

Maternal Differences in Healthcare Provider-Led Conversations About Patients' Work Prior to Pregnancy, Pregnancy Risk Assessment Monitoring System, 2016–2021

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Objective: The aim of the study was to describe characteristics of women with a recent live birth who are, and are not, asked about their work by healthcare providers before pregnancy. **Methods:** We analyzed 2016–2021 data from 48 jurisdictions participating in the Pregnancy Risk Assessment Monitoring System. Questionnaires asked mothers about provider-led conversations about their work. We descriptively compared weighted percentages with 95% confidence intervals across demographic and occupational characteristics. **Results:** Of 157,724 participants, 36% reported not being asked about their work by a provider in the year before pregnancy. Higher proportions of younger and lower-income mothers, certain Asian and Native groups, and mothers in some occupations and industries posing a risk of occupational hazards reported no provider-led conversations about their work. **Conclusions:** Healthcare providers can more routinely ask patients about work to assess for possible occupational hazards to pregnancy.

Keywords: occupational medicine, reproductive health, pregnancy, healthcare quality

Roughly 70% of US women of reproductive age are in the employed civilian labor force, representing nearly 50 million workers.¹ Occupational exposure to chemical, physical, biological, and radiation hazards, as well as certain workplace practices and policies, such as irregular working hours or lack of schedule flexibilities and leave, may lead to adverse maternal, reproductive, or developmental outcomes—such as pelvic pain, low birthweight, shortened gestational age, miscarriage, birth defects, and other adverse outcomes.^{2–7}

Recent policy efforts have been enacted in the US to help protect the health and wellbeing of pregnant workers. For example, the Pregnant Workers Fairness Act, in effect in 2024, requires covered

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Funding sources: None declared.

Conflict of interest: None declared.

Ethical considerations: The PRAMS methodology and protocol were reviewed and approved by the CDC institutional review board (IRB). In addition, each participating jurisdiction undergoes review by the local IRB of record for the health department. Informed consent information is provided to each participant and consent is implied if the survey is completed.

Author contributions: Conceptualization: MRS; methodology: MRS, KVB, AO, CMR; formal analysis: MRS, KVB; writing – original draft: MRS, KVB, AO, CMR, NJS; writing – review & editing: MRS, KVB, AO, CMR, NJS; project administration: MRS.

Data availability: To request the data analyzed in this paper, reach out to PRAMS at <https://www.cdc.gov/prams/index.html>.

AI statement: No AI was utilized at any stage during the study's development and design, data collection, analysis, or manuscript preparation.

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the National Institute for Occupational Safety and Health or Centers for Disease Control and Prevention. Supplemental digital contents are available for this article. Direct URL citation appears in the printed text and is provided in the HTML and PDF versions of this article on the journal's Web site (www.joem.org).

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DOI: 10.1097/JOM.0000000000000532

LEARNING OUTCOMES

- Readers will understand that around a third of women with a recent live birth report not being asked about their work by a healthcare provider in the year leading up to pregnancy.
- Readers will be able to identify groups of mothers who have a higher proportion of not being asked about their work by a healthcare provider in the year before pregnancy.
- Readers will be able to discuss potential recommendations for providers regarding potential occupational hazards to pregnancy, such as more routinely asking patients about their work and referring patients to occupational medicine physicians for workplace risk reduction counseling.

employers to provide “reasonable accommodations to a worker’s known limitations related to pregnancy, childbirth, or related medical conditions.”⁸ An employee’s request for reasonable accommodation(s) to ensure a healthy pregnancy, however, requires them to be informed about their unique workplace risk factors and feasible hazard mitigation strategies. Workers often obtain this information during conversations with their healthcare providers prior to and during pregnancy.⁹

The American College of Obstetrics and Gynecology (ACOG) and American Academy of Family Physicians (AAFP) recommend that women planning to become pregnant be assessed for occupational risk factors that could affect pregnancy and reproductive health.^{10,11} The American College of Occupational and Environmental Medicine (ACOEM) recommends specific medical monitoring thresholds for occupational lead exposure among women who are or may become pregnant.¹² Conversations about workplace risk factors to reproductive health with healthcare providers can be especially important prior to pregnancy, as certain occupational exposures before pregnancy and during early pregnancy periods can pose serious risks to fertility and increase the risk of other adverse reproductive outcomes, like birth defects.¹³ It is also important for patients to discuss their work with healthcare providers because there are occupational safety considerations that might arise from pregnancy or related conditions. For example, physical changes known to occur during pregnancy might affect the fit of personal protective equipment or risk of injury at work.¹⁴

Few US studies have evaluated how often conversations about patients’ work take place during healthcare visits.^{15–18} In general, evidence collected through patient or provider surveys suggests a wide range in estimates on the frequency of this practice, with many studies reporting only low to moderate frequency and variation by provider specialty.^{19,20}

Other studies examined missingness and accuracy of occupational history data documented in healthcare records, as opposed to surveying patients or providers. One consequence of omitted work-related conversations is missing information in records that are vital to prospective treatment plans and population-based occupational health research and surveillance.²¹ Indeed, the completion and accuracy of occupational

information recorded in various types of health records are limited and vary by patient, provider, and clinic or record characteristics.^{16,22–26} The variability in occupational history documentation by patient characteristics indicates possible demographic differences in provider-led discussions about patients' work.

Nonetheless, little is known about the prevalence of and patient variation in healthcare provider-led conversations about patients' work in the United States, particularly among women with the potential to become pregnant. The objective of this study was to estimate the proportion and describe the demographic and occupational characteristics of women with a recent live birth who are not asked about their work by healthcare providers prior to pregnancy.

METHODS

Participants

The study sample was composed of women in US jurisdictions that participated in Phase 8 of the Pregnancy Risk Assessment Monitoring System (PRAMS). PRAMS is a jurisdiction-based surveillance system from the Centers for Disease Control and Prevention (CDC) and health departments on maternal behaviors, attitudes, and experiences before, during, and shortly after pregnancy with the ultimate purpose of informing strategies to reduce maternal and infant morbidity and mortality.^{27,28} Phase 8 included participants who gave birth between 2016–2021.

