Supplementary Table 1. Age-adjusted baseline (2005) characteristics by responders vs. non-responders of night shift questions

Characteristics	Night Shift Questions Response[a]	
	Did not answer	Answered
Number of women	6,309	28,041
Mean age, years	47.6	47.6
Mean BMI, kg/m^2	29.3	29.4
Mean energy intake, kcal/day	1448	1471
Family history of diabetes, %	34	35
Current smokers, %	14	11
Current alcohol drinkers, %	27	26
Regular coffee consumption >1 cup/day, %	9	9
Decaf coffee consumption >1 cup/day, %	2	2
Regular soda consumption >1 cup/day, %	6	6
Diet soda consumption >1 cup/day, %	2	2
Education ≤12 years, %	17	12
Vigorous exercise ≥5 hours/week, %	9	8
Dietary patterns, %		
5^{th} quintile of vegetable/fruit (healthiest)	19	19
5^{th} quintile of meat/fried foods (unhealthiest)	20	20
Neighborhood socioeconomic status, %		
1^{st} quintile (poorest neighborhood)	22	18
5^{th} quintile (wealthiest neighborhood)	15	19

[a] Number of women after baseline exclusions as described in the Research Design and Methods section

Supplementary Table 2. Undiagnosed diabetes in 1,873 BWHS participants who donated a blood sample and who had never reported a diagnosis of diabetes up to 2013

Group	Number of women	Women with A1C ≥ 6.5%	Undiagnosed diabetes (%)
All	1,873	120	6.4
Answered night shift questions	1,642	104	6.3
Never shift workers	951	62	6.5
Ever shift workers	691	42	6.1
Did not answer night shift questions	231	16	6.9

Night shift work and incident diabetes among U.S. black women

Appendix

Attenuation of the observed relative risk compared to the true relative risk

Let us define the following terms

RR' = observed relative risk
RR = true (unobserved) relative risk
N_0 = number of ever night shift workers
N_1 = number of never night shift workers
a = number of self-reported cases of incident diabetes among ever night shift workers
b = number of self-reported cases of incident diabetes among never night shift workers
Sp = specificity of the self-report of incident diabetes
T^+ = self-report of incident diabetes
T^- = no self-report of incident diabetes
D^+ = case of incident diabetes (diagnosed case + undiagnosed case)
D^- = no case of incident diabetes

The attenuation, assuming non-differential misclassification of the outcome, of the observed relative risk compared to the true relative risk can be estimated using the following equation [1]

$$\frac{RR'}{RR} = \frac{a[c - N_0(1 - Sp)]}{c[a - N_1(1 - Sp)]}, \qquad (1)$$

Specificity of the self-report of diabetes in BWHS can be estimated by the following equation

$$Sp = P(T^-|D^-) = \frac{P(D^-|T^-)P(T^-)}{P(D^-)} = \frac{[1 - P(D^+|T^-)][1 - P(T^+)]}{1 - P(D^+)}, \qquad (2)$$

$P(D^+|T^-)$ = probability of undiagnosed diabetes in BWHS= 0.064 (Supplementary Table 2)

We estimated $P(T^+)$ (i.e. the probability of self-report of incident diabetes in BWHS) as the number of self-reported cases of incident diabetes divided by the number of diabetes-free women at baseline in the whole BWHS cohort,

$P(T^+)$ = 6,698/53,302 = 0.13

$P(D^+)$ is the probability of having diabetes, either diagnosed or undiagnosed, in the BWHS and it can be estimated by the following equation

$$P(D^+) = P(D^+|T^+)P(T^+) + P(D^+|T^-)P(T^-), \quad (3)$$

Our validation study of self-report of diabetes (see Research Design and Methods) indicated that 96% of the self-reported cases of diabetes were confirmed by medical records = $P(D^+|T^+)$, then the probability of having diabetes in BWHS is equal to

$P(D^+) = 0.96 \times 0.13 + 0.064 \times 0.87 = 0.18$

The specificity of the self-report of diabetes in the BWHS is equal to

$$Sp = \frac{(1 - 0.064)(1 - 0.13)}{1 - 0.18} = 0.99$$

In the present study we observed 772 cases of self-reported incident diabetes among 10,319 ever night shift workers, and 1,014 cases of self-reported incident diabetes among 17,722 never night shift workers. Substituting values into equation (1) we get that the attenuation of the observed relative risk compared to the true (unobserved) relative risk is equal to

$$\frac{RR'}{RR} = \frac{772[1{,}014 - 17{,}722(1 - 0.99)]}{1{,}014[772 - 10{,}319(1 - 0.99)]} = 0.95$$

That is, the observed relative risk is 5% lower that the true (unobserved) relative risk.

REFERENCES

[1] Copeland KT, Checkoway H, McMichael AJ, Holbrook RH (1977) Bias due to misclassification in the estimation of relative risk. Am J Epidemiol 105: 488-495