



# Women's Attitudes Towards Abortion in Response to the Zika and COVID-19 Outbreaks in Brazil

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## Abstract

**Introduction** Abortion attitudes are influenced by people's socioeconomic and demographic circumstances and can be volatile during times of crisis. Brazil is an interesting case for examining abortion attitudes because of its strict abortion policies, changing religious landscape, high income inequality, and extreme uncertainty generated by the back-to-back Zika and COVID-19 crises. This study seeks to assess Brazilian women's attitudes toward abortion and whether religion and income explain these attitudes in the context of novel infectious disease epidemics.

**Methods** We used data from a population-based sample of 3996 women ages 18–34 in Pernambuco, Brazil, collected during the onset of the COVID-19 pandemic (May–September 2020). We conducted paired *t*-tests and multivariate-adjusted logistic regression models with adjusted Odds Ratios (aORs) and 95% CIs to assess differences in support for abortion in the case of fetal congenital Zika syndrome (CZS), maternal Zika infection during pregnancy, and maternal COVID-19 infection during pregnancy.

**Results** Significantly more women support the right to abortion in the case of fetal CZS (50%) than in the case of maternal Zika infection (40%) and maternal COVID-19 infection (31%). Support for abortion varies by income and religion. Controlling for other demographic characteristics, high-income women have higher odds of supporting abortion in the case of fetal CZS (aOR = 1.92; 95% CI: 1.25–2.94) and maternal Zika infection (aOR = 2.07; 95% CI: 1.33–3.21) than low-income women. Evangelical women have lower odds of supporting abortion in the case of maternal Zika infection (aOR = 0.65; 95% CI: 0.45–0.93) and marginally lower odds of supporting the right to abortion in the case of maternal COVID-19 infection (aOR = 0.69; 95% CI: 0.47–1.00) than women of other religious affiliations.

**Conclusions and Policy Implications** With increasingly conservative religious groups gaining size in Brazil, we expect to see increasing abortion restrictions. However, this research finds that a sizable portion of women across all incomes and religious affiliations support abortion, particularly in the case of fetal anomalies associated with Zika.

**Keywords** Abortion attitudes · Zika · COVID-19 · Brazil · Reproductive health

## Introduction

Abortion attitudes shape public discourse and are an important indicator of a country's reproductive health policies and reproductive autonomy. Assessing abortion attitudes during times of crises is particularly important, as changes in attitudes are often accelerated during these periods (Cohen & Evans, 2018; Niswander et al., 1966; Ostrach, 2017). In addition to times of crisis, abortion attitudes

also vary according to religious affiliation and income (Adamczyk, 2008; Adamczyk et al., 2020). In general, Evangelicals and Catholics are less supportive of abortion than people affiliated with less conservative religious groups (Adamczyk, 2008; Oglan & Verona, 2011). Similarly, those with lower incomes are less supportive of abortion than those with higher incomes (Adamczyk et al., 2020). However, research also shows that people who report anti-abortion attitudes indeed do have abortions (Diniz & Medeiros, 2010; Frohwirth et al., 2018), and that even those with strongly held abortion attitudes are malleable based on contextual factors (Hans & Kimberly, 2014). Given the importance of religion, income, and structural crises on shaping abortion attitudes—what do abortion attitudes look like in a context

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simultaneously experiencing a changing religious landscape, high levels of income inequality, and back-to-back infectious disease outbreaks?

To answer this question, we turn to Brazil. Brazil is a unique setting to examine these questions because it was the epicenter of the 2015–2017 Zika epidemic and, less than 3 years later, became an epicenter of the COVID-19 pandemic (*New COVID-19 Cases Worldwide*, 2021). The country's religious landscape has also been changing dramatically in the last 3 decades, and high levels of income inequality have persisted (Brazil's Changing Religious Landscape, 2013; Morgan, 2017). We use primary data collected in Pernambuco, Brazil—the state most affected by the Zika epidemic and an epicenter of COVID-19—to analyze abortion attitudes across various Zika and COVID-19 scenarios, by religious affiliation and income, to parse out what different women in Brazil believe to be “acceptable” conditions for abortion.

## Background

### Abortion in Brazil

Brazil has one of the strictest abortion policies in the world, criminalizing abortion except in the case of rape, to save a woman's life or, as of 2012, in the case of anencephaly (Goldberg, 2012). However, during the Bolsonaro presidency from January 1, 2019, to December 31, 2022, lawmakers attempted to impose further restrictions on abortion (Zanotti, 2020). Growing support for restricting abortion access in Brazil is symptomatic of a broader conservative wave happening across the country. Brazil, a historically Catholic country, has a rapidly growing Evangelical population (22% of the population in 2010 compared to just 5% in 1970) (Brazil's Changing Religious Landscape, 2013). Evangelicals in Brazil are known for appealing to low-income groups and for promoting traditional family ideologies and conservative social ideologies, such as anti-abortion views (Zilla, 2020). Their increased representation in government (rising from just 6% in 1991 to 22% in 2010) (*Censo 2010*, 2012), coupled with the existing Catholic majority, has increased anti-abortion sentiment in the political sphere and created a more hostile abortion landscape in recent years.

Increasing income inequality and poverty levels also play an important role in shaping abortion attitudes in Brazil. The wealthiest 10% of Brazil's population accounts for 56% of the country's income (Morgan, 2017). Despite free and compulsory public education, less than half of Brazilians have completed high school (*PNAD Education 2019: More than Half of the Persons Aged 25 and over Did Not Finish High School*, 2020). Education tends to provide individuals

with knowledge, information, and more egalitarian attitudes toward women's role in society that can lead to greater acceptance of abortion (Guang-zhen & Buffalo, 2004). It is also well-documented that people with higher education have higher incomes and tend to be more supportive of abortion (Adamczyk et al., 2020). Thus, low levels of education and increasing levels of income inequality in Brazil may be associated with lower levels of support for abortion.

Despite strict abortion regulations and persistent income inequality, one in five women in Brazil has had an abortion by the age of 40, with most abortions occurring among those 24 or younger (Diniz & Medeiros, 2010). However, abortion access is highly variable across income gradients, mirroring the country's high levels of income inequality. Brazilian women with higher incomes have access to safe abortion, either through private sector doctors or by traveling to countries where abortion is legal (Diniz et al., 2012). Comparatively, women with lower incomes often self-induce abortion with herbal remedies, illegally purchase misoprostol, or undergo unsafe surgical abortions (Diniz & Medeiros, 2012; Diniz et al., 2012; Marteleto et al., 2017).

### Abortion in Brazil During Times of Infectious Disease Crises

Income disparities in abortion access for Brazilian women were particularly salient during the 2015 global outbreak of Zika, an epidemic that originated in Brazil and reached its peak in 2016 with over 250,000 reported cases in the country—most of which occurred among women (Mocelin et al., 2020). The Zika epidemic was particularly consequential for pregnant women and fetuses, as the virus can cause congenital Zika syndrome (CZS) which results in fetal brain malformation, notably microcephaly (*Zika Virus*, 2014). It is estimated that 3–15% of babies born to mothers with a confirmed Zika infection were affected with microcephaly, which is where the infant's head is underdeveloped (Oliveira et al., 2017). Women whose children have CZS abnormalities such as microcephaly have often become full-time caretakers for their child as a result of their complex health needs and frequently face economic hardship and marital tension due to the lack of necessary support received (“Brazil: Zika Epidemic Exposes Rights Problems,” 2017; Freitas et al., 2020).

Despite the potentially deleterious outcomes that Zika has on pregnant women and fetuses, the Brazilian government did not provide women with the necessary support during the outbreak. Although the government recommended that women delay or avoid pregnancy, they did not pass policies to increase contraceptive options, placing the onus of prevention on individual women (Valente, 2017). This lack of government support exacerbated socioeconomic disparities

in reproductive health outcomes (Mocelin et al., 2020; de Souza et al., 2018).

