Higher SARS-CoV-2 Infection Rate in Pregnant Patients

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PII: S0002-9378(21)00098-3

DOI: https://doi.org/10.1016/j.ajog.2021.02.011

Reference: YMOB 13714

To appear in: *American Journal of Obstetrics and Gynecology*

Received Date: 3 January 2021

Revised Date: 8 February 2021

Accepted Date: 9 February 2021

Please cite this article as: LOKKEN EM, TAYLOR GG, HUEBNER EM, VANDERHOEVEN J, HENDRICKSON S, COLER B, SHENG JS, WALKER CL, MCCARTNEY SA, KRETZER NM, RESNICK R, KACHIKIS A, BARNHART N, SCHULTE V, BERGAM B, K K, ALBRIGHT C, LARIOS V, KELLEY L, LARIOS V, EMHOFF S, RAH J, RETZLAFF K, THOMAS C, PAEK BW, HSU RJ, ERICKSON A, CHANG A, MITCHELL T, HWANG JK, GOURLEY R, ERICKSON S, DELANEY S, KLINE CR, ARCHABALD K, BLAIN M, LACOURSE SM, ADAMS WALDORF KM, Higher SARS-CoV-2 Infection Rate in Pregnant Patients, *American Journal of Obstetrics and Gynecology* (2021), doi: https://doi.org/10.1016/j.ajog.2021.02.011.

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Disclosure statement: Dr. Alisa Kachikis is on a Pfizer and GlaxoSmithKline Advisory Board for Immunizations, which is unrelated to the content of this manuscript. The remaining authors report no conflict of interest.

Source of financial support: This work was supported primarily by funding from the University of Washington Population Health Initiative, Department of Obstetrics & Gynecology and philanthropic gift funds. This work was also supported by the National Institute of Allergy and Infectious Diseases (grant numbers AI133976, AI145890, AI143265 and HD098713 to KAW, HD001264 to AK and AI120793 to SML). Study data were managed using a REDCap electronic data capture tool hosted by the Institute of Translational Health Sciences at the University of Washington, which was supported by the National Center for Advancing Translational Sciences (UL1TR002319). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or other funders.

Role of the funding source: The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Word Count: 3,254 words

Abstract Word Count: 482

CONDENSATION

The SARS-CoV-2 infection rate was significantly higher in pregnant people compared to a similarly-aged population and nearly all non-white racial/ethnic groups were disproportionately affected.

SHORT TITLE

SARS-CoV-2 Infection Rate in Pregnancy

AJOG AT A GLANCE

A. Why was the study conducted? To determine the SARS-CoV-2 infection rate in pregnant patients and assess racial/ethnic disparities in a multi-center, retrospective cohort study in Washington State.

B. What are the key findings? The SARS-CoV-2 infection rate was significantly higher in pregnant people (N=240; 13.9/1,000 deliveries) compared to 20-39 year olds (7.3/1,000; Rate Ratio (RR) 1.7, 95%CI 1.3-2.3) in Washington State. When compared to the distribution of women in Washington State who delivered live births in 2018, the proportion of SARS-CoV-2 cases in pregnancy among most racial and ethnic minority groups was 2-4 fold higher.

C. What does this study add to what is already known? The SARS-CoV-2 infection rate in pregnant patients was higher than non-pregnant adults in Washington State and nearly all non-white racial/ethnic groups were disproportionately affected.

Keywords: COVID-19, pregnancy, SARS-CoV-2, coronavirus, fetus, Hispanic, Black, Alaskan Native, American Indian, Pacific Islander, ethnic disparity, Washington State

ABSTRACT

Background: During the early months of the coronavirus disease of 2019 (COVID-19) pandemic, risks to pregnant women of a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection were uncertain. Pregnant patients can serve as a model for the success of the clinical and public health response during public health emergencies as they are typically in frequent contact with the medical system. Population-based estimates of SARS-CoV-2 infections in pregnancy are unknown due to incomplete ascertainment of pregnancy status or inclusion of only single centers or hospitalized cases. Whether pregnant women were protected by the public health response or through their interactions with obstetrical providers in the early pandemic is poorly understood.

Objective(s): To estimate the SARS-CoV-2 infection rate in pregnancy and examine disparities by race/ethnicity and English-language proficiency in Washington State.

Study Design: Pregnant patients with a polymerase chain reaction (PCR)-confirmed severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection diagnosed between March 1-June 30, 2020 were identified within 35 hospitals/clinic systems capturing 61% of annual deliveries in Washington State. Infection rates in pregnancy were estimated overall and by Washington State Accountable Community of Health (ACH) region and cross-sectionally compared to SARS-CoV-2 infection rates in similarly aged adults in Washington State. Race/ethnicity and language used for medical care among the pregnant patients were compared to recent data from Washington State.

