Appendix A: sample with data at all waves (n=4,946) (weighted2)

**Table A1: Descriptive statistics of the sample with data available at all waves**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Measure** | **Female**  **(n=2,722)** | | | | **Male**  **(n=2,224)** | | | |
|  | **Wave 1** | **Wave 2** | **Wave 3** | **Wave 4** | **Wave 1** | **Wave 2** | **Wave 3** | **Wave 4** |
| Age (mean (SD)) | 62.38  (8.80) | - | - | - | 62.63  (8.74) | - | - | - |
| Secondary or higher education | 77.6% | - | - | - | 71.4% |  |  |  |
| Self-reported health |  |  |  |  |  |  |  |  |
| Excellent | 18.7% | 16.2% | 14.0% | 13.9% | 16.8% | 15.1% | 14.4% | 12.2% |
| Very good | 30.2% | 34.5% | 35.3% | 35.1% | 31.3% | 34.4% | 33.9% | 34.8% |
| Good | 31.8% | 33.5% | 34.0% | 34.8% | 32.4% | 35.7% | 34.4% | 36.9% |
| Fair | 15.6% | 13.3% | 13.9% | 13.3% | 15.7% | 12.8% | 14.5% | 14.1% |
| Poor | 3.6% | 2.5% | 2.9% | 2.8% | 3.8% | 2.0% | 2.8% | 2.0% |
| Marital status |  |  |  |  |  |  |  |  |
| Married / Cohabiting | 67.8% | 66.1% | 63.8% | 62.5% | 78.0% | 76.8% | 75.8% | 74.6% |
| Single (never married) | 7.8% | 7.5% | 7.6% | 7.6% | 10.2% | 9.9% | 9.9% | 9.9% |
| Separated / Divorced | 8.2% | 8.5% | 8.4% | 8.0% | 4.9% | 5.1% | 5.2% | 5.4% |
| Widowed | 16.2% | 17.9% | 20.2% | 21.9% | 7.0% | 8.2% | 9.1% | 10.1% |
| Religious affiliation |  |  |  |  |  |  |  |  |
| Catholic | 92.7% | 91.9% | 91.6% | 91.5% | 92.2% | 91.3% | 90.6% | 90.7% |
| Religious attendance |  |  |  |  |  |  |  |  |
| Never/Almost never | 8.2% | 8.5% | 9.7% | 10.4% | 11.1% | 12.0% | 11.1% | 12.2% |
| Once or twice a year | 9.4% | 10.3% | 11.2% | 11.3% | 12.6% | 11.8% | 13.8% | 13.5% |
| Every few months | 8.8% | 9.1% | 8.4% | 9.9% | 8.5% | 9.3% | 9.6% | 9.5% |
| Once or twice a month | 8.9% | 10.3% | 9.8% | 9.2% | 9.1% | 9.8% | 9.1% | 9.5% |
| Once a week | 48.1% | 45.8% | 45.0% | 43.7% | 49.8% | 47.8% | 46.9% | 45.0% |
| More than once a week | 16.6% | 15.9% | 15.9% | 15.5% | 9.0% | 9.2% | 9.5% | 10.3% |
| Religious importance |  |  |  |  |  |  |  |  |
| Not important | 14.4% | 15.3% | 15.4% | 14.4% | 25.0% | 25.4% | 25.3% | 24.7% |
| Somewhat important | 31.5% | 27.8% | 30.7% | 30.7% | 34.2% | 33.8% | 32.6% | 33.3% |
| Very important | 54.1% | 56.9% | 52.9% | 54.9% | 40.8% | 40.8% | 42.1% | 42.1% |
| Social connectivity (mean (SD)) | 10.56 (5.72) | 10.10 (5.50) | 9.23 (4.82) | 8.44 (4.24) | 11.77 (7.40) | 10.28 (6.86) | 9.69 (6.24) | 8.62 (5.25) |
| CES-D 8 (mean (SD) | 3.28  (3.99) | 2.99  (3.71) | 3.56  (3.99) | 3.54  (3.82) | 2.21 (3.25) | 2.18 (3.26) | 2.67 (3.42) | 2.70 (3.34) |