The risk of CZS led pregnant women and those planning for pregnancy to question whether it would be safe to continue a pregnancy or become pregnant during the outbreak (Diniz et al., 2017; Linde & Siqueira, 2018). This concern resulted in a 10% decline in live birth rates in Brazil between 2015 and 2016 (Marteletto et al., 2020). While this decline is likely attributed to multiple factors, such as women avoiding pregnancy during this time, this decline is also likely attributed to an increase in women obtaining abortions (Aiken et al., 2016; Wenham et al., 2021). In fact, one online international medication abortion platform reported a significant increase (up to 108% relative change between actual and expected requests) in consultations from Zika-affected countries in 2016 (Aiken et al., 2016).

Although there was a potential increase in the proportion of women who obtained abortions during the Zika outbreak (Aiken et al., 2016; Marteletto et al., 2017; Wenham et al., 2021), there was no change in abortion policy in Brazil (Wenham et al., 2021). Many activists and scholars predicted that Brazil would experience something similar to the USA during the Rubella outbreak and would legalize abortion in the case of fetal anomalies given the similarities in birth defects, lack of vaccine, and generally high levels of uncertainty (Killian, 2017). However, despite local and international women's groups advocating specifically for the right to abortion in the case of CZS (Wenham et al., 2021), abortion policy in Brazil remained unchanged.

This was the abortion landscape when, just 3 years after the Zika epidemic, Brazilians faced a new infectious disease: COVID-19. Brazil has been one of the countries most devastated by the COVID-19 pandemic. COVID-19 cases in Brazil have tended to be more deadly than in other countries, resulting in the second highest COVID-19 death toll (*Mortality Analyses*, 2022). Similar to the early stages of the Zika epidemic, the onset of COVID-19 was marked by limited and rapidly evolving scientific knowledge. Given the recency of the Zika epidemic and the severe effects of CZS, women in Brazil found it troubling that, at the start of the COVID-19 pandemic, research was unclear about COVID-19 and its effects on pregnancy (Schmid et al., 2020) and birth outcomes (Mehan et al., 2020; Yang et al., 2020). This uncertainty resulted in a large proportion of women in Brazil reporting that they wanted to delay pregnancy during the pandemic, citing health and economic consequences of COVID-19 as the primary reasons (Marteletto & Dondero, 2021).

## Study Rationale

It is important to examine abortion during times of crisis and uncertainty because such extenuating circumstances often force people to think about sensitive topics like abortion in potentially new ways. For example, during the Rubella

outbreak in the USA, it was documented that as awareness of birth defects increased, attitudes toward abortion for fetal defects became more favorable (Killian, 2017). In the case of Zika, fetal anomalies coupled with the economic toll of caretaking for a child with microcephaly may have shifted Brazilians views on abortion. In the case of COVID-19, although there are no documented fetal anomalies resulting from infection during pregnancy, there has been a lot of uncertainty and stress around adverse pregnancy outcomes, such as documented increases in maternal mortality, preterm birth, and stillbirth (Carvalho et al., 2021; Souza & Amorim, 2021). The COVID-19 pandemic has also resulted in a great deal of financial uncertainty. Many people have lost their jobs, have lost a loved one, or have lost their quality of life due to illness, impairing their ability to work. This instability may have resulted in people finding themselves in a position where they are unable to care for a child. This uncertainty may also influence people's attitudes toward abortion.

The uncertainty and disruption Brazilian women have experienced due to the back-to-back Zika and COVID-19 crises likely have profound implications on reproductive health attitudes in Brazil, particularly regarding abortion. Despite this, there has been no research assessing population-representative abortion attitudes. This study seeks to fill this gap by assessing women's attitudes toward abortion in the cases of Zika and COVID-19 and what factors—specifically religion and income—are associated with these attitudes in Pernambuco, Brazil.

## Hypotheses

Although Brazil is a religious nation with strong anti-abortion laws and public opinion, CZS (specifically microcephaly) may be seen as a justifiable reason for abortion, even for women affiliated with traditionally anti-abortion religions. We hypothesize that, despite the conservative religious wave happening in Brazil, women have flexibility in their abortion views, and that their level of flexibility depends on a combination of individual (religious affiliation and income) and structural (infectious disease crises) factors.

**Hypothesis 1:** Women will be least supportive of abortion in the scenario of maternal COVID-19 infection during pregnancy since there is no documented evidence of COVID-19 infection resulting in fetal anomaly, and most supportive of abortion in the scenario of fetal CZS.

**Hypothesis 2:** There will be less variation in support for abortion across infectious disease scenarios for Catholics and Evangelicals, compared to other religion categories, given their religion's emphasis on the sanctity of life regardless of the circumstances.

**Hypothesis 3:** Support for abortion will be highest among Atheists and lowest among Evangelicals across all infectious disease scenarios.

**Hypothesis 4:** Support for abortion will be greater among women with high incomes compared to women with lower incomes.

**Hypothesis 5:** There will be an interaction between income and religion in shaping abortion attitudes; specifically, low-income Evangelical women will have lower support for abortion across all infectious disease scenarios, whereas high-income Atheist women will have even greater support for abortion across all infectious scenarios.

## Methods

### Data

Between May and September 2020, the DeCodE project conducted 25-min phone interviews with a population-based sample of 3996 women ages 18–34 in the state of Pernambuco, Brazil. Pernambuco is a coastal state in the country's northwestern region which was severely impacted by the 2015–2017 Zika epidemic and by the COVID-19 pandemic. Pernambuco also reflects Brazil's diverse population in terms of socioeconomic status and race/ethnic variation. We focused on women ages 18–34 given the mean age at first birth in Brazil is 24 years and that few women in Brazil have births after age 34 (Lima et al., 2018). By restricting our criteria to age 34, we tried to ensure our sample was predominately capturing women to whom childbearing was still relevant.

Brazil's Census Bureau shows that 94% of women ages 18–34 in the metropolitan region of Recife, Pernambuco, own a cell phone (Access to Internet and TV, Ownership of Cell Phone for Personal Use, 2019), thus we recruited respondents using a random digit dialing technique. We used a list of randomly generated cell phone numbers from Brazil's government concession of cell phones, drawing from a sampling base of more than 19 million numbers. We used a dual frame sample design, with 70% of the sample selected through a list-assisted random-digit dialing (RDD) procedure and 30% selected at random from a commercial database. In the RDD frame, we used the available 1000 banks dedicated to cell phones in the target area code 81, as informed by the telecommunications authority in Brazil. We stratified the cell phone numbers into three strata. The first two strata contained cell phone numbers from the RDD frame and were based on region using the location of the listed phone numbers (stratum 1: metropolitan region of Recife; stratum 2: non-metropolitan region of Recife). The third stratum contained cell phone

numbers from a commercial database for those whom the 1000 banks did not have any listed number. The sample was allocated proportionately to the number of 1000 banks from each stratum. Within strata 1 and 2, the 1000 banks were selected with probabilities proportionate to the number of listed cell phones, and within stratum 3, they were selected at random. All numbers were sampled from the selected 1000 banks for a total of approximately 3,000,000 cell phone numbers. At least three attempts were made to complete an interview at every sampled cell phone number.

Interviews were conducted remotely via telephone due to the COVID-19 pandemic and recorded for supervision and quality purposes. The 25-min interviews were conducted with computer-assisted telephone interviews (CATI). We used a hybrid model of data collection in which the DeCodE team conducted data quality checks and interviewer training independently from the survey firm. The research was approved by the IRB at the University of Texas at Austin and the Brazilian National Commission for Research Ethics (Comissão Nacional de Ética em Pesquisa). The principal investigator of the study was involved in all steps of the data collection process, along with a team of researchers based in Brazil and in the USA.