The PRAMS sample of women who had a recent live birth is drawn from the jurisdiction's birth certificate file. Each jurisdiction samples between 1000 and 3000 women annually. Some groups are sampled at a higher rate to ensure adequate data are available. Selected women are first contacted by mail to complete a questionnaire packet 2 to 4 months after delivery. If there is no response to repeated mailings, they are contacted by telephone for an interview between 2 and 4 weeks following the last mailing of the questionnaire material. Data collection procedures and instruments are standardized to allow comparisons between sites and weighted to produce population-based estimated representative of each jurisdiction.

The PRAMS methodology and protocol were reviewed and approved by the CDC institutional review board. In addition, each participating jurisdiction undergoes review by the local institutional review board of record for the health department. Informed consent information is provided to each participant and consent is implied if the survey is completed.

Researchers can request PRAMS data for analysis. Participating sites across the US were included in the dataset requested for this analysis if they administered PRAMS and had sufficient response rates (50%–55% depending on the year, predetermined by PRAMS)²⁹ for at least 1 year during the Phase 8 period. Data were not available in the current dataset for three sites due to nonparticipation in PRAMS or insufficient response rates during the period of interest (ie, Nevada, Ohio, and South Carolina). Data from 48 sites—representing 45 states; Washington, DC; New York City individually; and Puerto Rico—were included in the current dataset.

Variables

Variables in the PRAMS dataset included in this analysis were ascertained via one of the following three ways: core questionnaire items, standard questionnaire items, and limited birth certificate records. Core questions included PRAMS questionnaire items that all participating sites were required to include. Therefore, variables from core questions were collected by all 48 sites that had any available data from Phase 8 of PRAMS. Standard questions were PRAMS questionnaire items offered in a question bank for individual sites to incorporate into their questionnaires voluntarily. Therefore, the number of sites with data for individual variables collected through standard questions varied. Lastly, some variables in the PRAMS dataset were

abstracted from the birth certificate records (limited to information made available by each jurisdiction) of participants' infants. Most birth certificate variables were available for all participating sites.

Information on healthcare provider-led conversations about patients' work was ascertained via participants' responses to the following core question with a no/yes option: "During any of your health care visits in the 12 months before you got pregnant, did a doctor, nurse, or other health care worker do any of the following things?" in conjunction with the subitem "Ask me about the kind of work I do."

The demographic characteristics selected for analysis included the following birth certificate variables: maternal age, mutually exclusive race and ethnicity (combined for a single race/ethnicity variable), and education level; marital status; urban or rural residence (as determined by the jurisdiction); receiving Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) support; and source of payment for delivery. Selected birth certificate variables were available for all 48 sites except urban or rural status, which was available for 30 sites. Disaggregated maternal race and ethnicity variables were not available for Vermont, and therefore, data from Vermont were excluded in analyses of maternal race/ethnicity. Household income during the 12 months prior to delivery was provided via core question, but sites had flexibility in the income category selections to present for this question, and there was subsequent variability and overlap in the coding for this variable across sites. We therefore collapsed the household income categories in a way that allowed for mutually exclusive grouping and maintained an informative level of detail. However, in doing so, values from five of the 46 original income categories in the dataset required exclusion due to overlap with other categories (<1% of total nonmissing income values).

Although the information on provider-led conversations about patients' work was assessed in relation to the 12 months prior to pregnancy, the questionnaire items about participants' jobs were asked in relation to the period during pregnancy. These occupational characteristics were ascertained with standard questions and included employment status during pregnancy (binary; ie, "At any time during your most recent pregnancy, did you work at a job for pay?"), collected by 15 sites; occupation (ie, job title and activities) (open ended), collected by Georgia, New Hampshire, and Louisiana; and industry (ie, what the company does or makes) (open ended), collected by Georgia and New Hampshire.

We used the narrative responses recorded for the questions on occupation and industry from the three participating sites that collected this information to classify jobs into standard occupation and industry coding schemas by inputting the text into the NIOSH Industry and Occupation Computerized Coding System (NIOCCS).³⁰ Detailed information on this system is available at <https://csams.cdc.gov/nioccs>. Briefly, the NIOCCS is a free web application that uses machine learning to assign standardized industry and occupation codes based on provided narrative job information. The NIOCCS assigns occupation codes and corresponding titles according to the 2018 Standard Occupational Classification System (SOC), and industry codes and corresponding titles according to the 2017 North American Industry Classification System (NAICS). Participants who reported their main job as a volunteer, student, or homemaker were classified as "Unpaid Workers." Those with missing or too little information to identify a corresponding SOC or NAICS code were classified as "Insufficient Information." This included participants from Louisiana, who were not presented the questionnaire item on industry but, in many cases, provided sufficient information about job title and activities for assigning a NAICS code; otherwise, they were assigned a NAICS code of "Insufficient Information."

The NIOCCS assigns probability scores for each observation's SOC and NAICS assignment. We manually reviewed any assigned codes with a probability score of <80% for accuracy. A reviewer with expertise in occupational health manually reassigned any low-probability codes that were deemed inaccurate based on a review of the

narrative responses. Subsequently, 2348 participants with NIOCCS-assigned SOC codes were manually reviewed and validated and 2120 participants with NIOCCS-assigned NAICS codes were manually reviewed and validated. During the review process, 37.9% (891/2348) of low-probability SOC codes and 41% (871/2120) of low-probability NAICS codes were manually assigned a different code than what was originally determined via NIOCCS. Ultimately, each participant was assigned one major (2-digit) SOC code and one major (2-digit) NAICS code according to the information they reported for their main job held during pregnancy.

Lastly, several variables related to maternal experiences were selected for exploratory analysis, including: trying for pregnancy (standard question included by 37 sites), reasons for healthcare visits in the 12 months prior to pregnancy (core question), and provider-led conversations about preparing for pregnancy (standard question included by 13 sites).

