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Disparities in birth outcomes within the U.S. White population: Prevalence of low birth weight among immigrant mothers from the Middle East and North Africa

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ABSTRACT

Immigration from the Middle East and North Africa (MENA) has diversified the U.S. non-Hispanic White population. Analyzing health disparities within this group is a complex task due to data limitations across most federal and state data collection systems. This study investigates disparities in the risk of giving birth to a low-birth-weight infant among foreign-born non-Hispanic White MENA and non-MENA mothers and by MENA mothers' nationality. This population-based study uses Restricted-Use Detail Natality Data from 2016 to 2019 accessed through the National Center for Health Statistics and provided by the Centers for Disease Control and Prevention. The study examines the risk of giving birth to a low-birth-weight infant (<2500g) among foreign-born non-Hispanic White mothers by MENA/non-MENA status as the primary independent variable of interest. Logistic regression models are used to control for social and demographic characteristics, medical risk factors, and measures of prenatal care adequacy. Results are presented as odds ratios. Among foreign-born non-Hispanic White mothers, 139,708 (32%) are classified as MENA and 296,093 (68%) as non-MENA. Results show that after controlling for social and demographic characteristics, medical factors, and measures of prenatal care adequacy, foreign-born non-Hispanic White MENA mothers have greater odds of giving birth to a low-birth-weight infant than their non-MENA counterparts (OR: 1.443, *p*-value <0.001). Increased immigration from the MENA region has contributed to changes in health profiles among foreign-born non-Hispanic White mothers. As this group grows, understanding the impact of immigration on the composition of the non-Hispanic White population, and consequently, racial disparities in the U.S., is crucial for researchers and policymakers.

1. Introduction

In 2015, the U.S. Census Bureau tested the implementation of a Middle East and North Africa (MENA) category during its National Content Test (NCT) following years of advocacy among MENA individuals concerning the inability of current data collection efforts to highlight the unique vulnerabilities of the U.S. MENA population. This period coincided with increased interest among researchers and policymakers in understanding the importance of heterogeneity among U.S. individuals who self-identify as White. The classification of MENA origin was based on 19 nationalities, certain transnational groups ("including both ethno-linguistic and ethno-sectarian groups, whose origins are in the Middle East and North Africa"), and pan-ethnic and general geographic terms ("such as 'Arab,' 'Middle Eastern,' or 'North African') (Matthews et al., 2017, p. 22). According to the standards set by the Office of Management and Budget in 1997, individuals from the MENA region are classified as White by the U.S. Census.

The purpose of the 2015 NCT was to test and improve design strategies for content areas of interest, including the potential implementation of a MENA category, in preparation for the 2020 decennial U.S. Census. The findings highlighted the importance of a distinct MENA category. According to the findings, "the inclusion of a MENA category helps MENA respondents to more accurately report their MENA identities. When no MENA category was available, MENA

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respondents were less likely to report as only MENA and instead reported their MENA identity within the White category. When a MENA category was included, MENA respondents were more likely to report as only MENA and less likely to report as MENA within the White category" (Matthews et al., 2017, p.xiii). The subsequent inclusion of a MENA category resulted in decreases in the percentage of individuals identifying as White and Some Other Race (SOR) (Matthews et al., 2017). Although these findings reveal heterogeneity within the White racial category, influenced by MENA individuals being categorized as White, few extant studies disaggregate the U.S. White population by MENA/Arab status, and even fewer further disaggregate MENA/Arab status by country of origin (Dallo et al., 2008; Dallo & Kindratt, 2015; Read et al., 2021).

While the NCT indicated that a significant portion of White respondents would select MENA as their race if the category were available, the U.S. Census Bureau ultimately decided to forego adding a separate MENA category to the 2020 Census and instead pursue additional testing to determine whether future censuses should use MENA as an ethnic category (similar to Hispanic/Latino) rather than a racial category (similar to Black or White) (Fontenot, Jr., 2018; U.S. Census Bureau, 2018). Due to the lack of detailed data on parents' birthplace or a distinct category and official definition of MENA across federally sponsored population health survey surveillance products, some researchers have utilized naming algorithms and/or ancestry/birth country information to shed light on the outcomes of individuals with origins from the Middle East or North Africa (Ajrouch et al., 2018; Bakhtiari, 2020; Hyder & Barnett, 2021; Lauderdale, 2006; Read, 2017; Read et al., 2020, 2021). This lack of data on parents' birthplace or availability of a distinct MENA category inhibits researchers from fully exploring variations in health outcomes between second-generation non-Hispanic Whites from the Middle East and North Africa (MENA) and their non-Hispanic White counterparts from other parts of the world (non-MENA).

Using Restricted-Use Detail Natality Data from 2016 to 2019, we provide insights into potential health variation among second-generation U.S.-born non-Hispanic Whites by focusing on a critical period in the life course: infancy. Restricted-Use Detail Natality Data contain information on mother's birth country,[2] which allows for the disaggregation of birth outcomes among second-generation non-Hispanic White infants who *might* identify as MENA at some point in their lives. Understanding these disparities sheds light on the potential usefulness of a MENA category across federal data collection initiatives and illuminates how the growth of the MENA population impacts researchers' understanding of the mechanisms responsible for the changing health profile of the U.S. White population. Specifically, the results highlight disparities in the risk of giving birth to a low-birth-weight infant—an outcome that population health researchers widely agree influences later life outcomes (Hack et al., 1995; McDade & Koning, 2021)—between non-Hispanic White mothers born in the MENA region and all other foreign-born non-Hispanic White mothers in the 50 U.S. States (Boardman et al., 2002; Hack, 2006). In addition, we identify birth-country heterogeneity in birth outcomes among non-Hispanic White MENA mothers.

