## 

## 

## Supplementary Materials for:

## **Accelerometer-derived sleep onset timing and cardiovascular disease incidence: a UK Biobank cohort study**

## 

## **Supplementary Material 1 - Codes used to identify CVD events from UK Biobank**

Myocardial infarction is identified by UK Biobank field IDs (42000, 131298, 131300, 131302, and 131304) and ICD10 codes (I21\*-I25\*).

Heart failure is identified by UK Biobank field ID (131354) and ICD10 codes (I50\*, I11.0, I13.0, and I13.2).

Chronic ischaemic heart diseases are identified by UK Biobank field IDs (131296 and 131306) and ICD10 codes (I20\*).

Stroke is identified by UK Biobank field IDs (42006, 131360, 131362, 131366, and 131368) and ICD10 codes (G46\*, I60\*-I64\*, I67.81, and I67.82).

Transient Ischaemic Attack is identified by UK Biobank field ID (131056) and ICD10 codes (G45\*).

42000 - Algorithmically-defined outcomes (Myocardial infarction)

131298 - First occurrences (Acute myocardial infarction)

131300 - First occurrences (Subsequent myocardial infarction)

131302 - First occurrences (Complications after myocardial infarction)

131304 - First occurrences (Acute ischaemic heart disease)

131354 - First occurrences (Heart failure)

131296 - First Occurrences (Angina Pectoris)

131306 - First occurrences (Chronic ischaemic heart disease)

42006 - Algorithmically-defined outcomes (Stroke)

131360 - First occurrences (Subarachnoid haemorrhage)

131362 - First occurrences (Intracerebral haemorrhage)

131366 - First occurrences (Cerebral infarction)

131368 - First occurrences (Stroke unspecified)

131056 - First Occurrences (Transient Ischaemic Attack)

## 

## **Supplementary Material 2 - Sensitivity analyses**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.18 (0.91-1.52) | 0.21 | 1.14 (0.88-1.48) | 0.31 | 1.14 (0.88-1.48) | 0.32 |
| **11:00pm-11:59pm** | 1.14 (0.99-1.31) | 0.07 | 1.13 (0.98-1.30) | 0.1 | 1.15 (1.00-1.32) | 0.06 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.25 (1.09-1.43) | < 0.005 | 1.16 (1.01-1.34) | 0.04 | 1.22 (1.05-1.42) | 0.01 |
| **Sleep Duration** | .. | .. | 0.95 (0.91-0.99) | 0.02 | 0.96 (0.92-1.00) | 0.08 |
| **Sleep Irregularity** | .. | .. | 1.02 (0.99-1.06) | 0.15 | 1.02 (0.99-1.05) | 0.26 |

**Supplementary Table 1:** Results of sensitivity analysis in participants with hypertension (N=18897).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.46 (1.09-1.95) | 0.01 | 1.42 (1.06-1.91) | 0.02 | 1.41 (1.05-1.90) | 0.02 |
| **11:00pm-11:59pm** | 1.09 (0.92-1.28) | 0.31 | 1.08 (0.91-1.27) | 0.38 | 1.07 (0.91-1.27) | 0.39 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.33 (1.13-1.57) | < 0.005 | 1.26 (1.06-1.49) | 0.01 | 1.23 (1.03-1.47) | 0.02 |
| **Sleep Duration** | .. | .. | 0.96 (0.91-1.01) | 0.11 | 0.97 (0.92-1.02) | 0.2 |
| **Sleep Irregularity** | .. | .. | 1.03 (0.99-1.07) | 0.19 | 1.02 (0.98-1.06) | 0.35 |

**Supplementary Table 2:** Results of sensitivity analysis in participants without hypertension (N=75426).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.27 (0.86-1.88) | 0.23 | 1.21 (0.81-1.80) | 0.35 | 1.18 (0.79-1.76) | 0.41 |
| **11:00pm-11:59pm** | 1.05 (0.83-1.31) | 0.71 | 1.02 (0.81-1.28) | 0.88 | 1.07 (0.85-1.35) | 0.55 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.33 (1.07-1.65) | 0.01 | 1.16 (0.93-1.45) | 0.19 | 1.22 (0.97-1.54) | 0.09 |
| **Sleep Duration** | .. | .. | 0.89 (0.84-0.94) | < 0.005 | 0.92 (0.87-0.98) | 0.01 |
| **Sleep Irregularity** | .. | .. | 1.03 (0.98-1.07) | 0.27 | 1.00 (0.96-1.05) | 0.97 |

