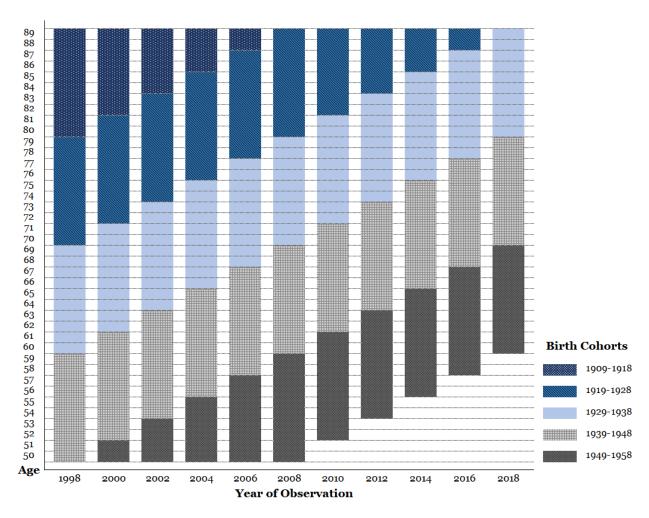
## Age and Cohort Trends in Formal Volunteering and Informal Helping in Later Life: Evidence from the Health and Retirement Study

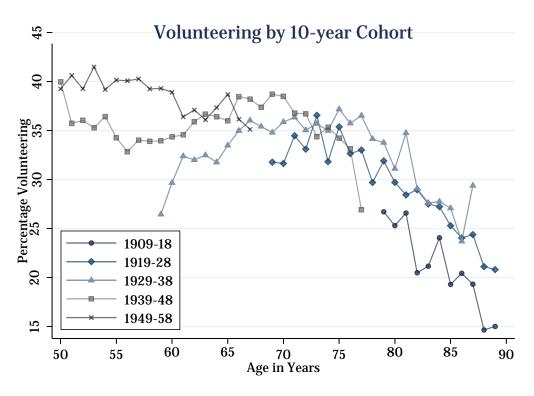
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## **Supplementary Materials**

- Figure S1. Graphical representation of the longitudinal study design
- Figure S2. Weighted rates of volunteering and informal helping by 10-year birth cohorts
- **Table S1.** Descriptive statistics of All Study Variables by 10-year Cohort Membership
- **Table S2.** Predicted probabilities of helping behavior participation at select ages
- **Table S3.** Multivariate multilevel models predicting volunteering and informal helping: Adjustment for education
- **Table S4.** Multivariate multilevel models predicting volunteering and informal helping: Additional adjustment for family caregiving
- **Table S5.** Multivariate multilevel models predicting volunteering and informal helping: Gender interaction



*Figure S1*. Graphical representation of the longitudinal study design for the five 10-year birth cohorts employed in this study.



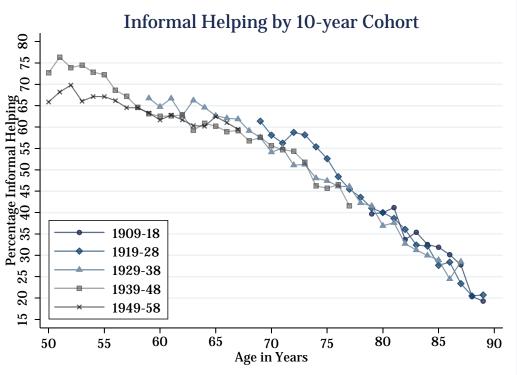


Figure S2. Weighted rates of volunteering and informal helping, respectively, by 10-year birth cohorts based on longitudinal data from the *Health and Retirement Study* (1998-2016). Data from the 2018 wave were not included because survey weights for the wave was not yet available as of this writing (July 2021).

