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Article

The influence of menstrual cost on women's work hours and the pursuit of wage gap equity

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SUMMARY

The gender wage gap is a significant issue in the United States, with women earning less than men on average in the workforce for similar work. In addition to differences in income, a less discussed inequity is the cost of menstrual products, which are essential for women's health and expensive, thus adding a financial burden on women. We utilized available datasets to calculate and analyze the impact of the cost of menstruation on working hours for women by race and state. We hypothesized that the cost of menstrual products disproportionately affects women's working hours compared to men and this impact varies among women from different racial backgrounds. We explored underlying factors linking the cost of menstruation in the United States, women's working hours, and the ongoing pursuit of gender wage gap equity. We found that, due to the difference in incomes, women must work an average of 6.9 hours annually to afford menstrual products whereas men can afford these products by working an average of only 5 hours annually. Our results suggest that the menstrual cost pushes the year of gender wage gap closure by two years from 2046 to 2048. Our findings highlight the issue that the ideal wage gap closure date is based on equality rather than equity. By recognizing this disparity, we can work with educators and policymakers to address it, such as by working towards wage equity and reducing the cost of menstrual products.

INTRODUCTION

Despite years of progress, studies have shown that the gender wage gap persists today. The gender wage gap constitutes considerably lower wages for women than their male counterparts and varies among women from different racial backgrounds (1). For example, the gender wage gap for Black women on average is larger than for White women in the United States (US) (2). The average yearly earnings of White women are $39,320, which is 76.15 % of the average yearly earnings of men whereas the average yearly earnings of Black women are $33,223 which is 63.39% of the average yearly earnings of men (2). Contributing factors for the gender wage gap range from gender stereotyping and cultural segregation to various traditional practices, like expecting women to be the primary caregiver and their underrepresentation in political positions (3).

The gender wage gap is often expressed as a percentage of men's earnings which we believe could be perceived merely as a numerical value and often fails to convey its real impact on an individual's life. We believe that reporting the gender wage gap as a difference in work hours instead of the percent difference in wages more truly reflects the impact on those affected. Research on the cost of the menstrual products necessary for safe and hygienic menstruation cycles has found that women are often forced to make difficult financial choices to afford these products, leading to "period poverty" (4). For example, some women were reported having to choose between buying a tampon or the next meal for their family (4). In discussions about the gender wage gap, menstrual expenses are often overlooked despite their significant impact on an individual's financial stability. It is important to explore the wage disparity along with the menstrual expenses to holistically understand the wage gap's impact on women's lives.

Previous research shows that the wage gap is decreasing in the US and is predicted to close in the future (1). Our calculations predict gender wage gap closure to be in the year 2046 **(Figure 1)**. However, no research that we are aware of to date has considered the added cost of menstruation, which only people who menstruate must bear. We hypothesized that the cost of menstrual products disproportionately affects women's working hours than men's, and that the impact varies among women from different racial backgrounds. We further predicted that this expense would further delay closure of the wage gap. We combined data from previous works to analyze the impact of menstruation on women's work hours (1, 2, 4). We then calculated how this extra cost impacts the year of wage gap closure.

We found that women must work an average of 6.9 hours annually to afford menstrual products whereas men can afford these products by working an average of only 5 hours annually. When the races of women are considered, the number of extra work hours to afford the cost of menstruation

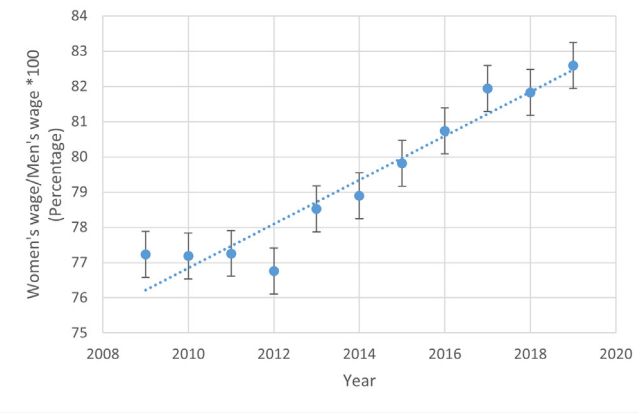

Figure 1: Previously determined gender wage gap through the years. Percent difference in women's earnings compared to men's 2008 – 2020. Plotted best fit line (dashed) is y = 0.6245x - 1178.3099, with R^2 = 0.92. Error bars represent standard error.

