

Travel During Pregnancy: A Study of Postpartum Women in Madison, Wisconsin

Lauren Melidosian, BS; Elizabeth Evans, BS; Katharina Stewart, MD; Kathleen M. Antony, MD, MSCI

ABSTRACT

Problem Considered: While travel during pregnancy is increasingly common, both the act of traveling and the destination itself may pose risks to pregnant women. Thus, it is relevant to ask pregnant women about travel for individual care and to assess how often pregnant women travel. Based upon our prior study, we hypothesized that domestic travel would be common, with approximately 30% of pregnant women traveling, and that international travel also would be common, with approximately 5% of the population traveling. We also hypothesized that maternal characteristics, such as socioeconomic status, country of birth, and parity, would affect domestic and international travel during pregnancy.

Methods: In order to study trends in travel by pregnant women, a survey was conducted among postpartum women at Meriter Hospital in Madison, Wisconsin, between October 17, 2016 and March 21, 2017.

Results: Of the 61 postpartum women surveyed, 75.4% had traveled domestically and 11.4% had traveled internationally while pregnant. Those who traveled domestically had a significantly higher level of education ($P=0.025$) and higher annual income ($P=0.001$) compared to women who did not travel domestically. There were no differences in these characteristics between those who did and did not travel internationally. Women traveling domestically were less likely to discuss their travel plans with their obstetrician when compared to women traveling internationally (67.4% v 85.7%, respectively). Out of 19 canceled trips, both domestic and international, 4 women opted to cancel their trips due to concerns about Zika virus (21.1%).

Conclusions: This study allowed for an in-depth look at pregnant travelers and their reasons for traveling and for canceling their trips. When travel plans were discussed, in most instances (94.6%), the obstetrician initiated the conversation. As pregnant women travel both domestically and internationally at increasing rates, it is important to discuss risks associated with travel.

• • •

Author Affiliations: Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Wisconsin-Madison, Madison, Wis (Melidosian, Evans, Stewart, Antony).

Corresponding Author: Kathleen M. Antony, MD, MSCI, Assistant Professor, Department of Obstetrics and Gynecology, Division of Maternal-Fetal Medicine, University of Wisconsin-Madison, 1010 Mound St, 4th Floor, Madison, WI 53715-1599; phone 608.417.6099; email kantony@wisc.edu.

INTRODUCTION

As travel during pregnancy becomes more and more common, it is imperative to address concerns regarding both the mother and the fetus, as being away from a maternity care provider for any amount of time can be dangerous, especially if complications arise during travel.¹⁻⁸ The safest time for pregnant women to travel is during the second trimester, because women in their first and third trimesters tend to experience more complications.^{4,5} Historically, concerns for air travel included noise, turbulence, cosmic radiation, low oxygen saturation, venous thromboembolism, infectious diseases related to air travel, and delivery en route.^{5,9} Fortunately, these risks are relatively low as long as the mother has no comorbid medical conditions.⁴ Regardless, some pregnant women may choose car travel to allow for more flexibility, but this mode of transportation is also not risk-free.

Historical data demonstrate that most pregnant travelers remain within the United States; however, some travel internationally, potentially exposing these women to infectious diseases.^{5,10} Exposure

to Zika virus and malaria while pregnant pose real threats for the fetus, and malaria can have serious effects on both the mother and fetus.^{5,11,12} Malaria can cause preterm delivery, low birth weight, congenital infection, spontaneous abortion, stillbirth, and even maternal death.^{5,11} Pregnant women are more likely than non-pregnant women to contract malaria.^{5,11} Zika virus also has been shown to cause adverse pregnancy outcomes. The most common effects are microcephaly and other brain abnormalities.^{5,12} Parts

of the United States have been affected by Zika virus in the past; however, there were no documented cases of local mosquito-borne transmission of Zika virus in the United States in 2018 or 2019 (to date).¹³

In this study, we sought to estimate the prevalence of travel during pregnancy in the population of women delivering at our health system in Madison, Wisconsin, by surveying recently postpartum women about domestic and international travel during their pregnancy. Our secondary purpose was to provide insight regarding whether travel and its risks and benefits were discussed with the obstetric providers. Based upon our prior study querying women at approximately 18 to 22 weeks gestation, we hypothesized that domestic and international travel would be common, occurring in approximately 30% and 5% of the study population, respectively. We also hypothesized that maternal characteristics, such as socioeconomic status, country of birth, and parity, would affect domestic and international travel during pregnancy.