2 Longitudinal weights using age, education and urban versus rural location were derived to account for attrition

**Table A2: Growth curve models using a sample with data available at all waves**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Estimates** | | | | | **Model fit** | | |
|  |  | **Intercept [90%CI]** | **StdYX** | **Slope [90%CI]** | **StdYX** | **I/S covariance [90%CI]** | **RMSEA [90%CI]** | **CFI** | **TLI** |
|  |  |  |  |  |  |  |  |  |  |
| **Depressive symptoms** | Female | 3.410 [3.252; 3.567] | 1.104 | 0.122 [0.068; 0.175] | 0.161 | -0.858 [-1.264;  -0.452] | 0.047 [0.037; 0.058] | 0.980 | 0.976 |
|  | Male | 2.287 [2.155; 2.420] | 0.863 | 0.176 [0.131; 0.221] | 0.228 | -0.705 [-0.998;  -0.413] |  |  |  |
| **Religious attendance** | Female | 0.288 [0.223; 0.354]1 | 0.279 | -0.053 [-0.065; -0.041] | -0.338 | -0.020 [-0.035;  -0.006] | 0.018 [0.010; 0.025] | 1.000 | 1.000 |
|  | Male | 0.0001 | - | -0.015 [-0.025; -0.004] | -0.115 | -0.009 [-0.021;  0.003] |  |  |  |
| **Religious importance** | Female | 0.420[0.351; 0.489]1 | 0.472 | -0.001 [-0.017; 0.015] | -0.008 | -0.006 [-0.029; 0.017] | 0.031 [0.020; 0.043] | 0.999 | 0.999 |
|  | Male | 0.0001 | - | 0.014 [0.000; 0.027] | 0.105 | -0.007 [-0.028;  0.015] |  |  |  |
| **Social connectedness** | Female | 10.091 [9.921; 10.262] | 2.906 | -0.631 [-0.691; -0.572] | -0.794 | -1.336 [-1.728;  -0.944] | 0.037 [0.026; 0.049] | 0.988 | 0.986 |
|  | Male | 10.714 [10.493; 10.936] | 2.838 | -0.785 [-0.865; -0.705] | -0.901 | -1.243 [-1.791;  -0.694] |  |  |  |

1No intercept value is calculated for the reference group (male) in growth models for ordered categorical variables.