Results: A total of 240 pregnant patients with SARS-CoV-2 infections were identified during the study period with 70.7% from minority racial and ethnic groups. The principal

findings in our study are: 1) The SARS-CoV-2 infection rate in pregnancy was 13.9/1,000 deliveries (95% confidence interval [CI], 8.3-23.2) compared to 7.3/1,000 (95%CI 7.2-7.4) in 20-39 year old adults in Washington State (Rate Ratio [RR] 1.7, 95%CI 1.3-2.3), 2) the SARS-CoV-2 infection rate reduced to 11.3/1000 (95%CI 6.3-20.3) when excluding 45 cases of SARS-CoV-2 detected through asymptomatic screening (RR 1.3, 95%CI 0.96-1.9), 3) the proportion of SARS-CoV-2 cases in pregnancy among most non-white racial/ethnic groups was 2-4 fold higher than the race and ethnicity distribution of women in Washington State who delivered live births in 2018, and 5) the proportion of SARS-CoV-2 infected pregnant patients receiving medical care in a non-English language was higher than estimates of limited English proficiency in Washington State (30.4% versus 7.6%).

Conclusions: The SARS-CoV-2 infection rate in pregnant people was 70% higher than similarly aged adults in Washington State, which could not be completely explained by universal screening at delivery. Pregnant patients from nearly all racial/ethnic minority groups and patients receiving medical care in a non-English language were overrepresented. Pregnant women were not protected from COVID-19 in the early months of the pandemic with the greatest burden of infections occurring in nearly all racial/ethnic minority groups. This data coupled with a broader recognition that pregnancy is a risk factor for severe illness and maternal mortality strongly suggests that pregnant people should be broadly prioritized for COVID-19 vaccine allocation in the U.S. similar to some states.

Introduction

In the early coronavirus disease of 2019 (COVID-19) pandemic, risks associated with a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in pregnancy were uncertain.[1] As pregnant patients are typically in frequent contact with the medical system, they can serve as a model for the success of the clinical and public health response during public health emergencies. Outside of U.S. urban centers with high infection rates, studies in the early pandemic reported low SARS-CoV-2 prevalence in pregnant patients undergoing universal screening at admission for delivery.[2-4] Population-based estimates of SARS-CoV-2 infections in pregnancy are lacking due to incomplete ascertainment of pregnancy status or inclusion of only single centers or hospitalized cases.[5-11] Further, a disproportionate impact of COVID-19 on racial/ethnic minorities, including among pregnant patients, has been reported.[5, 11-15] However, CDC data is missing pregnancy status for 65% of their COVID-19 case report forms making it impossible to estimate infection rates in the U.S. pregnant population.[16] Population-based studies of COVID-19 in pregnancy with comprehensive data regarding race, ethnicity, and language is essential to developing effective interventions for populations disproportionately affected by COVID-19.

Washington State provides a valuable case study for evaluating the impact of COVID-19 on pregnant individuals. Washington State was the first state to detect community transmission of SARS-CoV-2 and impose a shelter-in-place order.[17] The objectives of this study were to estimate and compare infection rates in pregnant patients with

similarly-aged adults in Washington State, as well as examine disparities by race/ethnicity and language use.

Materials and Methods

Study Population

The Washington State COVID-19 in Pregnancy Collaborative (WA-CPC) identified pregnant women (≥18 years) with SARS-CoV-2 infections confirmed by a polymerase chain reaction test from 35 hospitals and clinic systems in Washington State between March 1, 2020-June 30, 2020 (Fig. 1; Table1). Each site identified patients with an infection during any trimester of pregnancy irrespective of pregnancy outcome, abstracted clinical and SARS-CoV-2 testing data from medical records and reported number of annual deliveries, actual number of deliveries during the study period, and SARS-CoV-2 testing strategies employed over time.[18] Pregnant women were tested for several reasons during the study period including exposure to a known SARS-CoV-2 case, universal screening prior to procedures or delivery, symptoms, travel, and personal requests. Testing occurred in the general population for similar reasons, including universal testing prior to medical procedures, with increasing test availability over time. Race/ethnicity abstracted from medical charts was self-reported by patients at care entry.

This multi-site medical records review was approved by Institutional Review Boards (IRB) at the University of Washington (STUDY# 00009701, approved 03/06/2020) and Swedish Medical Center (STUDY #2020000172, approved 03/19/2020). All other sites

entered into reliance agreements with the University of Washington IRB. The IRB waived the need for informed consent. Data provided by each site were de-identified.

