Supplemental Text - Methods

Annual mean model. One year is considered to be a "circle", and the date of a woman's blood draw is assigned an angle based on its distance from January 1st. The sine and cosine of this angle are used as predictors in a linear regression model of $\log_2$ 25(OH)D. The model also included interaction terms between the sine and cosine functions and the level of supplement use (see classification of supplement data below) because supplement users showed less seasonal variation in 25(OH)D. Using the 25(OH)D for all women we first estimated an average 25(OH)D level for each day of the year. The actual 25(OH)D level for each woman differs from this mean by an amount known as the "residual". This residual term can be thought of as the amount a given woman differs from the population, accounting for the day of the year (i.e. season). To get an overall estimated annual mean for each woman we added this individual residual to the intercept term from the linear regression model (i.e. the population annual mean 25(OH)D level (15.4 ng/mL)).

Classification of supplement use. SELF participants completed a food frequency questionnaire (FFQ) that was analyzed for dietary and supplement intake of vitamin D (IU/day). At the clinic visit they also reported exposures from the last 24 hours and from the last month including hormonal birth control use and intake of nutritional supplements. Additionally, women were asked to bring to the clinic any vitamins or supplements they had taken in the past month.

Supplement use was categorized based on information from the FFQ, the 24-hour clinic recall, and the one month clinic recall. Non-users were women who reported no multivitamin or vitamin D supplement use on any of the questionnaires. Supplement users were categorized based on their highest reported intake from the three instruments. Women who reported use of a supplement containing vitamin D on the 24-hour questionnaire were considered "regular" users,

while women who only reported use of a supplement containing vitamin D on the one-month recall were considered “irregular” supplement users. “Low” supplement use was defined as ≤200 IU/day of vitamin D supplement on the FFQ or irregular use of a single supplement type. “Intermediate” supplement use was defined as 201-600 IU/day on the FFQ or irregular use of multiple supplement types or regular use of a single multivitamin. “High” supplement use was defined as >600 IU/day on the FFQ or regular use of multiple supplement types or regular use of a single vitamin D supplement. This supplement use classification scheme was positively and significantly associated with measured 25(OH)D ($p<0.0001$, data not shown).

Physical Activity. A five-level physical activity variable was created from several questions about physical activity during the last 12 months. Participants were asked hours/day walking, frequency of sports activities and the length of time practicing or playing each time they practiced or played, hours per week with exercise routines or classes, and other physical activities such as hiking or dancing. For sports, exercise routines/classes, and other activities like hiking, etc. they were asked how much of the time when they were doing those activities they experienced a large increase in breathing and heart rate (very little of the time, less than half the time, about half the time, more than half the time). They were also asked hours per week spent doing physically-active household chores and how much time per day (or per week) they did activities that involved “heavy manual labor” at work.

These data were used to estimate hours per week of three physical activity categories:

(1) Walking and household chores were combined and assigned a MET score of 3; high values at the extreme of the distributions were truncated (walking and chores were each truncated to 20 hours per week).

2) Moderate activity included time with recreational activities not involving a large increase in heart rate as well as hours of heavy manual labor at work, and this category was assigned a MET score of 5; values at the extreme of the distribution for manual labor were truncated to 5 hours per week.

3) Vigorous activity included time with recreational activities involving a large increase in heart rate and was assigned a MET score of 9.

The physical activity variable was created so that moderate and vigorous activity was required for high values, regardless of total MET scores, while the lowest level excluded women with much moderate or vigorous activity. Low and high values were assigned first and then the remaining women were assigned to either low-moderate or moderate. The definitions of the five levels are as follows.

Low: <1 hour per week of vigorous and <2 hours per week of moderate activity.

Low-moderate: a MET score below the median among women unassigned to low, high, or very high.

Moderate: a MET score above the median among women unassigned to low, high, or very high.

High: 2.5 - <5 hours per week of vigorous activity or 7 - <10 hours per week of moderate activity.

Very high: ≥5 hours per week of vigorous activity or ≥10 hours per week of moderate activity.

Supplemental Table 1. Sensitivity analyses of the association between 25(OH)D and menstrual cycle length and regularity among African-American women in the SELF study (N=1089).

	N	Adjusted* OR (95% CI) for a doubling† of 25(OH)D	p-value
Excluding women with a recent diagnosis of vitamin D deficiency			
Normal cycles (27-34 days)	568	1	
Short cycles (≤26 days)	344	1.01 (0.80, 1.28)	0.94
Long cycles (≥35 days)	49	0.48 (0.28, 0.83)	0.009
Irregular cycles	47	1.37 (0.80, 2.35)	0.26
Excluding women with a history of PCOS			
Normal cycles (27-34 days)	600	1	
Short cycles (≤26 days)	361	1.04 (0.83, 1.30)	0.75
Long cycles (≥35 days)	47	0.57 (0.33, 0.97)	0.04
Irregular cycles	45	1.42 (0.83, 2.43)	0.20
Excluding women who reported using a medication that regulated their menstrual cycles “some of the time”			
Normal cycles (27-34 days)	534	1	
Short cycles (≤26 days)	316	0.99 (0.78, 1.26)	0.95
Long cycles (≥35 days)	44	0.56 (0.32, 0.99)	0.04
Irregular cycles	40	1.55 (0.88, 2.74)	0.13
Excluding women who had been pregnant during the past year			
Normal cycles (27-34 days)	554	1	
Short cycles (≤26 days)	338	1.02 (0.81, 1.29)	0.87

Long cycles (≥35 days)	51	0.60 (0.36, 1.01)	0.06
Irregular cycles	46	1.51 (0.89, 2.54)	0.12
Adjusting for baseline fibroid status			
Normal cycles (27-34 days)	617	1	
Short cycles (≤26 days)	367	1.03 (0.82, 1.29)	0.81
Long cycles (≥35 days)	54	0.54 (0.32, 0.89)	0.02
Irregular cycles	51	1.42 (0.86, 2.34)	0.17

*Adjusted for: age, BMI, education, income, current smoking, alcohol use, and physical activity.

†Given the low levels of 25(OH)D in this population, a "doubling" of 25(OH)D can be thought of as changing most of the women from the range of deficiency to sufficiency.