METHODS

This study was approved by the UnityPoint Health-Meriter Hospital Institutional Review Board (Meriter IRB# 2016-005). All pregnant women who presented to the UnityPoint-Health birthing center for likely delivery were asked whether they gave permission to be approached about obstetric research projects (in general) during their hospital stay. Those who agreed were approached regarding participation in this study by a research coordinator during their stay on the postpartum unit. The study coordinator discussed the specific purpose, as well as the risks and benefits of the study. Ample time was provided for the woman to decide whether she wanted to participate. After she chose to participate, verbal consent was obtained.

The questionnaire was administered in the participant's hospital room by study personnel who asked the questions aloud and marked answers on paper. It took approximately 5 to 15 minutes to complete. No data were collected from the participants' medical records, and no personal health information was collected on the forms. All maternal characteristics and demographic factors presented here were self-reported by the participant.

Women were approached regarding completion of this questionnaire between October 17, 2016 and March 21, 2017. For the purpose of this study, domestic travel was defined as a distance exceeding 60 miles. International travel was defined as travel to another country or travel outside of the contiguous United States, thus travel to Alaska, Hawaii, and United States territories was included within the definition of international travel.

Descriptive statistics were calculated; chi-square, Fisher exact, and Student *t* tests were performed where appropriate. All data were entered into Excel (Microsoft Excel, 2013, Redmond, Washington), and all statistical analyses were performed using SPSS 25.0 (IBM Corporation. Released 2017. IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp).

Table 1. Demographic Characteristics of Gravidae Who Traveled Domestically Compared to Those Who Did Not Travel Domestically

Demographic ^a	No Domestic Travel n=15	Domestic Travel n=46	P-value
Age (mean, SD)	29.5 (6.8)	32.2 (4.6)	0.09
Advanced maternal age (n,%)	5 (33.3)	12 (26.1)	0.74
Race			
White/Caucasian	11 (73.3)	40 (87.0)	0.26
African American	3 (20.0)	2 (4.3)	
American Indian or Alaskan Native	0 (0.0)	1 (2.2)	
Asian	1 (6.7)	1 (2.2)	
Multiracial	0 (0.0)	2 (4.3)	
Hispanic or Latina	0 (0.0)	1 (2.2)	0.75
Parity (Mean, SD)	1.9 (1.0)	1.6 (0.8)	0.28
Tobacco use (n,%)	2 (13.3)	1 (2.2)	0.15
Medical problems (n,%)			
Diabetes	0 (0)	4 (8.7)	0.56
Hypertensive disorder of pregnancy	2 (13.3)	9 (19.6)	0.72
Thyroid disease	3 (20.0)	5 (10.9)	0.39
Asthma	0 (0.0)	2 (4.3)	1.00
Seizures	2 (13.3)	1 (2.2)	0.15
Other	0 (0.0)	2 (4.3)	0.57
Medical complications of pregnancy (n,%)			
Prior preterm birth	4 (26.7)	5 (10.9)	0.14
Preterm birth in index pregnancy			
Miscarriage	5 (33.3)	17 (37.0)	0.53
Venous thromboembolism	0 (0.0)	1 (2.2)	0.75
Twins	0 (0.0)	3 (6.5)	0.42
Residence ^b			
Urban	3 (20.0)	13 (28.3)	0.14
Suburban	5 (33.3)	23 (50.0)	
Rural	6 (40.0)	10 (21.7)	
Marital status			
Currently married or living with partner	13 (86.7)	43 (93.5)	0.36
Currently widowed, divorced, separated, or never married/ not living with partner	2 (13.3)	3 (6.5)	
Highest educational level			
High school/less than high school	2 (13.3)	0 (0.0)	0.025
Some or completed college	10 (66.7)	28 (60.9)	
Graduate degree	3 (20.0)	18 (39.1)	
Born in the United States ^c	13 (86.7)	45 (97.8)	0.08
Parents born in the United States	13 (86.7)	46 (100)	0.06
Primary household language English	14 (93.3)	46 (100)	0.25
Annual Income			
less than \$50,000	7 (46.7)	3 (6.5)	0.001
\$50,000-149,999	5 (33.3)	29 (63.0)	
\$150,000 or more	3 (20.0)	14 (30.4)	

^a Pearson's chi-square, Fisher exact, or Student *t* tests (where appropriate).