Analysis

Only participants that responded “yes” or lacked a response to the core question “In the 12 months before you got pregnant with your new baby, did you have any health care visits with a doctor, nurse, or other health care worker, including a dental or mental health worker?” were presented the question on provider-led conversations about work. Those that provided a “no” response to the former screener question and those that had a missing value for the latter question on provider-led conversations about work were excluded from all analyses.

We used cross-sectional univariate and bivariate analyses to calculate unweighted frequencies, weighted frequencies, and weighted percentages with 95% confidence intervals (CIs) using proc surveyfreq with strata and weight variables predefined by PRAMS in SAS version 9.4. Weighted row percentages of participants reporting provider-led conversations about work were descriptively compared across levels of selected demographic and occupational characteristics.

For the analyses of demographic characteristics, we calculated distributions across the entire sample as well as restricted to only participants who reported working during pregnancy for employment status, which was ascertained by 15 sites, to assess whether the results differed when restricted to participants who were presumably working during the time of their healthcare visits under question. These participants were considered presumably working at the time of healthcare visits because information was not available on employment status in the 12 months prior to pregnancy. The analyses of occupation (SOC titles) and industry (NAICS titles) comprised a subsample of participants from Georgia, New Hampshire, and Louisiana who reported working during pregnancy.

Values missing from any variables of interest were excluded from analysis of the respective variables. Data were not reported for any variable where at least one cell size had an unweighted frequency of <10 due to imprecision of results.

RESULTS

Of 242,573 participants from 48 sites included in the Phase 8 PRAMS dataset requested for this analysis, a total of 162,519 were presented the question on healthcare provider-led conversations about their work ($n = 80,054$ were screened from presentation of this question) (Fig. 1). After excluding missing values for the question on provider-led conversation about work ($n = 4,795$), 157,724 participants were included in the full sample for analysis. Additional exclusions for the analysis of occupation and industry removed participants from sites where these questions were not adopted ($n = 149,753$) and those who did not report working during pregnancy ($n = 2,125$), for an eligible unweighted subsample of 5846 participants with available data on occupation and industry.

Table 1 presents the demographic characteristics and employment status of the overall sample of participants included in the current

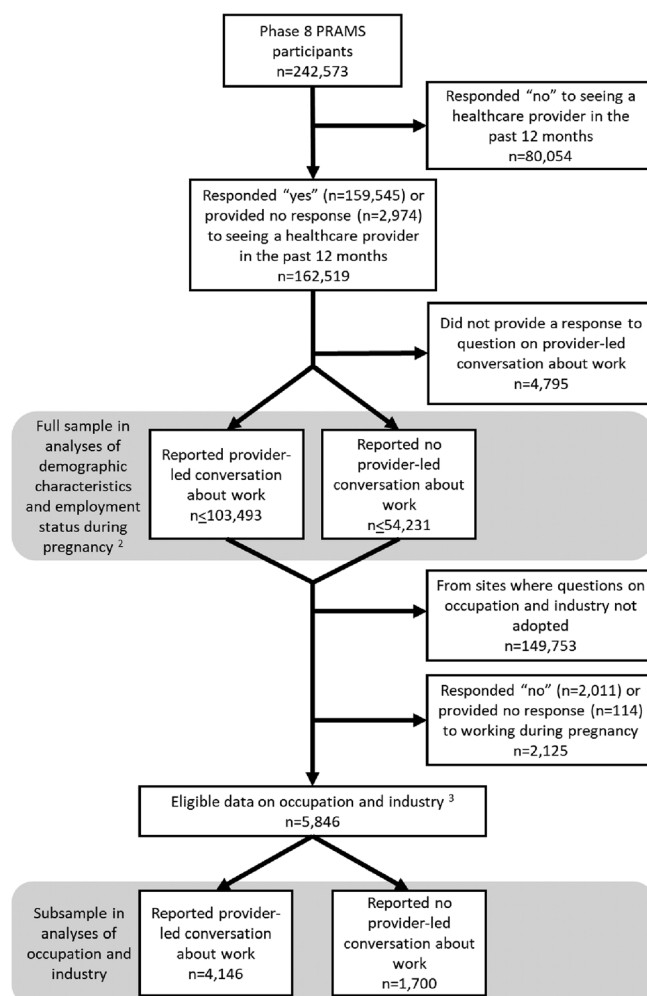


FIGURE 1. Flowchart of PRAMS participants (unweighted) included in the analysis of maternal differences in healthcare provider-led conversations about patients’ work prior to pregnancy, 2016–2021.

analysis. In total, while 64% of participants reported being asked about their work by a healthcare provider in the 12 months prior to pregnancy (CI: 63.7%–64.5%), 36% reported no healthcare provider-led conversation about their work (CI: 35.5%–36.3%), estimated to represent roughly three million women. Three quarters of participants who were asked about employment status reported working during pregnancy (75.6%; CI: 75.1%–76.2%), corresponding to over 2.3 million women. The largest group of participants were between the ages of 30–34 years (33.3%; CI: 33.0%–33.7%), followed by 25–29 years, 35–39 years, 20–24 years, 40 years or older, and less than 20 years. A large majority of participants were non-Hispanic white (64.6%; CI: 64.2%–64.9%), married (68.6%; CI: 68.3%–69.0%), not supported by WIC (72.4%; CI: 72.1%–72.8%), and used private insurance to pay for delivery costs (62.7%; CI: 62.4%–63.1%). Roughly half of participants held at least a college degree (46.5%; CI: 46.1%–46.8%). Most participants with available data were recorded as living in an urban area (74.0%; CI: 73.6%–74.4%). The largest group of participants reported an annual household income during the 12 months prior to delivery of over \$85,000 (37.5%; CI: 37.1%–37.9%).