Table S1

Descriptive Statistics of All Study Variables by 10-year Cohort Membership: Health and Retirement Study 1998-2018

	1909-	1918	1919-1928		1929	-1938	1939-1948		1949-1958	
Variable	Mean/%	(SD)	Mean/%	(SD)	Mean/%	(SD)	Mean/%	(SD)	Mean/%	(SD)
Volunteering, %	19.36		29.43		33.55		35.17		36.54	
Informal helping, %	30.13		41.88		50.63		58.45		58.34	
Age (years)	84.58	(2.86)	79.02	(4.98)	71.79	(6.52)	63.89	(6.53)	58.59	(4.24)
Female, %	62.95		56.97		55.94		58.29		56.65	
Race/ethnic status, %										
Non-Hispanic White	80.45		81.68		74.87		72.18		54.54	
Non-Hispanic Black	12.46		10.17		14.42		15.50		23.41	
Non-Hispanic other	1.47		1.78		1.96		2.49		4.14	
Hispanic	5.61		6.37		8.75		9.83		17.91	
Coupled, %	36.13		55.51		64.23		71.88		66.49	
Education in years	10.90	(3.63)	11.78	(3.51)	12.16	(3.27)	12.76	(3.07)	12.98	(3.25)
Wealth (in \$1,000)	278.39	(879.89)	361.53	(881.76)	400.31	(1237.27)	387.89	(1241.47)	309.87	(1552.10)
Working for pay, %	4.04		10.04		23.65		45.22		61.28	
Religious, %	66.50		66.98		66.38		61.45		65.24	
ADL limitations	0.70	(1.25)	0.45	(1.04)	0.33	(0.90)	0.25	(0.78)	0.28	(0.82)
Family caregiving, %	5.66		7.98		11.17		15.78		19.30	
Attrition, %	2.08		3.39		3.91		4.43		1.98	
Person-wave observations	6,307		26,123		54,266		54,201		39,568	

*Notes.* N = 180,465 person-wave observations. ADL = activities of daily living.

 Table S2

 Predicted Probabilities of Helping Behavior Participation at Select Ages along with Ratios of Probabilities for Adjacent Cohorts

					Cohorts		
		Age	1949-1958	1939-1948	1929-1938	1919-1928	1909-1918
	55	.385 [0.375,0.393]	.331 [0.322,0.340]				
		33	v.1939-1948: 1.164				
		65	.345 [0.335,0.357]	.345 [0.337,0.353]	.326 [0.315,0.334]		
Unadjusted	03	v.1939-1948: 1.002	v.1929-1938: 1.058				
	75		.297 [0.284,0.310]	.307 [0.298,0.314]	.303 [0.292,0.313]		
		13		v.1929-1938: 0.967	v.1919-1928: 1.014		
		85			.161 [0.148,0.173]	.172 [0.162,0.183]	.169 [0.154,0.191]
Volunteering		0.5			v.1919-1928: 0.933	v.1909-1918: 1.019	
Volunteering	55	.338 [0.328,0.348]	.286 [0.275,0.298]				
		33	v.1939-1948: 1.183				
		65	.286 [0.273,0.299]	.324 [0.314,0.335]	.310[0.301, 0.319]		
	Adjusted		v.1939-1948: 0.883	v.1929-1938: 1.044			
	rajustea	75		.248 [0.233,0.266]	.304[0.295, 0.313]	.319[0.307, 0.333]	
		75		v.1929-1938: 0.816	v.1919-1928: .953		
		85			.116[0.105, 0.127]	.173[0.162, 0.185]	.217[0.204, 0.235]
					v.1919-1928: 0.670	v.1909-1918: 0.797	
		55	.636 [0.629,0.644]	.669 [0.660,0.677]			
		55	v.1939-1948: .951				
		65	.558 [0.547,0.570]	.559 [0.551,0.567]	.598 [0.590,0.606]		
Informal	Unadjusted	0.5	v.1939-1948: 1.000	v.1929-1938: .934			
helping	2 maj astoa	75		.413 [0.401,0.426]	.417 [0.408,0.425]	.484 [0.474,0.494]	
		75		v.1929-1938: 0.992	v.1919-1928: 0.861		
		85			.163 [0.408,0.425]	.198 [0.474,0.494]	.281[0.269, 0.293]
		0.5			v.1919-1928: 0.825	v.1909-1918: 0.704	