^b One participant indicated "Other."

^c Foreign-born participants were born in South Korea, the United Kingdom, and the Philippines.

RESULTS

Sixty-six women agreed to be approached about participating in obstetric research in general between October 17, 2016 and March 21, 2017. Of those approached, 61 women agreed to participate in the study and completed the questionnaire. Reasons women refused (after initial agreement) included unexpected admission

Table 2. Demographic Characteristics of Gravidae Who Traveled Internationally (or Outside the Contiguous United States) Compared to Those Who Did Not

Demographic	No International Travel n=54	International Travel n=7	P-value
Age (mean, SD)	31.6 (5.4)	30.7 (4.3)	0.68
Advanced maternal age (n,%)	15 (27.8)	2 (28.6)	0.64
Race			
White/Caucasian	45 (83.3)	6 (85.7)	0.41
African American	5 (9.3)	0 (0.0)	
American Indian or Alaskan Native	1 (1.9)	0 (0.0)	
Asian	1 (1.9)	1 (14.3)	
Multiracial	2 (3.7)	0 (0.0)	
Hispanic or Latina	1 (1.9)	0 (0.0)	0.89
Parity (Mean, SD)	1.7 (0.9)	1.3 (0.5)	0.24
Tobacco use (n,%)	3 (5.6)	0 (0.0)	0.69
Medical problems (n,%)			
Diabetes	4 (7.4)	0 (0.0)	0.61
Hypertensive disorder of pregnancy	9 (16.7)	2 (28.6)	0.37
Thyroid disease	8 (14.8)	0 (0.0)	0.35
Asthma	2 (3.7)	0 (0.0)	0.78
Seizures	3 (5.6)	0 (0.0)	0.69
Other	1 (1.9)	1 (14.3)	0.22
Medical complications of pregnancy (n,%)			
Prior preterm birth	9 (16.7)	0 (0.0)	0.31
Preterm birth in index pregnancy	5 (9.3)	0 (0.0)	0.53
Prior miscarriage	21 (38.9)	1 (14.3)	0.20
Venous thromboembolism	1 (1.9)	0 (0.0)	0.89
Twins	3 (5.6)	0 (0.0)	0.69
Residence ^a			
Urban	15 (27.8)	1 (14.3)	0.55
Suburban	23 (42.6)	5 (71.4)	
Rural	15 (27.8)	0 (0.0)	
Marital status			
Currently married or living with partner	49 (90.7)	7 (100.0)	0.53
Currently widowed, divorced, separated, or never married/ not living with partner	5 (9.3)	0 (0.0)	
Highest educational level			
High school/less than high school	2 (3.7)	0 (0.0)	0.38
Some or completed college	35 (64.8)	3 (42.9)	
Graduate degree	17 (31.5)	4 (57.1)	
Born in the United States	52 (96.3)	6 (85.7)	0.31
Parents born in the United States	52 (96.3)	7 (100.0)	0.78
Primary household language English	53 (98.1)	7 (100.0)	0.89
Annual Income			
Less than \$50,000	10 (18.5)	0 (0.0)	0.14
\$50,000-149,999	31 (57.4)	3 (42.9)	
\$150,000 or more	13 (24.1)	4 (57.1)	

^aOne participant indicated "Other."

to the neonatal intensive care unit, loss of interest in participating, and visitors in the postpartum room at the time of approach. Maternal characteristics for domestic and international travelers compared to nontravelers are shown in Tables 1 and 2. The age range of participants was 19 to 45, with the average age being 31.8 years. All participants self-identified as female.

