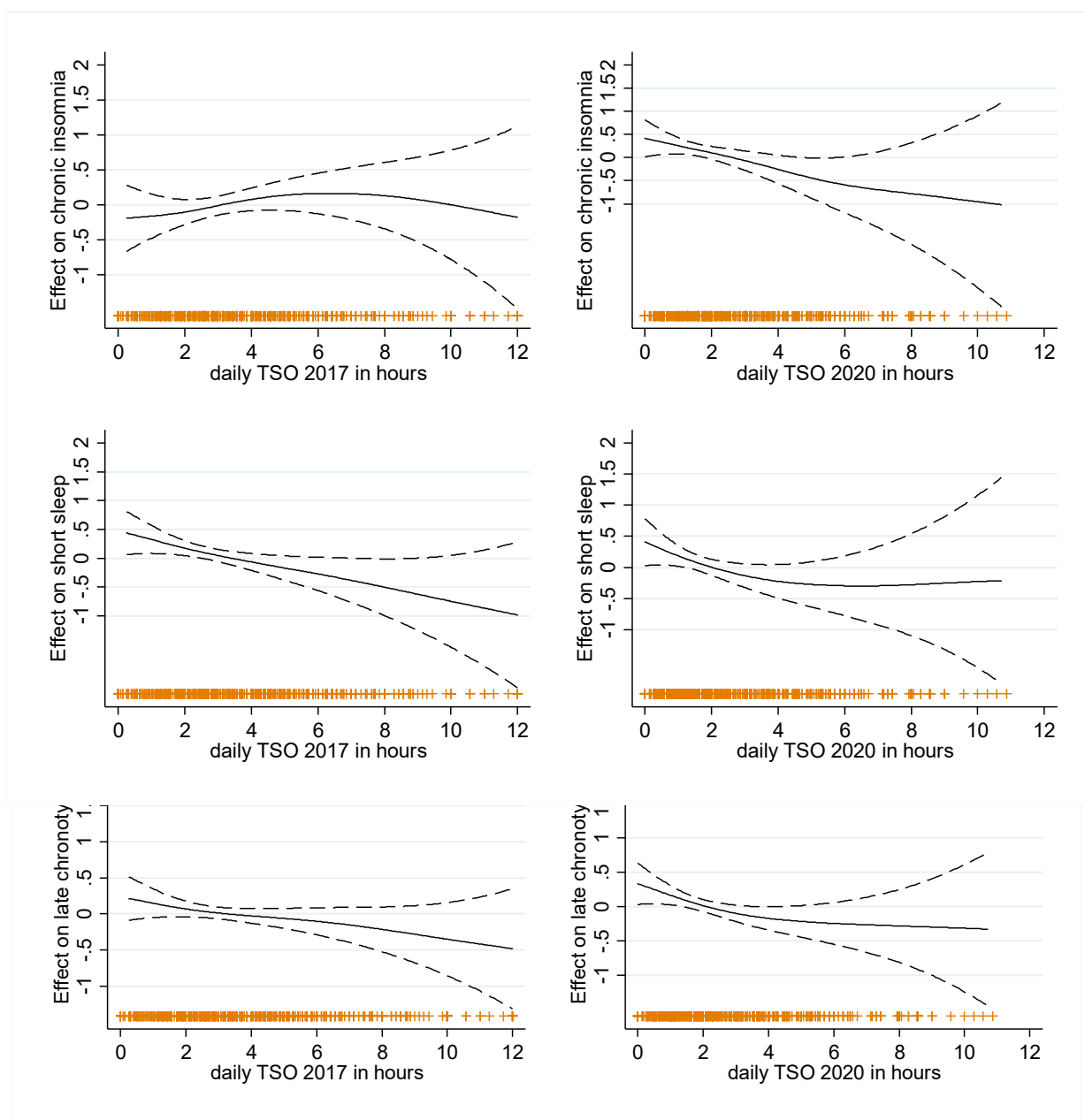


## Supplemental Materials



**Supplemental Figure S1.** Multivariable adjusted general additive models (GAM) splines (smooth function) for the association of time spent outdoors (hours/day) and sleep outcomes in the 2017 and 2020 survey.