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annually increases, especially for Hispanic, Black, and Native American women. We additionally found through our calculations that the cost of menstruation increases the wage equity date by two years and highlights the issue that the ideal wage gap closure date is based on equality rather than equity **(Figure 2).**

RESULTS

To analyze the influence of menstrual costs on women's work hours, we utilized data on women's yearly earnings in the US from the Institute for Women's Policy Research which provides data from all 50 states, the District of Columbia, and the US overall (2). This dataset includes the yearly earnings of women by race and the percent difference in average earnings of all women compared to all men (2). Data of yearly earnings of men by race was not available (2). We used these data to calculate the average yearly earnings of all men by states across the United States **(Table S1)**. We also calculated the hourly income of women by race and all men by state **(Table S2)**. We also utilized data available for the cost of menstruation per cycle per each state in the US based on the combined local cost of a one-month supply of tampons, sanitary pads and Ibuprofen medication (4). We calculated the average menstrual cost for the year 2013 for all states as $121.84 **(Table S1).** We used these results to further calculate the number of work hours to afford a yearly menstrual cost for women (by race) and men **(Table S1)**. Our results indicated that the average number of additional hours an individual must work per year is 6.90 hours for women and 5 hours for men **(Figure 3)**. The number of additional hours for various racial groups were 6.49 for White women, 7.59 for Black women, 9.08 for Hispanic women, 6.50 for Asian/Pacific Islander women, 7.73 for Native American women, and 7.00 for women from other races **(Figure 3)**.

To analyze the influence of menstrual costs on the pursuit of wage gap closure, we utilized the data provided by the Institute for Women's Policy Research (5). Notably, these data do not account for menstrual costs. We calculated and plotted a best fit line for the percentage difference in women's wages compared to men's over the years **(Figure 1)**. Using the linear regression calculator, the equation of the resulting line is y = 0.6245x - 1178.3099. From this fitted line, we predicted that the wage gap will be closed in approximately the year 2046 according to these data **(Figure 1)**.

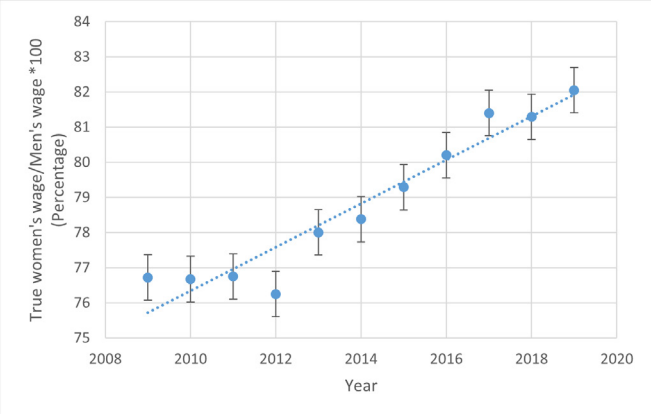

Figure 2: Gender wage gap accounting for menstrual cost through the years. Women's adjusted earnings in percentage compared to men (Y-axis) through the years (X-axis). Plotted best fit line (dashed) is y = 0.6203x - 1170.5589, with R^2 = 0.92. Error bars represent standard error.

We previously calculated the average menstrual cost in the United States to be $121.84 **(Table S1)**. The median yearly earnings of women were $43,044 for 2013 (5). Thus, we estimate that women in 2013 spent 0.3% of their earnings on menstruation products. Assuming every year (before and after 2013) women must spend roughly the same percent of their earnings on sanitary products, we calculated the cost of menstruation for each year and subtracted this expense from the annual earnings of women to calculate the adjusted annual earnings of women **(Table S4)**. We converted the adjusted annual earnings of women into the percentage of adjusted annual earnings of men **(Table S4)**. We used the percentage difference of the true women's annual earnings vs reported men's annual earnings to calculate and plot a best fit line **(Figure 2)**. According to the fitted line, the wage gap will likely be closed in the year 2048 **(Figure 2)**. By comparing the closure dates estimated by the fitted lines using previously reported and adjusted women's wages, we predict that the menstrual cost will additionally delay the year of wage gap closure by two years.

DISCUSSION

Menstruation is a natural aspect of a woman's life. A woman, on average, has menstrual cycles for 33 years of her life (6). In our study, we found that the average number of extra hours women must work is 6.9 hours per year to afford menstrual expenses. That accounts for about 230 hours of her lifetime earning money to pay for basic hygiene products. Our study used currently available data to calculate the number of hours men and women must work to afford these products. This number varies for women from different racial backgrounds. We found that Hispanic, Black, and Native American women must work the most extra hours to afford menstrual products, indicating an extra burden placed on non-White women.

