

**SUPPLEMENTARY TABLES**

**Supplementary Table 1. Dementia odds (Log<sub>e</sub> transformed) and all-cause mortality: four-way decomposition models by poor sleep quality (alternative measure), overall, by sex and by race: HRS 2006–2020<sup>a,b</sup>.**

Y: All-cause mortality; X: Poor sleep quality score	TE		CDE		INTREF		INTMED		PIE	
	β ± SE	P	β ± SE	P	β ± SE	P	β ± SE	P	β ± SE	P
<b>Overall</b>										
<b>Reduced Model 1A–1C (N = 6,991)</b>										
X: Hurd	+0.39460 ± 0.01918	<0.001	+0.39453 ± 0.01903	<0.001	-0.00014 ± 0.00038	0.72	-3.30e-07 ± 0.00011	0.99	+0.00020 ± 0.00044	0.65
X: Expert	+0.62019 ± 0.0298	<0.001	+0.62213 ± 0.02983	<0.001	+0.00044 ± 0.00144	0.76	-0.00357 ± 0.00156	<b>0.022</b>	+0.00120 ± 0.00081	0.14
X: LASSO	+0.58189 ± 0.026789	<0.001	+0.58260 ± 0.02677	<0.001	-0.00025 ± 0.00106	0.81	-0.00099 ± 0.00060	0.27	0.00051	0.29
<b>Full model 2A–2C (N = 6,510)</b>										
X: Hurd	+0.50834 ± 0.04784	<0.001	+0.46549 ± 0.045689	<0.001	+0.01968 ± 0.00630	<b>0.002</b>	+0.01734 ± 0.00537	<b>0.001</b>	+0.00583 ± 0.00204	<b>0.004</b>
X: Expert	+0.38242 ± 0.03200	<0.001	+0.35769 ± 0.03106	<0.001	+0.01078 ± 0.00355	<b>0.002</b>	+0.00946 ± 0.00281	<b>0.001</b>	+0.0045349 ± 0.0015896	<b>0.004</b>
X: LASSO	+0.44499 ± 0.03451	<0.001	+0.41445 ± 0.03359	<0.001	+0.01213 ± 0.00403	<b>0.003</b>	+0.01275 ± 0.00343	<0.001	+0.005669 ± 0.00184	<b>0.002</b>
<b>Male</b>										
<b>Reduced Model 1A–1C (N = 2,931)</b>										
X: Hurd	+0.56222 ± 0.04511	<0.001	+0.55160 ± 0.04485	<0.001	+0.013821 ± 0.00710	<b>0.052</b>	-0.00520 ± 0.00319	0.10	+0.0020 ± 0.00150	0.19
X: Expert	+0.60690 ± 0.05047	<0.001	+0.60239 ± 0.05057	<0.001	+0.00737 ± 0.00622	0.24	-0.0054 ± 0.00406	0.18	+0.00255 ± 0.00224	0.26
X: LASSO	+0.57335 ± 0.04414	<0.001	+0.56778 ± 0.04411	<0.001	+0.0074 ± 0.00576	0.20	-0.00389 ± 0.00278	0.16	+0.00202 ± 0.00161	0.21
<b>Full model 2A–2C (N = 2,698)</b>										
X: Hurd	+0.41639 ± 0.07245	<0.001	+0.36523 ± ±0.068596	<0.001	+0.040039 ± 0.015321	<b>0.009</b>	+0.0085921 ± 0.0069285	0.22	+0.002532 ± 0.0022419	0.26
X: Expert	+0.26999 ± 0.047615	<0.001	+0.24175 ± 0.046239	<0.001	+0.021059 ± 0.0088441	0.017	0.0048072 ± 0.0032497	0.14	+0.0023808 ± ±0.0018317	0.19
X: LASSO	+0.35083 ± 0.051341	<0.001	+0.32061 ± 0.050018	<0.001	+0.021737 ± 0.010039	<b>0.030</b>	+0.005549 ± 0.003598	0.12	+0.0029342 ± 0.0020567	0.15
<b>Female</b>										
<b>Reduced Model 1A–1C (N = 4,060)</b>										
X: Hurd	+0.37611 ± 0.023086	<0.001	+0.37427 ± 0.022192	<0.001	+0.002193 ± 0.0026789	0.41	-0.0001658 ± 0.0003734	0.66	-0.0001828 ± 0.0003964	0.65
X: Expert	+0.63458 ± 0.037328	<0.001	+0.64323 ± 0.037345	<0.001	-0.0068712 ± 0.0022929	<b>0.003</b>	-0.0024374 ± 0.0017279	0.16	+0.0006561 ± 0.0007173	0.36
X: LASSO	+0.6017 ± 0.034544	<0.001	+0.60697 ± 0.034311	<0.001	-0.0053899 ± 0.0024186	<b>0.026</b>	+0.0002494 ± 0.000989	0.80	-0.0001342 ± 0.0005357	0.80
<b>Full model 2A–2C (N = 3,812)</b>										
X: Hurd	+0.56999 ± 0.06366	<0.001	+0.53713 ± 0.061636	<0.001	+0.0016369 ± 0.00547	0.77	+0.022984 ± 0.0078648	<b>0.003</b>	+0.0082415 ± 0.00313	<b>0.008</b>
X: Expert	+0.45958 ± 0.043156	<0.001	+0.44125 ± 0.042226	<0.001	-0.0015519 ± 0.0034798	0.66	+0.013771 ± 0.0044423	<b>0.002</b>	+0.0061107 ± 0.0023974	<b>0.011</b>
X: LASSO	+0.51303 ± 0.046599	<0.001	+0.48847 ± 0.045698	<0.001	-0.0020449 ± 0.0037046	0.58	+0.019134 ± 0.0055133	<b>0.001</b>	+0.0074635 ± 0.0028207	<b>0.008</b>