**Table A3: Structural equation models of the baseline and longitudinal associations between depressive symptoms and religious attendance, religious importance and social connectedness, using a sample with data available at all waves**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Female** | | | | **Male** | | | |
|  | **Unmediated** | **StdYX** | **Mediated** | **StdYX** | **Unmediated** | **StdYX** | **Mediated** | **StdYX** |
| **Depressive symptoms**  **intercept** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | -0.692 (0.143)\*\*\* | -0.224 | -0.649 (0.141)\*\*\* | -0.211 | -0.839 (0.142)\*\*\* | -0.291 | -0.753 (0.145)\*\*\* | -0.261 |
| **Importance intercept** | 0.279 (0.204) | 0.070 | 0.376 (0.200)† | 0.096 | 0.729 (0.154)\*\*\* | 0.242 | 0.737 (0.154)\*\*\* | 0.245 |
| **Social intercept** | - | - | -0.191 (0.028)\*\*\* | -0.217 | - |  | -0.130 (0.022)\*\*\* | -0.185 |
| **Depressive symptoms**  **Slope** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | 0.033 (0.081) | 0.043 | 0.028 (0.077) | 0.036 | -0.013 (0.073) | -0.015 | -0.030 (0.081) | -0.035 |
| **Attendance slope** | -0.585 (1.368)  36) | -0.118 | -0.422 (1.387) | -0.086 | 0.468 (1.136) | 0.086 | 0.862 (1.304) | 0.160 |
| **Importance intercept** | 0.077 (0.311) | 0.077 | 0.094 (0.309) | 0.096 | -0.039 (0.141) | -0.043 | -0.012 (0.173) | -0.013 |
| **Importance slope** | -0.345 (1.433) | -0.085 | -0.426 (1.353) | -0.111 | -0.237 (1.160) | -0.046 | -0.461 (1.224) | -0.098 |
| **Social intercept** | - | - | 0.003 (0.013) | 0.013 | - | - | -0.004 (0.010) | -0.019 |
| **Social slope** | - | - | -0.054 (0.075) | -0.061 | - | - | -0.137 (0.080)† | -0.156 |
| **Social connectedness**  **intercept** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | - | - | 0.200 (0.182) | 0.057 | - | - | 0.660 (0.245)\*\* | 0.161 |
| **Importance intercept** | - | - | 0.534 (0.251) | 0.121 | - | - | 0.072 (0.256) | 0.017 |
| **Social connectedness**  **Slope** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | - | - | -0.027 (0.094) | -0.031 | - | - | -0.124 (0.115) | -0.126 |
| **Attendance slope** | - | - | 1.868 (1.385) | 0.337 | - | - | 2.554 (1.622) | 0.415 |
| **Importance intercept** | - | - | 0.122 (0.322) | 0.111 | - | - | 0.125 (0.252) | 0.122 |
| **Importance slope** | - | - | -0.899 (1.378) | -0.209 | - | - | -1.395 (1.720) | -0.259 |
|  |  |  |  |  |  |  |  |  |
| **Model fit** | **Unmediated** | | | | **Mediated** | | | |
| **RMSEA [90% CI]** | 0.061 [0.058, 0.063] | | | | 0.053 [0.051, 0.055] | | | |
| **CFI** | 0.984 | | | | 0.981 | | | |
| **TLI** | 0.982 | | | | 0.978 | | | |

*Note*. \*p < .05. \*\*p < .01. \*\*\*p < .001. †p < .10

Appendix B: Catholic sample (n=6,356 (female =3,505; male =2,851))

**Table B1: Latent growth curve models in a Catholic only sample**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Estimates** | | | | | **Model fit** | | |
|  |  | **Intercept [90%CI]** | **StdYX** | **Slope [90%CI]** | **StdYX** | **I/S covariance [90%CI]** | **RMSEA [90%CI]** | **CFI** | **TLI** |
|  |  |  |  |  |  |  |  |  |  |
| **Depressive symptoms** | Female | 3.296 [3.190; 3.403] | 1.085 | 0.117 [0.075; 0.158] | 0.157 | -0.864 [-1.096;  -0.631] | 0.047 [0.038; 0.057] | 0.988 | 0.986 |
|  | Male | 2.322 [2.223; 2.422] | 0.881 | 0.181 [0.141; 0.222] | 0.235 | -0.656 [-0.841;  -0.470] |  |  |  |
| **Religious attendance** | Female | 0.231 [0.185; 0.277]1 | 0.230 | -0.038 [-0.048; -0.028] | -0.270 | -0.014 [-0.025;  -0.002] | 0.030 [0.024; 0.036] | 1.000 | 1.000 |
|  | Male | 0.0001 | - | -0.023 [-0.034; -0.012] | -0.184 | -0.004 [-0.015; 0.007] |  |  |  |
| **Religious importance** | Female | 0.370 [0.315; 0.426]1 | 0.417 | -0.017 [-0.031; -0.003] | -0.141 | -0.018 [-0.037; 0.000] | 0.024 [0.014; 0.035] | 1.000 | 1.000 |
|  | Male | 0.0001 | - | -0.007 [-0.019; 0.006] | -0.053 | -0.009 [-0.029; 0.012] |  |  |  |
| **Social connectedness** | Female | 10.224 [10.102; 10.345] | 2.996 | -0.607 [-0.651; -0.563] | -0.854 | -1.046 [-1.336;  -0.756] | 0.041 [0.032; 0.051] | 0.990 | 0.988 |
|  | Male | 10.698 [10.543; 10.853] | 2.875 | -0.770 [-0.828; -0.711] | -0.903 | -1.103 [-1.547;  -0.660] |  |  |  |

1No intercept value is calculated for the reference group (male) in growth models for ordered categorical variables.