2. Background

2.1. Heterogeneity among non-Hispanic Whites: MENA status in the U.S.

Since 1980, the population of immigrants from the Middle East and North Africa in the U.S. has increased fivefold, from roughly 224,000 in 1980 to approximately 1.2 million in 2019 (Harjanto & Batalova, 2022). If the U.S. MENA population (both U.S.-born and foreign-born) continues to grow, the inability to capture MENA status in large-scale federal survey data sets might lead researchers to draw incorrect conclusions regarding the mechanisms responsible for changes in health profiles within the non-Hispanic White population. For example, Ohio has a relatively large and growing Arab American population. Prior research suggests that relative to non-Hispanic White mothers residing in Ohio, Arab American women have greater odds of giving birth to a low-birth-weight infant (Hyder & Barnett, 2021). If national trends mirror those in Ohio and other states with large MENA populations and researchers cannot clearly identify the outcomes of the MENA population (Abuelezam et al., 2020), then trends in birth outcomes among non-Hispanic White mothers might be influenced by the growing MENA population, in turn affecting how researchers understand birth outcome disparities between non-Hispanic Whites and other racial and ethnic groups (Kauh et al., 2021; Marks et al., 2023; Read et al., 2021).

Analyzing Detail Natality Data for 2016–2019, we highlight disparities in the risk of giving birth to a low-birth-weight infant between non-Hispanic White mothers born in the MENA region and foreign-born non-Hispanic White mothers born in other parts of the world. In addition, we disaggregate the results by birth country among MENA mothers. In doing so, we test two hypotheses:

H1. MENA and non-MENA mothers have marked disparities in the risk of having a low-birth-weight infant;

H2. There is significant heterogeneity in the risk of having a low-birth-weight infant among MENA mothers by birth country.

3. Data and measures

3.1. Data

The analysis is based on the birth outcomes of foreign-born non-Hispanic White mothers, whose infants are second-generation immigrants, who might identify as MENA later in life. We utilized Restricted-Use Detail Natality Data for all live births between 2016 and 2019.[3] The data were accessed through the National Center for Health Statistics (NCHS) and provided by the Centers for Disease Control and Prevention (CDC). The analytic sample excluded mothers who were under age 18 or over age 44, infants with congenital anomalies or unknown status of congenital anomalies, non-singleton births (birth of more than one child during a single delivery), infants with a gestational age under 20 weeks or over 45 weeks, cases where the mother resides outside the 50 U.S. states or residence is unknown, infants weighing less than 250g, cases where mother's birth country is unknown or mother's Hispanic ethnicity is unknown. We also excluded cases with missing data on the dependent or independent variables. The final analytic sample includes 435,801 births.

3.2. Measures

Low birth weight, defined as an infant who weighs less than 2500g (5 lbs., 8 oz.) at delivery, is the primary outcome of interest. Extensive literature has found that birth outcomes vary based on mother's demographic and social characteristics (Green & Hamilton, 2019). To

[2] We use the term "mother" throughout this paper to remain consistent with the terminology used in the Restricted-Use Detail Natality Data and affiliated codebooks.

[3] We do not include data after 2019 in our analysis due to the potential influence of COVID-19 on both health outcomes of the mother and patterns of immigration. We do not include years prior to 2016 in our analysis due to data limitations associated with the shift from the 1989 Version of the U.S. Standard Birth Certificate to the 2003 Standard, which did not go into full effect until 2016. Years prior to 2016 have missing data in key states (namely New Jersey, the 6th largest occurrence state for MENA mothers in the dataset and 7th largest for MENA individuals according to the 2020 Census (Marks et al., 2023)) on key variables of interest.

account for these factors, regression models control for mother's age, marital status, education, and type of insurance. Prior research has also shown that mother's health status and health behaviors influence the risk of adverse infant health outcomes (Dongarwar et al., 2021; El-Sayed & Galea, 2012; Rice et al., 2017). Thus, regression models also include gestational age in weeks, previous preterm birth, multiparity (defined as having at least one prior live birth), hypertension, diabetes, cigarette usage during pregnancy, presence of an STI during pregnancy[4], body mass index (BMI), and measures of prenatal care (PNC) adequacy, including initiation of prenatal care during the first trimester and five or more prenatal care visits.

In the years 2017–2019, all occurrences in California are missing marital status information. To account for this factor, we created an unknown marital status category, which essentially captures occurrences from California for those three years. We conducted two sensitivity analyses to evaluate the impact of missing data on marital status in California. We first reproduced all analyses excluding data from California. Second, we estimated models using the full sample of births, including California, but removing the marital status variables. All substantive results were consistent across these strategies. Results of sensitivity analyses are available upon request.