<b>White</b>										
<b>Reduced Model 1A–1C (N = 5,666)</b>										
X: Hurd	+0.40035 ± 0.021778	<0.001	+0.40084 ± 0.021522	<0.001	-0.0000128 ± 0.0009433	0.99	-0.0000583 ± 0.0002188	0.79	-0.000416 ± 0.0007205	0.56
X: Expert	+0.65841 ± 0.034181	<0.001	+0.66013 ± 0.034132	<0.001	-0.0013205 ± 0.0010699	0.22	-0.0013384 ± 0.001134	0.24	+0.0009395 ± 0.0007591	0.22
X: LASSO	+0.58944 ± 0.029623	<0.001	+0.59089 ± 0.029593	<0.001	-0.0014574 ± 0.0009838	0.14	+0.0001398 ± 0.0007785	0.86	-0.0001271 ± 0.0007059	0.86
<b>Full model 2A–2C (N = 5,324)</b>										
X: Hurd	+0.52799 ± 0.05374	<0.001	+0.4828 ± 0.051197	<0.001	+0.019272 ± 0.0071537	0.007	+0.020357 ± 0.0064565	0.002	+0.0055594 ± 0.0022126	0.012
X: Expert	+0.43223 ± 0.03738	<0.001	+0.4029 ± 0.036271	<0.001	+0.010697 ± 0.0041516	0.010	+0.013908 ± 0.0038493	<0.001	+0.0047164 ± 0.0019462	0.015
X: LASSO	+0.47268 ± 0.039032	<0.001	+0.43754 ± 0.037907	<0.001	+0.012776 ± 0.0047307	0.007	+0.017013 ± 0.0044407	<0.001	+0.0053461 ± 0.0021258	0.012
<b>Black/Hispanic/Others</b>										
<b>Reduced Model 1A–1C (N = 1,325)</b>										
X: Hurd	+0.36329 ± 0.040527	<0.001	+0.3657 ± 0.040865	<0.001	+0.0004392 ± 0.002962	0.88	-0.0004587 ± 0.0021728	0.83	-0.0023979 ± 0.0027029	0.38
X: Expert	+0.48137 ± 0.060746	<0.001	+0.48631 ± 0.060752	<0.001	+0.011991 ± 0.0081179	0.14	-0.011995 ± 0.006882	0.081	-0.0049335 ± 0.0053335	0.36
X: LASSO	+0.53417 ± ±0.06236	<0.001	+0.53799 ± ±0.062361	<0.001	+0.0063964 ± ±0.0064947	0.33	-0.0061 ± ±0.0053094	0.25	-0.0041111 ± ±0.0041556	0.32
<b>Full model 2A–C (N = 1,186)</b>										
X: Hurd	+0.41074 ± 0.10575	<0.001	+0.38256 ± 0.10227	<0.001	+0.015644 ± 0.014372	0.28	+0.0061412 ± 0.0073845	0.41	+0.0063943 ± 0.0067089	0.34
X: Expert	+0.22672 ± 0.061705	<0.001	+0.21797 ± 0.05989	<0.001	+0.0077981 ± 0.0082535	0.35	+0.0002961 ± 0.0021035	0.89	+0.0006594 ± 0.0046543	0.89
X: LASSO	+0.34001 ± 0.075128	<0.001	+0.32957 ± 0.073668	<0.001	+0.0044248 ± 0.0090454	0.63	+0.0014626 ± 0.0026447	0.58	+0.004556 ± 0.00579	0.43