**Table B2:** **Structural equation models of the baseline and longitudinal associations between depressive symptoms and religious attendance, religious importance and social connectedness, using a Catholic-only sample**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Female** | | | | **Male** | | | |
|  | **Unmediated** | **StdYX** | **Mediated** | **StdYX** | **Unmediated** | **StdYX** | **Mediated** | **StdYX** |
| **Depressive symptoms**  **intercept** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | -0.611 (0.114)\*\*\* | -0.201 | -0.558 (0.113)\*\*\* | -0.185 | -0.785 (0.124)\*\*\* | -0.272 | -0.715 (0.125)\*\*\* | -0.248 |
| **Importance intercept** | 0.280 (0.150)† | 0.078 | 0.331 (0.152)\* | 0.091 | 0.700 (0.139)\*\*\* | 0.231 | 0.726 (0.138)\*\*\* | 0.239 |
| **Social intercept** | - | - | -0.169 (0.021)\*\*\* | -0.191 | - |  | -0.149 (0.019)\*\*\* | -0.212 |
| **Depressive symptoms**  **Slope** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | 0.065 (0.050) | 0.083 | 0.064 (0.049) | 0.082 | 0.021 (0.091) | 0.025 | 0.012 (0.094) | 0.014 |
| **Attendance slope** | -0.644 (0.510)  36) | -0.128 | -0.638 (0.517) | -0.127 | -0.392 (1.057) | -0.076 | -0.331 (1.068) | -0.065 |
| **Importance intercept** | -0.016 (0.079) | -0.017 | -0.015 (0.080) | -0.016 | -0.104 (0.143) | -0.116 | -0.104 (0.141) | -0.116 |
| **Importance slope** | -0.464 (0.709) | -0.086 | -0.480 (0.733) | -0.088 | 0.552 (1.258) | 0.101 | 0.535 (1.245) | 0.099 |
| **Social intercept** | - | - | -0.002 (0.009) | -0.008 | - | - | 0.005 (0.009) | 0.026 |
| **Social slope** | - | - | -0.009 (0.065) | -0.009 | - | - | -0.062 (0.061) | -0.072 |
| **Social connectedness**  **intercept** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | - | - | 0.292 (0.147)\* | 0.086 | - | - | 0.463 (0.212)\* | 0.112 |
| **Importance intercept** | - | - | 0.293 (0.195) | 0.072 | - | - | 0.183 (0.233) | 0.042 |
| **Social connectedness**  **Slope** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | - | - | -0.024 (0.056) | -0.031 | - | - | -0.177 (0.142) | -0.176 |
| **Attendance slope** | - | - | 0.857 (0.544) | 0.170 | - | - | 1.792 (1.552) | 0.300 |
| **Importance intercept** | - | - | -0.055 (0.086) | -0.058 | - | - | 0.118 (0.224) | 0.112 |
| **Importance slope** | - | - | 0.235 (0.763) | 0.043 | - | - | -1.225 (1.925) | -0.197 |
|  |  |  |  |  |  |  |  |  |
| **Model fit** | **Unmediated** | | | | **Mediated** | | | |
| **RMSEA [90% CI]** | 0.069 [0.067, 0.071] | | | | 0.061 [0.059, 0.062] | | | |
| **CFI** | 0.983 | | | | 0.981 | | | |
| **TLI** | 0.981 | | | | 0.977 | | | |

*Note*. \*p < .05. \*\*p < .01. \*\*\*p < .001. †p < .10.