Raked weights were created after the completion of data collection to adjust for unequal selection probabilities, to integrate samples, and for nonresponse and coverage adjustments. We constructed raked weights with a three-step process (Deville & Sarndal, 1992; Valliant et al., 2013). First, we assigned each respondent a weight that was the inverse probability of selection from the telephone bank (i.e., the sampling base). Second, we adjusted weights to account for nonresponse. Finally, we calibrated weights so that our sample distribution matched the population distribution of Pernambuco with respect to age, race, education, and urbanicity of the municipality of residence.

### Measures

The primary study outcomes are three binary measures of abortion attitudes. Participants were asked whether they “totally agree,” “partially agree,” “neither agree or disagree,” “partially disagree,” or “totally disagree” that a woman should (1) be able to terminate her pregnancy safely and legally if she has or suspects she has Zika; (2) be able to terminate her pregnancy safely and legally if she suspects that the fetus has microcephaly, congenital Zika syndrome, or other brain malformation; (3) be able to terminate a pregnancy safely and legally if she has or suspects having Coronavirus (COVID-19). These measures were coded into binary variables where 1 = “totally” or “partially agree” and 0 = “neither agree or disagree,” “partially disagree,” or “totally disagree.”

The primary independent variables of interest are religious affiliation and income. Religion is categorized as “Catholic,” “Evangelical,” “Other religion,” and “Atheist.” Income is categorized at the household level as “low-income” (up to 1 minimum wage), “middle-income” (1 to 3 minimum wages), and “high-income” (4 + minimum wages). Other independent variables of interest include a binary measure of whether the respondent would be happy if they became pregnant in the next 3 months, a Likert-scale measure of how worried a respondent is of becoming pregnant and having a baby with congenital Zika syndrome (CZS) (1 = not at all worried, 5 = extremely worried), and a Likert-scale measure of how worried a respondent is of becoming pregnant and having a problem with the pregnancy or with the baby because of COVID-19 (1 = not at all worried, 5 = extremely worried). Control variables include urbanicity, age, race, mother’s education (given the young age structure of our sample, bivariate analyses revealed mother’s educational attainment had a stronger association with abortion attitudes than an individual’s level of education), and relationship type.

## Data Analysis

First, we conducted paired *t*-tests to assess significant differences in the proportion of women who agreed with the right to abortion in each of the three scenarios overall, by religious affiliation, and by income group. Next, we accounted for missing data on two key independent variables of interest—income and mother’s education—using multiple imputation. Multiple imputation is recommended to treat missing data, limit the threat to validity, and improve generalizability (Rose & Fraser, 2008; Saunders et al., 2006) when it cannot be assumed that missing data are missing at random and the variables have more than 5% but less than 20% of cases missing (Jakobsen et al., 2017). Our income variable was missing 11.4% of responses, and the mother’s education was missing 6.6%. It was not plausible to assume that these data were missing at random; thus, we used multiple imputation to treat these missing data. The imputation model contained 25 demographic variables that could help impute missing income and mother’s education data (i.e., age, race, number of children, whether they experienced a decrease in income in the past year), and 50 iterations were conducted based off the recommendation of Jakobsen et al. (2017). Using a more standard 20 iteration approach produced nearly identical results. Data were not imputed for any other variables. Complete case analysis was used for remaining variables. The use of multiple imputation produced a sample size of 3751 compared to a sample of 3213 if complete case analysis for income and mother’s education had been used.

To assess the relationship between religion, income, and abortion attitudes, we conducted multivariate-adjusted logistic regression models with adjusted Odds Ratios (aOR) and 95% confidence intervals using multiple imputation estimates in Stata (mi estimate: logit). Our models include the abortion attitude measure of interest as the outcome, religion and income as the primary independent variables, and adjust for whether a respondent would be happy if they found out they were pregnant in the next 3 months, how worried they are about becoming pregnant and having a baby with CZS, how worried they are about becoming pregnant and having a problem with the pregnancy or with the baby because of COVID-19, urbanicity, race, age, mother’s education, and relationship type. In a separate multi-variable adjusted model, we also included an interaction term for religion and income to assess whether low-income women affiliated with more conservative religions are even more likely to oppose the right to abortion. All models were weighted using raked survey weights and included robust estimators. The margins and marginsplot commands in Stata were used to visually show the predicted findings in Figs. 3, 4, and 5 (Williams, 2012).

## Results

Table 1 shows the socioeconomic and demographic characteristics of the study sample. Most women identified as Catholic (41%) or Evangelical (37%), low or middle income (83%), and mixed race or “Parda” (59%). About one-third reported they would be happy if they found out they were pregnant in the next 3 months (32%). Women were, on average, 26 years old, and over half lived in the metropolitan region of Recife (57%). One-quarter were either married or in a legal civil union (26%). One-fifth were cohabiting with a partner (21%) and a similar percentage were in a serious relationship, but not living with their partner (23%). Only 13% reported having a mother who completed some college or more. Most women were extremely worried about getting pregnant and having a baby with CZS (70%). An even higher proportion were extremely worried about getting pregnant and having a problem with the pregnancy or with the baby because of COVID-19 (76%).

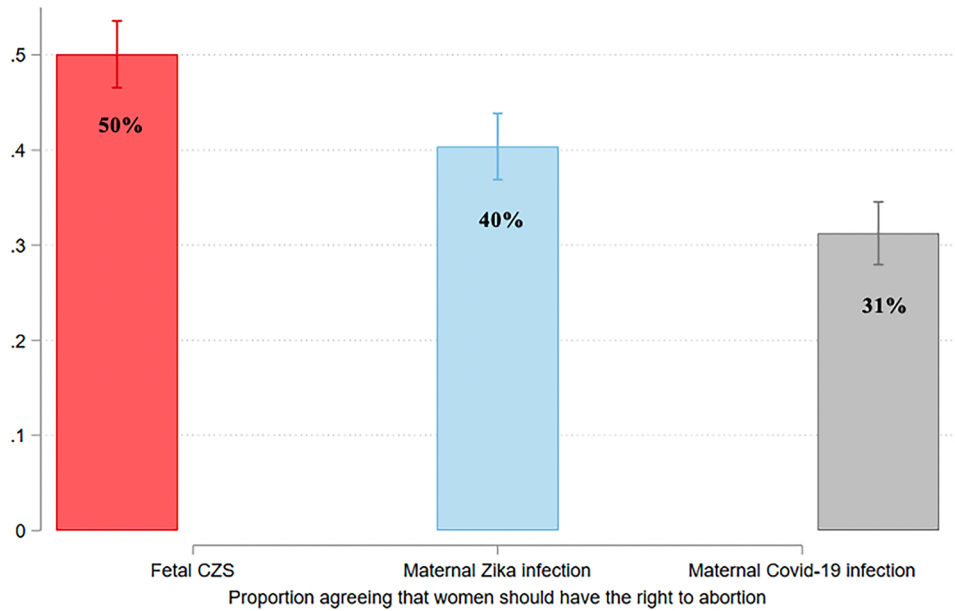
Figure 1 shows women’s overall support for abortion by infectious disease scenario. Supporting Hypothesis 1, we find that a significantly higher proportion of women support abortion in the scenario of fetal CZS (50%) compared to a scenario of maternal Zika infection during pregnancy (40%) and maternal COVID-19 infection during pregnancy (31%) ( $p$ -value < 0.05). Similarly, significantly fewer women support abortion in the scenario of maternal COVID-19 infection (31%) compared to maternal Zika infection (40%) and fetal CZS (50%) ( $p$ -value < 0.05).