Of the 61 participants, 46 traveled domestically (75.4%) and

7 traveled internationally (11.5%) during their pregnancy. Seven (11.5%) participants traveled both domestically and internationally; 9 (14.8%) participants did not travel domestically or internationally. In order to illustrate where participants traveled domestically, a map of the United States was created (Figure 1). Women who traveled domestically had a higher education level ($P=0.025$) and a higher annual income ($P=0.001$) compared to women who did not travel domestically. Domestic trips were due to family (78.8%), leisure/vacation (76.9%), work (36.5%), family emergency or unplanned travel (9.6%), and pregnancy or medical reasons (1.9%). International travel was for leisure/vacation (85.7%) and for work (14.3%) (Table 3). Of those who traveled domestically, 8 (13.1%) traveled to Florida and 3 (4.9%) traveled to Texas; both states had active transmission of Zika virus during this time period.¹³ Of those who traveled internationally, no one in this sample traveled to areas with active transmission of Zika virus.

Of the 19 canceled trips, 14 (73.7%) were domestic trips and 5 (26.3%) were international trips. Of the 14 canceled domestic trips, the majority were related to advanced gestational age and 2 were canceled due to Zika virus concerns (14.3%). Ten domestic trips were cancelled by women who ultimately did not travel at all domestically. Had these women traveled, then 56 (91.8%) of women sampled would have traveled domestically. Of the 5 canceled international trips, 3 were canceled due to concerns about venous thromboembolism (VTE) (60.0%) and 2 were canceled due to concerns about Zika virus (40.0%). Zika virus was considered a concern for 58.1% of domestic travelers and 66.7% of international travelers. Three international trips were cancelled by women who ultimately did not travel at all internationally. Had these women traveled, then 10 (16.4%) of women sampled would have traveled internationally.

Domestic travelers discussed their travel plans with their obstetric provider less frequently than international travelers (67.4%; 85.7%) (Table 4). Obstetric providers initiated the conversation and asked about travel 93.5% of the time for domestic travelers and 100.0% of the time for international travelers. Advice offered by providers for women traveling both domestically and internationally included frequent ambulation (74.2%, 100%), hydration (77.4%, 100%), steps to avoid food- and water-borne illnesses (19.4%, 33.3%), and steps to avoid mosquito-borne illnesses (38.7%, 33.3%).

The longest number of consecutive hours traveled by ground transport during pregnancy was 16 hours for domestic travelers (mean 5.0 hours, range 1-16 hours) and 8 hours for international travelers (mean 3.3 hours, range 1-16 hours). The longest number of consecutive hours traveled by air transport during pregnancy was 8 hours for domestic travelers (mean 3.7 hours, range 2-8 hours) and 15 hours for international travelers (mean 3.0 hours, range 2-8 hours).

DISCUSSION

This study demonstrates that in the sample population of women delivering at our health care institution, 11.5% traveled internationally and 75.4% traveled domestically. Of those who traveled internationally, no one in this sample traveled to areas with active transmission of Zika virus. However, 40% of cancelled international trips were due to concerns regarding active transmission of Zika virus.

Conducting this survey allowed for an in-depth look at the travel experience for pregnant women. Our finding that more women traveled domestically than internationally is consistent with the literature.^{5,10} Education level and annual income reflected the ability for women to travel domestically; a higher education level is typically correlated with a higher income level, and more income allows for more travel.¹⁴ We speculate that if our sample size had been larger, it is likely that similar differences would have been observed for international travel as well.

The purpose of travel among gravidae in our study differed slightly from the findings in the literature, which note more international travel to visit friends and relatives.^{5,6,15} This study also showed that pregnant women traveled more frequently than expected. We hypothesized that 30% of the population would travel domestically, while our survey found that 75.4% of pregnant women travel domestically. This may be based upon differing definitions of “domestic travel.” In our prior study, we defined travel outside the state of Wisconsin as “domestic” travel, whereas in this study we counted travel within the state if it exceeded 60 miles.¹⁰ The difference is slightly smaller for international travel; about 5% of the population in our prior study travelled internationally, and this survey revealed that 11.4% of pregnant women traveled internationally.¹⁰ We also found that no women in this population travelled to areas with active transmission of Zika virus, which is lower than in our prior ultrasound-unit based study.¹⁰ Our prior study was performed at our tertiary care clinic, thus may have disproportionately represented women who had traveled to areas with active transmission of Zika virus, particularly if they were referred due to concerns about this exposure.¹⁰ The survey used in the current study also covers a larger range of travel-related topics than the prior study.