Statistical Analysis

To estimate statewide coverage of annual deliveries captured by WA-CPC sites and the SARS-CoV-2 infection rates in pregnancy, we assessed site-specific data (SARS-CoV-2 cases, number of deliveries) within Washington State Accountable Community of Health (ACH) regions.[19, 20] Due to small case numbers in some of the nine ACH regions, we collapsed geographically close regions to yield six regions for analysis (Fig. 1A). To estimate the proportion of annual statewide deliveries captured by collaborating sites, the number of total site-reported annual deliveries was divided by the number of live births in 2018 in Washington State and by ACH region using Washington State Department of Health (WA-DOH) data.[19]

The ACH-specific and overall SARS-CoV-2 infection rates in pregnancy (per 1000) at WA-CPC sites were estimated using the site-specific infection rate (number of cases/number of deliveries during the study period) and Poisson regression (with 95%CI), with clustering by ACH region for the overall estimate. As a comparison group, the SARS-CoV-2 infection rates in all 20-39 year olds (females and males) in Washington State during the study period were calculated using publicly-available SARS-CoV-2 surveillance data for confirmed cases (numerator) and 2019 population estimates for 20-39 year olds (denominator); we were unable to exclude cases in men due to limitations of the publicly available surveillance data.[21, 22] This group served as

the best available proxy estimate for the SARS-CoV-2 infection rate for reproductive-aged women. While women <20 and >39 years of age are fecund, Washington State SARS-CoV-2 surveillance data were only available in wide categories including 0-19 years, 20-39 years, 40-59 years and older categories; neither age groups 0-19 nor 40-59 were appropriate comparison groups for approximating infection rates in most reproductive-age women and therefore the 20-39 year old age group was selected for comparison. Rate ratios (RR) and 95% confidence intervals (CI) were calculated comparing WA-CPC infection rates in pregnancy to overall SARS-CoV-2 infection rates among 20-39 years olds in Washington State within each ACH region; an ACH-weighted overall RR was also estimated. To assess how infection rates in pregnancy may have been affected by increased access to testing in the pregnant population, we conducted a sensitivity analysis excluding cases of SARS-CoV-2 in pregnancy detected through asymptomatic universal screening prior to procedures or delivery. We were unable to subtract cases in the general population comparison group similarly identified through pre-procedure universal testing. Lastly, WA-DOH provided SARS-CoV-2 case counts among pregnant females aged 18-50 between March 1-June 30, 2020 by ACH region for comparison[23]; pregnancy status was ascertained through public health department investigation. As a sensitivity analysis, infection rates in pregnancy were calculated and the DOH-reported case counts and the statewide live births estimated for March-June 2020 using Washington State 2018 birth data.[19]

We compared the race/ethnicity distribution of the study population to that among women delivering live births in 2018 in Washington State.[19] Race/ethnicity was

categorized as American Indian/Alaska Native, Asian, Black, Hispanic, Native Hawaiian Other Pacific Islander, Multi-Racial, and White; Hispanic was considered a mutually exclusive race/ethnicity group to align with WA-DOH categories.[19] For each race/ethnicity category among pregnant patients in the study population, prevalence and exact 95%CI were estimated with clustering by ACH region. Then, we generated ACH-weighted prevalence ratios (PR) and 95%CI comparing race/ethnicity in the study population to the race/ethnicity distribution among women delivering in Washington State in 2018. In addition, we generated prevalence ratios for the King and Greater Columbia ACH regions, which had the highest number of SARS-CoV-2 cases through June 30, 2020.[21] For ACH-specific analyses, race/ethnicity data were repressed when there were <10 cases in alignment with WA-DOH privacy guidelines. In addition, we compared the proportion of pregnant patients in our study a receiving medical care in a non-English language to the proportion of individuals in Washington State in 2017 with limited English language proficiency (individuals >5 years old, who speak English "less than very well") per 2014-2017 American Community Survey data reported by the WA-DOH.[20] Each publicly-available data source and how it contributed to these analyses is further described in Table 2.

Results

Capture of Pregnancies and SARS-CoV-2 Infections Among Pregnant Patients at WA-CPC sites

The estimated proportion of annual deliveries in Washington State covered by the WA-CPC sites was 61.1%, ranging from 35.0-93.0% (Fig. 1A, Table 1). Of 35 WA-CPC

sites, 22 (62.9%) were hospitals and 13 were clinics providing prenatal care only. Patients were universally screened for SARS-CoV-2 by nasopharyngeal swab prior to or at the time of the delivery admission in 14%, 64% and 76% of hospitals by the end of March, April and May, respectively. The five hospitals without universal testing at delivery by the end of May had initiated universal testing for scheduled delivery admissions only.