**Table 1** Demographic characteristics of a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020\*

	Unweighted sample size ( <i>N</i> )	Weighted mean/% (SE)
<b>Religious affiliation</b>		
Catholic	1434	40.8 (0.018)
Evangelical	1519	36.6 (0.017)
Other religion	615	12.7 (0.011)
Atheist	404	9.9 (0.010)
<b>Income</b>		
Low income (up to 1 minimum wage)	994	39.4 (0.018)
Middle income (1 to 3 minimum wages)	1625	43.6 (0.019)
High income (4 + minimum wages)	917	17.0 (0.012)
<b>Happy if found out they were pregnant in next 3 months</b>		
No	2701	68.4 (0.017)
Yes	1139	31.6 (0.017)
<b>Urbanicity</b>		
Lives in metropolitan area	3424	57.4 (0.019)
Lives outside metropolitan area	565	42.6 (0.019)
Age	3989	26.0 (0.180)
<b>Age category</b>		
18–19	267	11.2 (0.014)
20–24	891	30.3 (0.018)
25–29	1189	29.7 (0.016)
30–34	1642	28.7 (0.014)
<b>Race/ethnicity</b>		
Asian	146	0.6 (0.001)
White	1183	30.9 (0.016)
Indigenous	38	0.3 (0.001)
Parda (“Mixed” or “Brown”)	2016	59.4 (0.017)
Black	601	8.8 (0.009)
<b>Mother’s education</b>		
High school or less	3128	86.9 (0.012)
Some college or more	697	13.1 (0.012)
<b>Relationship type</b>		
Married or in a legal civil union	1181	26.2 (0.015)
Cohabiting	801	21.0 (0.015)
Serious relationship, but not living together	821	22.8 (0.016)
Other	1180	30.0 (0.016)
<b>Worried about getting pregnant and having a baby with congenital Zika syndrome (CZS)</b>		
Not worried at all	416	11.5 (0.012)
A little worried	171	4.5 (0.009)
Somewhat worried	221	6.0 (0.009)
Very worried	292	8.2 (0.010)
Extremely worried	2881	69.8 (0.017)
<b>Worried about getting pregnant and having a problem with the pregnancy or with the baby because of COVID-19</b>		
Not worried at all	357	9.8 (0.012)
A little worried	111	2.8 (0.005)
Somewhat worried	179	3.8 (0.005)
Very worried	269	8.2 (0.011)
Extremely worried	3067	75.5 (0.016)

\*Table 1 presents unweighted *N*s and weighted means/% with imputation

**Fig. 1** Proportion totally or partially agreeing with the right to abortion in the case of fetal congenital Zika syndrome (CZS), maternal Zika infection, and maternal COVID-19 infection among a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020 ( $N=3751$ )

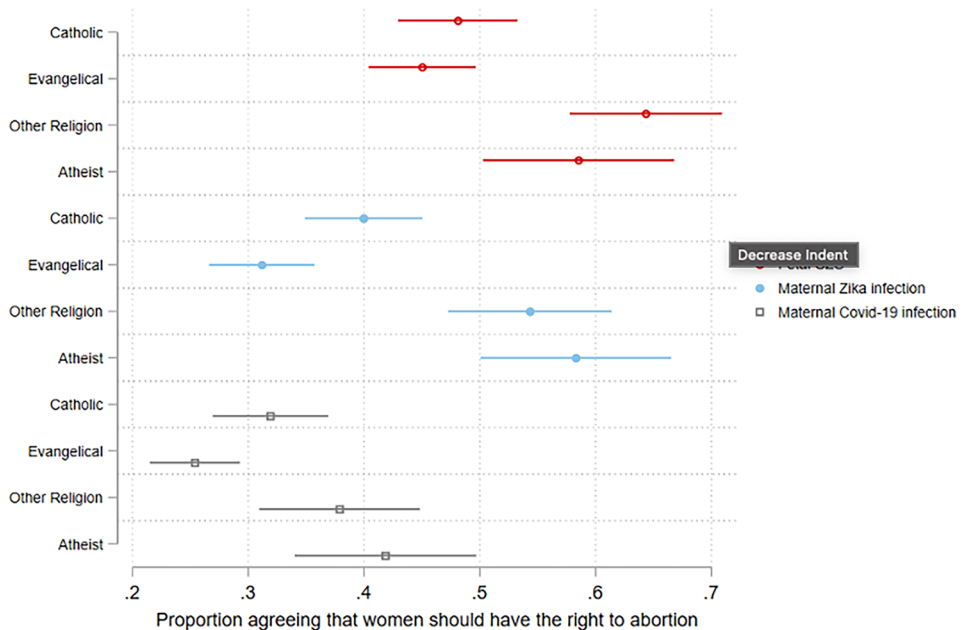


We also find a gradient of support for abortion within religious affiliation and income. Figure 2 shows women’s support for abortion by infectious disease scenario and religious affiliation. Contrary to Hypothesis 2, we find that Catholics and Evangelicals do not have static abortion attitudes and instead report significantly higher support for abortion in the case of fetal CZS (48% Catholics; 45% Evangelicals) compared to maternal COVID-19 infection (32% Catholics; 25% Evangelicals) ( $p$ -value < 0.05). Interestingly, Evangelicals report significantly lower support for abortion in the case of maternal Zika infection (31%) compared to fetal CZS (45%) ( $p$ -value < 0.05) whereas support for abortion for Catholics

does not differ significantly across fetal CZS (48%) and maternal Zika infection (40%) scenarios.

Supporting Hypothesis 3, Atheists and women affiliated with other religions are significantly more likely than Evangelicals to support abortion across all infectious disease scenarios. Specifically, we find that more Atheists (59%) and women affiliated with other religions (64%) support the right to abortion in the case of fetal CZS than Evangelicals (45%) ( $p$ -value < 0.05). Similarly, more Atheists (58%) and women affiliated with other religions (54%) support abortion in the case of maternal Zika infection than Evangelicals (31%) and Catholics (40%) ( $p$ -value < 0.05). Lastly, in the

**Fig. 2** Proportion totally or partially agreeing with the right to abortion in the case of maternal Zika infection, fetal congenital Zika syndrome (CZS), and maternal COVID-19 infection by religion among a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020 ( $N=3751$ )



case of maternal COVID-19 infection, more Atheists (42%) and women affiliated with other religions (38%) support abortion in the case of maternal COVID-19 infection than Evangelicals (25%) ( $p$ -value < 0.05).

Despite Fig. 2 showing that more conservative religious groups have lower levels of support for abortion across scenarios, this figure also shows that even among Evangelicals—the most conservative religious group—nearly half (45%) support abortion in the case of fetal CZS and one-third (33%) in the case of maternal Zika infection.

Figure 3 shows women's support for abortion by infectious disease scenario and income. Supporting Hypothesis 4, we find that high-income women are significantly more likely to support abortion in the case of fetal CZS (64%) and maternal Zika infection (56%) than middle- (52% and 41%, respectively) and low-income (42% and 33%, respectively) women ( $p$ -value < 0.05). In the case of maternal COVID-19 infection, there are only significant differences in support for abortion between high- (39%) and low-income (28%) women ( $p$ -value < 0.05).

