SUPPLEMENTARY DATA

Supplementary Table 1. Association analyses between current shift work (*n* =189,488) and morningness-eveningness preference (*n* =169,926) with unadjusted/adjusted odds of type 2 diabetes and mean difference in HbA1c (in mmol/mol) across shift work and morningness-eveningness preference categories in employed UK Biobank participants of European descent.

	Type 2 diabetes			HbA1c (mmol/mol)		
	Type 2 diabetes cases /controls	**Unadjusted OR [95% CI]**	**Sleep duration adjusted OR [95% CI]**	***N***	**Unadjusted Beta [95% CI]**	**Sleep duration adjusted Beta [95% CI]**
Shift work						
Day workers	4,047 /154,792	*reference*	*reference*	146,993	*reference*	*reference*
Shift work without nights	475 /14,863	**1.22 [1.11-1.35]**	**1.26 [1.14-1.39]**	14,110	**0.29 [0.22-0.35]**	**0.33 [0.27-0.39]**
Sometimes night shift work	284 /8,434	**1.29 [1.14-1.46]**	**1.32 [1.17-1.49]**	8,005	**0.25 [0.17-0.33]**	**0.46 [0.38-0.54]**
Usual night shift work	80 /2,171	**1.41 [1.13-1.77]**	**1.47 [1.17-1.85]**	2,069	0.16 [0-0.32]	**0.43 [0.27-0.58]**
Always night shift work	156 /4,186	**1.43 [1.21-1.68]**	**1.45 [1.23-1.71]**	3,979	**0.54 [0.43-0.66]**	**0.72 [0.60-0.83]**
Morningness-eveningness preference						
Definite-morning	1,272 /42,097	*reference*	*reference*	39,976	*reference*	*reference*
More morning than evening	1,482 /60,064	**0.82 [0.76-0.88]**	**0.86 [0.8-0.93]**	57,127	**-0.25 [-0.3--0.2]**	**-0.12 [-0.17--0.08]**
More evening than morning	1,268 /48,593	**0.86 [0.8-0.93]**	0.96 [0.89-1.04]	46,267	**-0.28 [-0.32--0.23]**	-0.03 [-0.08-0.01]
Definite-evening	497 /14,653	**1.12 [1.01-1.25]**	**1.30 [1.17-1.44]**	13,886	**-0.17 [-0.24--0.1]**	**0.11 [0.04-0.18]**

Legend: Prevalent type 2 diabetes associations are unadjusted and then sex-, age-, and sleep-duration adjusted odds ratios [95% confidence interval]. HbA1c associations are restricted to participants with no prevalent type 2 diabetes. HbA1c associations are unadjusted and then sex-, age-, and sleep-duration adjusted betas [95% confidence interval] in mmol/mol. Bold P <0.05.

SUPPLEMENTARY DATA

Supplementary Table 2. Adjusted odds ratios (OR) or adjusted betas and 95% confidence intervals (CI) of type 2 diabetes and HbA1c (in mmol/mol) with each additional copy of the *MTNR1B* G risk-allele across categories of current work schedule with further adjustment for morningngess-eveningness preference (*n* =169,926).

	Type 2 diabetes			HbA1c (mmol/mol)		
	Type 2 diabetes cases /controls	OR [95% CI]	P_{int}	*N*	Beta [95% CI]	P_{int}
Overall	4,519 /165,407	1.10 [1.05-1.15]	0.10	157,256	0.26 [0.23-0.29]	0.34
Day workers	3,634 /139,090	1.09 [1.03-1.15]		132,249	0.25 [0.22-0.28]	
Shift work without nights	430 /13,389	1.25 [1.07-1.45]		12,720	0.32 [0.22-0.42]	
Sometimes night shift work	247 /7,450	0.94 [0.76-1.16]		7,074	0.35 [0.22-0.48]	
Usual night shift work	70 /1,889	0.84 [0.56-1.27]		1,799	0.21 [-0.05-0.46]	
Always night shift work	138 /3,589	1.24 [0.94-1.63]		3,414	0.18 [-0.01-0.37]	

Legend: Association results are adjusted odds ratios [95% confidence interval] of type 2 diabetes per each additional copy of the *MTNR1B* G risk-allele or adjusted betas [95% confidence interval] describing differences in HbA1c in mmol/mol per each additional copy of the *MTNR1B* G risk-allele across categories of current work schedule. Association analyses are adjusted for age, sex, BMI, genotyping array, 10 principal components of ancestry, and morningness-eveningness preference. P_{int} is log likelihood ratio test comparing models with and without cross-product interaction terms (*MTNR1B* and current work schedule) including main effect terms in logistic or linear regression models adjusted for the aforementioned covariates.