**Supplementary Table 3:** Results of sensitivity analysis in participants who were obese (N= 16296).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.36 (1.09-1.69) | 0.01 | 1.30 (1.04-1.62) | 0.02 | 1.27 (1.01-1.59) | 0.04 |
| **11:00pm-11:59pm** | 1.13 (1.00-1.27) | 0.05 | 1.12 (0.99-1.26) | 0.07 | 1.14 (1.01-1.28) | 0.04 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.33 (1.18-1.50) | < 0.005 | 1.25 (1.10-1.42) | < 0.005 | 1.25 (1.10-1.43) | < 0.005 |
| **Sleep Duration** | .. | .. | 0.97 (0.93-1.00) | 0.08 | 0.98 (0.95-1.02) | 0.43 |
| **Sleep Irregularity** | .. | .. | 1.04 (1.01-1.07) | < 0.005 | 1.03 (1.00-1.06) | 0.07 |

**Supplementary Table 4:** Results of sensitivity analysis in participants who were not obese (N=71719).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.67 (1.01-2.78) | 0.05 | 1.47 (0.87-2.47) | 0.15 | 1.40 (0.83-2.35) | 0.21 |
| **11:00pm-11:59pm** | 1.16 (0.84-1.60) | 0.36 | 1.16 (0.84-1.60) | 0.37 | 1.20 (0.87-1.66) | 0.27 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.47 (1.09-1.99) | 0.01 | 1.30 (0.95-1.78) | 0.1 | 1.36 (0.99-1.88) | 0.06 |
| **Sleep Duration** | .. | .. | 0.93 (0.86-1.01) | 0.08 | 0.96 (0.89-1.04) | 0.3 |
| **Sleep Irregularity** | .. | .. | 1.07 (1.01-1.13) | 0.02 | 1.05 (0.99-1.12) | 0.08 |

**Supplementary Table 5:** Results of sensitivity analysis in participants with any diabetes (N=4667).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.29 (1.05-1.59) | 0.02 | 1.25 (1.01-1.55) | 0.04 | 1.23 (1.00-1.52) | 0.05 |
| **11:00pm-11:59pm** | 1.10 (0.99-1.24) | 0.08 | 1.09 (0.97-1.22) | 0.14 | 1.11 (0.99-1.24) | 0.08 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.31 (1.17-1.47) | < 0.005 | 1.22 (1.08-1.37) | < 0.005 | 1.22 (1.08-1.38) | < 0.005 |
| **Sleep Duration** | .. | .. | 0.94 (0.91-0.98) | < 0.005 | 0.97 (0.93-1.00) | 0.06 |
| **Sleep Irregularity** | .. | .. | 1.03 (1.00-1.06) | 0.03 | 1.01 (0.99-1.04) | 0.37 |

**Supplementary Table 6:** Results of sensitivity analysis in participants without any diabetes (N=83359).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 0.63 (0.26-1.52) | 0.31 | 0.67 (0.28-1.63) | 0.38 | 0.80 (0.33-1.95) | 0.62 |
| **11:00pm-11:59pm** | 0.90 (0.57-1.40) | 0.63 | 0.84 (0.54-1.32) | 0.45 | 1.00 (0.62-1.59) | 0.99 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.37 (0.89-2.10) | 0.15 | 1.21 (0.77-1.89) | 0.41 | 1.39 (0.85-2.27) | 0.19 |
| **Sleep Duration** | .. | .. | 0.84 (0.74-0.95) | 0.01 | 0.95 (0.84-1.08) | 0.45 |
| **Sleep Irregularity** | .. | .. | 0.90 (0.79-1.02) | 0.09 | 0.95 (0.84-1.08) | 0.41 |

**Supplementary Table 7:** Results of sensitivity analysis in participants with hypotension (N=1018).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.35 (1.07-1.71) | 0.01 | 1.27 (1.00-1.61) | 0.05 | 1.22 (0.96-1.54) | 0.11 |
| **11:00pm-11:59pm** | 1.15 (1.01-1.31) | 0.03 | 1.14 (1.01-1.30) | 0.04 | 1.15 (1.01-1.30) | 0.04 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.35 (1.19-1.54) | < 0.005 | 1.26 (1.10-1.44) | < 0.005 | 1.23 (1.07-1.41) | < 0.005 |
| **Sleep Duration** | .. | .. | 0.97 (0.93-1.01) | 0.13 | 1.00 (0.96-1.04) | 0.89 |
| **Sleep Irregularity** | .. | .. | 1.06 (1.03-1.09) | < 0.005 | 1.04 (1.01-1.07) | 0.01 |