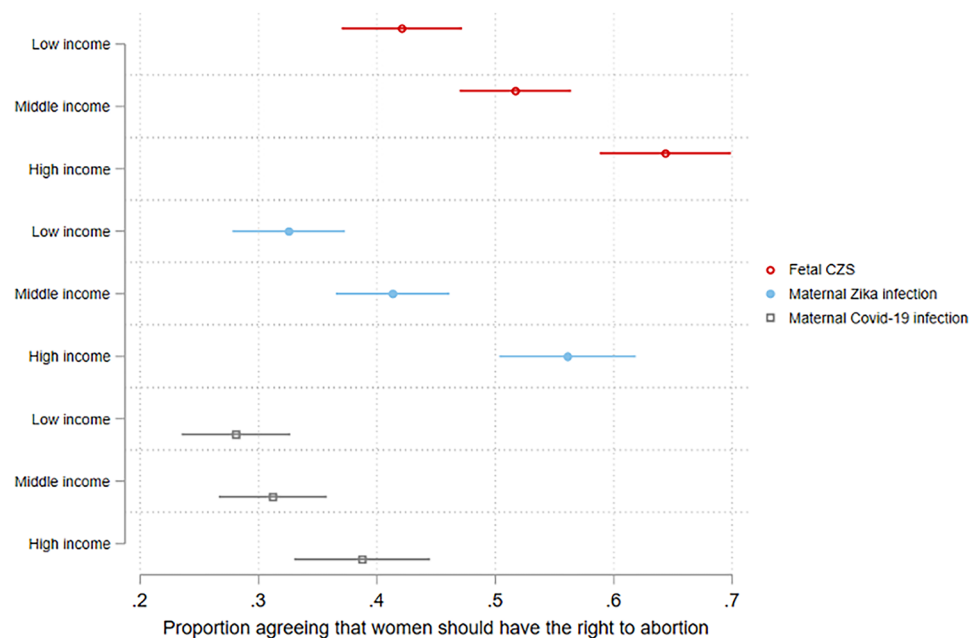
Table 2 presents results from adjusted logistic regression models. We find that, even when controlling for socioeconomic and demographic characteristics, religion and income remain significant predictors of abortion attitudes. In the case of maternal Zika infection, we find that compared to Catholics, Evangelicals have significantly lower odds of agreeing with the right to abortion (aOR = 0.65; 95% CI: 0.45–0.93), while Atheists have significantly higher odds of agreeing with the right to abortion (aOR = 1.79; 95% CI: 1.09–2.94). We also find that, compared to low-income women, high-income women have higher odds of agreeing with the right to abortion (aOR = 2.07; 95% CI: 1.33–3.21). In the case of fetal CZS, we find that other religions have

higher odds of agreeing with the right to abortion compared to Catholics (aOR = 1.68; 95% CI: 1.09–2.58) and that, compared to low-income women, high-income women have higher odds of agreeing with the right to abortion (aOR = 1.92; 95% CI: 1.25–2.94). In the case of maternal COVID-19 infection, we find that Evangelicals have marginally lower odds of agreeing with the right to abortion compared to Catholics (aOR = 0.69; 95% CI: 0.47–1.00).

Based on models that included an interaction term between religion and income, we found partial support for Hypothesis 5 in that, compared to low-income Catholic women, high-income Atheist women are significantly more likely to agree with the right to abortion in the case of fetal CZS (Appendix A; aOR = 8.84; 95% CI: 1.74–44.89) and marginally more likely to agree in the case of maternal COVID-19 infection (Appendix A; aOR = 3.51; 95% CI: 0.87–14.13). Although we found no other significant interaction effects, the variation in abortion attitudes by income and religious affiliation shows interesting patterns.

Figures 4, 5, and 6 show the predicted probabilities from the multivariate-adjusted model including the interaction term between religion and income of supporting the right to abortion in the case of fetal CZS, maternal Zika infection, and maternal COVID-19 infection. Figure 4 shows that there is surprisingly little variation in support for abortion in the case of fetal CZS among low-income women, but that as income increases, women of all religious affiliations have increased odds of supporting the right to abortion in the case of fetal CZS. However, this increase is significantly greater for Atheists (Appendix A). Figure 5 also shows that the odds of supporting the right to abortion in the case of maternal Zika infection increases as income increases for all religious categories. However, there do not appear to be significant

**Fig. 3** Proportion totally or partially agreeing with the right to abortion in the case of maternal Zika infection, fetal congenital Zika syndrome (CZS), and maternal COVID-19 infection by income among a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020 ( $N = 3751$ )





**Table 2** Predictors of totally or partially agreeing with the right to abortion in the case of maternal Zika infection, fetal congenital Zika syndrome (CZS), or maternal COVID-19 infection among a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020 ( $N=3751$ )

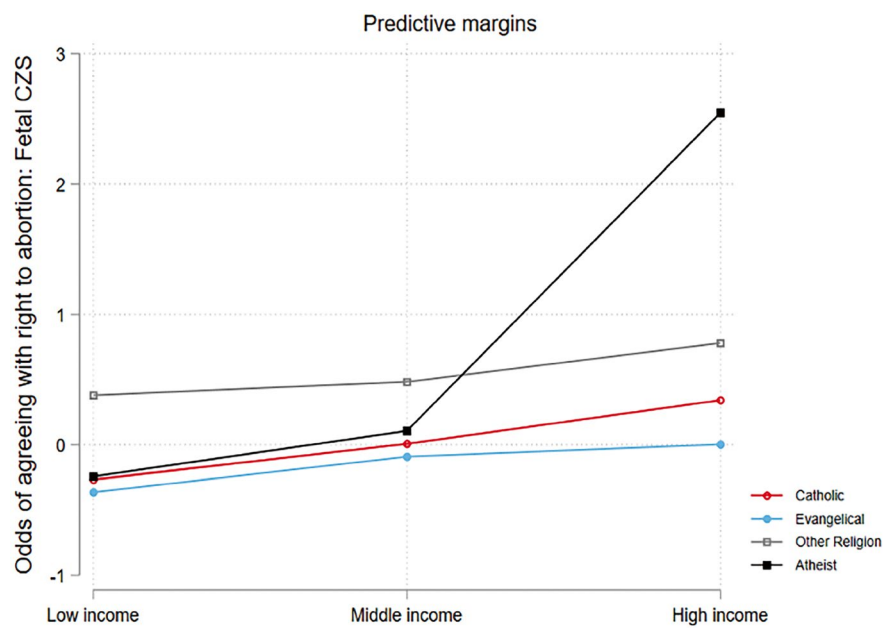
	Maternal Zika infection	Fetal CZS	Maternal COVID-19 infection
	aOR [95% CI]	aOR [95% CI]	aOR [95% CI]
Religion ( <i>Catholic = ref</i> )			
Evangelical	0.65* [0.45–0.93]	0.87 [0.62–1.24]	0.69+ [0.47–1.00]
Other religion	1.39 [0.91–2.14]	1.68* [1.09–2.58]	1.13 [0.73–1.75]
Atheist	1.79* [1.09–2.94]	1.39 [0.85–2.29]	1.32 [0.83–2.12]
Income ( <i>low-income = ref</i> )			
Middle income	1.27 [0.86–1.86]	1.30 [0.90–1.86]	1.06 [0.71–1.59]
High income	2.07** [1.33–3.21]	1.92** [1.25–2.94]	1.42 [0.93–2.18]
Happy if found out they were pregnant in the next 3 months	0.78 [0.54–1.12]	0.69* [0.49–0.96]	0.92 [0.63–1.34]
Lives outside metropolitan area	0.77 [0.54–1.12]	0.91 [0.66–1.26]	0.78 [0.55–1.11]
Age	0.98 [0.95–1.01]	0.99 [0.96–1.03]	0.98 [0.95–1.01]
Race/ethnicity ( <i>White = ref</i> )			
Asian	1.54 [0.72–3.32]	1.65 [0.84–3.27]	1.88 [0.81–4.39]
Indigenous	0.50 [0.15–1.70]	0.78 [0.21–2.98]	0.89 [0.27–2.85]
Parda (“Mixed” or “Brown”)	0.96 [0.69–1.34]	0.87 [0.62–1.22]	1.34+ [0.96–1.87]
Black	1.08 [0.66–1.76]	0.81 [0.50–1.31]	1.40 [0.87–2.26]
Mother completed some college or more	1.55+ [0.98–2.44]	1.46 [0.89–2.38]	1.22 [0.81–1.84]
Relationship type ( <i>Married or in legal civil union = ref</i> )			
Cohabiting	1.33 [0.82–2.16]	0.95 [0.61–1.48]	0.95 [0.58–1.56]
Serious relationship, not living together	1.48+ [0.93–2.36]	1.24 [0.79–1.94]	1.21 [0.81–2.15]
Other	1.68* [1.09–2.59]	1.03 [0.69–1.56]	1.26 [0.79–2.03]
Worried about getting pregnant and having a baby with congenital Zika syndrome (CZS)	1.12 [0.98–1.28]	1.14+ [0.98–1.34]	0.98 [0.85–1.12]
Worried about getting pregnant and having a problem with the pregnancy or with the baby because of COVID-19	0.82* [0.70–0.96]	0.89 [0.75–1.05]	1.00 [0.85–1.18]

+  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ 

differences in the magnitude (Appendix A). Lastly, Fig. 6 shows that the odds of agreeing with the right to abortion in the case of maternal COVID-19 infection increases as income increases for Catholics, Atheists, and other religions but in fact decreases for Evangelicals. However, this

increase is only marginally greater for Atheists (Appendix A). Overall, these figures show that there is surprisingly little variation in abortion attitudes among low-income women but that attitudes differ more substantially for middle- and high-income women across religious affiliation.