SUPPLEMENTARY DATA

Supplementary Table 3. Adjusted odds ratios (OR) or adjusted betas and 95% confidence intervals (CI) of type 2 diabetes and HbA1c (in mmol/mol) with each additional copy of the *MTNR1B* G risk-allele across categories of morningness-eveningness preference with further adjustment for current work schedule (*n* =169,926).

	Type 2 diabetes			HbA1c (mmol/mol)		
	Type 2 diabetes cases /controls	OR [95% CI]	P_{int}	*N*	Beta [95% CI]	P_{int}
Overall	4,519/165,407	1.10 [1.04-1.15]	0.044	157,256	0.26 [0.23-0.29]	0.86
Definite morning	1,272/42,097	1.17 [1.07-1.28]		39,976	0.30 [0.25-0.36]	
More morning than evening	1,482/60,064	1.09 [1.00-1.18]		57,127	0.23 [0.19-0.28]	
More evening than morning	1,268/48,593	1.06 [0.97-1.16]		46,267	0.23 [0.18-0.28]	
Definite evening	497/14,653	1.01 [0.87-1.18]		13,886	0.36 [0.27-0.46]	

Legend: Association results are adjusted odds ratios [95% confidence interval] of type 2 diabetes per each additional copy of the *MTNR1B* G risk-allele or adjusted betas [95% confidence interval] describing differences in HbA1c in mmol/mol per each additional copy of the *MTNR1B* G risk-allele across categories of morningness-eveningness preference. Association analyses are adjusted for age, sex, BMI, genotyping array, 10 principal components of ancestry, and current work schedule. P_{int} is log likelihood ratio test comparing models with and without cross-product interaction terms (*MTNR1B* and morningness-eveningness preference) including main effect terms in logistic or linear regression models adjusted for the aforementioned covariates.

SUPPLEMENTARY DATA

Supplementary Table 4. Sensitivity analyses of morningness-eveningness preference association with adjusted odds of type 2 diabetes (*n* =298,953) and adjusted mean difference in HbA1c (in mmol/mol; *n* =272,220) in UK Biobank participants of European descent regardless of employment status.

	Type 2 diabetes		HbA1c (mmol/mol)	
	Type 2 diabetes cases /controls	Sex- and age-adjusted OR [95% CI]	*N*	Sex- and age-adjusted Beta [95% CI]
Morningness-eveningness preference				
Definite-morning	3,490 /75,909	*reference*	72,013	*reference*
More morning than evening	4,006 /104,746	**0.86 [0.82-0.90]**	99,552	**-0.12 [-0.15--0.08]**
More evening than morning	3,455 /81,559	1.01 [0.96-1.06]	77,517	-0.03 [-0.06-0.01]
Definite-evening	1,373 /24,415	**1.40 [1.31-1.49]**	23,138	**0.17 [0.12-0.22]**

Legend: Prevalent type 2 diabetes associations are sex-, and age- adjusted odds ratios [95% confidence interval]. HbA1c associations are restricted to participants with no prevalent type 2 diabetes. HbA1c associations are sex- and age-, adjusted betas [95% confidence interval] in mmol/mol. Bold P <0.05.

SUPPLEMENTARY DATA

Supplementary Table 5. Sensitivity analyses of morningness-eveningness preference association with adjusted odds of type 2 diabetes (*n* =298,953) and adjusted mean difference in HbA1c (in mmol/mol; *n* =272,220) with each additional copy of the *MTNR1B* G in UK Biobank participants of European descent regardless of employment status.

	Type 2 diabetes			HbA1c (mmol/mol)		
	Type 2 diabetes cases /controls	OR [95% CI]	P_{int}	*N*	Beta [95% CI]	P_{int}
Overall	12,324 /286,629	1.10 [1.07-1.14]	0.17	272,220	0.24 [0.22-0.26]	0.83
Definite morning	3,490 /75,909	1.14 [1.08-1.2]		72,013	0.26 [0.22-0.30]	
More morning than evening	4,006 /104,746	1.11 [1.05-1.16]		99,552	0.22 [0.18-0.25]	
More evening than morning	3,455 /81,559	1.07 [1.02-1.13]		77,517	0.23 [0.19-0.27]	
Definite evening	1,373 /24,415	1.09 [0.99-1.19]		23,138	0.27 [0.20-0.35]	

Legend: Association results are adjusted odds ratios [95% confidence interval] of type 2 diabetes per each additional copy of the *MTNR1B* G risk-allele or adjusted betas [95% confidence interval] describing differences in HbA1c in mmol/mol per each additional copy of the *MTNR1B* G risk-allele across categories of morningness-eveningness preference. Association analyses are adjusted for age, sex, BMI, genotyping array and 10 principal components of ancestry. P_{int} is log likelihood ratio test comparing models with and without cross-product interaction terms (*MTNR1B* and morningness-eveningness preference) including main effect terms in logistic or linear regression models adjusted for the aforementioned covariates.