The primary independent variable of interest is MENA/non-MENA status for foreign-born non-Hispanic White mothers. Because the data on race and ethnicity provided by the CDC do not include a separate MENA category, MENA mothers were identified based on their country of birth, which only allows for the disaggregation of MENA/non-MENA status among immigrants. We used the definition of MENA that the U.S. Census employed in the 2015 NCT, which is the most exhaustive definition proposed, including additional countries suggested by stakeholders not listed in the U.S. Census' current working definition of MENA. We classified non-Hispanic White mothers born in 19 countries—Afghanistan, Armenia, Azerbaijan, Bahrain, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, the West Bank/Gaza Strip, Qatar, Saudi Arabia, Syria, Turkey, the United Arab Emirates (UAE), and Yemen—as Middle Eastern. Non-Hispanic White mothers born in Algeria, Djibouti, Egypt, Libya, Mauritania, Morocco, Somalia, South Sudan, Sudan, and Tunisia were classified as North African. The combined Middle Eastern and North African categories comprise our MENA category.[5] We define non-MENA mothers as foreign-born non-Hispanic White mothers born in any other part of the world.[6] In Tables 2c, 4, and 5, estimates for Djibouti and South Sudan are suppressed to comply with the CDC Data Use Agreement.[7]

[4] Sexually transmitted infection, namely chlamydia, gonorrhea or syphilis.

[5] According to the 2015 NCT, "[t]he working classification of MENA included the following 19 nationalities: Algerian, Bahraini, Egyptian, Emirati, Iraqi, Iranian, Israeli, Jordanian, Kuwaiti, Lebanese, Libyan, Moroccan, Omani, Palestinian, Qatari, Saudi Arabian, Syrian, Tunisian, and Yemeni." (Matthews et al., 2017; p.22). The U.S. Census definition employed in the NCT included countries such as Afghanistan, Armenia, Azerbaijan, Cyprus, Djibouti, Mauritania, Somalia, South Sudan, Sudan, and Turkey per stakeholder suggestions. The West Bank/Gaza Strip category comprises 1,008 individuals from the West Bank and 73 individuals from the Gaza Strip.

[6] Countries included in the non-MENA category are represented on each continent, with 75% of individuals coming from the following 20 countries (in order of frequency): Russia, Germany, Ukraine, Poland, Canada, the U.K., Brazil, Romania, Uzbekistan, Albania, Mexico, Moldova, France, Bosnia and Herzegovina, Belarus, Italy, Australia, Bulgaria, South Africa, and Japan. The remaining 25% of individuals in the non-MENA category come from 194 countries.

[7] According to the CDC Data Use Agreement, "Counts, rates, and percentages for sub-national geographic areas will be suppressed and not displayed in any manner if based on fewer than 10 observations in the numerator, denominator, or total, regardless of the number of years combined. This data suppression rule applies to all text, tables, and figures (including maps) contained in main and supplemental files."

Table 1
Descriptive statistics for foreign-born non-Hispanic White mothers, ages 18-44.

	Foreign-Born Non-Hispanic Whites		MENA Non-Hispanic Whites	
	(1)	(2)	(3)	(4)
	Non-MENA	MENA	Middle East	North Africa
Birth Outcomes				
Low Birth Weight (0250–2499g)	0.038	0.044	0.045	0.040
Social and Demographic Chars.				
Maternal Age	31.460	30.752	30.696	30.958
Marital Status				
Married	0.768	0.799	0.777	0.882
Unmarried	0.143	0.029	0.031	0.022
Marital Status Unknown	0.089	0.172	0.192	0.097
Education				
Less than High School	0.048	0.114	0.130	0.056
High School or GED	0.153	0.194	0.198	0.180
Some College	0.150	0.111	0.110	0.111
Associate's Degree	0.091	0.063	0.062	0.070
Bachelor's Degree	0.302	0.328	0.301	0.428
Master's Degree	0.193	0.124	0.129	0.107
Professional Degree	0.063	0.065	0.070	0.048
Insurance				
Medicaid	0.274	0.452	0.449	0.464
Private Insurance	0.629	0.442	0.462	0.367
Self-pay	0.060	0.081	0.067	0.134
Other Insurance	0.037	0.025	0.023	0.035
Medical Risk Factors				
Gestational Age (weeks)	38.927	38.847	38.843	38.863
Previous Preterm Birth	0.021	0.022	0.022	0.021
+1 Prior Birth	0.567	0.620	0.618	0.629
Short Inter-birth Interval	0.040	0.058	0.059	0.053
Hypertension	0.057	0.031	0.031	0.035
Diabetes	0.067	0.087	0.083	0.100
Cigarette Usage During Pregnancy	0.022	0.007	0.007	0.005
Gonorrhea, Chlamydia or Syphilis	0.006	0.002	0.002	0.002
Body Mass Index (BMI)				
Underweight	0.048	0.039	0.043	0.024
Normal	0.594	0.511	0.537	0.416
Overweight	0.227	0.293	0.278	0.349
Obese	0.132	0.157	0.142	0.211
Prenatal Care				
1st Trimester PNC Initiation	0.799	0.748	0.760	0.703
5+ PNC Visits	0.965	0.934	0.940	0.912
Observations	296,093	139,708	109,985	29,723

Source: National Center for Health Statistics 2016–2019 Natality Files.