**Fig. 4** Predicted probabilities of totally or partially agreeing with the right to abortion, by religion and income, in the case of fetal congenital Zika syndrome (CZS) among a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020 ( $N=3751$ )



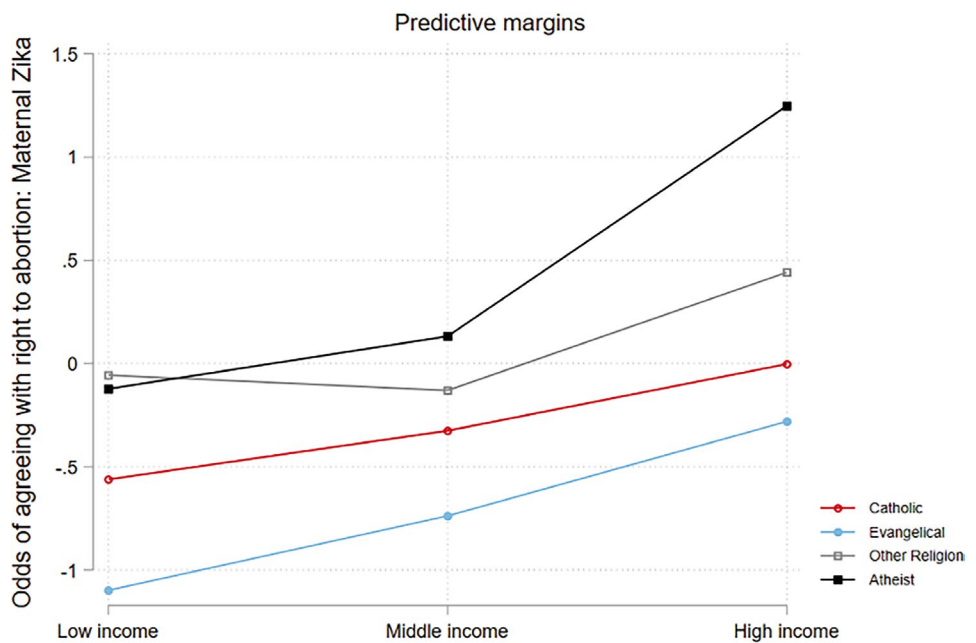
Predicted probabilities of totally or partially agreeing with the right to abortion in the case of fetal CZS were calculated using the margins command in Stata 17 following the multivariate-adjusted logistic regression model presented in Appendix A with an interaction term for religion and income

**Sensitivity Analyses**

We conducted additional analyses controlling for several characteristics—women who were currently pregnant, women who experienced a pregnancy during the Zika outbreak, women who experienced a live birth during the Zika outbreak, women who postponed pregnancy during

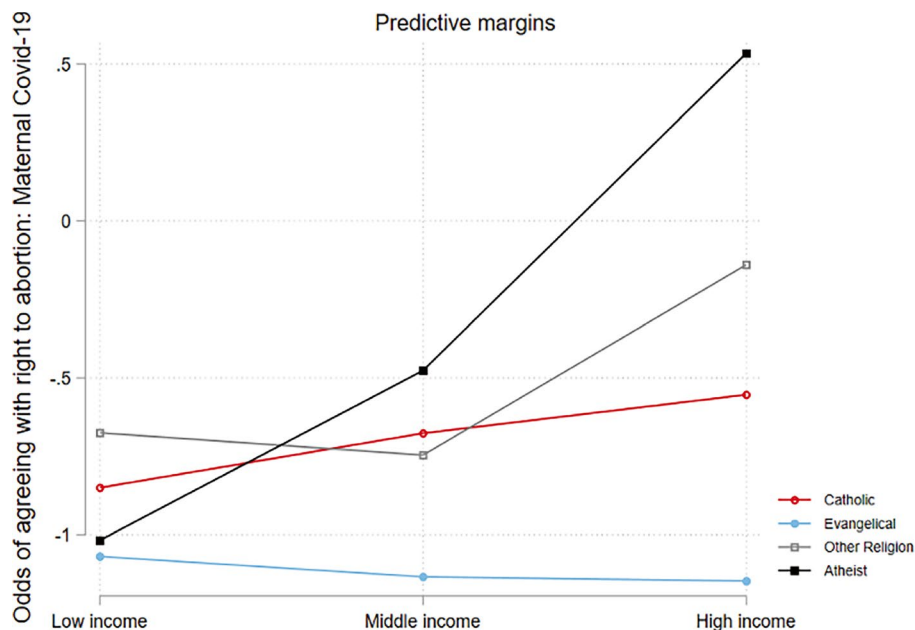
the Zika epidemic, and women who believe people should avoid pregnancy during an outbreak. The addition of these controls to the models produced similar results. We also conducted sensitivity analyses with an analytical sample using complete case analysis ( $N=3213$ ). Appendix B shows that the models are robust to using multiple imputation and that both models produced similar results.

**Fig. 5** Predicted probabilities of totally or partially agreeing with the right to abortion, by religion and income, in the case of maternal Zika infection among a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020 ( $N=3751$ )



Predicted probabilities of totally or partially agreeing with the right to abortion in the case of maternal Zika infection were calculated using the margins command in Stata 17 following the multivariate-adjusted logistic regression model presented in Appendix A with an interaction term for religion and income

**Fig. 6** Predicted probabilities of totally or partially agreeing with the right to abortion, by religion and income, in the case of maternal COVID-19 infection among a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020 ( $N=3751$ )



Predicted probabilities of totally or partially agreeing with the right to abortion in the case of maternal COVID-19 infection were calculated using the margins command in Stata 17 following the multivariate-adjusted logistic regression model presented in Appendix A with an interaction term for religion and income

## Discussion

Abortion attitudes shape abortion discourse and policy. It is therefore important to understand women's attitudes on the right to abortion in a place like Brazil where women have experienced back-to-back novel infectious disease crises, strict abortion policies, a changing religious landscape, and persistently high levels of income inequality. Using a unique population-representative dataset, this study shows that women's views on the right to abortion vary according to infectious disease scenario and across women's religious affiliation and income level. We discuss our main findings and propose potential explanations for the variations we found.

First, we found a gradient of support for abortion across the different infectious disease scenarios. Women are more likely to support the right to abortion in the case of fetal CZS (50%) than in the case of maternal Zika infection (40%) but are less likely to support abortion in the case of maternal COVID-19 infection (31%) than in the case of maternal Zika infection (40%). We speculate that this gradation of abortion support by infectious disease scenario is related to the potential of the infectious disease for fetal anomalies. When this study was conducted in May–September of 2020, the COVID-19 pandemic was novel, and information about the effects of maternal infection on fetuses and pregnancy outcomes were largely unknown. Conversely, it was well-established that maternal Zika infection was associated with fetal anomalies. Supporting prior research, our findings demonstrate that the prospect of fetal anomalies is associated with increased support for abortion (Killian, 2017).

Second, our findings underscore that even amid infectious disease crises and unprecedented levels of uncertainty, religion and income remain significant predictors of abortion attitudes. As expected, we found that women affiliated with more conservative religions, Evangelicals and Catholics, show lower levels of support for abortion across all scenarios compared to Atheists and women of other religions. However, even Evangelical and Catholic women showed higher levels of support for abortion in the case of fetal CZS than in the case of maternal COVID-19 infection. Furthermore, we found that nearly half of Evangelical and Catholic women support the right to abortion in the case of fetal CZS—indicating that support for abortion in the case of fetal anomalies transcends religious affiliation.

