	rate	%	rate	%
All deaths	52.78		46.45		51.13		33.47		29.20		33.60	
MCOD Dementia	6.31	100.00	5.57	100.00	6.18	100.00	6.78	100.00	5.78	100.00	6.83	100.00
UCOD, with MCODE Dementia-related dis.												
Dementia-related diseases	3.16	50.15	2.85	51.12	3.11	50.30	3.76	55.50	3.22	55.75	3.79	55.54
Parkinson's disease	0.19	3.04	0.20	3.62	0.20	3.15	0.13	1.94	0.12	2.15	0.13	1.95
Neoplasms	0.41	6.44	0.36	6.48	0.40	6.45	0.27	3.97	0.26	4.55	0.28	4.03
Circulatory system diseases	0.93	14.67	0.76	13.72	0.90	14.55	1.08	15.99	0.87	15.04	1.09	15.91
<i>Cerebrovascular diseases</i>	0.24	3.88	0.18	3.27	0.23	3.75	0.27	4.04	0.22	3.87	0.28	4.03
<i>Ischaemic heart diseases</i>	0.22	3.54	0.22	3.97	0.23	3.64	0.18	2.67	0.15	2.57	0.18	2.65
<i>Remaining circulatory system diseases</i>	0.46	7.25	0.36	6.48	0.44	7.16	0.63	9.28	0.50	8.60	0.63	9.23
Diabetes mellitus	0.17	2.65	0.11	1.93	0.16	2.52	0.20	2.91	0.09	1.57	0.19	2.78
Chronic liver disease and cirrhosis	0.02	0.26	0.01	0.16	0.01	0.23	0.01	0.16	0.01	0.17	0.01	0.15
Respiratory system diseases	0.30	4.75	0.20	3.51	0.28	4.52	0.16	2.29	0.13	2.18	0.16	2.29
<i>Chronic lower respiratory diseases</i>	0.17	2.77	0.10	1.86	0.16	2.62	0.06	0.91	0.05	0.91	0.06	0.92
<i>Remaining respiratory system diseases</i>	0.12	1.98	0.09	1.65	0.12	1.91	0.09	1.38	0.07	1.27	0.09	1.37
COVID-19	0.66	10.40	0.66	11.90	0.66	10.68	0.64	9.46	0.64	11.16	0.66	9.63
Other natural causes of death	0.44	6.90	0.37	6.64	0.42	6.83	0.49	7.15	0.41	7.04	0.49	7.11
External causes of death	0.05	0.74	0.05	0.90	0.05	0.76	0.04	0.62	0.02	0.38	0.04	0.60
<i>Accidental falls</i>	0.02	0.32	0.02	0.43	0.02	0.34	0.02	0.30	0.01	0.18	0.02	0.29
<i>Remaining external causes of death</i>	0.03	0.42	0.03	0.47	0.03	0.42	0.02	0.32	0.01	0.21	0.02	0.31

Source: Calculations based on data from the Spanish National Statistics Institute (see also main text).

Table 7S. Life expectancy at age 60, by sex and education level – Spain (2016-2021)

	Total	Low Education	High Education	High - Low
Men				
2016-2017	23.09	22.83	24.35	1.52
2018-2019	23.33	22.83	24.51	1.68
2020-2021	22.62	22.03	23.66	1.62
2016-2021	23.02	22.57	24.17	1.61
Women				
2016-2017	27.44	27.65	28.74	1.10
2018-2019	27.65	27.66	28.89	1.23
2020-2021	27.08	26.99	28.14	1.15
2016-2021	27.39	27.43	28.59	1.16