Table 2 displays the results of the descriptive analysis of demographic and employment status differences in the distribution of self-reported healthcare provider-led conversations about patients’ work

TABLE 1. Distribution of Demographic Characteristics and Employment Status in the Analyzed PRAMS Dataset, 2016–2021

Characteristic	Unweighted <i>n</i> ^a	Weighted <i>n</i>	%	95% LCL	95% UCL
Patient asked about work in the 12 mos before pregnancy					
No	54,231	2,932,504	35.9	35.5	36.3
Yes	103,493	5,239,375	64.1	63.7	64.5
Missing	—				
Employment status during pregnancy					
Did not work during pregnancy	12,770	758,053	24.4	23.8	24.9
Worked during pregnancy	39,439	2,352,273	75.6	75.1	76.2
Missing	925				
Maternal age (in yrs)					
Less than 20	5,436	260,004	3.2	3.0	3.3
20–24	22,753	1,165,270	14.3	14.0	14.5
25–29	43,717	2,277,559	27.9	27.5	28.2
30–34	51,868	2,723,876	33.3	33.0	33.7
35–39	27,820	1,442,264	17.6	17.4	17.9
40 or older	6,125	302,868	3.7	3.6	3.9
Missing	NR				
Maternal race/ethnicity ^b					
Non-Hispanic					
White	80,795	5,223,300	64.6	64.2	64.9
Black	24,458	1,052,796	13.0	12.8	13.3
Asian	9,807	381,290	4.7	4.6	4.9
Chinese	1,924	85,621	1.1	1.0	1.1
Japanese	413	11,508	0.1	0.1	0.2
Filipino	1,309	42,589	0.5	0.5	0.6
Other Asian race	6,161	241,572	3.0	2.9	3.1
AI/AN	4,768	50,178	0.6	0.6	0.7
American Indian	4,098	46,203	0.6	0.5	0.6
Alaska Native	670	3,976	<0.1	<0.1	0.1
Other race	857	50,203	0.6	0.6	0.7
Multiple races	7,775	189,433	2.3	2.2	2.4
Hispanic	24,213	1,143,054	14.1	13.9	14.4
Missing	5,051				
Maternal education					
No high school diploma	12,049	592,752	7.3	7.1	7.5
High school or equivalent	30,457	1,583,997	19.5	19.2	19.8
Some college	44,971	2,166,025	26.7	26.4	27.0
Bachelor's degree or higher	69,050	3,768,916	46.5	46.1	46.8
Missing	1,197				
Marital status					
Married	104,306	5,606,242	68.6	68.3	69.0
Other	53,327	2,563,180	31.4	31.0	31.7
Missing	91				
WIC support during pregnancy					
No	107,957	5,849,645	72.4	72.1	72.8
Yes	47,729	2,225,109	27.6	27.2	27.9
Missing	2,038				
Source of payment for delivery					
Private insurance	92,877	5,092,374	62.7	62.4	63.1
Medicaid	54,262	2,574,077	31.7	31.3	32.1
Self-pay	3,216	173,210	2.1	2.0	2.3
Other	6,418	279,220	3.4	3.3	3.6
Missing	951				
Urban or rural residence					
Urban	59,092	3,444,470	74.0	73.6	74.4
Rural	28,943	1,208,095	26.0	25.6	26.4
Missing	9,304				
Household income ^c					
<\$20,000	31,450	1,426,343	18.7	18.4	19.0
\$20,001–\$40,000	27,423	1,346,591	17.6	17.3	17.9
\$40,001–\$60,000	19,457	1,011,797	13.2	13.0	13.5
\$60,001–\$85,000	18,779	989,889	13.0	12.7	13.2
\$85,001+	49,827	2,867,137	37.5	37.1	37.9
Missing	10,788				

AI/AN, American Indian/Alaskan Native; LCL, lower confidence limit; NR, not reportable; UCL, upper confidence limit; WIC, women, infants, and children.

^aNot all frequencies sum to the sample total because not all variables were ascertained by all 48 sites. Data were reported on employment status during pregnancy by 15 sites, detailed maternal race and ethnicity by 47 sites, and urban or rural status by 30 sites.^bRace/ethnicity categories are mutually exclusive except where subcategories are presented.^cMissing category includes values excluded for analysis.

TABLE 2. Distribution of Self-reported Healthcare Provider-Led Conversations About Patients' Work Prior to Pregnancy by Demographic Characteristic and Employment Status in the PRAMS, 2016–2021