These findings demonstrate that (1) abortion attitudes are not static even among religious groups we may assume to be opposed to abortion in any circumstance and (2) there is something unique about fetal anomalies that allows even women affiliated with the most conservative religious groups to have flexibility in their abortion attitudes and to approve of abortion in that scenario.

This study also finds that high-income women show higher levels of support for the right to abortion across all scenarios. This is in line with previous research documenting that income often serves as a proxy for higher levels of education and thus more progressive and gender-equitable beliefs that translate into higher abortion support (Adamczyk et al., 2020; Guang-zhen & Buffalo, 2004). It is important to note, however, that even among low-income women, support for abortion in the case of fetal CZS was still over 40%. Interestingly, we do not find that high-income women have sustained high levels of support across infectious disease scenarios. Instead, we again see that

even among high-income women, levels of support for abortion are significantly higher in the case of fetal CZS than in the case of maternal COVID-19, demonstrating that fetal anomalies yield higher levels of abortion support even among those with overall higher levels of support.

Third, findings on the interaction between religious affiliation and income show that women across all religious groups and income levels have some flexibility in their abortion attitudes, particularly in the case of fetal CZS. Because research has shown that people affiliated with more conservative religious groups and people living on lower incomes are more likely to hold anti-abortion attitudes, we hypothesized that there would be an interaction between income and religion where low-income Evangelical women would have lower support for abortion across all infectious disease scenarios, whereas high-income Atheist women would have even greater support for abortion across all infectious scenarios. Although we found the interactions between religion and income to be largely insignificant, this lack of significance appears to stem from religious groups following similar trajectories by income. That is, for each religious group, support for abortion increased as income increased at similar rates (with the exception of high-income Atheists who have significantly higher levels of support in the case of fetal CZS and marginally higher levels of support in the case of maternal COVID-19 infection). However, as demonstrated in Figs. 5 and 6, support for abortion by religion and income does differ across maternal Zika and COVID-19 infection scenarios. We found that a higher proportion of women across all income and religious groups support the right to abortion in the case of maternal Zika infection compared to the case of maternal COVID-19 infection. This is likely because at the time of data collection, there was an established link between fetal anomalies and maternal Zika infection but not for maternal COVID-19 infection, despite the uncertainty and negative consequences of COVID-19 during pregnancy such as increased maternal mortality in Brazil during this time (Carvalho et al., 2021; Mehan et al., 2020; Schmid et al., 2020; Souza & Amorim, 2021; Yang et al., 2020).

These findings highlight the importance of assessing abortion attitudes by religion and income combined. This granularity allows us to see that even though support for abortion may be lower overall for women affiliated with conservative religions, all religious groups show flexibility in their support for abortion. Without examining these interactions, we would fail to see the nuance that people across all religious affiliations show in their attitudes toward abortion. Understanding this nuance is important for policymakers who may believe that all people of a particular religious affiliation have homogeneous views toward abortion when that is not the case.

Since Brazil's landscape has been changing dramatically, as both the Evangelical and low-income populations grow, it is important to understand if abortion attitudes also evolve in tandem with this phenomenon (i.e., will there be lower levels of support for abortion with the increasing Evangelical

and low-income populations?) or if support for abortion will increase as a result of back-to-back infectious disease crises (i.e., will there be higher levels of support for abortion with increased uncertainty and adverse pregnancy outcomes?). It will also be important to assess how, if at all, abortion attitudes change in the wake of other neighboring Latin American countries such as Argentina, Colombia, and Mexico legalizing abortion. Understanding how flexible abortion attitudes are in response to shifting demographics is critical for understanding the conditions under which women agree or disagree with abortion. Elucidating these trends will help inform policymakers of situations in which women support the right to abortion and how these attitudes may transcend religion and income in certain infectious disease scenarios.

Despite these significant contributions, this study has important limitations to fully assessing the flexibility of women's abortion views. First, this study did not measure baseline support for abortion (e.g., support for abortion under any circumstance). However, the goal of this paper was to examine differences in support for abortion in the context of infectious diseases, specifically in the case of potential fetal anomalies. Additionally, this study did not measure respondent's religiosity (e.g., how important religion is to a respondent), which is an important predictor of abortion attitudes (Adamczyk, 2008). This study cannot control for unobserved differences in our sample and is limited by its inability to examine causality due to the cross-sectional nature of the available data. Lastly, limited sample sizes when comparing subgroups may have prevented us from identifying significant differences despite seemingly large effect sizes.

## Conclusions

In conclusion, women in Brazil are experiencing the stress and uncertainty of back-to-back infectious disease crises, while women everywhere have been significantly affected by the COVID-19 pandemic. Zika and COVID-19 have had serious consequences on women's physical, financial, and mental health. With increasingly conservative religious groups gaining size in population and government in Brazil, we expect to see increasing abortion restrictions. This paper underscores how women affiliated with different religions in Brazil do not uniformly oppose abortion. Instead, half of women support the right to abortion in the case of fetal CZS, and a sizable minority support the right to abortion in the case of maternal Zika and COVID-19 infection—and this support transcends religious affiliation and income. Policymakers should be aware of these high levels of support for abortion, particularly in the case of fetal anomalies brought about by novel infectious disease outbreaks, so that future abortion policies reflect women's desires for reproductive autonomy and access to abortion, and enable women to make the best decision for their health and wellbeing, particularly during times of crisis.

**Appendix A. Predictors of totally or partially agreeing with the right to abortion in the case of maternal Zika infection, fetal congenital Zika syndrome (CZS), or maternal COVID-19 infection among a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020 (N = 3751)**

	Maternal Zika infection aOR [95% CI]	Fetal CZS aOR [95% CI]	Maternal COVID-19 infection aOR [95% CI]
Religion ( <i>Catholic = ref</i> )			
Evangelical	0.58 [0.30–1.15]	0.91 [0.51–1.63]	0.80 [0.42–1.56]
Other religion	1.66 [0.77–3.56]	1.91 + [0.92–3.96]	1.19 [0.53–2.68]
Atheist	1.55 [0.65–3.67]	1.02 [0.44–2.40]	0.85 [0.35–2.04]
Income ( <i>low-income = ref</i> )			
Middle income	1.27 [0.66–2.44]	1.32 [0.71–2.45]	1.19 [0.59–2.39]
High income	1.75 + [0.94–3.26]	1.84 + [0.97–3.48]	1.35 [0.70–2.58]
Happy if found out they were pregnant in the next 3 months	0.77 [0.54–1.11]	0.68* [0.48–0.95]	0.93 [0.64–1.35]
Lives outside metropolitan area	0.77 [0.55–1.08]	0.93 [0.67–1.27]	0.76 [0.54–1.08]
Age	0.98 [0.95–1.01]	0.99 [0.96–1.02]	0.98 [0.95–1.01]
Race/ethnicity ( <i>White = ref</i> )			
Asian	1.59 [0.75–3.38]	1.70 [0.86–3.37]	1.82 [0.79–4.22]
Indigenous	0.47 [0.13–1.66]	0.76 [0.19–2.99]	0.87 [0.26–2.91]
Parada (“Mixed” or “Brown”)	0.97 [0.70–1.34]	0.88 [0.63–1.23]	1.35 + [0.97–1.88]
Black	1.09 [0.67–1.77]	0.83 [0.51–1.35]	1.44 [0.89–2.33]
Mother completed some college or more	1.56 + [0.98–2.48]	1.47 [0.89–2.45]	1.21 [0.79–1.85]
Relationship type ( <i>Married or in legal civil union = ref</i> )			
Cohabiting	1.33 [0.82–2.15]	0.95 [0.61–1.47]	0.93 [0.57–1.54]
Serious relationship, not living together	1.45 [0.91–2.31]	1.18 [0.76–1.86]	1.30 [0.80–2.11]
Other	1.65* [1.07–2.54]	1.01 [0.68–1.52]	1.26 [0.79–2.02]
Worried about getting pregnant and having a baby with congenital Zika syndrome (CZS)	1.12 + [0.98–1.28]	1.15 + [0.98–1.35]	0.98 [0.85–1.12]