In order to determine and discuss relevant risks for pregnant women, it is critical to discuss travel plans during pregnancy. We identified that domestic travelers were less likely to discuss their travel plans with their provider than international travelers; international travel poses more risks, such as disease transmission or VTE. In most cases, the provider initiated the conversation,

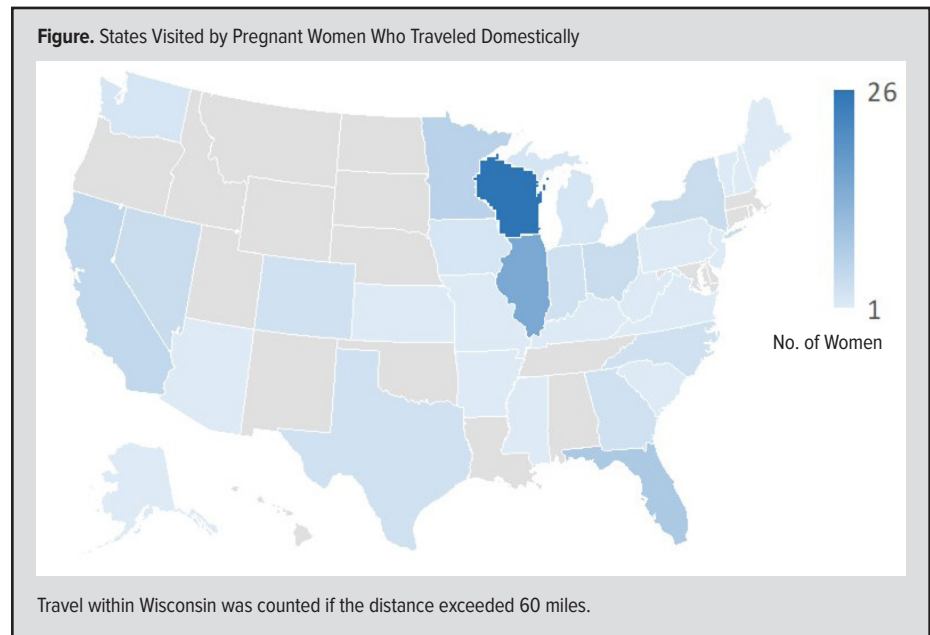


Table 3. Cited Reasons for Domestic and International Travel (or Travel Outside the Contiguous United States)

Reason	Domestic Travel (N=52) n (%)	International Travel (N=7) n (%)
Work	19 (36.5)	1 (14.3)
Leisure/vacation	40 (76.9)	6 (85.7)
Family	41 (78.8)	0 (0.0)
Pregnancy or medical	1 (1.9)	0 (0.0)
Family emergency or unplanned travel	5 (9.6)	0 (0.0)

which is important because women may not be aware of the risks and benefits of traveling while pregnant. Participants reported that their providers were generally supportive of domestic and international travel plans (77.4%, 83.3%).

A very small number of participants decided to cancel their travel plans; most canceled trips were domestic. Of the canceled trips, 21.1% were canceled due to concerns about Zika virus. While Zika virus was a concern for 58.1% of domestic travelers at the time of data collection, there have been no documented cases of mosquito-borne transmission of Zika virus in the United States in 2018 or 2019 to date.¹³ It is hopeful this trend will continue. Regarding Zika virus internationally, active transmission also has decreased.¹⁶ None of the participants were concerned about malaria, which is consistent with their travel destinations. The number of cancelled trips and the reasons for cancelling suggest that appropriate discussions about travel generally occurred.