	55	.616 [0.607,0.624]	.672 [0.658,0.683]			
	33	v.1939-1948: 0.917				
	<b>65</b>	.534 [0.522,0.547]	.553 [0.544,0.562]	.611 [0.602,0.620]		
Adinated	65	v.1939-1948: 0.967	v.1929-1938: 0.906			
Adjusted	75		.407 [0.391,0.423]	.429 [0.420,0.438]	.511 [0.499,0.524]	
	13		v.1929-1938: 0.949	v.1919-1928: 0.840		
	0.5			.162 [0.147,0.179]	.220 [0.209,0.233]	.330 [0.315,0.342]
8	85			v.1919-1928: 0.734	v.1909-1918: 0.668	

*Notes.* Predicted probabilities are based on coefficients from the unadjusted and adjusted multivariate models presented in Table 2; 95% credible intervals are presented in brackets. Ratios comparing helping behavior participation probabilities for adjacent cohorts at a given age are presented in grey shade.

 Table S3

 Multivariate Multilevel Models Predicting Volunteering and Informal Helping: Adjustment for Education

		Unadjusted (copi	ed from '	Table 2)	<b>Unadjusted + Education</b>					
	Vo	olunteering	<u>Info</u>	rmal helping	Vo	olunteering	<u>Info</u>	rmal helping		
	β	[95% CI]	β	[95% CI]	β	[95% CI]	β	[95% CI]		
Fixed effects										
Age linear	-0.120	[-0.139,-0.107]	-0.112	[-0.121, 0.000]	-0.127	[-0.144, -0.117]	-0.117	[-0.133, 0.000]		
Age quadratic <sup>a</sup>	0.091	[-0.020,0.182]	-0.747	[-0.835,-0.586]	-0.430	[-0.520, -0.340]	-0.802	[-0.995,-0.578]		
Age cubic <sup>b</sup>	-0.096	[-0.124, -0.068]	-0.049	[-0.079, -0.023]	-0.151	[-0.179, -0.121]	-0.092	[-0.129, -0.043]		
10-year cohort										
1919-1928	0.637	[0.467, 0.765]	0.373	[0.308, 0.437]	0.564	[0.379, 0.691]	0.320	[0.241, 0.394]		
1929-1938	0.995	[0.796, 1.124]	0.812	[0.756, 0.876]	0.836	[0.681, 0.962]	0.718	[0.643, 0.791]		
1939-1948	1.086	[0.898, 1.210]	1.061	[1.010,1.107]	0.780	[0.600, 0.907]	0.894	[0.824, 0.967]		
1949-1958	1.225	[1.043,1.350]	1.216	[1.162,1.274]	0.765	[0.582, 0.870]	0.976	[0.910, 1.059]		
Age linear by cohort interacti	on									
× 1919-1928	0.047	[0.034, 0.065]	0.005	[-0.003,0.014]	0.041	[0.026, 0.059]	0.007	[-0.003,0.022]		
× 1929-1938	0.106	[0.093, 0.125]	0.046	[0.038, 0.054]	0.111	[0.098, 0.127]	0.050	[0.040, 0.064]		
× 1939-1948	0.123	[0.110, 0.143]	0.072	[0.063, 0.081]	0.132	[0.122, 0.148]	0.078	[0.067, 0.093]		
× 1949-1958	0.100	[0.086,0.119]	0.085	[0.076, 0.095]	0.102	[0.091,0.120]	0.089	[0.078, 0.104]		
Age quadratic by cohort inter	raction a									
× 1919-1928	-0.531	[-0.661, -0.391]	0.469	[0.302, 0.583]	-0.293	[-0.441, -0.138]	0.478	[0.261, 0.691]		
× 1929-1938	-0.400	[-0.490,-0.311]	0.585	[0.427, 0.680]	-0.089	[-0.199,0.016]	0.626	[0.401, 0.821]		
× 1939-1948	-0.231	[-0.316,-0.131]	0.707	[0.544,0.802]	0.128	[0.035,0.216]	0.771	[0.526,0.976]		
× 1949-1958	-0.011	[-0.141,0.116]	0.772	[0.590,0.900]	0.426	[0.303,0.564]	0.849	[0.574,1.075]		
Covariates										
Female	0.162	[0.126, 0.209]	-0.326	[-0.354, -0.299]	0.218	[0.181, 0.255]	-0.323	[-0.348, -0.302]		
Race/ethnicity		- , -		- , -		- , -		- , -		
Non-Hispanic black	-0.151	[-0.197, -0.105]	-0.404	[-0.434, -0.372]	0.161	[0.104, 0.232]	-0.265	[-0.300,-0.223]		
Non-Hispanic other	-0.360	[-0.488,-0.194]	-0.399	[-0.479,-0.308]	-0.273	[-0.393,-0.121]	-0.337	[-0.419,-0.255]		
Hispanic	-1.028	[-1.088,-0.961]	-1.083	[-1.127,-1.041]	-0.286	[-0.344,-0.204]	-0.708	[-0.758,-0.647]		
Education in years	1.020	[ =.000, 000 04]	1.000	[ -/,]	0.216	[0.206,0.223]	0.099	[0.093,0.104]		
Attrition	-0.105	[-0.199, -0.025]	0.009	[-0.049,0.067]	-0.182	[-0.287,-0.083]	-0.023	[-0.083,0.034]		

