

# Travel During Pregnancy: Results From an Ultrasound Unit-Based Questionnaire

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## ABSTRACT

**Background:** The frequency of domestic and international travel among women residing in the United States, and specifically Wisconsin, during pregnancy is not known. Given the recent epidemic of Zika virus disease, clinicians should be aware of the frequency of travel during pregnancy and should inquire about travel by pregnant women, women of reproductive age, and their sexual partners.

**Methods:** Due to the Zika epidemic, our obstetric ultrasound center added questions about international and domestic travel to a general health form that is routinely distributed to all patients presenting for anatomic ultrasounds. The forms were then collected and recorded in order to provide an estimate of the frequency of travel during the first half of pregnancy.

**Results:** Of 1,256 women screened, 64 (5.1%) traveled internationally and 498 (39.6%) traveled domestically prior to their anatomic ultrasound. Additionally, 77 (6.1%) women screened reported international travel by their sexual partner. Among international travelers, 20 (28.1%) traveled to destinations with active ongoing transmission of Zika virus disease, and 16 (25%) traveled after the Centers for Disease Control and Prevention (CDC) issued a travel alert for the area. Among domestic travelers, Florida was the sixth most common destination, and Texas was the 10th most common.

**Conclusions:** In the population of women screened by this questionnaire, 5.1% traveled internationally and 39.6% traveled domestically prior to their anatomic ultrasound. Notably, Florida and Texas are common travel destinations among women at this clinic, and both have had active local transmission of Zika virus.

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## INTRODUCTION

The Zika virus is an emerging mosquito-borne arbovirus that recently has migrated to the Americas. There are now at least 50 countries affected, including parts of the United States.<sup>1,2</sup> Zika also can be transmitted sexually and vertically.<sup>3-5</sup> While asymptomatic in the majority of the population, it can cause profound congenital anomalies including severe neurodevelopmental anomalies, most notoriously microcephaly.<sup>6-9</sup> This proclivity, combined with ongoing transmission in Central and South America, among other destinations, places an unprecedented number of pregnancies at risk. Because the genus of mosquito that transmits Zika is not found in Wisconsin, active transmission here does not seem probable at this time, but at the time of this writing, 67 travel-related cases have been reported.<sup>10,11</sup> It is also notable that 1,776 travelers have been tested in Wisconsin.<sup>11</sup> Testing is limited to travelers who are either pregnant or who exhibit symptoms of Zika virus disease, so this testing does not encompass all potentially exposed individuals.

In 2014, 68.2 million US citizens traveled internationally—a notable increase from 28.5 million in 2010.<sup>12,13</sup> Travel during pregnancy also is thought to be increasing in frequency, but the actual frequency of domestic or international travel among women residing in the United States during pregnancy is not known.<sup>14-19</sup> Clinicians who provide care to obstetric patients or their sexual partners need to be aware of any travel so that appropriate counseling may be offered. Notably, the recent Zika epidemic has transformed previously low-risk travel destinations, such as Miami, into high risk travel destinations.<sup>1</sup>

**Table 1.** Self-reported Traveler Demographics

Demographics	International n=64	Domestic Travelers n=498	All Travelers n=517
Advanced maternal age (n, %)	20 (31.3%)	164 (32.9%)	170 (32.9%)
Body mass index (mean, SD)	26.3 (4.3)	27.8 (6.2)	27.8 (6.2)
Diabetes (n, %)	1 (1.6%)	18 (3.6%)	19 (3.7%)
Cardiovascular disease (n, %)	2 (3.1%)	12 (2.4%)	12 (2.3%)
Tobacco, alcohol, drug, or radiation exposure (n, %)	1 (1.6%)	35 (7.0%)	36 (7.0)
Infectious disease, any (n, %)	1 (1.6%)	17 (3.4%)	17 (3.3%)
Multifetal gestation	0 (0.0)	16 (3.2%)	16 (3.1)
Assisted reproductive technology (n, %)	4 (6.3%)	44 (8.8%)	45 (8.7%)