Our study highlights issues in our current determination of the wage gap closing date. This work provides information on how the inclusion of the cost of menstrual products delays the closure of the wage gap, we estimate by two years. Therefore, women having equal pay to men may not be enough to achieve wage equity. Our results suggest that for the gender wage gap to truly close, all people who menstruate should be compensated for the cost of buying menstrual products or these products should be made freely available.

One limitation of our study was that we could not find exact data on the cost of menstruation each year. To estimate this cost using the cost of menstrual products in 2013, we assumed that each year, the same percent (0.3%) of women's average annual earnings was spent on menstrual products, but there could be a fluctuation in how much women spend on menstrual products per year. This is because with time, inflation has affected the United States economy, making menstrual products more costly. Therefore, women may have spent more on menstrual products in subsequent years and thus, required work more hours than we calculated. Errors due to inflation would also further delay the wage gap closure date, because women may be spending more on menstrual products in later years, leading to a larger percent difference in the adjusted wages of women and reported wages of men.

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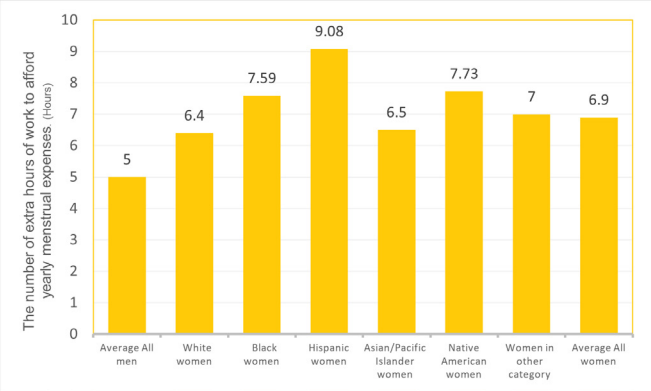

Figure 3: Number of extra work hours to afford annual menstrual cost for women (by race) and men. The number of extra work hours to afford yearly menstrual expenses for women by race, average for all women, and average for all men.

Another limitation is that our calculations would have been affected by uncontrollable outliers, such as extreme high or low salaries, which can skew the average wage calculations or cost of living in different regions and distort the overall analysis. Therefore, our best fit line is an approximation.

For future research, one could also account for menopause, as many women go through menopause during their working years and the expenses associated with this natural condition again uniquely impact menstruating people and may influence the wage gap. Additionally, better understanding the diverse experience of all women, including their socioeconomic status and ethnicity, could provide clearer understanding of systemic inequalities and inform more effective policies and interventions. Also, the cost of menstruation could be calculated more accurately by including expenses like doctors' visits, lost work time due to menstrual symptoms, and other related costs. Comparing data from other nations who have taken steps to address this issue by either providing free menstrual products or abolishing taxes on these items would be helpful to give a clearer idea on what policy steps could be taken within the US to address the menstrual cost. Findings from this study have the potential to bring awareness that the ideal wage gap closure date should be based on equality rather than equity and inform policymakers and educators about the extra working hours needed for women to afford menstrual products. By recognizing and addressing this disparity, we can work to make menstrual products free of cost, or work towards wage equity to allow for women to afford the menstrual costs.

MATERIALS AND METHODS

Influence of menstrual costs on women's work hours

We used the women's annual earnings data from "Institute for Women's Policy Research" **(Table S3)** (4). Average data over a three-year period (2011-2013) on women's yearly earnings was collected (2). This data was utilized to calculate men's average yearly earnings by states across the USA , using the following formula :

$$Men's\ Earnings = \frac{Women's\ Earnings}{\%\ of\ Women's\ Earnings\ in\ comparison\ to\ Men} \times 100$$

Averages of values were calculated using the formula above and used that as the men's average earnings for each corresponding state **(Table S2)**. According to data from the Bureau of Labor Statistics, a typical employee works about 8 hours each weekday, amounting to 40 hours per week, and totaling 2,080 hours annually (7). We were able to calculate the hourly income of women and men using the following formula **(Table S3):**

$$Hourly\ earnings = \frac{Annual\ earnings}{2080\ hours}$$

Data available were used for the cost of menstruation per cycle by state of the US (4). There are around 14 menstruation cycles in a year on average for women (6). The work hours to afford yearly menstrual cost is calculated using following formula:

$$Work\ hours\ to\ afford\ yearly\ menstrual\ cost = \frac{Menstrual\ \ cost\ per\ cycle\ \ x\ 14\ menstrual\ cycles\ per\ year}{Hourly\ earnings}$$

Influence of menstrual costs on the pursuit of wage gap closure

The wage gap percent difference by gender data was calculated **(Table S4)** (4). The percentage of women's earnings compared to men vs the corresponding years were used and a linear regression calculator was used to plot the best fit line (8). Y axis is the annual earnings of women in percentage compared to men and X axis is the corresponding year. Substituting Y, the annual earning women in percentage compared to men in the equation with 100, can be used to find the year **(Figure 1- 2)**.