4. Results

4.1. Descriptive results

Table 1 presents descriptive results for foreign-born non-Hispanic White mothers. The results in Columns 1 and 2 of Table 1 show slightly greater instances of low-birth-weight births for non-Hispanic White mothers born in the MENA region (0.044) compared to their counterparts born in non-MENA regions (0.038). The results in Columns 3 and 4 disaggregate mothers in the MENA category into two broad regions: the Middle East and North Africa. These results show that mothers born in the Middle East were slightly more likely to give birth to a low-birth-

Table 2a
Descriptive statistics for non-Hispanic White mothers, ages 18–44 (Middle Eastern-born, part 1).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Afghanistan	Armenia	Azerbaijan	Bahrain	Cyprus	Iran	Iraq	Israel	Jordan
Birth Outcomes									
Low Birth Weight (0250–2499g)	0.036	0.039	0.046	0.035	0.044	0.040	0.049	0.042	0.041
Social and Demographic Chars.									
Maternal Age	28.751	31.186	31.423	30.841	33.835	34.520	30.227	31.620	29.410
Married	0.605	0.341	0.707	0.835	0.848	0.599	0.870	0.782	0.880
Unmarried	0.020	0.035	0.139	0.035	0.051	0.021	0.032	0.066	0.022
Unknown	0.376	0.624	0.154	0.129	0.101	0.379	0.099	0.152	0.098
Education									
Less than High School	0.293	0.035	0.016	0.029	0.019	0.008	0.168	0.061	0.059
High School or GED	0.335	0.148	0.087	0.141	0.019	0.075	0.277	0.248	0.197
Some College	0.115	0.143	0.095	0.076	0.063	0.075	0.147	0.126	0.108
Associate's Degree	0.067	0.071	0.075	0.035	0.044	0.061	0.079	0.055	0.085
Bachelor's Degree	0.140	0.334	0.425	0.394	0.272	0.321	0.260	0.272	0.432
Master's Degree	0.034	0.207	0.225	0.212	0.285	0.228	0.043	0.167	0.084
Professional Degree	0.016	0.061	0.076	0.112	0.297	0.232	0.025	0.071	0.034
Insurance									
Medicaid	0.679	0.445	0.335	0.165	0.127	0.184	0.659	0.375	0.520
Private Insurance	0.279	0.516	0.581	0.612	0.791	0.781	0.300	0.580	0.346
Self-pay	0.015	0.025	0.063	0.153	0.038	0.017	0.022	0.030	0.104
Other Insurance	0.027	0.013	0.022	0.071	0.044	0.018	0.019	0.015	0.030
Medical Risk Factors									
Gestational Age (weeks)	38.953	38.721	38.870	38.812	38.968	38.800	38.671	39.011	38.842
Previous Preterm Birth	0.017	0.006	0.017	0.006	0.019	0.011	0.027	0.029	0.027
+1 Prior Birth	0.740	0.566	0.551	0.553	0.500	0.436	0.665	0.673	0.634
Short Inter-birth Interval	0.071	0.046	0.039	0.053	0.032	0.023	0.075	0.067	0.080
Hypertension	0.032	0.025	0.038	0.024	0.025	0.030	0.046	0.027	0.027
Diabetes	0.112	0.044	0.082	0.065	0.032	0.090	0.115	0.047	0.068
Cigarette Usage During Pregnancy	0.002	0.002	0.005	0.024	0.025	0.002	0.005	0.009	0.013
Gonorrhea, Chlamydia or Syphilis	0.002	0.002	0.003	0.006	0.000	0.001	0.002	0.002	0.001
Body Mass Index (BMI)									
Underweight	0.041	0.050	0.052	0.071	0.063	0.037	0.024	0.056	0.035
Normal	0.461	0.587	0.626	0.547	0.646	0.616	0.424	0.607	0.520
Overweight	0.341	0.236	0.205	0.259	0.196	0.246	0.330	0.228	0.299
Obese	0.156	0.127	0.116	0.124	0.095	0.101	0.222	0.109	0.146
Prenatal Care									
1st Trimester PNC Initiation	0.724	0.880	0.814	0.729	0.861	0.885	0.779	0.823	0.690
5+ PNC Visits	0.950	0.985	0.964	0.924	1.000	0.983	0.956	0.965	0.905
Observations	7,837	6,323	1,530	170	158	11,787	14,792	12,493	8,090

Source: National Center for Health Statistics 2016–2019 Natality Files.

Table 2b
Descriptive statistics for non-Hispanic White mothers, ages 18–44 (Middle Eastern-born, part 2).