**Supplementary Table 8:** Results of sensitivity analysis in participants without hypotension (N=75426).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.35 (1.10-1.65) | < 0.005 | 1.28 (1.04-1.57) | 0.02 | 1.22 (1.00-1.50) | 0.05 |
| **11:00pm-11:59pm** | 1.11 (0.99-1.24) | 0.07 | 1.09 (0.98-1.22) | 0.12 | 1.12 (1.00-1.26) | 0.04 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.37 (1.23-1.53) | < 0.005 | 1.24 (1.11-1.39) | < 0.005 | 1.24 (1.10-1.40) | < 0.005 |
| **Sleep Duration** | .. | .. | 0.94 (0.90-0.97) | < 0.005 | 0.97 (0.94-1.00) | 0.07 |
| **Sleep Irregularity** | .. | .. | 1.05 (1.02-1.07) | < 0.005 | 1.02 (1.00-1.05) | 0.07 |

**Supplementary Table 9:** Results of sensitivity analysis in participants with HDL >1 (N=82645).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.45 (0.76-2.75) | 0.26 | 1.43 (0.75-2.75) | 0.28 | 1.39 (0.72-2.68) | 0.32 |
| **11:00pm-11:59pm** | 1.13 (0.79-1.61) | 0.52 | 1.11 (0.78-1.59) | 0.56 | 1.13 (0.79-1.62) | 0.5 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.35 (0.96-1.90) | 0.09 | 1.25 (0.87-1.78) | 0.22 | 1.24 (0.85-1.79) | 0.26 |
| **Sleep Duration** | .. | .. | 0.92 (0.84-1.01) | 0.09 | 0.96 (0.87-1.06) | 0.38 |
| **Sleep Irregularity** | .. | .. | 1.00 (0.92-1.08) | 0.99 | 0.98 (0.90-1.06) | 0.57 |

**Supplementary Table 10:** Results of sensitivity analysis in participants with an HDL ≤1 (N=5381).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.67 (1.24-2.25) | < 0.005 | 1.69 (1.25-2.29) | < 0.005 | 1.63 (1.20-2.21) | < 0.005 |
| **11:00pm-11:59pm** | 1.21 (1.02-1.44) | 0.03 | 1.17 (0.98-1.39) | 0.08 | 1.18 (0.99-1.40) | 0.07 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.57 (1.32-1.86) | < 0.005 | 1.40 (1.17-1.68) | < 0.005 | 1.34 (1.11-1.61) | < 0.005 |
| **Sleep Duration** | .. | .. | 0.88 (0.84-0.93) | < 0.005 | 0.92 (0.87-0.97) | < 0.005 |
| **Sleep Irregularity** | .. | .. | 0.99 (0.95-1.03) | 0.61 | 0.98 (0.94-1.02) | 0.26 |

**Supplementary Table 11:** Results of sensitivity analysis in female participants only (N=51214).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.18 (0.92-1.52) | 0.2 | 1.08 (0.84-1.39) | 0.56 | 1.05 (0.81-1.35) | 0.73 |
| **11:00pm-11:59pm** | 1.05 (0.92-1.20) | 0.47 | 1.05 (0.91-1.20) | 0.52 | 1.08 (0.94-1.24) | 0.27 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.26 (1.11-1.44) | < 0.005 | 1.15 (1.00-1.32) | 0.05 | 1.17 (1.01-1.35) | 0.03 |
| **Sleep Duration** | .. | .. | 0.96 (0.92-1.00) | 0.04 | 0.99 (0.95-1.03) | 0.77 |
| **Sleep Irregularity** | .. | .. | 1.08 (1.04-1.11) | < 0.005 | 1.05 (1.02-1.08) | < 0.005 |

**Supplementary Table 12:** Results of sensitivity analysis in male participants only (N=36812).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.95 (0.62-6.12) | 0.25 | 1.77 (0.56-5.64) | 0.33 | 1.94 (0.61-6.18) | 0.26 |
| **11:00pm-11:59pm** | 1.45 (0.73-2.89) | 0.29 | 1.39 (0.69-2.77) | 0.35 | 1.51 (0.75-3.03) | 0.24 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 2.43 (1.24-4.74) | 0.01 | 1.93 (0.96-3.87) | 0.07 | 1.99 (0.96-4.12) | 0.06 |
| **Sleep Duration** | .. | .. | 0.83 (0.70-0.98) | 0.02 | 0.86 (0.72-1.02) | 0.08 |
| **Sleep Irregularity** | .. | .. | 1.04 (0.92-1.18) | 0.5 | 1.04 (0.91-1.19) | 0.56 |

**Supplementary Table 13:** Results of sensitivity analysis in participants aged 50 or under (N=9106).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.35 (0.96-1.90) | 0.09 | 1.30 (0.92-1.84) | 0.14 | 1.23 (0.87-1.74) | 0.24 |
| **11:00pm-11:59pm** | 1.24 (1.02-1.50) | 0.03 | 1.22 (1.01-1.48) | 0.04 | 1.26 (1.04-1.53) | 0.02 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.48 (1.22-1.79) | < 0.005 | 1.36 (1.12-1.66) | < 0.005 | 1.35 (1.10-1.66) | < 0.005 |
| **Sleep Duration** | .. | .. | 0.94 (0.88-0.99) | 0.03 | 0.97 (0.92-1.03) | 0.36 |
| **Sleep Irregularity** | .. | .. | 1.03 (0.99-1.08) | 0.17 | 1.01 (0.96-1.05) | 0.76 |