**Supplemental Table S1.** Association of time spent outdoors (TSO) in quintiles (hours/day) and prevalence of adverse sleep outcomes in 2017

	TSOq1 0-1.74h	TSOq2 1.75-2.71h	TSOq3 2.72-3.71h	TSOq4 3.72-5.11h	TSOq5 5.12-12h
N (n%)	203 [20.5%]	194 [19.6%]	209 [21.1%]	187 [18.8%]	198 [20.0%]
<b>Chronic Insomnia</b>					
N (n%)	23 [11.3%]	11 [5.7%]	26 [12.4%]	25 [13.4%]	24 [12.1%]
Age adjusted OR (95%CI)	1	<b>0.46</b> [0.22, 0.98]	1.10 [0.60, 2.00]	1.18 [0.64, 2.17]	1.05 [0.57, 1.94]
MV adjusted OR (95%CI)	1	<b>0.45</b> [0.21, 0.97]	1.15 [0.62, 2.14]	1.14 [0.61, 2.14]	1.01 [0.54, 1.89]
MV adjusted+ <b>opt.</b> + <b>happy</b> OR (95%CI)	1	0.55 [0.25, 1.22]	1.56 [0.81, 3.02]	1.51 [0.78, 2.93]	1.44 [0.73, 2.82]
MV adjusted+ <b>activity</b> OR (95%CI)	1	<b>0.45</b> [0.21, 0.97]	1.12 [0.60, 2.09]	1.06 [0.56, 2.01]	0.92 [0.48, 1.76]
MV adjusted+ <b>health</b> OR (95%CI)	1	0.58 [0.25, 1.33]	1.55 [0.79, 3.06]	1.73 [0.87, 3.46]	1.60 [0.80, 3.21]
<b>Short sleep</b>					
N* (%)	45 [22.2%]	28 [14.4%]	34 [16.3%]	28 [15.0%]	23 [11.6%]
Age adjusted OR (95%CI)	1	<b>0.57</b> [0.34, 0.97]	<b>0.67</b> [0.41, 1.09]	<b>0.60</b> [0.35, 1.01]	<b>0.44</b> [0.25, 0.76]
MV adjusted OR (95%CI)	1	<b>0.49</b> [0.29, 0.85]	<b>0.59</b> [0.35, 0.99]	<b>0.52</b> [0.30, 0.89]	<b>0.38</b> [0.22, 0.68]
MV adjusted+ <b>opt.</b> + <b>happy</b> OR (95%CI)	1	<b>0.53</b> [0.31, 0.91]	0.64 [0.38, 1.07]	<b>0.54</b> [0.31, 0.94]	<b>0.43</b> [0.24, 0.76]
MV adjusted + <b>activity</b> OR (95%CI)	1	<b>0.48</b> [0.28, 0.83]	<b>0.58</b> [0.35, 0.97]	<b>0.49</b> [0.28, 0.85]	<b>0.37</b> [0.20, 0.65]
MV adjusted+ <b>health</b> OR (95%CI)	1	<b>0.52</b> [0.30, 0.89]	<b>0.60</b> [0.36, 1.01]	<b>0.55</b> [0.32, 0.95]	<b>0.43</b> [0.24, 0.77]
<b>Late chronotype</b>					
N* (%)	50 [24.6%]	41 [21.1%]	46 [22.0%]	36 [19.3%]	27 [13.6%]
Age OR (95%CI)	1	0.83 [0.52, 1.32]	0.87 [0.55, 1.37]	0.74 [0.45, 1.19]	<b>0.49</b> [0.29, 0.82]
MV OR (95%CI)	1	0.78 [0.48, 1.27]	0.87 [0.54, 1.40]	0.70 [0.42, 1.17]	<b>0.49</b> [0.29, 0.83]
MV + <b>opt.</b> + <b>happy</b> OR (95%CI)	1	0.82 [0.50, 1.34]	0.93 [0.57, 1.50]	0.74 [0.44, 1.23]	<b>0.52</b> [0.30, 0.90]
MV + <b>activity</b> OR (95%CI)	1	0.85 [0.52, 1.40]	0.95 [0.59, 1.54]	0.82 [0.48, 1.38]	<b>0.57</b> [0.33, 0.98]
MV + <b>health</b> OR (95%CI)	1	0.81 [0.49, 1.33]	0.90 [0.56, 1.46]	0.74 [0.44, 1.23]	<b>0.51</b> [0.30, 0.88]