The average menstruation cost was calculated to be $121.84 for the year 2013 **(Table S1)**. This is the average cost of menstruation products throughout the US. The median yearly earnings of women was $43,044 for 2013 **(Table S4)** (4). The cost of menstruation products in percentage of women's yearly earnings in 2013 was calculated by following formula.

$$Cost\ of\ menstruation\ products\ in\ \%\ of\ women's\ yearly\ earnings = \frac{Average\ annual\ \ menstruation\ Cost\ \times\ 100}{Median\ Annual\ Earnings\ of\ Women}$$

Women in 2013 had to spend 0.3% of their earnings for menstruation products. Assuming that every year, women spend roughly the same percent of their earnings on menstruation products, the cost of menstruation for each year is

$$Annual\ menstruation\ cost\ =\ Women's\ Annual\ earnings\ \times\ 0.3$$

To calculate the actual gender wage gap, this menstruation cost needed to be subtracted from women's annual earnings each year to find out the women's adjusted annual earnings. The annual menstrual cost was subtracted from the women's annual earnings **(Table S4)**, to calculate the new adjusted annual earnings for women as a percentage of men's earnings using the following formula:

$$True\ Women's\ Annual\ Earnings\ in\ percentage = \frac{Women's\ Annual\ Earnings\ -\ \ Annual\ mensural\ Cost}{Men's\ Annual\ Earnings}\ x\ 100$$

The percentage of true women's annual earnings vs the corresponding years was used to plot a line **(Table S4)**. A linear regression calculator was used to plot the best fit line (8). Resulting line's equation is Y= 0.6203x-1170.5589 **(Figure 2)**. Here, the Y axis is the adjusted annual earnings of women in percentage compared to men and X axis is the corresponding year. Substituting Y in the equation with 100, the approximate year of wage gap closure (X) can be calculated. The X values calculated from both lines in were compared and used to calculate the delay in the wage gap closure in years **(Figure 1-2)**.

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Appendix

State	Menstrual cost		White women		Hispanic Women		Black Women		Asian/ Pacific Islander		Native American Women		Other Races		All Women Avg.		Men	
	One Month ($)	One Year ($)	E.H.* ($)	E.W. H.*	E.H.* ($)	E.W. H.*	E.H.* ($)	E.W. H.*	E.H.* ($)	E.W. H.*	E.H.* ($)	E.W. H.*	E.H.* ($)	E.W. H.*	E.H. ($)	E.W. H.	E.H. ($)	E.W. H.
AL	7.53	105.42	16.93	6	10.88	10	13.66	8	17.92	6	17.92	6	17.43	6	15.87	7	23.40	5
AK	10.97	153.58	22.12	7	NA	NA	NA	NA	14.42	11	18.12	8	19.92	8	15.87	10	29.97	5
AZ	7.51	105.14	19.51	5	13.46	8	17.07	6	19.51	5	14.90	7	17.92	6	17.31	6	24.35	4
AR	7.57	105.98	15.38	7	10.73	10	13.89	8	14.42	7	NA	NA	13.32	8	14.42	7	19.63	5
CA	6.74	94.36	24.90	4	14.42	7	20.98	4	23.90	4	18.75	5	22.39	4	20.19	5	31.45	3
CO	6.17	86.38	20.67	4	14.42	6	17.56	5	18.92	5	14.94	6	18.27	5	19.23	4	26.42	3
CT	11.87	166.18	24.40	7	14.66	11	18.92	9	24.90	7	NA	NA	18.42	9	22.12	8	31.78	5
DE	9.16	128.24	20.91	6	14.94	9	18.00	7	25.85	5	NA	NA	NA	NA	19.71	7	24.80	5
FL	8.67	121.38	18.27	7	13.66	9	14.42	8	17.31	7	NA	NA	16.83	7	16.35	7	22.53	5
GA	10.60	148.40	18.94	8	11.95	12	15.38	10	16.83	9	NA	NA	16.59	9	16.83	9	23.72	6
HI	7.60	106.40	21.95	5	16.93	6	NA	NA	18.05	6	NA	NA	17.56	6	19.23	6	24.13	4
ID	7.32	102.48	15.44	7	10.95	9	NA	NA	NA	NA	NA	NA	NA	NA	14.42	7	20.73	5
IL	8.49	118.86	20.00	6	12.98	9	17.56	7	23.90	5	NA	NA	19.51	6	19.23	6	27.25	4
IN	7.40	103.60	16.68	6	12.45	8	15.38	7	17.56	6	NA	NA	14.94	7	16.35	6	22.60	5
IA	8.71	121.94	17.07	7	12.45	10	13.75	9	15.41	8	NA	NA	NA	NA	16.83	7	21.89	6
KS	7.19	100.66	17.31	6	11.95	8	14.94	7	16.58	6	NA	NA	14.63	7	16.83	6	22.84	4
KY	7.36	103.04	16.10	6	12.45	8	13.94	7	17.43	6	NA	NA	17.45	6	15.96	6	21.27	5
LA	8.73	122.22	17.31	7	13.46	9	12.45	10	16.68	7	NA	NA	14.44	8	15.38	8	24.98	5
ME	9.84	137.76	17.31	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	17.31	8	20.83	7
MD	8.56	119.84	24.90	5	14.94	8	22.12	5	26.83	4	NA	NA	24.04	5	23.94	5	31.53	4
MA	10.54	147.56	24.04	6	15.22	10	18.92	8	24.39	6	NA	NA	17.43	8	23.32	6	30.45	5
MI	7.57	105.98	18.27	6	14.05	8	16.43	6	22.60	5	15.07	7	16.83	6	17.79	6	24.20	4
MN	11.67	163.38	19.92	8	13.66	12	15.85	10	17.79	9	15.73	10	16.59	10	19.23	8	24.77	7