Two-hundred and forty cases of SARS-CoV-2 infections in pregnancy were detected by WA-CPC sites.[24] The majority of SARS-CoV-2 cases in pregnancy were detected in the King (39.2%, n=94) and Greater Columbia (36.7%, n=88) ACH regions (Fig. 1B, Table 1). Of the WA-CPC cases, 15.8% (n=38) were detected in the first trimester, 27.9% (n=67) in second trimester, and 56.3% (n=135) in third trimester pregnancies, as previously reported.[24] Of these cases, 18.8% (45/240) were diagnosed through asymptomatic screening strategies (pre-procedure and universal screening prior to delivery); this excludes patients who were asymptomatic but tested due to having a known exposure to COVID-19.

During the study period, the WA-DOH identified 346 cases of SARS-CoV-2 in pregnancy throughout Washington state, but pregnancy status was missing for 35% of cases in females aged 18-50.[25] The WA-CPC captured an estimated 69.4% (240/346) of the total number of SARS-CoV-2 infections in pregnancy reported to the WA-DOH, ranging from 26.7%-110.0% at the ACH region level (Table 1). However, direct linking

of WA-CPC and WA-DOH cases was not possible so the exact overlap of WA-CPC and WA-DOH identified cases is unknown.

SARS-CoV-2 Infection Rates

The overall infection rate in pregnancy at WA-CPC sites was 13.9/1000 deliveries (95%CI 8.3-23.2). At the ACH region level, infection rates in pregnancy at WA-CPC Sites ranged from 6.2/1000 (95%CI 3.2-11.2) to 33.2/1000 deliveries (95%CI 26.9-40.9) (Fig. 1B, Table 2). In the King ACH region, where capture of annual deliveries and of state reported SARS-CoV-2 cases in pregnancy were >90%, the infection rate in pregnancy at WA-CPC sites was 12.9/1000 deliveries (95%CI 10.5-15.8). When compared to the SARS-CoV-2 infection rate among 20-39 year olds in Washington State of 7.3/1000 (95%CI 7.2-7.4), the overall infection rate in pregnancy at WA-CPC sites was a significant 1.7 times higher (ACH-weighted RR 1.7; 95%CI 1.3-2.3; Table 2). This equates to an absolute risk difference of 5.4/1000 (95%CI 0.8-10.0). There were significantly higher infection rates in pregnancy in some, but not all, ACH regions (Table 2). For example, in the King ACH region, there was a 2.2 times higher rate of SARS-CoV-2 infections in pregnant women at WA-CPC sites compared to the 20-39 year old population (RR 2.2, 95%CI 1.8-2.8). In the sensitivity analysis estimating the infection rate in pregnancy using the WA-DOH reported SARS-CoV-2 in pregnancy case counts, the statewide infection rate in pregnancy was similar to that estimated using data from WA-CPC sites (WA DOH: 12.1/1000 deliveries, 95%CI 10.8-13.4) and was also a significant 1.7 times higher than that of 20-39 year olds in Washington State (95%CI 1.4-2.2; Table S3). Lastly, when excluding the 45 cases of SARS-CoV-2 in pregnancy

that were detected through asymptomatic screening strategies (pre-procedure and universal testing at delivery) at WA-CPC sites, the overall infection rate in pregnancy at WA-CPC sites was 11.3/1000 deliveries (95%CI 6.3-20.3), which was 30% higher than the infection rate among Washingtonians aged 20-39 years old (ACH-weighted RR 1.3, 95%CI 0.96-1.9; Table S4).

Racial/Ethnic Groups

Among the 240 SARS-CoV-2 cases in pregnancy detected by WA-CPC, the majority were among racial and ethnic minority groups including 52.5% (n=126) among Hispanic women, 8.3% (n=20) among Black women, and 3.3% each for American Indian/Alaska Native (n=8), Asian (n=8), and Native Hawaiian/Other Pacific Islander (n=8) women (Table 3). When compared to the distribution of women in Washington State who delivered live births in 2018, the proportion of SARS-CoV-2 cases in pregnancy among most racial and ethnic minority groups were 2.0-3.9 fold higher (Table 3). For example, the proportion of SARS-CoV-2 cases in pregnancy among Hispanic women was 2.1-times higher (ACH-weighted PR 2.1, 95%CI 1.4-3.1) than the proportion of Hispanic women delivering in 2018 in Washington State (52.5% versus 18.6%; Table 3). In contrast, the proportion of White and Asian pregnant women with SARS-CoV-2 infections was lower than expected based on 2018 birth data (White ACH-weighted PR 0.6, 95%CI 0.3-1.1; Asian ACH-weighted PR 0.4, 95%CI 0.1-1.5).