Appendix C: Models using >=9 cut offs for depression using the CES-D 8

**Table C1: Latent growth curve models for depression using a binary cut off of the CES-D 8**

Models used a cut off of CES-D 8 >= 9 to derive a binary marker for depression. As these are included in models as binary variables, no intercept value is given for the reference group (Male).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **Estimates** | | | | | **Model fit** | | |
|  |  | **Intercept [90%CI]** | | **StdYX** | **Slope [90%CI]** | **StdYX** | **I/S covariance [90%CI]** | **RMSEA [90%CI]** | **CFI** | **TLI** |
| **Depressive symptoms** | Female | 0.256 [0.218; 0.295] | | 0.468 | 0.050 [0.038; 0.062] | 0.329 | -0.028 [-0.044;  -0.012] | 0.026 [0.022; 0.030] | 0.970 | 0.993 |
|  | Male | 0.000 | | - | 0.077 [0.063; 0.091] | 0.470 | -0.037 [-0.056;  -0.017] |  |  |  |

**Table C2: Structural equation models of the baseline and longitudinal associations between depressive symptoms and religious attendance, religious importance and social connectedness, using a binary cut off of the CES-D 8 as a marker for depressive symptoms**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Female** | | | | **Male** | | | |
|  | **Unmediated** | **StdYX** | **Mediated** | **StdYX** | **Unmediated** | **StdYX** | **Mediated** | **StdYX** |
| **Depressive symptoms**  **intercept** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | -0.068 (0.031)\* | -0.116 | -0.057 (0.031)† | -0.096 | -0.124 (0.041)\*\* | -0.173 | -0.104 (0.041)\* | -0.146 |
| **Importance intercept** | 0.018 (0.039) | 0.026 | 0.030 (0.039) | 0.043 | 0.086 (0.045)† | 0.116 | 0.091 (0.044)\* | 0.122 |
| **Social intercept** | - | - | -0.036 (0.006)\*\*\* | -0.212 | - |  | -0.032 (0.006)\*\*\* | -0.185 |
| **Depressive symptoms**  **Slope** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | 0.028 (0.015)† | 0.169 | 0.026 (0.015)† | 0.159 | 0.016 (0.024) | 0.085 | 0.014 (0.024) | 0.077 |
| **Attendance slope** | -0.127 (0.154)  36) | -0.114 | -0.129 (0.157) | -0.116 | -0.025 (0.266) | -0.021 | -0.006 (0.273) | -0.005 |
| **Importance intercept** | -0.024 (0.023) | -0.122 | -0.025 (0.024) | -0.128 | -0.022 (0.036) | -0.114 | -0.022 (0.038) | -0.115 |
| **Importance slope** | -0.127 (0.197) | -0.113 | -0.124 (0.198) | -0.113 | -0.015 (0.299) | -0.013 | -0.021 (0.289) | -0.019 |
| **Social intercept** | - | - | 0.005 (0.003)\* | 0.110 | - | - | 0.001 (0.003) | 0.012 |
| **Social slope** | - | - | 0.001 (0.016) | 0.002 | - | - | -0.013 (0.016) | -0.071 |
| **Social connectedness**  **intercept** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | - | - | 0.327 (0.145)\* | 0.094 | - | - | 0.607 (0.206)\*\* | 0.148 |
| **Importance intercept** | - | - | 0.311 (0.189) | 0.076 | - | - | 0.140 (0.225) | 0.033 |
| **Social connectedness**  **Slope** |  |  |  |  |  |  |  |  |
| **Attendance intercept** | - | - | -0.013 (0.057) | -0.017 | - | - | -0.116 (0.105) | -0.116 |
| **Attendance slope** | - | - | 0.944 (0.657) | 0.176 | - | - | 1.758 (1.297) | 0.275 |
| **Importance intercept** | - | - | -0.069 (0.098) | -0.073 | - | - | 0.054 (0.181) | 0.052 |
| **Importance slope** | - | - | 0.272 (0.854) | 0.051 | - | - | -0.859 (1.441) | -0.142 |
|  |  |  |  |  |  |  |  |  |
| **Model fit** | **Unmediated** | | | | **Mediated** | | | |
| **RMSEA [90% CI]** | 0.059 [0.057, 0.061] | | | | 0.053 [0.051, 0.054] | | | |
| **CFI** | 0.986 | | | | 0.985 | | | |
| **TLI** | 0.987 | | | | 0.984 | | | |

*Note*. \*p < .05. \*\*p < .01. \*\*\*p < .001. †p < .10.