Characteristic ^a	Patients Not Asked about Work					Patients Asked about Work				
	Unweighted <i>n</i>	Weighted <i>n</i>	Row %	95% LCL	95% UCL	Unweighted <i>n</i>	Weighted <i>n</i>	Row %	95% LCL	95% UCL
Overall	54,231	2,932,504	35.9	35.5	36.3	103,493	5,239,375	64.1	63.7	64.5
Employment status during pregnancy										
Did not work during pregnancy	5,506	341,213	45.0	43.7	46.3	7,264	416,841	55.0	53.7	56.3
Worked during pregnancy	11,126	723,363	30.8	30.1	31.4	28,313	1,628,909	69.2	68.6	69.9
Maternal age (in yrs)										
Less than 20	2,841	141,432	54.4	52.1	56.7	2,595	118,572	45.6	43.3	47.9
20–24	8,319	440,151	37.8	36.7	38.8	14,434	725,119	62.2	61.2	63.3
25–29	14,419	781,931	34.3	33.6	35.0	29,298	1,495,628	65.7	65.0	66.4
30–34	16,865	927,624	34.1	33.4	34.7	35,003	1,796,252	65.9	65.3	66.6
35–39	9,654	530,236	36.8	35.9	37.6	18,166	912,027	63.2	62.4	64.1
40 or older	2,133	111,130	36.7	34.8	38.6	3,992	191,737	63.3	61.4	65.2
Maternal race/ethnicity ^b										
Non-Hispanic										
White	27,535	1,862,718	35.7	35.2	36.1	53,260	3,360,582	64.3	63.9	64.8
Black	8,152	358,465	34.0	33.0	35.1	16,306	694,331	66.0	64.9	67.0
Asian	3,603	149,310	39.2	37.6	40.7	6,204	231,981	60.8	59.3	62.4
Chinese	771	38,477	44.9	41.7	48.2	1,153	47,144	55.1	51.8	58.3
Japanese	211	5,792	50.3	41.9	58.7	202	5,716	49.7	41.3	58.1
Filipino	409	13,130	30.8	26.4	35.2	900	29,459	69.2	64.8	73.6
Other Asian race	2,212	91,911	38.0	36.0	40.1	3,949	149,661	62.0	59.9	64.0
AI/AN	1,807	18,763	37.4	34.5	40.3	2,961	31,415	62.6	59.7	65.5
American Indian	1,541	17,107	37.0	33.9	40.1	1,541	17,107	37.0	33.9	40.1
Alaska Native	266	1,656	41.7	38.0	45.3	404	2,319	58.3	54.7	62.0
Other race	286	18,393	36.6	31.4	41.8	571	31,811	63.4	58.2	68.6
Multiple races	2,635	69,231	36.5	34.4	38.7	5,140	120,203	63.5	61.3	65.6
Hispanic	8,947	428,436	37.5	36.4	38.5	15,266	714,618	62.5	61.5	63.6
Maternal education										
No high school diploma	5,355	278,472	47.0	45.4	48.5	6,694	314,281	53.0	51.5	54.6
High school or equivalent	11,857	646,327	40.8	39.9	41.7	18,600	937,670	59.2	58.3	60.1
Some college	15,439	772,279	35.7	34.9	36.4	29,532	1,393,745	64.3	63.6	65.1
Bachelor's degree or higher	21,144	1,213,581	32.2	31.7	32.7	47,906	2,555,335	67.8	67.3	68.3
Marital status										
Married	35,082	1,993,177	35.6	35.1	36.0	69,224	3,613,066	64.4	64.0	64.9
Other	19,114	938,467	36.6	35.9	37.3	34,213	1,624,713	63.4	62.7	64.1
WIC support during pregnancy										
No	35,352	2,019,106	34.5	34.1	35.0	72,605	3,830,538	65.5	65.0	65.9
Yes	18,188	879,033	39.5	38.8	40.3	29,541	1,346,076	60.5	59.7	61.2
Source of payment for delivery										
Private insurance	29,442	1,698,099	33.3	32.9	33.8	63,435	3,394,275	66.7	66.2	67.1
Medicaid	20,796	1,022,528	39.7	39.0	40.4	33,466	1,551,549	60.3	59.6	61.0
Self-pay	1,442	88,513	51.1	48.2	54.0	1,774	84,697	48.9	46.0	51.8
Other	2,186	101,664	36.4	34.3	38.6	4,232	177,556	63.6	61.4	65.7
Urban or rural residence										
Urban	20,649	1,242,658	36.1	35.5	36.7	38,443	2,201,813	63.9	63.3	64.5
Rural	10,667	467,320	38.7	37.7	39.6	18,276	740,775	61.3	60.4	62.3
Household income										
<\$20,000	12,565	578,179	40.5	39.6	41.5	18,885	848,164	59.5	58.5	60.4
\$20,001–\$40,000	9,813	517,301	38.4	37.5	39.4	17,610	829,291	61.6	60.6	62.5
\$40,001–\$60,000	6,815	383,007	37.9	36.8	38.9	12,642	628,790	62.1	61.1	63.2
\$60,001–\$85,000	6,218	347,925	35.1	34.1	36.2	12,561	641,965	64.9	63.8	65.9
\$85,001+	14,661	890,190	31.0	30.5	31.6	35,166	1,976,947	69.0	68.4	69.5

AI/AN, American Indian/Alaskan Native; LCL, lower confidence limit; UCL, upper confidence limit; WIC, women, infants, and children.

^aNot all variables were ascertained by all 48 sites. Data were reported on employment status during pregnancy by 15 sites, detailed maternal race and ethnicity by 47 sites, and urban or rural status by 30 sites.^bRace/ethnicity categories are mutually exclusive except where subcategories are presented.

prior to pregnancy. Among participants who reported working during pregnancy in the 15 sites that collected this information, 31% reported no healthcare provider-led conversation about their work (CI: 30.1%–31.4%). More than half of participants under 20 years old were not asked about their work by a healthcare provider (54.4%; 52.1%–56.7%). Certain groups of non-Hispanic Asian origin—primarily Chinese

(44.9%; CI: 41.7%–48.2%) and Japanese (50.3%; CI: 41.9%–58.7%) participants—reported higher proportions of an absence in conversations about work during healthcare visits. Proportions were also higher among Alaskan Native (41.7%; CI: 38.0%–45.3%) participants, although the confidence interval was somewhat wide. Proportions of participants reporting no provider-led conversations about

TABLE 3. Distribution of Self-reported Healthcare Provider-Led Conversations about Patients' Work Prior to Pregnancy by Patient Occupation in the PRAMS, Georgia, Louisiana, and New Hampshire, 2016–2021^a

Occupation Title	Patients Not Asked about Work					Patients Asked about Work				
	Unweighted <i>n</i>	Weighted <i>n</i>	Row %	95% LCL	95% UCL	Unweighted <i>n</i>	Weighted <i>n</i>	Row %	95% LCL	95% UCL
Management	133	13,534	35.0	28.1	41.8	339	25,181	65.0	58.2	71.9
Business and financial operations	92	10,082	44.9	35.5	54.2	214	12,381	55.1	45.8	64.5
Computer and mathematical	26	2,342	27.6	13.8	41.5	80	6,131	72.4	58.5	86.2
Architecture and engineering	14	1,024	35.5	12.3	58.6	24	1,862	64.5	41.4	87.7
Life, physical, and social science	18	1,588	28.6	11.9	45.2	40	3,973	71.4	54.8	88.1
Community and social service	51	4,153	36.9	25.4	48.4	155	7,104	63.1	51.6	74.6
Legal occupations	21	2,140	37.0	20.0	54.1	46	3,637	63.0	45.9	80.0
Educational instruction and library	152	10,833	27.5	21.8	33.2	408	28,557	72.5	66.8	78.2
Arts, design, entertainment, sports, and media	29	2,628	29.6	16.6	42.5	60	6,261	70.4	57.5	83.4
Healthcare practitioners and technical	180	15,579	27.9	23.2	32.7	616	40,191	72.1	67.3	76.8
Healthcare support	101	6,847	27.0	20.4	33.6	292	18,504	73.0	66.4	79.6
Protective service	13	1,274	28.0	10.5	45.4	44	3,280	72.0	54.6	89.5
Food preparation and serving related	111	8,307	32.9	25.5	40.4	242	16,934	67.1	59.6	74.5
Building and grounds cleaning and maintenance	52	4,623	39.5	27.3	51.7	98	7,085	60.5	48.3	72.7
Personal care and service	51	4,782	25.9	17.6	34.3	194	13,670	74.1	65.7	82.4
Sales and related	189	15,564	35.3	29.3	41.3	355	28,538	64.7	58.7	70.7
Office and administrative support	320	29,870	40.9	36.0	45.7	612	43,184	59.1	54.3	64.0
Farming, fishing, and forestry	NR									
Construction and extraction	NR									
Installation, maintenance, and repair	NR									
Production	38	3,939	39.8	25.5	54.0	81	5,967	60.2	46.0	74.5
Transportation and material moving	40	4,532	41.7	28.2	55.2	95	6,331	58.3	44.8	71.8
Unpaid worker (volunteer, student, homemaker)	NR									
Military	NR									
Insufficient Information	45	4,959	37.4	26.1	48.7	105	8,299	62.6	51.3	73.9