	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
	Kuwait	Lebanon	Oman	West Bank/Gaza Strip	Qatar	Saudi Arabia	Syria	Turkey	UAE	Yemen
Birth Outcomes										
Low Birth Weight (0250–2499g)	0.052	0.032	0.065	0.041	0.060	0.068	0.038	0.030	0.051	0.060
Social and Demographic Chars.										
Maternal Age	31.912	31.365	30.159	27.389	30.333	28.399	30.401	32.602	30.818	28.292
Marital Status										
Married	0.870	0.843	0.757	0.977	0.872	0.913	0.829	0.835	0.846	0.861
Unmarried	0.021	0.028	0.140	0.011	0.015	0.012	0.023	0.032	0.019	0.023
Unknown	0.109	0.130	0.103	0.012	0.113	0.074	0.148	0.133	0.135	0.116
Education										
Less than HS Education	0.043	0.043	0.047	0.109	0.040	0.022	0.177	0.029	0.022	0.544
HS or GED Education	0.131	0.106	0.121	0.305	0.160	0.148	0.204	0.100	0.117	0.307
Some College	0.096	0.120	0.093	0.151	0.115	0.116	0.140	0.068	0.084	0.076
Associate's Degree	0.069	0.060	0.084	0.079	0.050	0.039	0.087	0.062	0.059	0.023
Bachelor's Degree	0.455	0.374	0.430	0.292	0.534	0.452	0.278	0.394	0.513	0.040
Master's Degree	0.132	0.201	0.150	0.052	0.070	0.169	0.068	0.236	0.143	0.007
Professional Degree	0.074	0.095	0.075	0.012	0.030	0.054	0.047	0.110	0.062	0.002
Insurance										
Medicaid	0.329	0.331	0.252	0.641	0.323	0.178	0.517	0.254	0.267	0.808
Private Insurance	0.501	0.496	0.673	0.248	0.301	0.690	0.398	0.524	0.442	0.146
Self-pay	0.148	0.155	0.065	0.086	0.326	0.100	0.066	0.194	0.242	0.020
Other Insurance	0.023	0.019	0.009	0.025	0.050	0.032	0.018	0.028	0.049	0.026
Medical Risk Factors										
Gestational Age (weeks)	38.730	38.844	38.682	38.995	38.632	38.805	38.834	38.915	38.788	38.919
Previous Preterm Birth	0.024	0.016	0.056	0.025	0.040	0.022	0.029	0.015	0.033	0.030
+1 Prior Birth	0.669	0.602	0.589	0.657	0.652	0.562	0.687	0.462	0.609	0.760
Short Inter-birth Interval	0.066	0.064	0.037	0.090	0.093	0.053	0.053	0.026	0.058	0.081
Hypertension	0.033	0.029	0.047	0.025	0.063	0.026	0.027	0.032	0.033	0.024
Diabetes	0.072	0.062	0.075	0.041	0.093	0.073	0.076	0.095	0.074	0.114
Cigarette Usage During Pregnancy	0.013	0.011	0.056	0.004	0.005	0.006	0.012	0.017	0.008	0.000
Gonorrhea, Chlamydia or Syphilis	0.004	0.001	0.019	0.002	0.003	0.003	0.001	0.004	0.001	0.002
Body Mass Index (BMI)										
Underweight	0.030	0.032	0.037	0.037	0.038	0.060	0.031	0.042	0.035	0.062
Normal	0.486	0.592	0.486	0.549	0.436	0.510	0.513	0.615	0.481	0.508
Overweight	0.280	0.257	0.290	0.290	0.338	0.277	0.295	0.249	0.303	0.298
Obese	0.205	0.119	0.187	0.123	0.188	0.154	0.161	0.095	0.182	0.132
Prenatal Care										
1st Trimester PNC Initiation	0.693	0.759	0.794	0.687	0.574	0.717	0.762	0.718	0.661	0.636
5+ PNC Visits	0.895	0.922	0.963	0.905	0.799	0.921	0.943	0.926	0.853	0.899
Observations	2,459	6,543	107	1,081	399	9,367	5,539	8,866	1,507	10,937

Source: National Center for Health Statistics 2016–2019 Natality Files.

Table 2c
Descriptive statistics for non-Hispanic White mothers, ages 18–44 (North African-born).

	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
	Algeria	Egypt	Libya	Mauritania	Morocco	Somalia	Sudan	Tunisia
Birth Outcomes								
Low Birth Weight (0250–2499g)	0.041	0.042	0.031	0.054	0.037	0.065	0.052	0.034
Social and Demographic Chars.								
Maternal Age	31.330	30.470	31.525	30.023	31.486	30.405	31.857	32.210
Marital Status								
Married	0.875	0.861	0.934	0.862	0.923	0.833	0.871	0.847
Unmarried	0.013	0.012	0.010	0.138	0.035	0.131	0.076	0.026
Unknown	0.112	0.127	0.057	0.000	0.042	0.036	0.054	0.128
Education								
Less than High School	0.050	0.023	0.015	0.123	0.117	0.339	0.143	0.036
High School or GED	0.127	0.154	0.115	0.415	0.259	0.274	0.169	0.134
Some College	0.124	0.076	0.105	0.146	0.173	0.113	0.114	0.117
Associate's Degree	0.068	0.042	0.054	0.054	0.123	0.071	0.076	0.079
Bachelor's Degree	0.400	0.557	0.458	0.169	0.217	0.149	0.361	0.337
Master's Degree	0.186	0.089	0.156	0.077	0.093	0.042	0.086	0.211
Professional Degree	0.045	0.059	0.096	0.015	0.017	0.012	0.052	0.086
Insurance								
Medicaid	0.496	0.431	0.526	0.677	0.504	0.673	0.512	0.371
Private Insurance	0.413	0.329	0.365	0.177	0.416	0.256	0.325	0.484
Self-pay	0.055	0.199	0.078	0.131	0.055	0.018	0.137	0.109
Other Insurance	0.036	0.041	0.031	0.015	0.025	0.054	0.026	0.036
Medical Risk Factors								
Gestational Age (weeks)	38.997	38.737	38.977	38.838	39.022	39.304	38.825	38.934
Previous Preterm Birth	0.014	0.023	0.024	0.038	0.018	0.054	0.048	0.012
+1 Prior Birth	0.533	0.650	0.787	0.738	0.598	0.810	0.755	0.543
Short Inter-birth Interval	0.059	0.050	0.092	0.038	0.047	0.179	0.060	0.050
Hypertension	0.047	0.033	0.030	0.100	0.032	0.077	0.048	0.026
Diabetes	0.099	0.083	0.104	0.162	0.126	0.089	0.106	0.128
Cigarette Usage During Pregnancy	0.002	0.005	0.004	0.000	0.004	0.000	0.010	0.014
Gonorrhea, Chlamydia or Syphilis	0.001	0.002	0.001	0.015	0.003	0.006	0.008	0.002
Body Mass Index (BMI)								
Underweight	0.030	0.020	0.019	0.000	0.031	0.042	0.036	0.024
Normal	0.446	0.394	0.416	0.169	0.441	0.440	0.388	0.505
Overweight	0.352	0.347	0.338	0.377	0.359	0.304	0.327	0.330
Obese	0.172	0.240	0.228	0.454	0.169	0.214	0.249	0.140
Prenatal Care								
1st Trimester PNC Initiation	0.717	0.702	0.683	0.577	0.711	0.637	0.608	0.731
5+ PNC Visits	0.936	0.892	0.919	0.877	0.939	0.929	0.884	0.927
Observations	3,078	15,438	1,235	130	8,202	168	502	941