**MV:** adjusted for age, gender, education, area, workstatus, marital, kids <16 years, smoking status

**MV + opt. + happy:** adjusted for MV + optimism and happiness

**MV + activity:** adjusted for MV + daily walking and moderate and vigorous physical activity

**MV + health:** adjusted for MV + self-estimated health status

**Supplemental Table S2.** Association of time spent outdoors (TSO) in quintiles and prevalence of adverse sleep outcomes in 2020

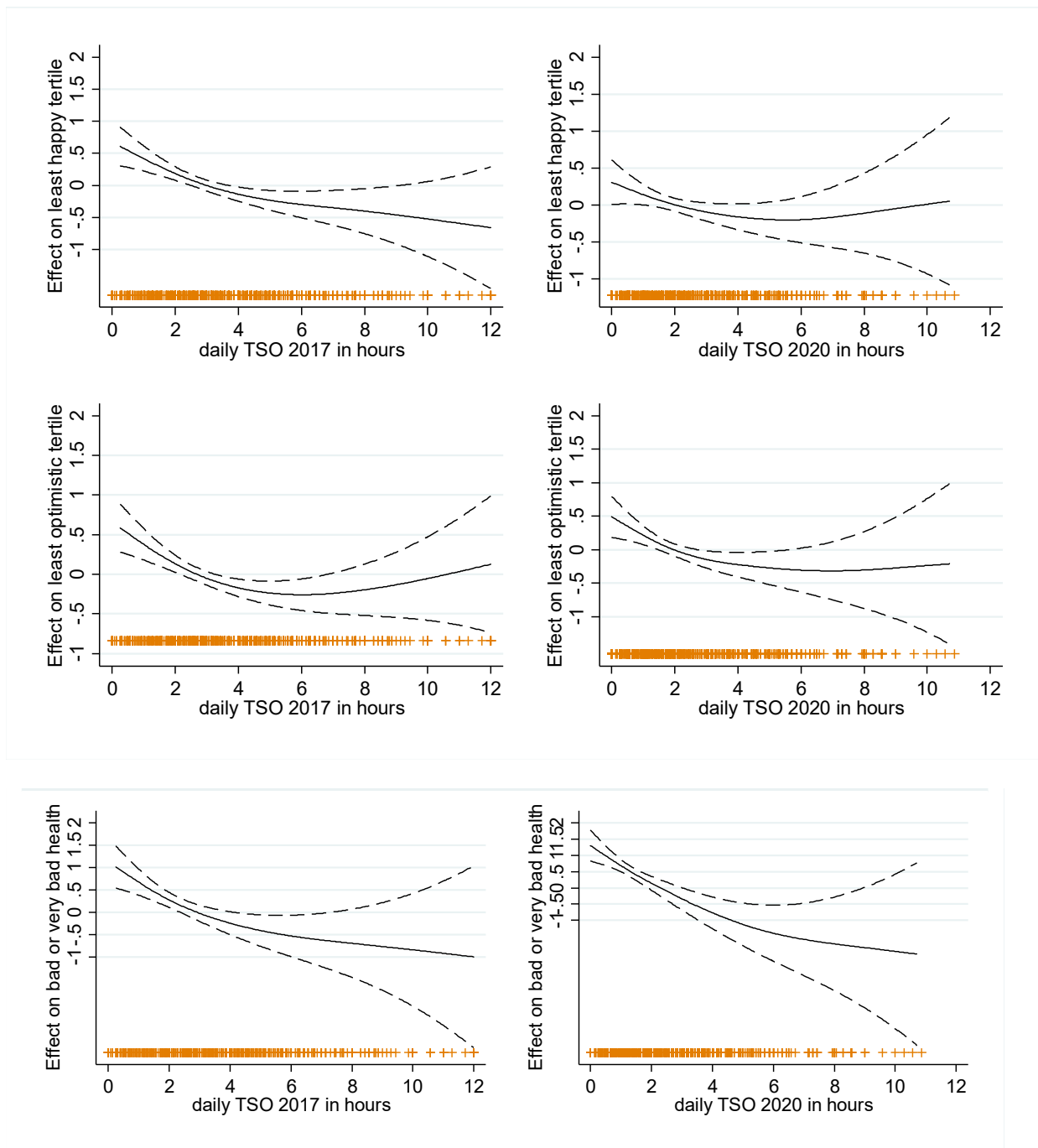
	TSOq1 0-1.00h	TSOq2 1.01-1.79h	TSOq3 1.80-2.57h	TSOq4 2.58-3.86h	TSOq5 3.87-10.86h
N (n%)	175 [21.0%]	1163 [19.6%]	168 [20.2%]	162 [19.5%]	164 [19.7%]
<b>Chronic Insomnia</b>					
N (n%)	36 [20.6%]	18 [11.0%]	25 [14.9%]	18 [11.1%]	12 [7.3%]
Age adjusted OR (95%CI)	1	<b>0.48</b> [0.26,0.89]	0.68 [0.39,1.20]	<b>0.46</b> [0.25,0.85]	<b>0.29</b> [0.15,0.59]
MV adjusted OR (95%CI)	1	0.57 [0.30,1.07]	0.76 [0.42,1.39]	0.56 [0.29,1.09]	<b>0.34</b> [0.16,0.69]
MV adjusted+ <b>opt.</b> + <b>happy</b> OR (95%CI)	1	0.75 [0.37,1.51]	1.03 [0.54,1.98]	0.77 [0.38,1.57]	<b>0.39</b> [0.18,0.86]
MV adjusted+ <b>activity</b> OR (95%CI)	1	0.55 [0.29,1.05]	0.75 [0.41,1.37]	0.55 [0.28,1.08]	<b>0.32</b> [0.15,0.68]
MV adjusted + <b>health</b> OR (95%CI)	1	0.71 [0.36,1.40]	0.82 [0.43,1.56]	0.83 [0.41,1.68]	0.51 [0.24,1.10]
<b>Short sleep</b>					
N (%)	41 [23.4%]	22 [13.5%]	22 [13.1%]	20 [12.4%]	21 [12.8%]
Age adjusted OR (95%CI)	1	<b>0.51</b> [0.28,0.90]	<b>0.48</b> [0.27,0.85]	<b>0.43</b> [0.24,0.78]	<b>0.47</b> [0.26,0.84]
MV adjusted OR (95%CI)	1	0.61 [0.33,1.11]	0.57 [0.31,1.05]	0.54 [0.29,1.02]	<b>0.52</b> [0.28,0.96]