MS	7.20	100.80	15.93	6	13.17	8	12.02	8	NA	NA	NA	NA	NA	NA	14.42	7	21.03	5
MO	7.20	100.80	16.83	6	12.45	8	14.94	7	15.87	6	NA	NA	15.53	6	16.35	6	21.68	5
MT	9.77	136.78	15.44	9	NA	NA	NA	NA	NA	NA	14.42	9	NA	NA	15.19	9	20.20	7
NE	9.76	136.64	16.83	8	12.02	11	13.22	10	NA	NA	NA	NA	NA	NA	15.82	9	22.17	6
NH	5.96	83.44	19.92	4	13.46	6	16.23	5	17.31	5	15.38	5	16.83	5	16.83	5	24.24	3
NJ	12.67	177.38	19.92	9	NA	NA	NA	NA	18.05	10	NA	NA	NA	NA	19.23	9	25.90	7
NM	8.34	116.76	24.90	5	14.94	8	20.19	6	29.27	4	NA	NA	20.91	6	23.08	5	33.28	4
NY	9.56	133.84	20.31	7	14.42	9	NA	NA	16.83	8	12.88	10	NA	NA	16.83	8	23.98	6
NC	15.56	217.84	23.08	9	15.93	14	19.23	11	23.40	9	17.43	13	19.51	11	21.06	10	28.16	8
ND	7.41	103.74	17.92	6	10.96	9	14.44	7	16.35	6	13.46	8	15.38	7	16.83	6	22.67	5
MP	7.43	104.02	16.63	6	NA	NA	NA	NA	NA	NA	14.63	7	NA	NA	16.83	6	22.68	5
OH	6.16	86.24	17.56	5	14.63	6	15.12	6	19.23	4	NA	NA	16.83	5	17.31	5	23.27	4
OK	7.23	101.22	15.93	6	11.25	9	14.42	7	14.94	7	14.63	7	14.42	7	15.38	7	21.91	5
OR	15.06	210.84	18.92	11	12.20	17	17.07	12	17.88	12	15.85	13	16.83	13	18.27	12	23.76	9
PA	8.56	119.84	18.75	6	13.17	9	17.07	7	19.92	6	NA	NA	16.35	7	18.27	7	24.33	5
RI	10.55	147.70	21.15	7	13.44	11	15.46	10	19.42	8	NA	NA	NA	NA	20.67	7	25.76	6
SC	7.53	105.42	17.31	6	12.45	8	12.79	8	14.94	7	NA	NA	13.94	8	15.38	7	21.87	5
SD	7.36	103.04	14.94	7	NA	NA	NA	NA	NA	NA	14.42	7	NA	NA	14.42	7	19.26	5
TN	7.59	106.26	16.83	6	10.26	10	14.63	7	17.56	6	NA	NA	14.63	7	16.11	7	21.09	5
TX	7.08	99.12	20.19	5	12.45	8	16.59	6	21.91	5	19.71	5	18.27	5	16.83	6	27.34	4
UT	7.07	98.98	17.07	6	11.54	9	NA	NA	17.43	6	13.46	7	14.42	7	16.83	6	24.63	4
VT	12.67	177.38	18.92	9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18.70	9	21.63	8
VA	10.97	153.58	21.16	7	14.63	10	16.93	9	24.39	6	NA	NA	19.71	8	19.71	8	28.21	5
WA	7.00	98.00	20.76	5	12.98	8	17.56	6	19.51	5	17.85	5	19.51	5	19.86	5	27.95	4
WV	7.08	99.12	14.63	7	NA	NA	13.17	8	NA	NA	NA	NA	NA	NA	14.57	7	21.64	5
WI	7.30	102.20	17.97	6	12.20	8	14.63	7	15.61	7	14.39	7	14.94	7	17.31	6	23.35	4
WY	7.32	102.48	17.07	6	14.94	7	NA	NA	NA	NA	NA	NA	NA	NA	17.31	6	25.49	4