Notes: Table 1 includes descriptive statistics for Djibouti and South Sudan. However, results for these countries are suppressed in this table to comply with the CDC data use agreement.
Source: National Center for Health Statistics 2016–2019 Natality Files.

weight infant than mothers born in North Africa (0.045 and 0.040, respectively).

Tables 2a, 2b, and 2c show descriptive results for the two MENA regions disaggregated by birth country to determine the degree of heterogeneity within the Middle East and North African categories. Tables 2a and 2b present descriptive statistics for mothers born in the Middle East. These tables show that the origin groups with the lowest proportions of low-birth-weight infants occur among mothers from Turkey (0.030), Lebanon (0.032), Bahrain (0.035), Afghanistan (0.036), and Syria (0.038), while the origin groups with the highest proportions of low-birth-weight infants occur among mothers from Yemen (0.060), Qatar (0.060), Oman (0.065), and Saudi Arabia (0.068). The likelihood of giving birth to a low-birth-weight infant also varies among mothers from Northern Africa (Table 2c), with mothers from Libya having the lowest proportion of low-birth-weight infants (0.031) and mothers from Somalia (0.065) having the highest proportion of low-birth-weight infants.

4.2. Regression results

To determine whether the descriptive results hold after accounting for a range of social, demographic, and health characteristics, we estimate logistic regression models of low birth weight status. Estimates are presented as odds ratios (ORs). Table 3 examines disparities in the risk of giving birth to a low-birth-weight infant between foreign-born non-Hispanic White mothers from the MENA region and those from non-MENA regions. Column 1 of Table 3 shows regression results that only account for age differences between the two groups. Consistent with the descriptive results, relative to non-MENA mothers, MENA mothers have 1.153 greater odds of giving birth to a low-birth-weight infant. Model 2 adds controls for a variety of social and demographic characteristics. After accounting for these factors, the odds ratio (OR: 1.212) for the White MENA mother variable remained statistically significant. Models 3 and 4 account for differences in medical risk factors (Model 3) and measures of prenatal care adequacy (Model 4). The results of Model 4, the fully specified model, show that relative to non-MENA mothers, MENA mothers have 1.443 greater odds of giving birth to a low-birth-weight infant. In summary, Table 3 reveals significant variation in the likelihood of giving birth to a low-birth-weight infant, with non-Hispanic White mothers born in the MENA region having a greater risk of giving birth to a low-birth-weight infant than non-Hispanic White mothers born outside the MENA region.

To determine whether the unadjusted country-level disparities documented in Tables 2a-2c hold after accounting for factors correlated with the risk of giving birth to a low-birth-weight infant, Table 4 presents results from logistic regression models in which the MENA region is disaggregated by birth country. Table 3 includes data for Djibouti and South Sudan, however, these estimates are suppressed in Tables 4 and 5

Table 3
Odds ratios from logistic regression models of low birth weight for foreign-born non-Hispanic White mothers, ages 18-44.

	Low Birth Weight			
	(1) Age	(2) + SES	(3) + MRF	(4) + PNC
(Reference Group: Non-MENA)				
MENA	1.153***	1.212***	1.446***	1.443***
Social and Demographic Chars.				
Maternal Age	0.810***	0.867***	0.985	0.989
Age Squared	1.003***	1.002***	1.000	1.000
(Reference Group: Married)				
Unmarried		1.440***	1.116***	1.114***
Unknown		0.906***	0.861***	0.871***
(Reference Group: Less than High School)				
High School or GED		0.904**	0.837***	0.843***
Some College		0.839***	0.743***	0.750***
Associate's Degree		0.801***	0.679***	0.686***
Bachelor's Degree		0.748***	0.691***	0.698***
Master's Degree		0.722***	0.713***	0.722***
Professional Degree		0.706***	0.675***	0.684***
(Reference Group: Private Insurance)				
Medicaid		0.975	1.079**	1.063*
Self-pay		0.795***	0.877**	0.852***
Other Insurance		1.060	1.015	1.005
Medical Risk Factors (MRF)				
Gestational Age (weeks)			0.348***	0.347***
Previous Preterm Birth			1.338***	1.337***
+1 Prior Birth			0.544***	0.545***
Short Inter-Birth Interval			0.966	0.961
Hypertension			1.877***	1.879***
Diabetes			0.770***	0.769***
Cigarette Usage During Pregnancy			2.083***	2.066***
Gonorrhea, Chlamydia or Syphilis			0.851	0.843
(Reference Group: Normal BMI)				
Underweight			1.655***	1.653***
Overweight			0.779***	0.777***
Obese			0.604***	0.603***
Prenatal Care (PNC)				
1st Trimester PNC Initiation				0.857***
5+ PNC Visits				1.074
Observations	435,801	435,801	435,801	435,801