Appendix D: CES-D 8 items

**Table D1. Summary of the Center for Epidemiologic Studies-Depression Scale Short Form Items (CES-D 8) (O’Halloran, 2014).**

|  |  |
| --- | --- |
| Item | Scoring (range 0-24) |
| I felt depressed | 0-3 |
| I felt that everything I did was an effort | 0-3 |
| My sleep was restless | 0-3 |
| I was happy | 3-0 |
| I felt lonely | 0-3 |
| I enjoyed life | 3-0 |
| I felt sad | 0-3 |
| I could not get “going” | 0-3 |

**Appendix E: Further methodological details for latent growth curve analysis**

Conditional growth models were estimated, and predictors and covariates were added to the conditional latent growth model. This determined whether components of religious attendance explain initial differences in depressive symptoms and influence changes in depressive symptoms over time, after controlling for covariates.

We used a number of statistics to assess model fit; good fitting models are expected to have a RMSEA value lower than 0.7 (Steiger 2007) and CFI and TLI close to 0.95 (Hu and Bentler 1999).

We applied latent growth models to select an optimal model to fit longitudinal data. Estimated intercept and slopes are given for models with continuous outcomes (depressive symptoms and social connectedness). For models with ordered categorical outcomes (religious attendance and importance) the intercept of the latent variable is fixed at zero, as the outcomes are modelled by thresholds, eliminating the need for estimating an intercept parameter (Muthén and Muthén 2010). Therefore, only a slope parameter is presented for these models.

Due to uncertainty as to the likely shape of the slope of depressive symptoms, the model was initially estimated in two ways; a linear growth curve, estimated when the parameters for the slope at each time point are specified as 0, 1, 2 and so on; and a freely estimated parameter model, which specifies the first two time points as 0 and 1, and allows the subsequent time points to be freely estimated. After examining goodness of fit statistics, the most compelling model was chosen. This is useful for when the growth trajectory is not known or expected to be non-linear. Religious attendance was expected to remain stable with a slight decline over time as the sample age and encounter mobility difficulties, whereas religious importance was expected to remain stable, or increase slightly. Social connectedness was expected to decline over time, as older persons tend to reduce their social networks with age (Wrzus, Hanel et al. 2013).

As the relationship of interest concerns the development of depressive symptoms, we estimated the possible effect of two growth factors, the intercept and slope for religious attendance and religious importance on the slope (development) of depressive symptoms, as well as the effect of each intercept on intercept (initial) depressive symptoms. The second model then conditioned on important covariates (age, education, baseline marital status). We also include self-rated health as latent growth factors, which were estimated separately, as this maximized the available data and controlled for the changing effect of health on depressive symptoms.

To test the mediating effect of social connectedness we fit a third latent growth curve model. The intercept and slope of social connectedness were then tested as putative mediators of the relationship between depressive symptoms and religious factors. A change in the effects for religious attendance or importance would indicate that the relationship between religiosity factors and depressive symptoms can be in part or fully explained by the effect of religiosity on social connectedness and social connectedness on mental health.

Latent growth curve models were estimated using Maximum Likelihood (ML) estimator for continuous outcomes (depressive symptoms and social connectedness) and weighted least square parameter estimates using a diagonal weight matrix with standard errors and mean and variance adjusted chi-square test statistics estimator (WLSMV) for categorical outcomes (religious attendance, religious importance, and self-rated health). For the structural equation models, WLSMV was used. All analyses were conducted using Mplus 6.12 (Muthén and Muthén 1998-2010). We present parameters and their standard errors, as well as standardized parameters using stdxy standardization. This uses the variances of continuous latent variables as well as those of outcome and background variables, and shows the change in y standard deviation units for a standard deviation change in x (Muthén and Muthén 2010).

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