Table S1: Number of extra work hours to afford menstrual costs for women (by race) and men. Calculated annual cost of mensuration, hourly earnings, and the number of hours women (by race) and men must work extra every year to afford the cost of menstruation by state. All values reported in USD. E.H. = Earnings Per Hour. E.W.H. = Extra Work Hours.

State	Men's yearly earnings ($)	State	Men's yearly earnings($)	State	Men's yearly earnings ($)	State	Men's yearly earnings ($)
Alabama	48,664	Illinois	56,671	Montana	42,020	Rhode Island	53,585
Alaska	62,333	Indiana	47,001	Nebraska	46,122	South Carolina	45,498
Arizona	50,658	Iowa	45,529	Nevada	50,428	South Dakota	40,056
Arkansas	40,834	Kansas	47,505	New Hampshire	53,872	Tennessee	43,861
California	65,413	Kentucky	44,248	New Jersey	69,217	Texas	56,865
Colorado	54,957	Louisiana	51,956	New Mexico	49,885	Utah	51,231
Connecticut	66,093	Maine	43,323	New York	58,583	Vermont	45,000
Delaware	51,591	Maryland	65,588	North Carolina	47,143	Virginia	58,669
Florida	46,857	Massachusetts	63,335	North Dakota	47,181	Washington	58,143
Georgia	49,346	Michigan	50,339	Ohio	48,395	West Virginia	45,011
Hawaii	50,191	Minnesota	51,518	Oklahoma	45,572	Wisconsin	48,561
Idaho	43,109	Mississippi	43,744	Oregon	49,428	Wyoming	53,014
Illinois	56,671	Missouri	45,086	Pennsylvania	50,607		

Table S2: Men's yearly earnings by state. Calculated men's yearly earnings in USD by state for three-year (2011–2013) averages.

State	Women														All Men	
	White		Hispanic		Black		Asia/ Pacific Islander		Native American		Other		All Women Average			
	A.E.($)	H.E.* ($)	A.E.($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E* ($)
AL	35,212	16.93	22,627	10.88	28,410	13.66	37,283	17.92	N/A	NA	36,248	17.43	33,000	15.87	48,664	23.40
AK	46,000	22.12	N/A	NA	N/A	NA	30,000	14.42	37,697	18.12	41,426	19.92	33,000	15.87	62,333	29.97
AZ	40,586	19.51	28,000	13.46	35,513	17.07	40,586	19.51	31,000	14.90	37,283	17.92	36,000	17.31	50,658	24.35
AR	32,000	15.38	22,322	10.73	28,895	13.89	30,000	14.42	N/A	NA	27,700	13.32	30,000	14.42	40,834	19.63
CA	51,782	24.90	30,000	14.42	43,630	20.98	49,718	23.90	39,000	18.75	46,572	22.39	42,000	20.19	65,413	31.45
CO	43,000	20.67	30,000	14.42	36,527	17.56	39,355	18.92	31,069	14.94	38,000	18.27	40,000	19.23	54,957	26.42
CT	50,747	24.40	30,500	14.66	39,355	18.92	51,782	24.90	N/A	NA	38,319	18.42	46,000	22.12	66,093	31.78
DE	43,497	20.91	31,069	14.94	37,440	18.00	53,776	25.85	N/A	NA	N/A	NA	41,000	19.71	51,591	24.80
FL	38,000	18.27	28,410	13.66	30,000	14.42	36,000	17.31	31,069	14.94	35,000	16.83	34,000	16.35	46,857	22.53
GA	39,400	18.94	24,855	11.95	32,000	15.38	35,000	16.83	N/A	NA	34,498	16.59	35,000	16.83	49,346	23.72
HI	45,659	21.95	35,212	16.93	N/A	NA	37,542	18.05	N/A	NA	36,527	17.56	40,000	19.23	50,191	24.13
ID	32,105	15.44	22,784	10.95	N/A	NA	N/A	NA	N/A	NA	N/A	NA	30,000	14.42	43,109	20.73
IL	41,601	20.00	26,990	12.98	36,527	17.56	49,711	23.90	N/A	NA	40,586	19.51	40,000	19.23	56,671	27.25
IN	34,694	16.68	25,891	12.45	32,000	15.38	36,527	17.56	N/A	NA	31,069	14.94	34,000	16.35	47,001	22.60
IA	35,513	17.07	25,891	12.45	28,600	13.75	32,053	15.41	N/A	NA	N/A	NA	35,000	16.83	45,529	21.89
KS	36,000	17.31	24,855	11.95	31,069	14.94	34,487	16.58	N/A	NA	30,439	14.63	35,000	16.83	47,505	22.84