There were similar racial/ethnic disparities observed when focusing on King and Greater Columbia ACH regions, which experienced the worst SARS-CoV-2 outbreaks during the

study period and where the WA-CPC had highest coverage (Table 1, Table 5). In the King ACH, there was a 2.4-fold higher prevalence of Hispanic women (95%CI 1.6-3.4, 30.9% vs. 13.1%) and 2.1-fold higher prevalence of Black women (95%CI 1.2-3.3, 19.2% vs. 9.3%) with SARS-CoV-2 in pregnancy compared to the 2018 race/ethnicity distribution of women delivering in the region. In contrast, the proportion of pregnant patients with a SARS-CoV-2 infection who were White was 50% lower than expected in the King ACH region (PR 0.5, 95%CI 0.3-0.7; 22.3% vs. 47.1%). In the Greater Columbia ACH region, a disproportionate number of cases also occurred in Hispanic women compared to the distribution of race/ethnicity among women delivering in the region in 2018 (PR 1.9, 95%CI 1.5-2.4, 85.2% vs. 44.4%).

Language Used During Medical Encounters

Of the pregnant patients with a SARS-CoV-2 infection, 24.6% (n=59) received medical care in Spanish and 5.8% (n=14) in other languages. The proportion of pregnant patients using a non-English language in WA-CPC was higher than individuals with limited English proficiency statewide (WA-CPC crude estimate: 30.4% vs. WA State: 7.6%. This prevalence difference in use of a non-English language was also observed in the King and Greater Columbia ACH. In the King ACH, 26.6% (25/94) of pregnant patients with a SARS-CoV-2 infection were provided care in a non-English language compared to 10.6% (95%CI 10.4-10.8) of all individuals in the ACH with limited English proficiency.[20] In the Greater Columbia ACH, 34.1% (30/88) of pregnant women with COVID-19 were provided care in a non-English language versus 12.0% (95%CI 11.6-12.3) of individuals in the region with limited English proficiency.[20]

Discussion

Principal Findings

In the early months of the COVID-19 pandemic, the SARS-CoV-2 infection rate was 70% higher in pregnant patients than in similarly-aged adults in Washington State. This remained 30% higher after excluding pregnant patients whose SARS-CoV-2 infections were detected through asymptomatic screening strategies including pre-procedure and universal screening at delivery. We also detected significant disparities in the proportion of SARS-CoV-2 infections occurring among pregnant women from most racial/ethnic minority groups, particularly among Hispanic and American Indian/Alaska Native pregnant patients, as well as a disproportionate number of SARS-CoV-2 infections in pregnant patients receiving medical care in a non-English language. The higher infection rates in pregnant patients coupled with an elevated risk for severe illness and maternal mortality[16, 24, 25] due to COVID-19 suggests that pregnancy should be considered a high-risk health condition for COVID-19 vaccine allocation in Phase 1B across the United States (U.S.), similar to some U.S. states (i.e. Texas[26], New Hampshire[27], New Mexico[28], Alaska[29]).

Results in the Context of What is Known

While not considered an immunosuppressed condition, pregnancy is associated with an increased risk of disease severity for some infections and potentially, acquisition risk.[30-36] However, population-based studies are lacking to compare infection rates in pregnant and non-pregnant patients and disentangling behavioral and biological determinants of

infection susceptibility is challenging. While the increased infection rate in pregnant patients may be largely driven by increased testing, it remained elevated compared to the general population in the sensitivity analysis excluding cases detected through universal testing pre-procedure and at delivery admission. Notably, our infection rate estimate excluding asymptomatic cases was conservative as we were not able to similarly exclude those in the general population whose infections were also detected through universal testing prior to medical procedures. Whether an increased infection rate in pregnancy has a biological basis or is due to other factors, such as increased testing, greater exposure by living in inter-generational households, working in higher-risk occupations (i.e. healthcare, teaching, service industries) or selection bias is unknown.

Our data also demonstrate a disproportionate burden of SARS-CoV-2 among non-white pregnant patients in our study population in Washington State. When compared to the distribution of women in Washington State who delivered live births in 2018, the proportion of SARS-CoV-2 cases in pregnancy among most racial and ethnic minority groups was 2-4 fold higher, with the greatest disparity among Hispanic and American Indian/Alaska Native pregnant patients. Large disparities in rates of SARS-CoV-2 infections have been reported in the U.S. for individuals of Black, Hispanic, Native American and Native Hawaiian or Pacific Islander race or ethnicity.[6, 12, 13, 15, 37] A fundamental cause of health disparities is the socioeconomic inequality that arises from structural racism and decades of limited access to quality healthcare, education, and housing.[38, 39] Pregnant patients with SARS-CoV-2 infections were also more likely to

receive care in a non-English language compared to the statewide prevalence of limited English proficiency.