Clinicians also should be aware that the Centers for Disease Control and Prevention (CDC) currently recommends that pregnant women avoid travel to areas with Zika.<sup>3</sup> Similarly, it recommends that if the sexual partner of a pregnant woman has traveled to an affected area, that the couple either abstain from intercourse or correctly and consistently use a condom for the remainder of the pregnancy.<sup>4</sup> The CDC suggests screening pregnant women at every prenatal visit for possible Zika virus exposure (ie, asking about travel history for the patient and her partner[s]).<sup>20</sup> It is also important to note that the map of affected areas is constantly changing, so both clinicians and pregnant travelers should periodically check updates, available online at <http://www.cdc.gov/zika/geo/index.html>.<sup>1</sup>

The purpose of this study is to describe current trends in travel during the first half of pregnancy among obstetric patients presenting for their anatomic ultrasound at a center for perinatal care. While there are no US data on international travel during pregnancy, studies in France and England found that 22% to 58% of women travel abroad.<sup>21,22</sup> Since the geographic composition of the United States differs from Europe, we estimated that fewer women would travel abroad from the United States than Europe, but that the rates of interstate travel may be similar to the rates of international travel in Europe. We were also mindful that our data collection method captured only the first half of pregnancy, thus would underestimate travel that occurred during pregnancy overall. Our hypothesis, therefore, was that both domestic and international travel were common, occurring among at least 30% and 10% of the population, respectively.

## METHODS

This study was approved by the Meriter Hospital Internal Review Board (Meriter IRB# 2016-007). All patients who present to the Meriter Center for Perinatal Care for a fetal anatomic ultrasound evaluation (CPT code 76805 or 76811) complete a general health form inquiring about comorbid conditions and pregnancy exposures. As per our unit protocol, these fetal ultrasound evaluations are performed between 19 and 22 weeks of gestation. This health

form supplements the history available from either the electronic medical record or faxed referral forms. Considering the recent Zika epidemic, questions regarding international travel by the pregnant woman or her sexual partner(s) were added to this form in February 2016, and questions about domestic travel outside the state of Wisconsin were added in May 2016. The purpose of adding questions about domestic travel was to proactively ensure that such travel was queried due to the potential for active transmission of the Zika virus in the southern United States.

The questions simply query who traveled, the travel destination(s), and when travel occurred. The questions specifically queried travel during pregnancy itself. Travel prior to pregnancy was assessed separately and was not recorded for the purposes of this study. However, data on how many such travelers required counseling for potential Zika exposure were recorded for clinical purposes. Once completed, clinicians utilize data from these forms to ensure that the appropriate level of anatomy scan is performed and that appropriate counseling and testing is offered.

For this study, forms from all travelers were collected and recorded from May 6, 2016 through September 30, 2016. Data regarding the answers to questions about medical comorbidities and travel history were extracted from these forms and entered into a database. In July 2016, active transmission of Zika was identified in Dade County, Florida with a statement that transmission may have occurred as early as June 15, 2016.<sup>23</sup> The presence of this database also allowed us to retrospectively review the timing of travel to identify women potentially at risk of Zika who were seen for ultrasound before this warning was issued.

Statistical analysis was performed using SPSS version 23.0 (SPSS Incorporated, IBM Corp, Armonk, NY) and Excel 2013 (Microsoft Office 2013, Microsoft Corporation, Redmond, WA).

## RESULTS

Between May 6, 2016 and September 30, 2016, 1256 patients presented to the Meriter Center for Perinatal Care for a fetal anatomic ultrasound evaluation (CPT code 76805 or 76811). Of these women, 64 (5.1%) reported a history of international travel, 498 (39.6%) reported a history of domestic travel; and 45 (3.6%) reported a history of both types of travel. Thus 517 (41.2%) women presenting for anatomic ultrasound had traveled prior to their appointment. In addition, 77 (6.1%) reported international travel and 408 (32.5%) reported domestic travel by their sexual partner(s).