Intercept	-1.812	[-1.928,-1.639]	-0.438	[-0.496, -0.385]	-1.864	[-1.977,-1.690]	-0.394	[-0.462, -0.328]
Selected random effects								
Intercept	2.787	[2.686,2.889]	0.968	[0.936, 0.998]	3.052	[2.956,3.159]	0.930	[0.874, 0.975]
Cov (volunteering, helping)	0.973	[0.935, 1.009]			0.979	[0.874, 0.961]		
Age	0.001	[0.000, 0.002]	0.001	[0.000, 0.001]	0.013	[0.011, 0.014]	0.003	[0.001, 0.005]
Cov (volunteering, helping)	-0.0002	[-0.0004,0.00001]			0.003	[0.002, 0.003]		
Intercept-slope covariance	0.017	[0.013, 0.024]	0.014	[0.011, 0.018]	0.029	[0.022, 0.036]	0.014	[0.012, 0.017]

*Notes.* Sample N = 29,816 (180,465 person-wave observations). Posterior means for the coefficients and 95% Bayesian credible intervals (CIs). CIs are based on the 2.5th and 97.5th quantiles of the posterior distribution; Bayesian CIs that do not contain zero are **bolded**. HRS = *Health and Retirement Study*. CI = Credible intervals. <sup>a</sup> Estimates multiplied by 100 to reduce leading zeros. <sup>b</sup> Estimates multiplied by 1000 to reduce leading zeros.

 Table S4

 Multivariate Multilevel Models Predicting Volunteering and Informal Helping: Additional Adjustment for Family Caregiving