Clinical and Research Implications

This data provides the first evidence that pregnant individuals may have a higher SARS-CoV-2 infection rate than a similarly-aged population. Whether pregnant patients are truly at a higher risk is yet unknown and exploring mechanisms for a potentially elevated infection risk will be challenging with limited data currently available. However, this data should lead to a greater public health response to prevent infections in pregnant women and to focus efforts on individuals from minority racial/ethnic groups and with limited English proficiency. Culturally-appropriate public health messaging focused on preventing SARS-CoV-2 infections in pregnancy, including messages in multiple languages, and services targeting disproportionately affected communities is desperately needed.[40] This data should also inform research investigating risk factors faced by pregnant individuals for SARS-CoV-2 infection including household transmission, employment in high-risk occupations (e.g. healthcare) and potential biological determinants of infection susceptibility.

Strengths and Limitations

This study had several strengths. WA-CPC sites captured 61% of annual deliveries in Washington State, including the vast majority in ACH regions with highest SARS-CoV-2 cases reported to WA-DOH. We included all COVID-19 cases in pregnancy, including all trimesters, hospitalized and non-hospitalized cases, independent of pregnancy

449 outcome. Study limitations include selection bias due to incomplete ascertainment of all
450 pregnancy cases in Washington State. Differences in socio-demographic characteristics
451 of pregnant patients and SARS-CoV-2 testing strategies among participating versus
452 non-participating facilities may have introduced bias in infection rate estimates and size
453 of racial/ethnic disparities. Notably, although the WA-DOH captured statewide data,
454 pregnancy status was missing in approximately 35% of case report forms for
455 reproductive-aged females; we may have captured cases not reported to WA-DOH, but
456 were unable to estimate degree of non-overlap. The ideal comparison group for the WA-
457 CPC SARS-CoV-2 cases in pregnancy would have been non-pregnant reproductive
458 aged females, but data on these women were not collected in our study. Therefore, the
459 best available comparison group for comparing infection rates to reproductive aged
460 females was publicly-available WA-DOH data; COVID-19 surveillance data were
461 available by age (presented in 20 year categories) or gender, but not both, necessitating
462 a comparison to females and males between 20-39 years.[21] In addition, we did not have
463 individual-case data for any publicly-available datasets so were unable to adjust for
464 individual level characteristics. Moreover, pregnant adolescents (<18 years old) were
465 excluded in our study, but included in overall delivery numbers; though, adolescents
466 only account for <1% of births in Washington State minimizing concern for bias.[19]
467 Publicly-available WA-DOH data also served as imperfect proxies for the ideal
468 denominators for analyses of racial/ethnic and language disparities. Nonetheless, this
469 study provided statewide and regional assessments of infection rates in pregnancy,
470 including cases from all pregnancy trimesters, and identified pervasive demographic
471 disparities in pregnant individuals with SARS-CoV-2 infections.

Conclusions

During the early COVID-19 pandemic, pregnant patients in Washington State had a 70% higher SARS-CoV-2 infection rate than similarly-aged adults, which in part reflects a population that was prioritized for testing. However, we can conclude that pregnant patients were not protected in the early pandemic in Washington State by the public health response or through frequent interactions with obstetrical care providers. Further, the greatest burden of infections occurred within racial/ethnic minority groups and patients preferring a non-English language. Understanding the geographical, racial/ethnic and language distribution of SARS-CoV-2 infections among pregnant patients would enable targeting the public health response to pregnant patients at greatest risk for SARS-CoV-2 infection and associated adverse maternal-fetal outcomes.[11, 18, 24, 41-43] Broader recognition that pregnancy is a risk factor for severe illness and maternal mortality[16, 24, 25] coupled with a higher infection rate in pregnancy strongly suggests that pregnant people should be broadly prioritized for COVID-19 vaccine allocation in the U.S. similar to some states.[26-29]