State	Women														All Men	
	White		Hispanic		Black		Asia/ Pacific Islander		Native American		Other		All Women Average			
	A.E.($)	H.E.* ($)	A.E.($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E* ($)
KY	33,483	16.10	25,891	12.45	28,998	13.94	36,248	17.43	N/A	NA	36,300	17.45	33,200	15.96	44,248	21.27
LA	36,000	17.31	28,000	13.46	25,891	12.45	34,694	16.68	N/A	NA	30,034	14.44	32,000	15.38	51,956	24.98
ME	36,000	17.31	N/A	NA	N/A	NA	N/A	NA	N/A	NA	N/A	NA	36,000	17.31	43,323	20.83
MD	51,782	24.90	31,069	14.94	46,000	22.12	55,806	26.83	N/A	NA	50,000	24.04	49,800	23.94	65,588	31.53
MA	50,000	24.04	31,657	15.22	39,355	18.92	50,732	24.39	N/A	NA	36,248	17.43	48,500	23.32	63,335	30.45
MI	38,000	18.27	29,222	14.05	34,176	16.43	47,000	22.60	31,353	15.07	35,000	16.83	37,000	17.79	50,339	24.20
MN	41,426	19.92	28,410	13.66	32,976	15.85	37,000	17.79	32,726	15.73	34,498	16.59	40,000	19.23	51,518	24.77
MS	33,141	15.93	27,395	13.17	25,000	12.02	N/A	NA	N/A	NA	N/A	NA	30,000	14.42	43,744	21.03
MO	35,000	16.83	25,891	12.45	31,069	14.94	33,000	15.87	N/A	NA	32,312	15.53	34,000	16.35	45,086	21.68
MT	32,105	15.44	N/A	NA	N/A	NA	N/A	NA	30,000	14.42	N/A	NA	31,600	15.19	42,020	20.20
NE	35,000	16.83	25,000	12.02	27,500	13.22	N/A	NA	N/A	NA	N/A	NA	32,900	15.82	46,122	22.17
NV	41,426	19.92	28,000	13.46	33,762	16.23	36,000	17.31	32,000	15.38	35,000	16.83	35,000	16.83	50,428	24.24
NH	41,426	19.92	N/A	NA	N/A	NA	37,542	18.05	N/A	NA	N/A	NA	40,000	19.23	53,872	25.90
NJ	51,782	24.90	31,069	14.94	42,000	20.19	60,879	29.27	N/A	NA	43,497	20.91	48,000	23.08	69,217	33.28
NM	42,250	20.31	30,000	14.42	N/A	NA	35,000	16.83	26,800	12.88	N/A	NA	35,000	16.83	49,885	23.98
NY	48,000	23.08	33,141	15.93	40,000	19.23	48,675	23.40	36,248	17.43	40,586	19.51	43,800	21.06	58,583	28.16
NC	37,283	17.92	22,800	10.96	30,034	14.44	34,000	16.35	28,000	13.46	32,000	15.38	35,000	16.83	47,143	22.67
ND	34,600	16.63	n/A	NA	N/A	NA	N/A	NA	30,439	14.63	N/A	NA	35,000	16.83	47,181	22.68