		Adjusted (copied	l from Ta	$\frac{1}{2}$	Adjusted + Family Caregiving				
	Vol	lunteering	<u>Info</u>	rmal helping	Vo	olunteering	<u>Info</u>	rmal helping	
	β	[95% CI]	β	[95% CI]	β	[95% CI]	β	[95% CI]	
Fixed effects									
Age linear	-0.101	[-0.115, -0.081]	-0.104	[-0.113, -0.092]	-0.093	[-0.110, -0.076]	-0.106	[-0.116, -0.095]	
Age quadratic <sup>a</sup>	-0.205	[-0.321, -0.093]	-0.401	[-0.467, -0.328]	-0.451	[-0.652, -0.281]	-0.725	[-0.876,-0.619]	
Age cubic <sup>b</sup>	-0.148	[-0.177,-0.116]	-0.092	[-0.128, -0.053]	-0.139	[-0.173, -0.099]	-0.091	[-0.127, -0.045]	
10-year cohort									
1919-1928	0.387	[0.238, 0.510]	0.269	[-0.128, -0.053]	0.355	[0.270, 0.475]	0.225	[-0.127, -0.045]	
1929-1938	0.628	[0.486,0.741]	0.633	[0.586,0.713]	0.606	[0.549, 0.695]	0.591	[0.544,0.637]	
1939-1948	0.609	[0.465,0.718]	0.815	[0.764,0.888]	0.596	[0.530,0.672]	0.764	[0.717,0.813]	
1949-1958	0.615	[0.503,0.713]	0.912	[0.861,0.978]	0.608	[0.532,0.699]	0.856	[0.803,0.901]	
Age linear by cohort interaction		_ , _							
× 1919-1928	0.026	[0.006, 0.042]	0.003	[-0.008,0.012]	0.017	[-0.005,0.037]	0.006	[-0.005, 0.017]	
× 1929-1938	0.091	[0.069, 0.105]	0.042	[0.031, 0.050]	0.082	[0.064, 0.100]	0.045	[0.033, 0.055]	
× 1939-1948	0.109	[0.086, 0.123]	0.068	[0.056, 0.077]	0.100	[0.083, 0.117]	0.071	[0.058, 0.082]	
× 1949-1958	0.077	[0.056, 0.092]	0.078	[0.065, 0.087]	0.069	[0.050, 0.087]	0.081	[0.068, 0.093]	
Age quadratic by cohort interact	ion <sup>a</sup>								
× 1919-1928	-0.422	[-0.574, -0.256]	0.131	[0.016, 0.243]	-0.171	[-0.380,0.053]	0.460	[0.322, 0.626]	
× 1929-1938	-0.262	[-0.382, -0.134]	0.264	[0.181, 0.335]	-0.019	[-0.180,0.193]	0.582	[0.456, 0.743]	
× 1939-1948	-0.067	[-0.190,0.054]	0.387	[0.305, 0.466]	0.177	[0.018, 0.383]	0.716	[0.576, 0.874]	
× 1949-1958	0.208	[0.045, 0.361]	0.444	[0.339, 0.560]	0.444	[0.249, 0.680]	0.774	[0.613, 0.945]	
Covariates									
Female	0.085	[-0.399,0.125]	-0.345	[-0.377, -0.318]	0.082	[-0.426,0.121]	-0.352	[-0.378,-0.320]	
Race/ethnicity									
Non-Hispanic black	0.019	[-0.058,0.096]	-0.232	[-0.267, -0.196]	-0.003	[-0.058,0.053]	-0.242	[-0.283,-0.205]	
Non-Hispanic other	-0.284	[-0.389,-0.174]	-0.315	[-0.390,-0.227]	-0.306	[-0.435,-0.151]	-0.321	[-0.398,-0.244]	
Hispanic	-0.310	[-0.399,-0.229]	-0.232	[-0.267,-0.196]	-0.349	[-0.426,-0.272]	-0.242	[-0.283,-0.205]	
Coupled	0.073	[0.046,0.102]	-0.032	[-0.053,-0.010]	0.062	[0.031,0.101]	-0.050	[-0.076,-0.028]	
Education in years	0.204	[0.193,0.212]	0.086	[0.081,0.091]	0.204	[0.197,0.211]	0.086	[0.081,0.091]	