In our ultrasound unit overall, 73% of the patients are white, 7.5% are African American, 6.9% are Asian, 1.8% are Hispanic, 2.4% are multiracial, and the remaining patients decline to report. Overall, 28.7% of women have advanced maternal age and the

average body mass index (BMI) is 28.2 kg/m<sup>2</sup>. Self-reported demographics of travelers is shown in Table 1. Among all reported travelers, 32.9% had advanced maternal age and the average BMI was 27.8 kg/m<sup>2</sup>. Rates of self-reported diabetes and cardiovascular disease were 3.7% and 2.3%, respectively. Overall, 8.7% of travelers underwent assisted reproductive technologies. No international travelers had multifetal pregnancies whereas 3.2% of domestic travelers did.

Among international travelers, 18 (28%) traveled to destinations with active ongoing Zika transmission. Fourteen (21.9%) traveled after the CDC issued a level 2 travel advisory for people traveling to regions and countries where Zika virus transmission is ongoing.<sup>1,24</sup>

Among domestic travelers, Figure 1 shows the frequency of travel destination by state. The 10 most frequently listed states are shown in Table 2. Of these 10 states, California, Florida, and Texas have reported the presence of *Aedes aegypti* in recent years.<sup>10</sup> Both Florida and Texas, the 6th and 10th most frequently visited states, respectively, have had active Zika virus transmission. Overall, 11.6% of domestic travelers visited these states. The majority of travel occurred prior to the time of active transmission of Zika virus, but 11 travelers to Florida traveled during the time of active transmission. Two women specified that they traveled to Miami and three indicated that they traveled to cities outside of Dade County, which was the specific county with active Zika virus transmission.<sup>23</sup> The remaining 6 women who traveled during the time of concern were either queried during their ultrasound visit or called to clarify the exact areas visited. Five had traveled to Miami and therefore had additional testing offered, as recommended. Of note, during the data collection period, there was not active Zika virus transmission in Texas; therefore no patients traveled during the time of active transmission in this dataset.

During the time of data collection, 30 women were tested for Zika; 12 of these women were tested due to travel that exclusively occurred prior to pregnancy.

## DISCUSSION

This study demonstrates that in the population of women obtaining anatomic ultrasounds in our ultrasound clinic, 5.1% traveled internationally and 39.6% traveled domestically prior to their ultrasound. During 2016, 28% of the international travelers and 11.6% of domestic travelers traveled to destinations with active ongoing transmission of Zika virus disease, although that risk was not necessarily known or present at the time of travel. Nevertheless, travelers continued to visit such areas: 21.9% of international travelers visited destinations with active Zika virus transmission after the travel warning.

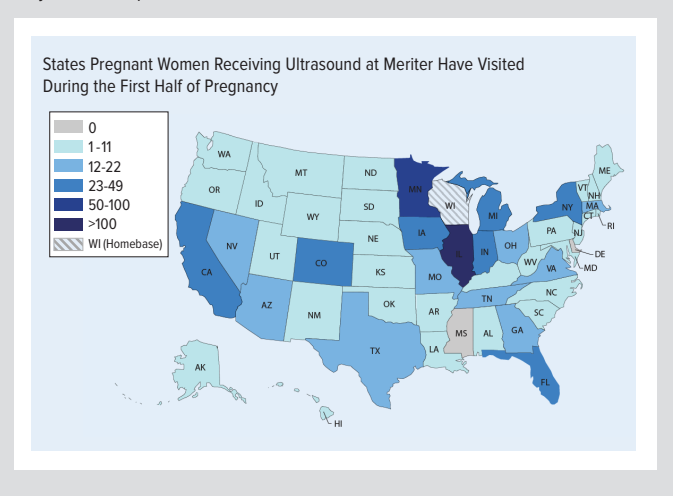
There are no prior studies investigating the frequency of international travel during pregnancy performed in the United States. However, retrospective travel clinic studies suggest that when pregnant women travel, their destinations are similar to destinations

**Table 2.** The Top 10 Most Frequently Visited States Among Pregnant Women Obtaining Anatomic Ultrasounds at the Study Site

State	Number of Travelers N= 1256
Illinois	179
Minnesota	71
California	43
Iowa	42
Michigan	41
Florida*	38
New York	30
Colorado	27
Indiana	24
Texas*	20

\*Indicates states that have had active vector-borne transmission of Zika virus.