Strengths of this study include the focused nature of the questionnaire, which allowed for in-depth queries regarding the travel destinations and reasons for travel, as well as for the analysis of cancelled domestic and international trips in order to assess the

Table 4. Details of Discussions With Obstetric Provider for Women Who Traveled Internationally or Domestically

Discussion Items	Domestic Travelers N=46 n (%)	International Travelers N=7 n (%)
Participant discussed travel plans with obstetric provider	31 (67.4)	6 (85.7)
Obstetric provider initiated the conversation and asked about travel ^a	29 (93.5)	6 (100.0)
Obstetric provider's recommendations about travel ^a		
Generally supportive of travel plans ^a	24 (77.4)	5 (83.3)
Discouraged travel ^a	2 (6.5)	0 (0.0)
Discussed risks and benefits, left decision to pregnant woman ^a	5 (16.1)	1 (16.7)
Obstetric provider discussed risks and benefits of travel	22 (71.0)	6 (100.0)
Risks of blood clots related to immobility ^b	14 (63.6)	6 (100.0)
Risk of food or water borne-illness ^b	1 (4.5)	1 (16.7)
Risk of other illnesses ^b	4 (18.2)	1 (16.7)
Other	3 (13.6)	0 (0.0)
No risks discussed	8 (36.4)	0 (0.0)
Obstetric provider recommended the following		
Frequent ambulation ^a	23 (74.2)	6 (100.0)
Hydrating ^a	24 (77.4)	6 (100.0)
Steps to avoid food and water borne illnesses ^{a,c}	6 (19.4)	2 (33.3)
Steps to avoid mosquito borne illnesses ^{a,c}	12 (38.7)	2 (33.3)
Obstetric provider reviewed the following		
Signs of blood clots ^a	16 (51.6)	5 (83.3)
Symptoms of travel related illnesses ^a	9 (29)	3 (50.0)
Whether Zika was a concern ^{a,c}	18 (58.1)	4 (66.7)

^an (%) for participants who discussed travel plans with their provider.

^bn (%) for participants whose providers discussed risks.

^cFood-borne, waterborne, and mosquito-borne illnesses were not concerns for most destinations.

strable risks include the risk of VTE, but also the possibility of disease transmission or motor vehicular collisions once at the destination.

The obstetric provider should be aware of domestic and international incidence rates of both Zika virus and malaria, as well as other diseases that can impact pregnancy, such as Listeria, Yellow Fever, and traveler's diarrhea, and educate the gravida accordingly.⁵ Despite the decreased rate of Zika transmission globally, it remains important for gravidae to discuss all travel plans with obstetric providers prior to the scheduled trip, particularly if certain precautions (such as immunizations or prophylactic medications) must be taken.⁵ Obstetric providers should continue to inquire about travel plans, as we found that most conversations about travel were, indeed, initiated by the provider.

Acknowledgements: Data from this paper were presented as a poster presentation at the Wisconsin Association for Perinatal Care (WAPC) 2019 Annual Conference, Abstract #11, Oshkosh, Wisconsin, April 7-9, 2019.

impact of Zika virus disease on travel patterns near the time of its epidemiologic peak impact.¹⁷

Limitations of this study include the low overall capture rate of pregnancies occurring during this time period, which limits the generalizability of our findings. We only approached women who had signed a permission-to-contact form regarding obstetric research in general; very few women signed the form. Since the completion of this study, our unit has changed its approach to requesting permission regarding individual studies. It may be possible that if women were asked about participating in a questionnaire (versus research in general), more would have agreed to participate, but this cannot be assessed. Generalizability of our findings is also limited by this low sample size and inclusion of women delivering at a single center in a relatively wealthy, small city. Representation of racial and ethnic minorities was low, as was representation of non-native English speakers or those born outside the United States. Finally, all women were queried about travel at the end of their pregnancy, thus our findings may be subject to recall bias.

CONCLUSION

It can be deduced that among sampled participants delivering at our institution, pregnancy is not a significant limiting factor when planning travel. We have observed a very limited effect of travel on pregnancy and birth outcomes.¹⁰ For international travel, demon-

Funding/Support: None declared.

Financial Disclosures: None declared.