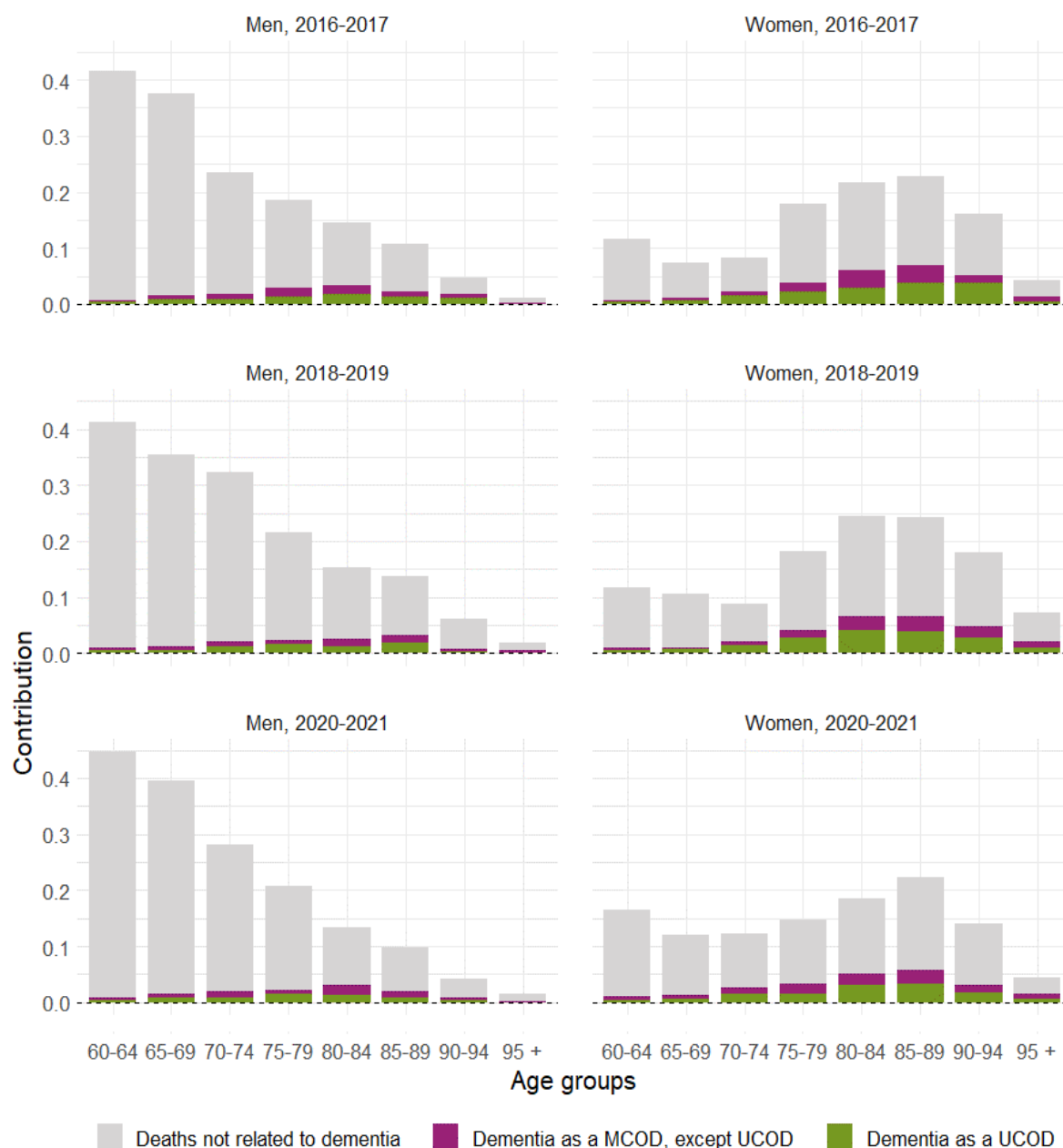
Source: Calculations based on data from the Spanish National Statistics Institute (see also main text).

Table 8S. Contribution of dementia-related mortality to the educational gap in life expectancy at age 60 - Spain (2016-2021): As an underlying cause of death (UCOD), as a contributing cause, and as a multiple cause of death (MCOD)

Dementia as an UCOD			Dementia as a contributing cause		Dementia as an MCOD		Other causes		educational gap (High – Low)
Contribution in years	%		Contribution in years	%	Contribution in years	%	Contribution in years	%	Years
Men									
2016-2017	0.08	5.10	0.07	4.35	0.14	9.44	1.38	90.56	1.52
2018-2019	0.08	4.49	0.06	3.63	0.14	8.12	1.54	91.88	1.68
2020-2021	0.06	3.66	0.07	4.12	0.13	7.79	1.50	92.21	1.62
2016-2021	0.07	4.50	0.06	3.87	0.13	8.36	1.47	91.64	1.61
Women									
2016-2017	0.16	14.24	0.11	10.44	0.27	24.69	0.83	75.31	1.10
2018-2019	0.17	13.69	0.11	9.16	0.28	22.85	0.95	77.15	1.23
2020-2021	0.13	11.14	0.11	9.70	0.24	20.84	0.91	79.16	1.15
2016-2021	0.15	13.20	0.11	9.47	0.26	22.67	0.90	77.33	1.16

Source: Calculations based on data from the Spanish National Statistics Institute (see also main text). Note: Cause-specific contributions may not always add up to the total due to rounding.

Figure S1. Contribution of dementia-related diseases to the educational gap in in years of life expectancy by age group. Population aged 60+. Spain, 2016-17, 2018-19 and 2020-21.



Source: Calculations based on data from the Spanish National Statistics Institute (see also main text).