MV adjusted + <b>opt.</b> + <b>happy</b> OR (95%CI)	1	0.67 [0.37,1.24]	0.60 [0.32,1.12]	0.62 [0.33,1.18]	0.57 [0.30,1.06]
MV adjusted + <b>activity</b> OR (95%CI)	1	0.66 [0.36,1.23]	0.63 [0.34,1.16]	0.61 [0.32,1.17]	0.59 [0.31,1.12]
MV adjusted + <b>health</b> OR (95%CI)	1	0.62 [0.34,1.15]	0.58 [0.31,1.08]	0.56 [0.29,1.06]	0.54 [0.29,1.02]
<b>Late chronotype</b>					
N (%)	62 [35.4%]	32 [19.6%]	45 [26.8%]	24 [14.8%]	32 [19.5%]
Age adjusted OR (95%CI)	1	<b>0.44</b> [0.27,0.73]	0.67 [0.42,1.06]	<b>0.31</b> [0.18,0.53]	<b>0.44</b> [0.27,0.73]
MV adjusted OR (95%CI)	1	<b>0.48</b> [0.28,0.80]	0.71 [0.43,1.16]	<b>0.32</b> [0.18,0.56]	<b>0.45</b> [0.27,0.76]
MV adjusted + <b>opt.</b> + <b>happy</b> OR (95%CI)	1	<b>0.52</b> [0.31,0.89]	0.78 [0.47,1.29]	<b>0.36</b> [0.20,0.65]	<b>0.49</b> [0.29,0.84]
MV adjusted + <b>activity</b> OR (95%CI)	1	<b>0.53</b> [0.31,0.89]	0.79 [0.48,1.30]	<b>0.37</b> [0.21,0.66]	<b>0.53</b> [0.31,0.91]
MV adjusted + <b>health</b> OR (95%CI)	1	<b>0.50</b> [0.30,0.84]	0.72 [0.44,1.19]	<b>0.35</b> [0.20,0.62]	<b>0.49</b> [0.29,0.85]

**MV:** adjusted for age, gender, education, area, workstatus, marital, kids <16 years, smoking status

**MV + opt. + happy:** adjusted for MV + optimism and happiness

**MV + activity:** adjusted for MV + daily walking and moderate and vigorous physical activity

**MV + health:** adjusted for MV + self-estimated health status



**Supplemental Figure S2.** Multivariable adjusted general additive models (GAM) splines (smooth function) for the association of time spent outdoors (hours/day) and optimism, happiness and health status in the 2017 and 2020 survey.