Abbreviations: CDE: Controlled Direct Effect; HRS: Health and Retirement Study; INTMED: Mediated Interaction; INTREF: Interaction Referent; PIE: Pure Indirect Effect; SE: Standard Error. <sup>a</sup>Cox PH regression models with mortality as the main outcome and poor sleep quality as the potential mediator/moderator allowed to interact with the main exposure. Log<sub>e</sub> (odds (dementia probability)) using Hurd, expert and LASSO algorithms were the main alternative exposures of interest, sample size N = 6,991, four-way decomposition analysis. 1 SD of the “poor sleep quality score” corresponded to 0.72-point higher score. 1 SD of Hurd, expert and LASSO algorithm Log<sub>e</sub> (dementia probability) corresponded to 3.93, 3.13 and 2.40, respectively. <sup>b</sup>Exogenous variables are the ones included in Table 2, Models 1A–1D and 2A–2D, as covariates for the reduced and full models, respectively. See Covariates section for detail.

**Supplementary Table 2. Poor sleep quality (alternative measure) and all-cause mortality: four-way decomposition models by dementia odds (Log<sub>e</sub> transformed), overall, by sex and by race, HRS 2006–2020<sup>a,b</sup>.**

Y: All-cause mortality; X: Poor sleep quality score	TE		CDE		INTREF		INTMED		PIE	
	$\beta \pm SE$	<i>P</i>	$\beta \pm SE$	<i>P</i>	$\beta \pm SE$	<i>P</i>	$\beta \pm SE$	<i>P</i>	$\beta \pm SE$	<i>P</i>
<b>Overall</b>										
<b>Reduced model 1A–1C (N = 6,991)</b>										
M: Hurd	+0.030902 ± 0.015271	<b>0.043</b>	+0.030249 ± 0.014538	<b>0.037</b>	-0.0009163 ± 0.002958	0.76	+0.00000325 ± 0.000066	0.96	+0.0015668 ± 0.003409	0.65
M: Expert	+0.022314 ± 0.01533	0.14	+0.023319 ± 0.014172	0.10	-0.014888 ± 0.0040651	<b>&lt;0.001</b>	-0.001674 ± 0.0007357	<b>0.023</b>	+0.015558 ± 0.0048172	<b>0.001</b>
M: LASSO	+0.021734 ± 0.015277	0.16	+0.029001 ± 0.014166	<b>0.029</b>	-0.012448 ± 0.0040104	<b>0.002</b>	-0.0005014 ± 0.0004548	0.27	+0.0056822 ± 0.0046441	0.22
<b>Full model 2A–2C (N = 6,510)</b>										
M: Hurd	-0.071307 ± 0.015996	<b>&lt;0.001</b>	-0.069697 ± 0.016273	<b>&lt;0.001</b>	+0.0056935 ± 0.0017507	<b>&lt;0.001</b>	+0.0039003 ± 0.0011567	<b>0.001</b>	-0.011204 ± 0.0029377	<b>&lt;0.001</b>
M: Expert	-0.072455 ± 0.016005	<b>&lt;0.001</b>	-0.065013 ± 0.016198	<b>&lt;0.001</b>	+0.0008955 ± 0.0012469	0.47	+0.0038437 ± 0.0010987	<b>&lt;0.001</b>	-0.012181 ± 0.0030042	<b>&lt;0.001</b>
M: LASSO	-0.074468 ± 0.015933	<b>&lt;0.001</b>	-0.065691 ± 0.016257	<b>&lt;0.001</b>	+0.0023859 ± 0.0013247	<i>0.072</i>	+0.0045361 ± 0.0011665	<b>&lt;0.001</b>	-0.015699 ± 0.0032712	<b>&lt;0.001</b>
<b>Male</b>										
<b>Reduced Model 1A–1C (N = 2,931)</b>										