Household wealth <sup>c</sup>	0.042	[0.037, 0.048]	0.028	[0.024, 0.033]	0.041	[0.034, 0.048]	0.028	[0.023, 0.033]
Working for pay	0.045	[0.015, 0.073]	0.041	[0.021, 0.065]	0.034	[0.007, 0.069]	0.044	[0.023, 0.067]
Religious	1.093	[1.057,1.135]	0.228	[0.201, 0.258]	1.082	[1.043,1.129]	0.228	[0.201, 0.263]
ADL limitations <sup>d</sup>	-0.251	[-0.267, -0.236]	-0.255	[-0.266, -0.243]	-0.249	[-0.269, -0.232]	-0.254	[-0.267, -0.242]
Family caregiving <sup>e</sup>					-0.023	[-0.058,0.008]	0.138	[0.113, 0.163]
Attrition	-0.199	[-0.304, -0.100]	-0.054	[-0.113,0.005]	-0.187	[-0.297, -0.085]	-0.049	[-0.110,0.011]
Intercept	-2.468	[-2.551,-2.319]	-0.516	[-0.568, -0.444]	-2.408	[-2.494,-2.333]	0.138	[0.113, 0.163]
Selected random effects								
Intercept	2.600	[2.513,2.702]	0.838	[0.792, 0.871]	2.586	[2.514,2.608]	0.832	[0.788, 0.866]
Cov (volunteering, helping)	0.750	[0.718, 0.786]			0.746	[0.715, 0.786]		
Age	0.012	[0.011, 0.013]	0.003	[0.001, 0.004]	0.012	[0.011, 0.013]	0.003	[0.001, 0.004]
Cov (volunteering, helping)	0.003	[0.002, 0.003]			0.003	[0.002, 0.003]		
Intercept-slope covariance	0.030	[0.023, 0.039]	0.013	[0.011, 0.015]	0.030	[0.022, 0.037]	0.013	[0.011, 0.015]

Notes. Sample N = 29,816 (180,465 person-wave observations). Posterior means for the coefficients and 95% Bayesian credible intervals (CIs). CIs are based on the 2.5th and 97.5th quantiles of the posterior distribution; Bayesian CIs that do not contain zero are **bolded**. HRS = Health and Retirement Study. CI = Credible intervals. ADL = Activities of daily living. <sup>a</sup> Estimates multiplied by 100 to reduce leading zeros. <sup>b</sup> Estimates multiplied by 1000 to reduce leading zeros. <sup>c</sup> Transformed by the inverse hyperbole sine. <sup>d</sup> Count of five ADL limitations.

<sup>&</sup>lt;sup>e</sup> Whether provided caregiving to parents (including in-laws) and spouses with self-care and household task items.

Table S5

Multivariate Multilevel Models Predicting Volunteering and Informal Helping: Gender Interaction