**Supplemental Table S3.** Association of time spent outdoors (TSO) in quintiles (hours/day) and prevalence of least happy tertile, least optimistic tertile and bad health status in 2017

	TSOq1 0-1.74h	TSOq2 1.75-2.71h	TSOq3 2.72-3.71h	TSOq4 3.72-5.11h	TSOq5 5.12-12h
N (n%)	203 [20.5%]	194 [19.6%]	209 [21.1%]	187 [18.8%]	198 [20.0%]
<b>Least happy tertile</b>					
N (n%)	95 [46.8%]	67 [34.5%]	62 [29.7%]	63 [33.7%]	55 [27.2%]
Age adjusted OR (95%CI)	1	<b>0.63</b> [0.42,0.95]	<b>0.50</b> [0.33,0.75]	<b>0.61</b> [0.41,0.93]	<b>0.47</b> [0.31,0.72]
MV adjusted OR (95%CI)	1	<b>0.64</b> [0.42,0.98]	<b>0.50</b> [0.33,0.76]	<b>0.62</b> [0.40,0.94]	<b>0.45</b> [0.29,0.69]
MV adjusted + <b>opt.</b> OR (95%CI)	1	0.81 [0.48,1.35]	<b>0.59</b> [0.35,0.98]	0.71 [0.42,1.20]	0.61 [0.36,1.03]
MV adjusted + <b>activity</b> OR (95%CI)	1	0.67 [0.44,1.03]	<b>0.51</b> [0.33,0.77]	<b>0.65</b> [0.42,1.00]	<b>0.47</b> [0.30,0.73]
MV adjusted + <b>health</b> OR (95%CI)	1	0.72 [0.46,1.11]	<b>0.52</b> [0.34,0.81]	0.70 [0.45,1.09]	<b>0.53</b> [0.34,0.83]
<b>Least optimistic tertile</b>					
N (%)	100 [49.3%]	65 [33.5%]	68 [32.5%]	64 [34.2%]	62 [31.3%]
Age adjusted OR (95%CI)	1	<b>0.54</b> [0.36,0.82]	<b>0.51</b> [0.34,0.77]	<b>0.57</b> [0.37,0.86]	<b>0.51</b> [0.34,0.77]
MV adjusted OR (95%CI)	1	<b>0.58</b> [0.38,0.88]	<b>0.54</b> [0.36,0.83]	<b>0.57</b> [0.37,0.87]	<b>0.48</b> [0.32,0.74]
MV adjusted + <b>happy</b> OR (95%CI)	1	0.63 [0.38,1.06]	0.71 [0.43,1.19]	0.67 [0.40,1.13]	0.67 [0.40,1.12]
MV adjusted + <b>activity</b> OR (95%CI)	1	<b>0.57</b> [0.37,0.87]	<b>0.53</b> [0.35,0.80]	<b>0.54</b> [0.35,0.83]	<b>0.45</b> [0.29,0.69]
MV adjusted + <b>health</b> OR (95%CI)	1	<b>0.63</b> [0.41,0.97]	<b>0.58</b> [0.38,0.88]	<b>0.63</b> [0.41,0.98]	<b>0.56</b> [0.36,0.86]
<b>Bad or very bad health status</b>					
N (%)	23 [11.3%]	10 [5.2%]	13 [6.2%]	8 [4.3%]	10 [5.1%]
Age adjusted OR (95%CI)	1	<b>0.40</b> [0.18,0.86]	0.49 [0.24,1.00]	<b>0.32</b> [0.14,0.74]	<b>0.37</b> [0.17,0.81]
MV adjusted OR (95%CI)	1	<b>0.37</b> [0.16,0.83]	<b>0.47</b> [0.22,0.99]	<b>0.30</b> [0.13,0.72]	<b>0.34</b> [0.15,0.76]
MV adjusted + <b>happy</b> OR (95%CI)	1	0.47 [0.21,1.08]	0.61 [0.28,1.34]	<b>0.37</b> [0.15,0.91]	<b>0.40</b> [0.17,0.94]
MV adjusted+ <b>opt.</b> OR (95%CI)	1	0.50 [0.22,1.17]	0.63 [0.28,1.40]	<b>0.34</b> [0.13,0.86]	<b>0.40</b> [0.17,0.96]
MV adjusted + <b>activity</b> OR (95%CI)	1	<b>0.40</b> [0.18,0.91]	0.48 [0.22,1.02]	<b>0.31</b> [0.13,0.75]	<b>0.37</b> [0.16,0.85]