Acknowledgments

We would like to thank the pregnant patients contributing data to this manuscript, as well as our partners across Washington State that enabled this investigation. We note that we have shown single names for groups, such as "Hispanic" or "American Indian/Alaska Native", which reflected an inclusive approach to naming, but does not capture the spectrum of diversity in ancestry and cultural, behavioral and linguistic differences. We also recognize the differences between sex and gender, noting that the term “women” is not inclusive for biologically born female individuals that identify as non-binary or transgender. Labels and words are imperfect and ethnic, cultural and gender groups are sometimes overlapping or mischaracterized by single words or names. We apologize if offense is taken regarding group names used in the manuscript. We thank Ms. Jane Edelson, who provided expert assistance with project management at the University of Washington and was compensated on an hourly rate through the Institute for Translational Health Sciences. Ms. Adrienne Meyer with the University of Washington Human Subjects Division provided critical assistance to obtain reliance agreements with community Institutional Review Boards. Barbara James, BSN, RNC graciously provided COVID-19 case counts for PeaceHealth Southwest. We thank Robert Weston, MD and Erin Andreas, RN for reporting COVID-19 cases at Mid-Valley Hospital. Peter Napolitano, MD provided assistance with patient identification at the University of Washington Yakima site. We also thank Hanna Oltean, MPH, at the Washington State Department of Health, Office of Communicable Disease Epidemiology for providing the WA-DOH data regarding SARS-CoV-2 cases reported to the DOH by each ACH region. We are grateful to Nicole Wothe for administrative

511 assistance with this manuscript. Lastly, we thank Ronit Katz, DPhil at the University of
512 Washington for biostatistical consultations.

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Figure Legend

Figure 1. In panel A, the number of study sites (circles) and proportion of deliveries (color gradient) captured by the Washington State COVID-19 in Pregnancy Collaborative is depicted within each Washington State Department of Health Accountable Community of Health (ACH) region. In panel B, the number of COVID-19 cases in pregnant patients within each ACH is shown numerically and by circle size with infection depicted by the color gradient.

Table 1. WA-CPC Statewide Coverage of Pregnancies and Cases of SARS-CoV-2 Reported to WA-DOH

Accountable Community of Health	Washington State COVID-19 in Pregnancy Coverage						SARS-CoV-2 Cases in Pregnancy				
	Sites	Annual deliveries at sites[i]		Live Births in WA State in 2018[ii]			Cases detected by WA-CPC		Cases reported to WA-DOH[iii]		
	N	N	(%)	N	(%)	% captured by WA-CPC	N	(%)	N	(%)	% captured by WA-CPC[iv]
Better Heath Together/North Central	7	3832	(7.3)	10129	(11.8)	37.8%	14	(5.8)	23	(6.6)	60.9%
Greater Columbia	10	7720	(14.7)	9438	(11.0)	81.8%	88	(36.7)	135	(39.0)	65.2%
King	9	22623	(43.1)	24337	(28.3)	93.0%	94	(39.2)	98	(28.3)	95.9%
North Sound	3	7460	(14.2)	14265	(16.6)	52.3%	16	(6.7)	60	(17.3)	26.7%
Pierce	2	5148	(9.8)	11462	(3.3)	44.9%	17	(7.1)	20	(5.8)	85.0%
SW WA Regional Health/Olympic/Cascade Pacific Action Alliance	4	5725	(10.9)	16375	(19.0)	35.0%	11	(4.6)	10	(2.9)	110.0%
Washington State Total	35	52508	(100)	86006[v]	(100)	61.1%	240		346		69.4%

Abbreviations: WA-CPC - Washington State COVID 19 in Pregnancy Collaborative; WA DOH – Washington State Department of Health

[i] Approximate annual deliveries were reported by each site.
[ii] 2018 data from the Washington Department of Health's Birth Data Dashboard tool (Birth Certificate Data, 2000-2018, Community Health Assessment Tool)[19]
[iii] Case counts of confirmed SARS-CoV-2 cases among females aged 18-50 who were pregnant at the time of infection were provided by the Washington State Department of Health for March 1-June 30, 2020. Pregnancy status was ascertained through case interviews or by local health jurisdiction investigation. In 35% of SARS-CoV-2 case records among females aged 18-50, pregnancy status was unknown or missing.
[iv] Direct linking of WA-CPC and WA-DOH cases was not possible so the exact overlap of WA-CPC and WA-DOH identified cases is unknown.
[v] The total number of live births in WA State in 2018 was 84,046, but 40 were not attributed to an ACH.