LCL, lower confidence limit; NR, not reportable; UCL, upper confidence limit.

^aOnly Georgia, Louisiana, and New Hampshire adopted questionnaire items on occupation and/or industry.

work prior to pregnancy varied for several socioeconomic characteristics. Higher proportions were observed for participants with lower education level (47.0%; CI: 45.4%–48.5% for the lowest level, no high school diploma) and household income (40.5%; CI: 39.6%–41.5% for the lowest level, ≤\$20,000 in income) and whose payment method for delivery costs was listed as self-pay (51.1%; CI: 48.2%–54.0%). Substantial differences were not observed for marital status, use of WIC support, or urban versus rural location.

The results of the analysis restricted to only participants who reported working during pregnancy are presented in Table S1 (<http://links.lww.com/JOM/C85>). Observed patterns in the restricted analysis were similar to those observed in the main results, albeit slightly attenuated, given the overall proportion of participants reporting no conversations about work in healthcare visits was smaller among participants who worked during pregnancy than among the overall sample. However, because of smaller cell sizes, precision decreased with wider confidence intervals for some estimates (eg, the proportion among participants of Japanese origin) and results were not reportable among others.

Tables 3 and 4 display the results of the analysis of occupation and industry differences in the distribution of self-reported healthcare provider-led conversations about patients' work among a subset of participants from Georgia, Louisiana, and New Hampshire. Occupations with the highest proportions of participants (roughly 40% or more) who were not asked about their work by healthcare providers prior to pregnancy include business and financial operations, transportation and material moving, office and administrative support, production, and building and grounds cleaning and maintenance (39.5%–44.9%) (Table 3). Industries with the highest proportions of participants (roughly 40% or more) who were not asked about their work

by healthcare providers included administrative and support and waste management and remediation services; wholesale trade; professional, scientific, and technical services; and manufacturing (40.2%–44.2%) (Table 4).

Results of an exploratory analysis of selected maternal experience variables are presented in Table S2 (<http://links.lww.com/JOM/C85>). Stratifying by whether one was trying to get pregnant did not result in estimates substantially different from main overall analysis. For participants who reported that their healthcare provider discussed preparing for pregnancy with them, the frequency of not being asked about work was lower (23.3%; CI: 22.1%–24.6%) in relation to findings from the main analysis. Three quarters of participants reported multiple types of healthcare visits (CI: 76.1%–76.7%), and as expected, the proportion of patients who were not asked about their work was much higher for participants who only had one versus multiple types of healthcare visits. Among the approximate one quarter of participants who reported one reason for a healthcare visit in the 12 months before pregnancy (*n* = 37,414), little variation existed in the proportion of patients asked about their work by reason for single healthcare visit except for visits with a dentist or for some other reason.

DISCUSSION

We found that over a third of women with a recent live birth in the overall analysis of 48 PRAMS jurisdictions, and just under a third of women with recent live birth that worked during pregnancy in 15 jurisdictions, reported not being asked about their work by a healthcare provider in the 12 months prior to pregnancy. Furthermore, we found differences by some demographic and occupational characteristics.

TABLE 4. Distribution of Self-reported Healthcare Provider-Led Conversations About Patients' Work Prior to Pregnancy by Patient Industry in the PRAMS, Georgia, Louisiana, and New Hampshire, 2016–2021^a

Industry Title	Patients Not Asked about Work					Patients Asked about Work				
	Unweighted <i>n</i>	Weighted <i>n</i>	Row %	95% LCL	95% UCL	Unweighted <i>n</i>	Weighted <i>n</i>	Row %	95% LCL	95% UCL
Agriculture, forestry, fishing and hunting	NR									
Mining, quarrying, and oil and gas extraction	NR									
Utilities	NR									
Construction	14	959	27.9	7.0	48.7	25	2,483	72.1	51.3	93.0
Manufacturing	65	7,222	40.2	29.3	51.1	152	10,742	59.8	48.9	70.7
Wholesale trade	10	1,475	42.7	18.8	66.5	42	1,984	57.3	33.5	81.2
Retail trade	157	14,318	35.8	29.1	42.5	302	25,648	64.2	57.5	70.9
Transportation and warehousing	33	3,911	36.6	22.6	50.5	67	6,784	63.4	49.5	77.4
Information	13	1,281	22.0	6.7	37.4	44	4,532	78.0	62.6	93.3
Finance and insurance	89	9,419	38.7	29.7	47.8	188	14,910	61.3	52.2	70.3
Real estate and rental and leasing	12	1,419	30.4	10.7	50.1	35	3,247	69.6	49.9	89.3
Professional, scientific, and technical services	103	11,254	41.3	32.9	49.7	225	16,002	58.7	50.3	67.1
Management of companies and enterprises	NR									
Administrative and support and waste management and remediation services	67	7,419	44.2	33.4	54.9	141	9,384	55.8	45.1	66.6
Educational services	195	15,310	32.0	26.5	37.6	524	32,485	68.0	62.4	73.5
Health care and social assistance	414	32,330	28.5	25.1	31.9	1,274	81,173	71.5	68.1	74.9
Arts, entertainment, and recreation	13	950	29.4	9.0	49.8	39	2,280	70.6	50.2	91.0
Accommodation and food services	157	14,146	38.9	32.2	45.6	333	22,226	61.1	54.4	67.8
Other services (except public administration)	57	5,203	27.4	18.4	36.4	162	13,804	72.6	63.6	81.6
Public administration	37	3,917	28.8	17.9	39.7	130	9,682	71.2	60.3	82.1
Military	NR									
Unpaid worker	NR									
Insufficient information	242	17,668	37.5	32.8	42.2	416	29,419	62.5	57.8	67.2