**MV:** adjusted for age, gender, education, area, workstatus, marital, kids <16 years, smoking status, optimism index

**MV + opt. + happy:** adjusted for MV + optimism and happiness

**MV + activity:** adjusted for MV + daily walking and moderate and vigorous physical activity

**MV + health:** adjusted for MV + self-estimated health status

**Supplemental Table S4.** Association of time spent outdoors (TSO) in quintiles and prevalence of least happy tertile, least optimistic tertile and bad health status in 2020

	TSOq1 0-1.74h	TSOq2 1.75-2.71h	TSOq3 2.72-3.71h	TSOq4 3.72-5.11h	TSOq5 5.12-12h
N (n%)	175 [21.0%]	1163 [19.6%]	168 [20.2%]	162 [19.5%]	164 [19.7%]
<b>Least happy tertile</b>					
N (n%)	91 [52.0%]	63 [38.7%]	71 [42.3%]	60 [37.0%]	61 [37.2%]
Age adjusted OR (95%CI)	1	<b>0.57</b> [0.37,0.89]	0.66 [0.43,1.02]	<b>0.56</b> [0.36,0.87]	<b>0.58</b> [0.37,0.90]
MV adjusted OR (95%CI)	1	<b>0.61</b> [0.39,0.95]	0.72 [0.46,1.13]	<b>0.59</b> [0.37,0.93]	<b>0.61</b> [0.38,0.96]
MV adjusted+ <b>opt.</b> OR (95%CI)	1	0.80 [0.46,1.41]	0.96 [0.55,1.66]	0.83 [0.47,1.47]	0.68 [0.39,1.21]
MV adjusted+ <b>activity</b> OR (95%CI)	1	0.65 [0.41,1.03]	0.77 [0.49,1.22]	0.65 [0.41,1.05]	0.68 [0.42,1.09]
MV adjusted+ <b>health</b> OR (95%CI)	1	0.67 [0.42,1.07]	0.75 [0.47,1.19]	0.72 [0.45,1.17]	0.74 [0.46,1.19]
<b>Least optimistic tertile</b>					
N (%)	98 [56.0%]	55 [33.7%]	62 [36.9%]	51 [31.5%]	59 [36.0%]
Age adjusted OR (95%CI)	1	<b>0.40</b> [0.25,0.62]	<b>0.47</b> [0.30,0.72]	<b>0.38</b> [0.24,0.59]	<b>0.47</b> [0.30,0.73]
MV adjusted OR (95%CI)	1	<b>0.42</b> [0.26,0.67]	<b>0.50</b> [0.32,0.80]	<b>0.40</b> [0.25,0.65]	<b>0.51</b> [0.32,0.82]
MV adjusted + <b>happy</b> OR (95%CI)	1	<b>0.50</b> [0.29,0.87]	<b>0.53</b> [0.31,0.91]	<b>0.46</b> [0.26,0.81]	0.60 [0.35,1.05]
MV adjusted+ <b>activity</b> OR (95%CI)	1	<b>0.45</b> [0.28,0.73]	<b>0.54</b> [0.34,0.86]	<b>0.45</b> [0.28,0.74]	<b>0.58</b> [0.36,0.94]
MV adjusted+ <b>health</b> OR (95%CI)	1	<b>0.46</b> [0.28,0.74]	<b>0.51</b> [0.31,0.82]	<b>0.49</b> [0.30,0.81]	0.62 [0.38,1.01]
<b>Bad or very bad health status</b>					
N (%)					
Age adjusted OR (95%CI)	1	<b>0.33</b> [0.14,0.78]	<b>0.46</b> [0.21,0.98]	<b>0.21</b> [0.08,0.55]	<b>0.10</b> [0.03,0.35]
MV adjusted OR (95%CI)	1	0.42 [0.17,1.05]	0.66 [0.29,1.54]	<b>0.26</b> [0.09,0.74]	<b>0.10</b> [0.03,0.36]
MV adjusted + <b>happy</b> OR (95%CI)	1	0.52 [0.20,1.34]	0.76 [0.31,1.83]	<b>0.28</b> [0.10,0.82]	<b>0.11</b> [0.03,0.41]
MV adjusted+ <b>opt.</b> OR (95%CI)	1	0.47 [0.17,1.29]	0.88 [0.35,2.16]	<b>0.30</b> [0.10,0.92]	<b>0.08</b> [0.02,0.33]
MV adjusted+ <b>activity</b> OR (95%CI)	1	0.46 [0.18,1.17]	0.72 [0.30,1.70]	0.31 [0.11,0.89]	0.11 [0.03,0.41]