Table 2. SARS-CoV-2 Infection Rates in Pregnancy in Washington State

Accountable Community of Health	Washington State COVID-19 in Pregnancy Collaborative						Washington State: 20-39 Year Olds					Rate Ratio	
	Cases in pregnancy		Deliveries during study period		SARS-CoV-2 Infection rate/ 1000 deliveries		Cases[i]		Population[ii]	SARS-CoV-2 Infection rate/ 1000			
	N	(%)	N	(%)	Rate	(95%CI)	N	(%)	N	Rate	(95%CI)	RR	(95%CI)
Better Heath Together/North Central	14	(5.8)	1,318	(7.6)	10.6	(6.3, 17.9)	1,746	(11.5)	214,300	8.1	(7.8, 8.5)	1.3	(0.7, 2.2)
Greater Columbia	88	(36.7)	2,653	(15.4)	33.2	(26.9, 40.9)	5,459	(35.8)	193,851	28.2	(27.4, 28.9)	1.2	(0.9, 1.4)
King	94	(39.2)	7,283	(42.3)	12.9	(10.5, 15.8)	4,274	(28.0)	744,386	5.7	(5.6, 5.9)	2.2	(1.8, 2.8)
North Sound	16	(6.7)	2,506	(14.5)	6.4	(3.9, 10.4)	1,752	(11.5)	325,671	5.4	(5.1, 5.6)	1.2	(0.7, 1.9)
Pierce	17	(7.1)	1,696	(9.8)	10.0	(6.2, 16.1)	1,173	(7.7)	239,814	4.9	(4.6, 5.2)	2.0	(1.2, 3.3)
SW WA Regional Health/Olympic/ Cascade Pacific Action Alliance	11	(4.6)	1,777	(10.3)	6.2	(3.4, 11.2)	834	(5.5)	358,226	2.3	(2.2, 2.5)	2.7	(1.3, 4.8)
Washington State Total	**240**		**17,233**		**13.9**	**(8.3, 23.2)[iii]**	**15,238[iv]**		**2,076,248**	**7.3**	**(7.2, 7.4)**	**1.7**	**(1.3, 2.3)[v]**

[i] Case data were calculated for March 1-June 28, 2020 (closest available date to June 30, 2020) using the "COVID-19 in Washington State: Confirmed Cases, Hospitalizations and Deaths by Week of Illness Onset, County, and Age" dataset available

from the Washington State Department of Health at https://www.doh.wa.gov/Emergencies/COVID19/DataDashboard. Counts include females and males.[21]

[ii] Population estimate calculated using the 2019 post-censal population estimates from the WA Office of Financial Management.[22]

[iii] Infection rates were calculated with Poisson regression with additional clustering by Accountable Community of Health (ACH) for the statewide estimate.

[iv] The overall number of SARS-CoV-2 cases through June 28, 2020 was 15,238, but 20 cases were not assigned to an ACH.

[v] The state-wide rate ratio is an ACH-weighted state estimate.

Table 3. Race/Ethnicity Among Pregnant Patients with SARS-CoV-2 Infections Compared to Washington State

	Washington State COVID-19 in Pregnancy Collaborative[a] (N=240)			Washington State 2018 Live Births[b] (N=86,046)		Prevalence Ratio[c]	
Race/Ethnicity	**n**	**(%)**	**(95%CI)**	**n**	**(%)**	**PR**	**(95%CI)**
Hispanic	126	(52.5)	(11.9, 90.7)	16,010	(18.6)	2.1	(1.4, 3.1)
American Indian/Alaska Native-NH	8	(3.3)	(0.1, 16.2)	1,206	(1.4)	3.8	(1.3, 9.7)
Asian-NH	8	(3.3)	(0.3, 12.6)	8,843	(10.3)	0.4	(0.1, 1.5)
Native Hawaiian or Other Pacific Islander-NH	8	(3.3)	(0.4, 11.6)	1,195	(1.4)	3.9	(0.8,13.0)
Black-NH	20	(8.3)	(0.3, 36.4)	4,151	(4.8)	2.0	(1.1, 3.7)
White-NH	51	(21.3)	(5.8, 46.9)	49,513	(57.6)	0.6	(0.3, 1.1)
Multiracial/Other[d]	5	(2.1)	(0.04, 11.8)	3,772	(4.4)	1.3	(0.4, 3.1)
Unknown	14	(5.8)	(1.1, 17.0)	1,356	(1.6)	5.9	(2.4, 13.3)

Abbreviations: NH - Non-Hispanic

[a] Estimated with clustering by ACH region
[b] 2018 data from the Washington Department of Health's Birth Data Dashboard tool (Birth Certificate Data, 2000-2018, Community Health Assessment Tool).[19]
[c] Prevalence ratios and 95%CI were ACH-weighted.

[d] For the Washington State COVID-19 in Pregnancy Collaborative, data were abstracted from the medical records. The "other" category reflects the patient's self-reported designation of their race/ethnicity to the health care provider. The Washington State Department of Health data does not include an "other" category.