LCL, lower confidence limit; NR, not reportable; UCL, upper confidence limit.

^aOnly Georgia, Louisiana, and New Hampshire adopted questionnaire items on occupation and/or industry.

Higher proportions of younger mothers, certain Asian and Native race groups, lower income and education groups, and those who self-paid for delivery costs reported no provider-led conversations about their work in healthcare visits prior to pregnancy. Certain occupation and industry groups also had higher proportions of mothers reporting no provider-led conversations about their work prior to pregnancy.

Few previous studies from the US have surveyed patients or healthcare providers to estimate the proportion of healthcare visits that involve a discussion about patient occupation.^{15–18} In general, existing literature suggests low to moderate adherence to this clinical practice, which is similar to the moderate estimate we observed (64%). A survey of roughly 300 obstetrician gynecologists across the country found that less than 30% routinely screened patients for environmental or occupational exposures.¹⁵ On the other hand, a study that surveyed nearly 400 obstetricians in Texas found that >70% reported collecting basic occupational information from patients (eg, job status, job title, job type), but under half routinely obtained information about specific occupational activities.¹⁸ One small survey of 28 cancer survivors qualitatively reported that patients reported infrequently receiving guidance about their work from healthcare providers.¹⁷ A small survey of 20 healthcare providers in a chiropractic clinic found that a majority (>75%) reported taking an occupational history on every or most new patients, whereas less than half reported doing so during reexamination visits.¹⁶

There are many examples of studies from other countries, however, that surveyed patients or providers to estimate the frequency of this practice, also supporting only low to moderate adherence.^{31–35} Of interest, a survey of gynecological patients in London found that only 24% reported that their provider had asked about their occupation.³⁴ Another London survey of various healthcare specialties found that 67% of gynecologic providers reported asking about occupation most or all of the time, but only 24% of providers from any specialty reported asking about occupation all the time.³¹

Several literature reviews of studies from around the world that assess the extent to which healthcare providers incorporate patient occupation in clinical care (including prenatal care) highlighted multiple themes.^{19,20} In general, conversations about patients' work are not routinely included in clinical practice and are mostly initiated by patients. The reviews demonstrated variability between studies in the estimated frequency of providers discussing or collecting information on patients' occupation, with notable differences by clinical specialty. Our study was not able to reliably narrow down the type of practice(s) where doctors asked about patients' work because over three quarters of participants reported seeing multiple types of providers prior to pregnancy. However, of a small group of participants that reported a single healthcare visit for a checkup with an obstetrician gynecologist, 58% reported being asked about their work prior to pregnancy, which was not substantially different from most other single healthcare visit categories (Table S2, <http://links.lww.com/JOM/C85>).

Related research from the US has focused on the documentation of occupational histories in healthcare and administrative records, which can be affected by the presence of the work-related conversations during patient-clinician interactions in addition to other charting and abstraction practices. Examples of the types of records that have been analyzed for completeness of information on occupation include medical records,²⁴ electronic health records,²⁶ cancer registry records,^{22,25} and death certificates.²³ Unlike previous survey-based studies, some of these records-based studies have identified differences in the documentation of occupation by patient characteristics. For example, occupational histories were less likely to be recorded in medical records for younger patients,²⁴ a pattern that was similar to our findings. Results from an analysis of death certificate records also mirrored results from the current study: decedents who were younger, from a racial minority group (including Asian), and less educated were less likely to have an occupation code.²³ Also consistent with our results, the proportion of cancer patients without a coded

industry or occupation in cancer registry records was substantially lower for uninsured/self-paying patients than those with private insurance.²⁵ Of note, two records-based studies found women to be less likely than men to have occupation recorded or coded.^{23,24} Unfortunately, there is a general lack of studies evaluating discrepancies in clinical conversations about or reporting of patient occupation by occupational group.

Our results are important because we found that several groups that are at higher risk for occupational exposure, illness, and injury were less likely to be asked about their work by healthcare providers. For example, research demonstrates that younger workers have higher rates of work-related injury compared to workers of older ages.^{36,37} Research also shows that Black, Hispanic, American Indian/Alaskan Native, and foreign-born workers have higher rates of workplace injury than other race/ethnicity groups.^{38–41} One study found that Asian workers had higher odds of disability from a work-related injury than non-Hispanic White workers.³⁹ Workers with lower education or income are also at an increased risk for occupational injury or exposure.^{40,41}

Several of the occupation and industry groups that we found to have a lower proportion of provider-led conversations about patients' work are also at an increased risk for workplace injury or hazardous occupational exposures. One study found that workers from Transportation and Material Moving occupations have one of the highest rates of occupational injury in the US.⁴⁰ Additionally, an analysis of National Health and Nutrition Examination Survey data found that blue collar workers from several industry groups with notable findings in the current study (ie, Wholesale Trade; Professional, Scientific, and Technical Services; and Manufacturing) had higher biomarker levels of chemicals with potential reprotoxic effects, including several heavy metals, acrylamide, glycidamide, and several volatile organic compounds compared to white-collar workers in Public Administration.⁴² ACOG lists manufacturing as an employment sector of particular concern due to the potential for hazardous exposures.¹⁰ Many potential reproductive hazards, like chemical exposures (eg, organic solvents, polycyclic aromatic hydrocarbons, diesel exhaust), physical hazards (eg, noise), strenuous physical demands (eg, heavy lifting), and irregular or nonstandard working patterns (eg, shiftwork, long hours) can also be identified in some of the occupation and industry groups that we noted.