**MV:** adjusted for age, gender, education, area, workstatus, marital, kids <16 years, smoking status

**MV + opt. + happy:** adjusted for MV + optimism and happiness

**MV + activity:** adjusted for MV + daily walking and moderate and vigorous physical activity

**MV + health:** adjusted for MV + self-estimated health status

**Supplemental Table S5.** Association of time spent outdoors (TSO) (hours/day) and prevalence of all outcomes in 2017 and 2020 stratified by sex.

	TSO-2017 continuous Per units increase			TSO-2020 continuous Per units increase		
	Total	Female	Male	Total	Female	Male
<b>N(n%)</b>	991	504 [50.9%]	487 [49.1%]	832	417 [50.1%]	415 [49.9%]
<b>Chronic Insomnia</b>						
MV	1.01	1.08	0.96	<b>0.82</b>	0.88	<b>0.73</b>
OR (95%CI)	[0.92-1.11]	[0.94-1.24]	[0.84-1.10]	<b>[0.71-0.94]</b>	[0.74,1.06]	<b>[0.58-0.92]</b>
Interaction (p-value)	0.734			0.497		
<b>Short sleep</b>						
MV	<b>0.88</b>	0.80	0.94	<b>0.89</b>	0.89	0.88
OR (95%CI)	<b>[0.80-0.96]</b>	[0.68-0.93]	[0.84-1.05]	<b>[0.79-1.00]</b>	[0.73,1.08]	[0.76-1.02]
Interaction (p-value)	0.073			0.568		
<b>Late chronotype</b>						
MV	<b>0.87</b>	0.98	<b>0.77</b>	<b>0.87</b>	<b>0.82</b>	0.91
OR (95%CI)	<b>[0.80-0.95]</b>	[0.87-1.10]	<b>[0.68-0.88]</b>	<b>[0.79-0.96]</b>	<b>[0.69,0.96]</b>	[0.80-1.04]
Interaction (p-value)	<b>0.038</b>			0.307		
<b>Least happiness tertile</b>						
MV	<b>0.88</b>	<b>0.86</b>	<b>0.89</b>	0.94	1.02	<b>0.87</b>
OR (95%CI)	<b>[0.83-0.95]</b>	<b>[0.78-0.96]</b>	<b>[0.81-0.97]</b>	[0.87-1.02]	[0.91,1.15]	<b>[0.77-0.97]</b>
Interaction (p-value)	0.644			0.165		
<b>Least optimism tertile</b>						
MV	<b>0.92</b>	<b>0.89</b>	0.95	<b>0.90</b>	0.93	<b>0.86</b>
OR (95%CI)	<b>[0.87-0.98]</b>	<b>[0.80-0.98]</b>	[0.88-1.04]	<b>[0.83-0.98]</b>	[0.82-1.05]	<b>[0.76-0.97]</b>
Interaction (p-value)	0.30			0.822		
<b>Bad or very bad health status</b>						
MV	<b>0.80</b>	<b>0.70</b>	0.84	<b>0.62</b>	<b>0.72</b>	0.47
OR (95%CI)	<b>[0.69-0.92]</b>	<b>[0.55-0.91]</b>	[0.70-1.00] P=0.0055	<b>[0.48-0.79]</b>	<b>[0.52-0.99]</b>	[0.32-0.71]
Interaction (p-value)	0.067			0.776		

**MV:** adjusted for age, gender, education, area, workstatus, marital, kids <16 years, smoking status

**MV + opt. + happy:** adjusted for MV + optimism and happiness

**MV + activity:** adjusted for MV + daily walking and moderate and vigorous physical activity

**MV + health:** adjusted for MV + self-estimated health status