$+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$ (two-tailed tests).
Source: National Center for Health Statistics 2016–2019 Natality Files.

to comply with the CDC data use agreement. Foreign-born non-Hispanic White, non-MENA mothers serve as the reference group for the models in Table 4. The results of the fully specified model (Model 4) reveal considerable heterogeneity in the odds of giving birth to a low-birth-weight infant among MENA mothers. Relative to non-MENA mothers, women from 15 MENA countries—Algeria (OR: 1.212), Egypt (OR: 1.503), Iraq (OR: 1.392), Israel (OR: 1.556), Jordan (OR: 1.470), Kuwait (OR: 1.854), Mauritania (OR: 2.429), Morocco (OR: 1.292), West Bank/Gaza Strip (OR: 1.651), Qatar (OR: 1.772), Saudi Arabia (OR: 2.813), Somalia (OR: 3.042), Syria (OR: 1.252), the UAE (OR: 1.750), and Yemen (OR: 2.224)—all have greater odds of giving birth to a low-birth-weight infant. Mothers from Turkey are the only MENA group that has significantly lower odds (OR: 0.878) than non-MENA mothers of giving birth to a low-birth-weight infant.

To examine the extent of variation in the risk of giving birth to a low-birth-weight infant among MENA mothers, Table 5 estimates a set of logistic regression models using only data for MENA mothers. The reference group for these models is mothers born in Egypt, the largest MENA subgroup. The results of Model 4, the fully specified model, show that relative to mothers born in Egypt, mothers born in eight countries—Afghanistan (OR: 0.705), Algeria (OR: 0.787), Armenia (OR: 0.637), Iran (OR: 0.694), Lebanon (OR: 0.669), Morocco (OR: 0.843),

Table 4
Odds ratios from logistic regression models of low birth weight for foreign- born non-Hispanic White mothers by birth country, ages 18-44.

	Low Birth Weight			
	Age	+ SES	+ MRF	+ PNC
(Reference Group: Non-MENA)				
Afghanistan	0.918	0.915	1.057	1.054
Algeria	1.089	1.162	1.220+	1.212+
Armenia	1.045	1.138+	0.984	0.987
Azerbaijan	1.242+	1.292*	1.289	1.293
Bahrain	0.923	1.017	0.983	0.977
Cyprus	1.152	1.249	1.390	1.390
Egypt	1.125**	1.257***	1.507***	1.503***
Iran	1.036	1.135*	1.108	1.109
Iraq	1.311***	1.306***	1.387***	1.392***
Israel	1.096*	1.118*	1.549***	1.556***
Jordan	1.086	1.170**	1.478***	1.470***
Kuwait	1.407***	1.526***	1.867***	1.854***
Lebanon	0.841*	0.921	1.033	1.033
Libya	0.800	0.877	1.085	1.076
Mauritania	1.427	1.368	2.455+	2.429+
Morocco	0.970	0.966	1.297***	1.292***
Oman	1.794	1.831	1.727	1.742
West Bank/Gaza Strip	1.041	1.102	1.648**	1.651**
Qatar	1.637*	1.853**	1.801*	1.772*
Saudi Arabia	1.843***	2.058***	2.836***	2.813***
Somalia	1.834+	1.645	3.105**	3.042**
Sudan	1.372	1.393	1.586+	1.567
Syria	0.997	1.018	1.249*	1.252*
Tunisia	0.893	0.959	1.260	1.255
Turkey	0.796***	0.877*	0.883	0.878+
UAE	1.398**	1.571***	1.765***	1.750***
Yemen	1.553***	1.452***	2.234***	2.224***
Observations	435,801	435,801	435,801	435,801

Notes: Models include controls for age, marital status, education, payment type, and measures of prenatal care adequacy, including prenatal care initiation in the 1st trimester and five or more prenatal care visits. Medical controls include gestational age, prior preterm birth, multiparity, short inter-birth interval, hypertension, diabetes, cigarette usage during pregnancy, STIs (including gonorrhea, chlamydia, or syphilis) during the pregnancy, and body mass index.
$+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$ (two-tailed tests).
Source: National Center for Health Statistics 2016–2019 Natality Files.

Syria (OR: 0.826) and Turkey (OR: 0.572)—have significantly lower odds of giving birth to a low-birth-weight infant. Mothers born in four countries—Kuwait (OR: 1.221), Saudi Arabia (OR: 1.796), Somalia (OR: 2.134) and Yemen (OR: 1.504)—have greater odds of giving birth to a low-birth-weight infant relative to mothers born in Egypt.