SUPPLEMENTARY DATA

Supplementary Table 6. Characteristics of subset of UK Biobank participants of European descent with up to 7-day actigraphy information.

	Employed Participants	All Participants
N	38,701	82,923
Age, years	56.4	62.5
Sex, % male	41.90	43.9
BMI, kg/m^2	26.5	26.7
Type 2 diabetes, *n* cases (%)	555 (1.4)	2,165 (2.6)
Sleep midpoint, clock time	26.91	26.99
Townsend Index*	-1.64	-1.80
People in Household, *n* (%)		
Husband, Wife or Partner	29,166 (75.4)	63,354 (76.4)
Son and/or Daughter	21,163 (54.7)	29,413 (35.5)
Mother and/or Father	149 (0.4)	287 (0.3)
Grandchild	809 (2.1)	1,285 (1.5)
Other	7 (0.02)	10 (0.01)

Data are mean (SD), median (interquartile range), or percentages.
*Positive values of the index will indicate areas with high material deprivation, whereas those with negative values will indicate relative affluence.

SUPPLEMENTARY DATA

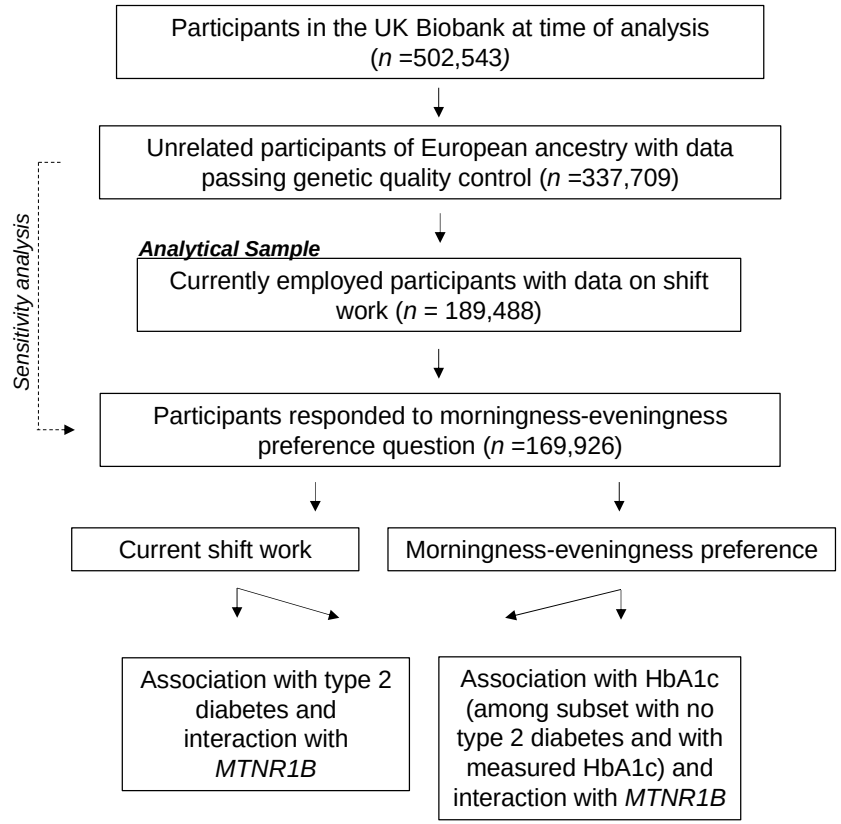
Supplementary Table 7. Associations between quartiles of accelerometer-derived sleep midpoint (*n* =82,923) with adjusted odds of type 2 diabetes in UK Biobank participants of European descent regardless of employment status.

	Type 2 diabetes cases /controls	Sex- and age-adjusted OR [95% CI]	Sex- and age- and household status- adjusted OR [95% CI]
Sleep midpoint (Q1)	590 / 20,141	*reference*	*reference*
Sleep midpoint (Q2)	474 / 20,258	**0.79 [0.72-0.88]**	**0.80 [0.73-0.89]**
Sleep midpoint (Q3)	481 / 20,249	**0.79 [0.71-0.87]**	**0.80 [0.72-0.88]**
Sleep midpoint (Q4)	620 / 20,110	0.99 [0.88-1.11]	1.00 [0.89-1.12]

Legend: Prevalent type 2 diabetes associations are sex- and age- adjusted odds ratios [95% confidence interval] and bold P <0.05. In sensitivity analysis, associations were further adjusted for people residing in the household with the participant (household status).

SUPPLEMENTARY DATA

Supplementary Figure 1. Analysis workflow.



SUPPLEMENTARY DATA

Supplementary Figure 2. Adjusted odds ratios (OR) of type 2 diabetes with each additional copy of the *MTNR1B* G risk-allele in the overall sample and across categories of morningness-eveningness preference in employed UK Biobank participants of European descent (*n* =169,926).