**Supplementary Table 14:** Results of sensitivity analysis in participants aged between 50 and 64 (N=40746).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.33 (1.05-1.69) | 0.02 | 1.27 (1.00-1.61) | 0.05 | 1.23 (0.96-1.56) | 0.09 |
| **11:00pm-11:59pm** | 1.04 (0.92-1.19) | 0.51 | 1.03 (0.90-1.17) | 0.68 | 1.05 (0.92-1.20) | 0.46 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.30 (1.14-1.48) | < 0.005 | 1.17 (1.03-1.34) | 0.02 | 1.17 (1.02-1.35) | 0.02 |
| **Sleep Duration** | .. | .. | 0.94 (0.90-0.97) | < 0.005 | 0.97 (0.93-1.01) | 0.13 |
| **Sleep Irregularity** | .. | .. | 1.05 (1.02-1.08) | < 0.005 | 1.02 (0.99-1.06) | 0.12 |

**Supplementary Table 15:** Results of sensitivity analysis in participants aged greater than 64 (N=38174).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.36 (1.10-1.68) | < 0.005 | 1.29 (1.04-1.60) | 0.02 | 1.25 (1.01-1.55) | 0.04 |
| **11:00pm-11:59pm** | 1.11 (0.99-1.25) | 0.08 | 1.09 (0.97-1.23) | 0.15 | 1.11 (0.99-1.25) | 0.08 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.35 (1.20-1.52) | < 0.005 | 1.20 (1.07-1.36) | < 0.005 | 1.19 (1.05-1.35) | 0.01 |
| **Sleep Duration** | .. | .. | 0.92 (0.89-0.95) | < 0.005 | 0.95 (0.92-0.99) | 0.01 |
| **Sleep Irregularity** | .. | .. | 1.05 (1.02-1.07) | < 0.005 | 1.02 (0.99-1.05) | 0.12 |

**Supplementary Table 16:** Results of sensitivity analysis for time to CVD event, discounting the first 12 months after accelerometer measurement (N=87312).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
| **Sleep Onset Time** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| **≥12:00am** | 1.26 (1.00-1.59) | 0.05 | 1.20 (0.95-1.52) | 0.12 | 1.16 (0.92-1.47) | 0.21 |
| **11:00pm-11:59pm** | 1.12 (0.99-1.27) | 0.07 | 1.10 (0.97-1.25) | 0.14 | 1.12 (0.99-1.27) | 0.08 |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | 1 (ref) | .. |
| **<10:00pm** | 1.34 (1.18-1.52) | < 0.005 | 1.19 (1.04-1.35) | 0.01 | 1.16 (1.01-1.33) | 0.03 |
| **Sleep Duration** | .. | .. | 0.91 (0.88-0.95) | < 0.005 | 0.95 (0.91-0.98) | 0.01 |
| **Sleep Irregularity** | .. | .. | 1.04 (1.01-1.07) | < 0.005 | 1.02 (0.99-1.05) | 0.2 |

**Supplementary Table 17:** Results of sensitivity analyses for time to CVD event, discounting the first 18 months after accelerometer measurement (N=86905).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Base Model** | | **Adjusted Model 1** | | **Fully Adjusted Model 2** | |
|  | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** | **Hazard Ratio (95% CI)** | ***p*-value** |
| ≥**12:00am** | 1.35 (1.12-1.64) | < 0.005 | 1.29 (1.06-1.57) | 0.01 | **1.22 (0.99-1.48)** | **0.02** |
| **11:00pm-11:59pm** | 1.11 (1.00-1.24) | 0.05 | 1.09 (0.98-1.22) | 0.1 | **1.09 (0.98-1.22)** | **0.05** |
| **10:00pm-10:59pm** | 1 (ref) | .. | 1 (ref) | .. | **1 (ref)** | **..** |
| **<10:00pm** | 1.38 (1.24-1.53) | < 0.005 | 1.25 (1.12-1.39) | < 0.005 | **1.21 (1.07-1.35)** | **< 0.005** |
| **Sleep Duration** | .. | .. | 0.93 (0.90-0.96) | < 0.005 | **0.94 (0.92-0.97)** | **0.02** |
| **Sleep Irregularity** | .. | .. | 1.04 (1.02-1.07) | < 0.005 | **0.99 (0.96-1.002)** | **0.11** |

**Supplementary Table 18:** Results of sensitivity analyses for time to CVD event, discounting the first 18 months after accelerometer measurement (N=88,026).