5. Discussion and conclusion

This study used Restricted-Use Detail Natality Data from 2016 to 2019 to document subgroup heterogeneity in the risk of giving birth to a low-birth-weight infant among foreign-born non-Hispanic White mothers in the United States. Compared to their non-MENA counterparts, MENA mothers had greater odds of giving birth to a low-birth-weight infant. This result held even after controlling for social, demographic, medical risk factors, and measures of prenatal care adequacy (Salem et al., 2017). In addition to documenting disparities between MENA and non-MENA mothers, we also document variation in birth outcomes among non-Hispanic MENA mothers by birth country (Acevedo-Garcia et al., 2007; Dongarwar et al., 2021; Girsen et al., 2020). Relative to non-MENA mothers, mothers from most MENA countries have greater odds of giving birth to a low-birth-weight infant (of the 24 countries with odds ratios greater than one, 15 are statistically significant).

The study results have three primary implications for the ongoing debate on the usefulness of a MENA category for understanding disparities within the U.S. White population. First, given the significant variation in the risk of giving birth to a low-birth-weight infant between

Table 5
Odds ratios from logistic regression models of low birth weight for foreign-born non-Hispanic White MENA mothers by birth country, ages 18-44.

	Low Birth Weight			
	(1) Age	(2) + SES	(3) + MRF	(4) + PNC
(Reference Group: Egypt)				
Afghanistan	0.824**	0.772***	0.708***	0.705***
Algeria	0.964	0.926	0.790^{+}	0.787^{+}
Armenia	0.926	0.912	0.636***	0.637***
Azerbaijan	1.101	1.050	0.858	0.862
Bahrain	0.821	0.798	0.637	0.634
Cyprus	1.013	0.982	0.872	0.878
Iran	0.909	0.892^{+}	0.693***	0.694***
Iraq	1.169**	1.087	0.929	0.930
Israel	0.972	0.912	1.002	1.005
Jordan	0.971	0.938	0.973	0.971
Kuwait	1.244*	1.214^{+}	1.220^{+}	1.221^{+}
Lebanon	0.746***	0.733***	0.666***	0.669***
Libya	0.709*	0.695*	0.721	0.718
Mauritania	1.273	1.183	1.720	1.722
Morocco	0.860*	0.789**	0.846^{+}	0.843^{+}
Oman	1.597	1.503	1.215	1.219
West Bank/Gaza Strip	0.941	0.894	1.077	1.077
Qatar	1.457^{+}	1.469^{+}	1.189	1.195
Saudi Arabia	1.656***	1.597***	1.802***	1.796***
Somalia	1.629	1.447	2.180^{+}	2.134^{+}
Sudan	1.215	1.157	1.102	1.087
Syria	0.888	0.837*	0.824^{+}	0.826^{+}
Tunisia	0.789	0.762	0.815	0.813
Turkey	0.702***	0.695***	0.572***	0.572***
UAE	1.240^{+}	1.236^{+}	1.142	1.143
Yemen	1.400***	1.281***	1.513***	1.504***
Observations	139,708	139,708	139,708	139,708

Notes: Models include controls for age, marital status, education, payment type, and measures of prenatal care adequacy, including prenatal care initiation in the 1st trimester and five or more prenatal care visits. Medical controls include gestational age, prior preterm birth, multiparity, short inter-birth interval, hypertension, diabetes, cigarette usage during pregnancy, STIs (including gonorrhea, chlamydia, or syphilis) during the pregnancy, and body mass index.
$+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$ (two-tailed tests).
Source: National Center for Health Statistics 2016–2019 Natality Files.

foreign-born non-Hispanic White MENA and non-MENA mothers documented in the current study, it is likely that similar disparities by MENA status will exist among adolescent and adult second-generation non-Hispanic White individuals. Few existing data sources, however, allow researchers to capture this variation. Future federal and state data collection efforts should incorporate measures that allow researchers to identify U.S.-born individuals with origins in the Middle East and North Africa. These efforts would equip researchers and policymakers with the necessary data to better understand the evolution of U.S. health disparities, especially within the White population. Second, given the marked disparities between MENA and non-MENA mothers, future research should examine the potential effects of religious and ethnic discrimination on negative birth outcomes among MENA mothers (Bakhtiari, 2020; Collins et al., 2004; Dallo & Kindratt, 2016; Dominguez et al., 2009).

Third, the results highlight potential limitations of the MENA category used by the U.S. Census in the 2015 NCT. In particular, the broadness of the category will likely mask the subgroups with the worst health outcomes. For example, Tables 2a and 2b show that among foreign-born non-Hispanic White mothers from the Middle East, the proportion who gave birth to a low-birth-weight infant varies by 0.038 points, ranging from 0.030 among Turkish-born mothers to 0.068 among Saudi Arabian-born mothers. However, Table 1 shows that the risk of giving birth to a low-birth-weight infant varies by only 0.006 points between foreign-born non-Hispanic White MENA mothers and their non-MENA counterparts. These findings suggest that a MENA category based on the 2015 NCT definition might be too broad to capture the outcomes of the most disadvantaged members of the population of individuals who descend from the Middle East or North Africa. To capture the outcomes of these individuals, the U.S. Census Bureau should continue collecting data on place of birth and ancestry. Further, the U.S. Census Bureau should potentially add a question on parental place of birth to capture the nuanced variation in health outcomes among non-Hispanic Whites in the United States (Kauh et al., 2021; Read et al., 2021).

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Leila Moustafa: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Patricia McGaughey:** Writing – review & editing, Validation, Supervision, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Tod G. Hamilton:** Writing – review & editing, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Data availability

The data that has been used is confidential.

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