**Figure 1.** Number of Women Who Traveled to Each of the 50 States, May 2016 to September 2016



of nonpregnant travelers, including travel to areas with endemic infectious diseases.<sup>13,16,17</sup> These findings are similar to ours, demonstrating that travelers visit destinations with known pregnancy risks.

In 2016, the CDC recommended that clinicians who care for pregnant women inquire about travel to areas with ongoing Zika transmission at every prenatal visit.<sup>20</sup> Here, we demonstrate that by adding 2 questions to an existing health form, we were able to identify women at risk of Zika. Additionally, by maintaining a database of travelers, we were able to retrospectively identify 5 women at risk of Zika after active Zika virus transmission was identified domestically. Strengths of this study include our ability to effectively screen patients presenting to our clinic for travel prior to their ultrasound appointment.

This study has notable limitations. By nature of the timing of the fetal anatomic evaluation, which, per unit protocol occurs at 19 to 22 weeks of pregnancy, this history form only captures travel

that occurs during the first half of pregnancy. Thus, all travel that occurred after the fetal anatomic ultrasound is missed by this study, which results in an underestimation of travel frequency. Second, travel history is self-reported onto a form that patients may only partially complete. For example, 11.7% of travelers did not complete the height and weight section of the form, which implies that other portions of the form may be similarly incomplete. Travelers who do not understand the rationale for asking about travel may be less inclined to answer these questions completely, therefore some travelers may have been missed. Additionally, travelers who completed Zika screening prior to their ultrasound may not have fully completed this form because they knew they had already been tested. They also may have not fully completed the form due to concerns about judgment from clinical staff. Because our clinic is staffed by maternal-fetal medicine specialists, our ultrasound unit sees a high proportion of patients with maternal comorbidities or fetal concerns. Given the higher medical risk of our clinic population, patients may be less inclined to travel than in a general obstetric population, which would result in an underestimation of travel. Because we did not record information from the health forms of patients who did not travel, we were not able to perform statistics to describe any clinical characteristics of travelers versus non-travelers. The frequency of travel also may be overestimated here, due to referrals for the indication of maternal Zika exposure. Finally, the health form, due to its brevity, did not capture information about mode of transportation (air vs ground), the reasons for travel (work, family, or leisure), or any other travel-related details. We also did not previously request information on the specific cities or regions visited within a state. However, as travel warnings specify cities and counties, we have subsequently modified our form to request more specific information about domestic travel.

Travel during pregnancy is reported to be increasingly common.<sup>14-19</sup> Obstetric clinicians, therefore, should ask pregnant women about whether travel is planned during pregnancy, and should also be prepared to discuss basic travel considerations or refer to a travel clinic.<sup>19,25</sup> Obstetric clinicians also should ask whether travel has already occurred so that relevant post-travel testing may be offered for infectious diseases such as Zika virus.<sup>20</sup> Finally, counseling regarding recommendations on the timing of pregnancy after travel should be discussed with both men and nonpregnant women during routine care, such as physical examinations or well woman examinations.

This study sought to describe current trends in travel by pregnant women who receive their ultrasound examinations at a perinatal care center in Madison, Wisconsin, which is a medium-sized city in the Midwest. Travel patterns in the United States may vary widely between coastal cities and rural areas. While the majority of patients in this population did not travel internationally prior to their anatomic ultrasound, a significant proportion of those who did travel internationally visited areas with ongoing Zika

transmission, which poses pregnancy risks. Additionally, among women who traveled domestically, two of the top 10 travel destinations have had active Zika virus transmission in the past year. Ideally, future studies should focus on capturing data from the duration of pregnancy and ascertain additional details about the timing of travel, reason for travel, and whether any pretravel discussion occurred between the obstetric patient and her provider.

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