Therefore, provider-led discussions about patients' work present an important, yet often overlooked, opportunity for prevention. Research shows that two of the most common barriers for clinicians in discussing or recording patients' work include perceived relevance of occupation to health and perceived time constraints in healthcare visits.^{33,43} Although clinicians express a desire for training on the subject,^{31,33} training and interventions to promote the discussion and collection of patients' occupation have yielded mixed results.^{16,32,44–46} Furthermore, many prenatal care quality measures fail to consider whether doctors ask patients about their occupational exposures alongside items about information sharing in other domains.⁴⁷ Incorporating this factor into future prenatal care quality measures could help researchers and practitioners monitor improvements in this area. Public health resources are available to aid healthcare systems and providers in routinely implementing this practice.^{48–50}

There are several strengths to the current study. With a survey sample of over 150,000 participants, our results provide the most robust estimate of the proportion of patients in a US sample asked about their work by healthcare providers to date. Our study is also one of few to identify demographic and occupational differences in this clinical practice. Furthermore, because PRAMS samples participants from birth certificates, the estimated overall proportion is representative of women who recently delivered a baby in each of 48 included jurisdictions.²⁷ Lastly, information was obtained through participant report, as opposed to physician report (which may lead to a less accurate reporting of the prevalence of this practice) or records review (which may reflect charting behaviors in addition to provider interactions).

Nonetheless, there are multiple limitations to our analysis. First, our results are limited in generalizability to only the jurisdictions that

participated in PRAMS with sufficient response rates and for which data were available for each respective variable—which differed by variable and by year. Additionally, the main outcome of interest, information on healthcare provider-led conversations about patients' work in the 12 months before pregnancy, was ascertained using a survey item that may be vulnerable to misclassification. The question posed to participants after their delivery was dependent on recall over a long period. There also may have been different interpretations of the question across participants, and their responses could have reflected any amount of solicitation of work information (eg, fields on intake forms versus providers verbally asking about employment status and/or job activities). Affirmative answers may have also included conversations that were initiated by the patient—which may have been differential by some characteristics (eg, occupation).

Information on participants' employment status, occupation, and industry was also subject to misclassification. Information was only available on jobs held during pregnancy but was used to characterize employment during the period of interest (ie, the 12 months prior to pregnancy in congruency with the main outcome variable). Therefore, if participants gained, lost, or changed employment from before to during pregnancy, they may have been misclassified. Although there could be some differential misclassification by demographic or occupational groups, the effects on our results are likely small because employment changes likely impacted a small number of participants. The nature of our retrospective job assignment could have also caused limited misclassification of industry and occupation.

Additionally, we were not able to discern characteristics of the clinics or healthcare providers about which participants responded for a majority of the sample. This is mainly because most participants reported multiple types of healthcare visits and the main outcome variable was ascertained in relation to any healthcare visit. We conducted an exploratory analysis of reason for visit on a small subset of participants that reported only one, but these results are not representative of the entire sample.

There were small cell sizes for some characteristics that we analyzed, including for some race/ethnicity, occupation, and industry groups. These small sample sizes led to imprecise estimates with wide confidence intervals or suppression of results where $n < 10$.

This study focused on provider-led discussions during the 12 months before pregnancy among women who had a recent live birth. The periods before conception and early pregnancy (ie, before many women are aware they are pregnant) can represent periods of vulnerability for multiple health risks such as reduced fertility, miscarriage, and birth defects.¹³ Future research can compare the results of this analysis to studies of women during pregnancy, women who had nonviable pregnancies or nonlive births, and other populations.

CONCLUSIONS

Several professional clinical organizations of the US medical system call for consideration of how patients' work might affect their health. This is particularly important for women with the intent or possibility to become pregnant. Nevertheless, around a third of women with a recent live birth report not being asked about their work by a healthcare provider in the year leading up to pregnancy.

Healthcare providers can more routinely ask about what type of work their patients do to assess for possible workplace hazards to pregnancy and reproductive health. Providers can refer patients with potential workplace exposures to occupational medicine physicians for additional exposure assessment and workplace risk reduction counseling. Opportunities for raising awareness and training among healthcare providers on the role occupation plays in reproductive health—and overall health—can be evaluated for effectiveness and considered for clinical education programs. Additionally, healthcare institutions can consider standardized guidelines and procedures for increasing this practice among their clinicians.

ACKNOWLEDGMENTS

The authors thank the PRAMS Working Group, which includes the PRAMS Team, Division of Reproductive Health, CDC and the following PRAMS sites for their role in conducting PRAMS surveillance and allowing the use of their data: PRAMS Alabama, PRAMS Alaska, PRAMS Arizona, PRAMS Arkansas, PRAMS Colorado, PRAMS Connecticut, PRAMS Delaware, PRAMS DC, PRAMS Florida, PRAMS Georgia, PRAMS Hawaii, PRAMS Illinois, PRAMS Indiana, PRAMS Iowa, PRAMS Kansas, PRAMS Kentucky, PRAMS Louisiana, PRAMS Maine, PRAMS Maryland, PRAMS Massachusetts, PRAMS Michigan, PRAMS Minnesota, PRAMS Mississippi, PRAMS Missouri, PRAMS Montana, PRAMS Nebraska, PRAMS New Hampshire, PRAMS New Jersey, PRAMS New Mexico, PRAMS New York City, PRAMS New York State, PRAMS North Carolina, PRAMS North Dakota, PRAMS Oklahoma, PRAMS Oregon, PRAMS Pennsylvania, PRAMS Puerto Rico, PRAMS Rhode Island, PRAMS South Dakota, PRAMS Tennessee, PRAMS Texas, PRAMS Utah, PRAMS Vermont, PRAMS Virginia, PRAMS Washington, PRAMS West Virginia, PRAMS Wisconsin, and PRAMS Wyoming.

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