M: Hurd	+0.036394 ± 0.023714	0.13	+0.03855 ± 0.022696	<i>0.085</i>	-0.012609 ± 0.0038722	<b>0.001</b>	-0.002007 ± 0.0012411	0.11	+0.01246 ± 0.0061561	<b>0.043</b>
M: Expert	+0.041568 ± 0.023999	<i>0.083</i>	+0.026619 ± 0.022592	0.24	-0.0079929 ± 0.004602	<i>0.082</i>	-0.0020728 ± 0.0015948	0.19	+0.025015 ± 0.0068767	<b>&lt;0.001</b>
M: LASSO	+0.040998 ± 0.023893	<i>0.086</i>	+0.031346 ± 0.022755	0.17	-0.0074983 ± 0.003495	<b>0.032</b>	-0.0017166 ± 0.0012603	0.17	+0.018867 ± 0.0068946	<b>0.006</b>
<b>Full Model 2A–2C (N = 2,698)</b>										
M: Hurd	-0.049922 ± 0.025342	<b>0.049</b>	-0.054646 ± 0.02556	<b>0.033</b>	+0.0074653 ± 0.0031169	<b>0.017</b>	+0.0018204 ± 0.0014413	0.21	-0.0045613 ± 0.0034561	0.19
M: Expert	-0.049416 ± 0.025435	<i>0.052</i>	-0.051529 ± 0.025562	<b>0.044</b>	+0.0055075 ± 0.0026007	<b>0.034</b>	+0.0019059 ± 0.0012649	0.13	-0.0053001 ± 0.0031745	<i>0.095</i>
M: LASSO	-0.051863 ± 0.025306	<b>0.040</b>	-0.057227 ± 0.026158	<b>0.029</b>	+0.01078 ± 0.0043433	<b>0.013</b>	+0.001954 ± 0.0012319	0.11	-0.0073697 ± 0.0039338	<i>0.061</i>
<b>Female</b>										
<b>Reduced Model 1A–1C (N = 4,060)</b>										
M: Hurd	+0.021244 ± 0.01996	0.29	+0.020074 ± 0.018716	0.28	+0.0036149 ± 0.0047921	0.45	-0.0001155 ± 0.0002588	0.66	-0.0023297 ± 0.0045684	0.61
M: Expert	+0.0092236 ± 0.019975	0.64	+0.01992 ± 0.018151	0.27	-0.020214 ± 0.006299	<b>0.001</b>	-0.0012756 ± 0.0009076	0.16	+0.010794 ± 0.0067233	0.11
M: LASSO	+0.0088882 ± 0.019948	0.66	+0.025951 ± 0.018025	0.15	-0.015572 ± 0.0068724	<b>0.023</b>	+0.0001363 ± 0.0005395	0.80	-0.0016275 ± 0.0063951	0.80
<b>Full Model 2A–2C (N = 3,812)</b>										
M: Hurd	-0.087193 ± 0.020602	<b>&lt;0.001</b>	-0.080351 ± 0.021098	<b>&lt;0.001</b>	+0.0039831 ± 0.0021884	<i>0.069</i>	+0.0053083 ± 0.0017144	<b>0.002</b>	-0.016134 ± 0.0044396	<b>&lt;0.001</b>
M: Expert	-0.089694 ± 0.020571	<b>&lt;0.001</b>	-0.073317 ± 0.020868	<b>&lt;0.001</b>	-0.0041846 ± 0.0021176	<b>0.048</b>	+0.0056334 ± 0.0017336	<b>0.001</b>	-0.017826 ± 0.0047459	<b>&lt;0.001</b>
M: LASSO	-0.091803 ± 0.020474	<b>&lt;0.001</b>	-0.068552 ± 0.020738	<b>0.001</b>	-0.0076524 ± 0.0023243	<b>0.001</b>	+0.0068409 ± 0.0018637	<b>&lt;0.001</b>	-0.022439 ± 0.0049456	<b>&lt;0.001</b>
<b>White</b>										
<b>Reduced Model 1A–1C (N = 5,666)</b>										
M: Hurd	+0.042615 ± 0.017248	<b>0.013</b>	+0.045593 ± 0.016644	<b>0.006</b>	-0.0006782 ± 0.00257	0.79	-0.0000424 ± 0.0001336	0.75	-0.0022575 ± 0.0038237	0.56
M: Expert	+0.035484 ± 0.017316	<b>0.040</b>	+0.038322 ± 0.016226	<b>0.018</b>	-0.010111 ± 0.00365	<b>0.006</b>	-0.000566 ± 0.0004904	0.25	+0.0078392 ± 0.0054609	0.15
M: LASSO	+0.032891 ± 0.017185	<i>0.056</i>	+0.043853 ± 0.016208	<b>0.007</b>	-0.010087 ± 0.003663	<b>0.006</b>	+0.0000682 ± 0.0003795	0.86	-0.0009427 ± 0.0052236	0.86