	Maternal Zika infection aOR [95% CI]	Fetal CZS aOR [95% CI]	Maternal COVID-19 infection aOR [95% CI]
Worried about getting pregnant and having a problem with the pregnancy or with the baby because of COVID-19	0.82* [0.70–0.96]	0.89 [0.75–1.06]	1.01 [0.86–1.19]
Religion#Income ( <i>Catholic and low income = ref</i> )			
Evangelical#Middle income	1.13 [0.46–2.79]	1.00 [0.45–2.21]	0.79 [0.32–1.94]
Evangelical#High income	1.30 [0.48–3.48]	0.78 [0.31–1.95]	0.69 [0.25–1.86]
Other religion#Middle income	0.73 [0.25–2.13]	0.84 [0.30–2.35]	0.78 [0.25–2.41]
Other religion#High income	0.94 [0.32–2.78]	0.81 [0.28–2.39]	1.27 [0.40–4.03]
Atheist#Middle income	1.02 [0.31–3.32]	1.08 [0.34–3.37]	1.44 [0.46–4.49]
Atheist#High income	2.25 [0.49–10.41]	8.84* [1.74–44.89]	3.51 + [0.87–14.13]

+  $p < 0.10$ ; \*  $p < 0.05$

## Appendix B. Predictors of totally or partially agreeing with the right to abortion using complete case analysis among a population-based sample of women ages 18–34 in Pernambuco, Brazil, 2020 ( $N = 3213$ )

	Model 1			Model 2		
	(Original)			(Religion#Income)		
	Zika	CZS	COVID-19	Zika	CZS	COVID-19
	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]
Religion ( <i>Catholic = ref</i> )						
Evangelical	0.68 + [0.45–1.02]	0.90 [0.62–1.32]	0.70 + [0.46–1.06]	0.62 [0.30–1.28]	0.87 [0.46–1.63]	0.83 [0.41–2.56]
Other religion	1.35 [1.03–3.04]	1.64* [1.02–2.65]	1.09 [0.67–1.75]	1.60 [0.75–3.42]	1.78 [0.83–3.82]	1.12 [0.49–2.56]
Atheist	1.77* [1.03–3.04]	1.41 [0.81–2.44]	1.46 [0.86–2.48]	1.56 [0.63–3.86]	1.02 [0.41–2.56]	1.03 [0.39–2.72]
Income ( <i>low-income = ref</i> )						
Middle income	1.36 [0.90–2.03]	1.33 [0.91–1.95]	1.15 [0.74–1.78]	1.39 [0.72–2.70]	1.30 [0.67–2.52]	1.33 [0.64–2.75]
High income	2.33*** [1.47–3.68]	2.09** [1.34–2.56]	1.58* [1.00–2.48]	1.86 + [0.97–3.55]	1.78 + [0.91–3.48]	1.37 [0.68–2.76]
Happy if found out they were pregnant in next 3 months	0.77 [0.51–1.16]	0.67* [0.46–0.98]	0.85 [0.54–1.32]	0.77 [0.51–1.16]	0.67* [0.46–0.97]	0.84 [0.54–1.31]
Lives outside metropolitan area	0.72 [0.49–1.07]	0.93 [0.65–1.33]	0.67 [0.45–1.02]	0.72 + [0.49–1.05]	0.93 [0.66–1.33]	0.66* [0.45–0.99]

	Model 1			Model 2		
	(Original)			(Religion#Income)		
	Zika	CZS	COVID-19	Zika	CZS	COVID-19
	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]
Age	0.99 [0.95–1.02]	0.99 [0.95–1.02]	0.98 [0.94–1.01]	0.98 [0.95–1.02]	0.98 [0.95–1.02]	0.97 [0.94–1.01]
Race/ethnicity ( <i>White = ref</i> )						
Asian	1.06 [0.48–2.34]	1.30 [0.61–2.76]	1.75 [0.71–4.28]	1.07 [0.49–2.33]	1.31 [0.63–2.76]	1.72 [0.71–4.16]
Indigenous	0.61 [0.15–2.43]	1.21 [0.26–5.63]	1.32 [0.37–4.77]	0.58 [0.14–2.38]	1.18 [0.25–5.56]	1.3 [0.35–4.86]
Parada (“Mixed” or “Brown”)	0.96 [0.67–1.95]	0.83 [0.57–1.21]	1.41+ [0.97–2.04]	0.96 [0.67–1.36]	0.83 [0.58–1.20]	1.35+ [0.97–2.03]
Black	1.14 [0.67–1.95]	0.8 [0.47–1.38]	1.54 [0.91–2.63]	1.15 [0.68–1.95]	0.83 [0.49–1.42]	1.55 [0.92–2.63]
Mother completed some college or more	1.39 [0.83–2.34]	1.28 [0.73–2.21]	1.03 [0.65–1.64]	1.41 [0.84–2.37]	1.29 [0.74–2.26]	1.01 [0.64–1.62]
Relationship type ( <i>Married or in legal civil union = ref</i> )						
Cohabiting	1.3 [0.76–2.20]	0.98 [0.60–1.61]	0.98 [0.56–1.69]	1.29 [0.76–2.20]	0.98 [0.60–1.60]	0.96 [0.55–1.66]
Serious relationship, not living together	1.59+ [0.98–2.59]	1.2 [0.74–1.95]	1.41 [0.83–2.41]	1.55+ [0.95–2.53]	1.16 [0.71–1.88]	1.36 [0.80–2.31]
Other	1.74* [1.09–2.78]	1.01 [0.64–1.58]	1.26 [0.73–2.18]	1.70* [1.07–2.71]	1.00 [0.64–1.55]	1.23 [0.72–2.11]
Worried about getting pregnant and having a baby with congenital Zika syndrome (CZS)	1.12 [0.96–1.28]	1.16 [0.96–1.39]	0.97 [0.84–1.12]	1.12 [0.97–1.29]	1.16 [0.97–1.40]	0.97 [0.84–1.13]
Worried about getting pregnant and having a problem with the pregnancy or with the baby because of COVID-19	0.81* [0.68–0.96]	0.86 [0.70–1.05]	1.00 [0.84–1.21]	0.81* [0.68–0.97]	0.86 [0.70–1.06]	1.01 [0.83–1.21]
Religion#Income ( <i>Catholic and low income = ref</i> )						
Evangelical#Middle income				1.06 [0.43–2.61]	1.11 [0.48–2.54]	0.71 [0.29–1.75]
Evangelical#High income				1.43 [0.52–4.00]	0.95 [0.37–2.43]	0.77 [0.29–2.04]
Other religion#Middle income				0.71 [0.25–2.05]	0.89 [0.30–2.65]	0.75 [0.24–2.32]
Other religion#High income				1.00 [0.34–3.01]	0.93 [0.31–2.80]	1.47 [0.45–4.83]
Atheist#Middle income				0.96 [0.28–3.17]	1.03 [0.31–3.44]	1.22 [0.36–4.17]
Atheist#High income				2.39 [0.47–12.20]	13.60*** [3.42–54.07]	3.19 [0.70–14.53]

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

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**Data Availability** Research data are not able to be shared at the time due to funding agreement.

**Code Availability** Stata 17 code available upon request.

## Declarations

**Ethics Approval** The research was approved by the IRB at the University of Texas at Austin and the Brazilian National Commission for Research Ethics (Comissão Nacional de Ética em Pesquisa).

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

**Conflict of Interest** The authors declare no competing interests.

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