REFERENCES

- Kingman CE, Economides DL. Travel in pregnancy: pregnant women's experiences and knowledge of health issues. *J Travel Med.* 2003;10(6):330-333. doi:10.2310/7060.2003.9353
- Jones CA, Chan C. Bon voyage: an update on safe travel in pregnancy. *J Obstet Gynaecol Can.* 2014;36(12):1101-1106. doi:10.1016/S1701-2163(15)30389-3
- Sammour RN, Bahous R, Grupper M, et al. Pregnancy course and outcome in women traveling to developing countries. *J Travel Med.* 2012;19(5):289-293. doi:10.1111/j.1708-8305.2012.00637.x
- Hezelgrave NL, Whitty CJM, Shennan AH, Chappell LC. Advising on travel during pregnancy. *BMJ.* 2011;342:d2506. doi:10.1136/bmj.d2506
- Antony KM, Ehrental D, Evensen A, Iruretagoyena JI. Travel during pregnancy: considerations for the obstetric provider. *Obstet Gynecol Surv.* 2017;72(2):97-115. doi:10.1097/OGX.0000000000000398
- Jaeger VK, Tschudi N, Rüegg R, Hatz C, Bühler S. The elderly, the young and the pregnant traveler--a retrospective data analysis from a large Swiss travel center with a special focus on malaria prophylaxis and yellow fever vaccination. *Travel Med Infect Dis.* 2015;13(6):475-484. doi:10.1016/j.tmaid.2015.10.001
- Aubel N, Brin M, Equy V, Moreau-Gaudry A. Advising the pregnant traveler. Place of the health care professionals. *Rev Prat.* 2009;59(10 Suppl):23-28.
- Jothivijayarani A. Travel considerations during pregnancy. *Prim Care Update Ob Gyns.* 2002;9(1):36-40. doi:10.1016/s1068-607x(01)00100-7
- Cardona-Ospina JA, Salazar-Vargas CE, Barreto-Moreno JJ, Muñoz-Gaviria S, García-Sánchez T, Rodríguez-Morales AJ. Flying and pregnant?--Regulations of the main airlines in Latin America. *Travel Med Infect Dis.* 2015;13(4):335-337. doi:10.1016/j.tmaid.2015.06.014

10. Antony KM, Gupta VK, Hoppe KK, Quamme T, Feldman N, Stewart K. Travel during pregnancy: results from an ultrasound unit-based questionnaire. *WMJ*. 2017;116(5):205-209.
11. Lagerberg RE. Malaria in pregnancy: a literature review. *J Midwifery Womens Health*. 2008;53(3):209-215. doi:10.1016/j.jmwh.2008.02.012
12. Rasmussen SA, Jamieson DJ, Honein MA, Petersen LR. Zika virus and birth defects--reviewing the evidence for causality. *N Engl J Med*. 2016;374(20):1981-1987. doi:10.1056/NEJMs1604338
13. Zika virus: statistics and maps. Centers for Disease Control and Prevention website. https://www.cdc.gov/zika/reporting/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fzika%2Freporting%2Fcase-counts.html. Reviewed March 13, 2019. Accessed May 5, 2019.
14. Muller A. Education, income inequality, and mortality: a multiple regression analysis. *BMJ*. 2002;324(7328):23-25. doi:10.1136/bmj.324.7328.23
15. Hochberg NS, Barnett ED, Chen LH, et al. International travel by persons with medical comorbidities: understanding risks and providing advice. *Mayo Clin Proc*. 2013;88(11):1231-1240. doi:10.1016/j.mayocp.2013.07.018
16. Zika travel information. Centers for Disease Control and Prevention website. <https://wwwnc.cdc.gov/travel/page/zika-travel-information>. Reviewed June 28, 2019. Accessed May 5, 2019.
17. O'Reilly KM, Lowe R, Edmunds WJ, et al. Projecting the end of the Zika virus epidemic in Latin America: a modelling analysis. *BMC Med*. 2018;16(1):180. doi:10.1186/s12916-018-1158-8

advancing the art & science of medicine in the midwest

WMJ

WMJ (ISSN 1098-1861) is published through a collaboration between The Medical College of Wisconsin and The University of Wisconsin School of Medicine and Public Health. The mission of *WMJ* is to provide an opportunity to publish original research, case reports, review articles, and essays about current medical and public health issues.

© 2019 Board of Regents of the University of Wisconsin System and The Medical College of Wisconsin, Inc.

Visit www.wmjonline.org to learn more.