<b>Full model 2A–2C (N = 5,324)</b>										
M: Hurd	-0.056391 ± 0.017887	0.002	-0.061824 ± 0.01847	0.001	+0.013754 ± 0.0031299	<0.001	+0.0045156 ± 0.0013674	0.001	-0.012836 ± 0.0033782	<0.001
M: Expert	-0.057803 ± 0.017899	0.001	-0.052722 ± 0.018373	0.004	+0.0065844 ± 0.0020024	0.001	+0.0051515 ± 0.001365	<0.001	-0.016816 ± 0.0036252	<0.001
M: LASSO	-0.05932 ± 0.017815	0.001	-0.054199 ± 0.018439	0.003	+0.0081853 ± 0.0022739	<0.001	+0.0058666 ± 0.0014602	<0.001	-0.019172 ± 0.003814	<0.001
<b>Non-White</b>										
<b>Reduced Model 1A–1C (N = 1,325)</b>										
M: Hurd	-0.016372 ± 0.033019	0.62	-0.03019 ± 0.030445	0.32	-0.0018161 ± 0.01184	0.88	-0.0002873 ± 0.001341	0.83	+0.015922 ± 0.0076197	0.037
M: Expert	-0.02867 ± 0.033247	0.39	-0.02983 ± 0.030918	0.34	-0.032022 ± 0.016716	0.055	-0.0070443 ± 0.0039502	0.075	+0.040226 ± 0.010528	<0.001
M: LASSO	-0.023034 ± 0.033538	0.48	-0.031699 ± 0.029852	0.29	-0.018889 ± 0.015875	0.23	-0.0031746 ± 0.0027188	0.24	+0.030728 ± 0.010316	0.003
<b>Full model 2A–2C (N = 1,186)</b>										
M: Hurd	-0.13108 ± 0.036592	<0.001	-0.1111 ± 0.037134	0.003	-0.015845 ± 0.010362	0.13	+0.0014531 ± 0.0016788	0.39	-0.0055812 ± 0.0056183	0.32
M: Expert	-0.13057 ± 0.036569	<0.001	-0.11974 ± 0.037074	0.001	-0.010308 ± 0.0085493	0.23	+0.0001613 ± 0.0011436	0.89	-0.0006843 ± 0.0048254	0.89
M: LASSO	-0.13464 ± 0.036457	<0.001	-0.12457 ± 0.036056	0.001	-0.005761 ± 0.0085282	0.50	+0.0006235 ± 0.0010289	0.54	-0.0049392 ± 0.0061316	0.42

Abbreviations CDE: Controlled Direct Effect; HRS: Health and Retirement Study; INTMED: Mediated Interaction; INTREF: Interaction Referent; PIE: Pure Indirect Effect; SE: Standard Error. <sup>a</sup>Cox PH regression models with mortality as the main outcome and poor sleep quality as the exposure. Log<sub>e</sub> (odds (dementia probability)) using Hurd, expert and LASSO algorithms were potential mediators/moderators allowed to interact with the main exposure, four-way decomposition analysis. 1 SD of the “poor sleep quality score” corresponded to 0.72-point higher score. 1 SD of Hurd, expert and LASSO algorithm Log<sub>e</sub> (dementia probability) corresponded to 3.93, 3.13 and 2.40, respectively. <sup>b</sup>Exogenous variables are the ones included in Table 2, Models 1A–1D and 2A–2D, as covariates for the reduced and full models, respectively. See Covariates section for detail.