	S5-A: Gender $\times$	Cohort In	iteraction	S5-B: Three-way Interaction					
	<u>Volunteering</u>	Infor	mal helping	V	<u>olunteering</u>	Informal helping			
	β [95% CI]	β	[95% CI]	β	[95% CI]	β	[95% CI]		
Fixed effects									
Age linear	-0.112 <b>[-0.125,-0.090]</b>	-0.118	[-0.124, -0.107]	-0.117	[-0.140, -0.086]	-0.126	[-0.137, -0.114]		
10-year cohort									
1919-1928	0.374 <b>[0.261,0.498]</b>	0.346	[0.291, 0.397]	0.382	[0.253, 0.538]	0.388	[0.326, 0.446]		
1929-1938	0.727 <b>[0.630,0.831]</b>	0.865	[0.811, 0.930]	0.733	[0.627, 0.909]	0.916	[0.866, 0.957]		
1939-1948	0.857 <b>[0.762,0.979]</b>	1.131	[1.078,1.186]	0.874	[0.730, 1.032]	1.196	[1.147,1.239]		
1949-1958	0.944 <b>[0.830,1.075]</b>	1.204	[1.144,1.271]	0.949	[0.780, 1.154]	1.257	[1.190,1.314]		
Female	-0.186 <b>[-0.303,-0.113]</b>	-0.307	[-0.396,-0.217]	-0.183	[-0.299, -0.054]	-0.257	[-0.295,-0.194]		
Two-way interactions									
Age linear by cohort intera	action								
× 1919-1928	0.039 <b>[0.017,0.054]</b>	0.011	[0.001, 0.018]	0.040	[0.008, 0.063]	0.015	[0.000, 0.028]		
× 1929-1938	0.097 <b>[0.076,0.111]</b>	0.052	[0.041, 0.058]	0.106	[0.076, 0.128]	0.064	[0.051, 0.074]		
× 1939-1948	0.115 <b>[0.094,0.128]</b>	0.077	[0.066, 0.083]	0.121	[0.089, 0.145]	0.093	[0.079, 0.106]		
× 1949-1958	0.091 <b>[0.069,0.106]</b>	0.090	[0.078, 0.096]	0.099	[0.068, 0.121]	0.103	[0.087, 0.116]		
$Age \times female$				-0.019	[-0.032, -0.011]	0.006	[-0.010,0.026]		
Female by cohort interacti	on								
× 1919-1928	0.365 <b>[0.255,0.471]</b>	0.069	[-0.068,0.170]	0.379	[0.254, 0.529]	0.038	[-0.025,0.105]		
× 1929-1938	0.391 <b>[0.305,0.541]</b>	-0.062	[-0.162,0.071]	0.387	[0.230, 0.490]	-0.117	[-0.186, -0.045]		
× 1939-1948	0.343 <b>[0.231,0.462]</b>	-0.090	[-0.181,0.001]	0.305	[0.143, 0.459]	-0.171	[-0.250, -0.108]		
× 1949-1958	0.413 <b>[0.311,0.515]</b>	0.045	[-0.056,0.145]	0.415	[0.256, 0.580]	-0.002	[-0.086,0.052]		
Three-way interaction									
Age, female by cohort inte	eraction								
× 1919-1928				0.027	[0.013, 0.040]	0.003	[-0.019,0.024]		
× 1929-1938				0.014	[0.004, 0.027]	-0.012	[-0.031,0.005]		
× 1939-1948				0.019	[0.009, 0.031]	-0.016	[-0.037,0.001]		
× 1949-1958				0.015	[0.005, 0.029]	-0.013	[-0.035,0.008]		

## **Selected random effects**

Intercept	2.778 <b>[2.682,2.879</b> ]	0.971	[0.944, 1.002]	2.800	[2.697,2.955]	0.973	[0.942,1.003]	
Cov (volunteering, helping)	0.972 <b>[0.935,1.012]</b>			0.977	[0.938,1.023]			
Age	0.0003 <b>[0.0001,0.0007]</b>	0.0004	[0.0002, 0.0007]	0.001	[0.000, 0.002]	0.001	[0.000, 0.001]	
Cov (volunteering, helping)	>-0.0001 [-0.0001,0.0001]			-0.0002	[-0.001,0.000]			
Intercept-slope covariance	0.019 <b>[0.014,0.025]</b>	0.013	[0.009, 0.017]	0.019	[0.014, 0.025]	0.014	[0.011, 0.018]	

*Notes*. Sample *N* = 29,816 (180,465 person-wave observations). Posterior means for the coefficients and 95% Bayesian credible intervals (CIs). CIs are based on the 2.5th and 97.5th quantiles of the posterior distribution; Bayesian CIs that do not contain zero are **bolded**. Estimates are for all variables shown in unadjusted model presented in Table 2, including higher-order age terms. HRS = *Health and Retirement Study*. CI = Credible intervals. <sup>a</sup> Estimates multiplied by 100 to reduce leading zeros. <sup>b</sup> Estimates multiplied by 1000 to reduce leading zeros. We note here that, while we find positive and sizable estimates for the interaction terms between gender and cohort membership in Model S5-A, the interaction effects are difficult to interpret because cohorts have different mean ages. In the three-way interaction model (Model S5-B), we found evidence for gender differences in age-cohort trends for volunteering (but not informal helping); however, the size of the estimates and the 95% CIs indicated the gender differences were minor.