State	Women														All Men	
	White		Hispanic		Black		Asia/ Pacific Islander		Native American		Other		All Women Average			
	A.E.($)	H.E.* ($)	A.E.($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E.*($)	A.E. ($)	H.E* ($)
OH	36,527	17.56	30,439	14.63	31,454	15.12	40,000	19.23	N/A	NA	35,000	16.83	36,000	17.31	48,395	23.27
OK	33,141	15.93	23,400	11.25	30,000	14.42	31,069	14.94	30,439	14.63	30,000	14.42	32,000	15.38	45,572	21.91
OR	39,355	18.92	25,366	12.20	35,513	17.07	37,180	17.88	32,976	15.85	35,000	16.83	38,000	18.27	49,428	23.76
PA	39,000	18.75	27,400	13.17	35,513	17.07	41,426	19.92	N/A	NA	34,000	16.35	38,000	18.27	50,607	24.33
RI	44,000	21.15	27,962	13.44	32,164	15.46	40,390	19.42	N/A	NA	N/A	NA	43,000	20.67	53,585	25.76
SC	36,000	17.31	25,891	12.45	26,600	12.79	31,069	14.94	N/A	NA	29,000	13.94	32,000	15.38	45,498	21.87
SD	31,069	14.94	N/A	NA	N/A	N/A	N/A	NA	30,000	14.42	N/A	NA	30,000	14.42	40,056	19.26
TN	35,000	16.83	21,334	10.26	30,439	14.63	36,527	17.56	N/A	NA	30,439	14.63	33,500	16.11	43,861	21.09
TX	42,000	20.19	25,891	12.45	34,498	16.59	45,568	21.91	41,000	19.71	38,008	18.27	35,000	16.83	56,865	27.34
UT	35,513	17.07	24,000	11.54	N/A	N/A	36,248	17.43	28,000	13.46	30,000	14.42	35,000	16.83	51,231	24.63
VT	39,355	18.92	N/A	NA	N/A	N/A	N/A	NA	N/A	NA	N/A	NA	38,900	18.70	45,000	21.63
VA	44,015	21.16	30,439	14.63	35,212	16.93	50,732	24.39	N/A	NA	41,000	19.71	41,000	19.71	58,669	28.21
WA	43,186	20.76	27,000	12.98	36,527	17.56	40,586	19.51	37,136	17.85	40,586	19.51	41,300	19.86	58,143	27.95
WV	30,439	14.63	N/A	NA	27,395	13.17	N/A	NA	N/A	NA	N/A	NA	30,300	14.57	45,011	21.64
WI	37,387	17.97	25,366	12.20	30,439	14.63	32,469	15.61	29,930	14.39	31,069	14.94	36,000	17.31	48,561	23.35
WY	35,513	17.07	31,069	14.94	N/A	N/A	N/A	NA	N/A	NA	N/A	NA	36,000	17.31	53,014	25.49

Table S3: Hourly earnings of men, women by race and by states. Calculated hourly earnings of men, women by race and by states for three-year (2011–2013) averages. Following codes appear in headings: A.E. = Annual Earnings (3). H.E = Hourly Earnings, all values are reported in USD.

Year	Men's Annual Earnings ($)	Reported Women's Annual Earnings ($)	Percent Difference using Reported Women's Earnings (%)	Annual Menstrual Cost ($)	Adjusted Women's Earnings ($)	Percent Difference using Adjusted Women's Earnings (%)
2009	56,292.00	43,333	77.23	122.63	43,210	76.72
2010	56,347.00	43,347	77.18	122.67	43,224	76.67
2011	54,911.00	42,284	77.26	119.66	42,164	76.75
2012	55,106.00	42,158	76.76	119.31	42,039	76.25
2013	55,000.00	43,044	78.52	121.81	42,922	78.00
2014	54,462.00	42,829	78.90	121.21	42,708	78.38
2015	55,263.00	43,965	79.82	124.42	43,841	79.30
2016	55,015.00	44,270	80.73	125.28	44,145	80.20
2017	54,427.00	44,449	81.94	125.79	44,323	81.40
2018	56,293.00	45,914	81.83	129.94	45,784	81.29
2019	57,456.00	47,299	82.60	133.86	47,165	82.05

Table S4: The adjusted annual earnings of women. Calculated annual menstrual cost, the adjusted annual earnings of women after subtracting cost of Menstruation from their reported annual earnings, and the calculated percent differences in reported and adjusted women's annual earnings compared to men's annual earnings all values are in USD, using data from "Institute for Women's policy Research" (4).