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Contraception, Intra-household Behaviour and Epidemic: Evidence from the Zika crisis in Colombia*

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Abstract

We exploit the Zika outbreak in Colombia in 2015 to explore how a negative shock that puts at high risk the newborn's health affects female behaviours associated with fertility, according to their marital status. The potential endogeneity of behaviours and the outbreak onset is avoided by using instrumental variables strategies in the context of an intensity-of-treatment difference-in-differences at the municipality level. While single women reduce sexual activity (the extensive margin), married women do not; instead, married women increase contraception in both the extensive margin and the intensive margin (they substitute less effective methods for more effective ones). This result is in line with a moral hazard model of fertility decisions within the couple. According to the model, not having a child may aggrieve the husband, and he may, in turn, become a "difficult" husband. In such a model, the ZIKV epidemic increases the use of women's contraception and reduces the likelihood of men's retaliation. We find no significant effects on intra-household violence exerted by men (i.e. physical and psychological violence or forced sex) nor reductions in the proportion of expenditures made by women. We do find that husbands of older women are less likely to have other sexual partners. There are heterogeneous effects across age groups and education level.

JEL Codes: D13; I12; I15; J13
Keywords: fertility; intra-household allocation; outbreaks; intimate partner violence

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1 Introduction

Control of fertility is one of the development milestones in the 20th century. However, several factors might affect to what extent women might effectively control fertility. At a macro level in developing countries, it has been shown that family planning has had small effects on the reduction of fertility. While postponing the first child improves several posterior outcomes for women as they become more educated and obtain better jobs (Miller, 2010). At a micro level, recent evidence suggests that fertility choices heavily depends on preferences so that the mere access to contraception does not necessarily reduce births (Ashraf et al., 2014). Besides, contraception choices are affected by the distribution of information within the couple about contraception access and differences on expectations between the partners (Ashraf et al., 2014; Doepke and Kindermann, 2019). All this evidence suggests that the relationship between contraception and fertility choices are driven by factors such as available information, individual expectations and previous violent events (Gazmararian et al., 2000; Olorunsaiye et al., 2017; Williams et al., 2008; Moore et al., 2010).

Husbands cannot observe the way how individual expectations about the demand for fertility are formed and materialised in the presence of risky outcomes. Desired family size results from the conjunction of individual preferences and bargaining in the couple. However, people responses will not be known to each other. As it was mentioned before, some specific actions related to their family size such as the use of modern contraceptive devices and the intensity and frequency of sexual activity belong to a piece of non-verifiable information set by both partners (i.e., McCarraher et al. (2006)). The absence of sexual activity or the lack of a materialised demand of children are actions with not-only individual implications. Besides, a large share of the consequences of a newborn is assumed by females, motivating the use of hidden actions. Thus, these choices might induce some possible retaliation by the partner.

In order to explore the link between expectations of newborns' health and women fertility decisions according to household composition, we exploit a negative shock caused by the Zika virus (ZIKV) epidemic. The shock comes from the fact that ZIKV is associated with fetal neurological malformations (brain damage and microcephaly). Such shock on expectations caused a non-negligible reduction in the number of births in affected tropical countries Gamboa and Rodriguez-Lesmes (2019); Quintana-Domeque et al. (2018). Changes in contraception, abortion and other fertility-related decisions are the means for the reduction in fertility choices.

We use data from Colombia, one of the countries affected by this outbreak in 2015-16. The Colombian case is relevant for several reasons. First, Latin America exhibits the second largest teenage pregnancy in the world (just after sub-Saharan Africa) with numbers above one or two orders of magnitude of those in the developed countries. Second, Colombia is a tropical country that provides a useful setting for analysing urban-mosquito-transmitted diseases (Barron et al., 2018). Its population is distributed in varied ecological zones, with vast differences on average rainfall, humidity, and temperature. Therefore, the vector cannot live and reproduce all over its territory.

The empirical strategy starts with the analysis of the effect of the ZIKV on sexual activity and contraception use. The primary identification issue is the existence of endogeneity given the potential correlation between sexual activity and contraceptive use with ZIKV expansion. Therefore, we opt for using an instrumental variables approach that makes use of the ecological-based potential expansion of the virus as an instrument. Given that factors as the patterns of mobility of the population explain the ZIKV diffusion and potentially reproductive behaviours; it is necessary to have an instrument that allows us to isolate that part of the prevalence attributed to natural features. By using a non-parametric method known as multivariate mixed data local constant regression, we make use of geographical variables to obtain the predicted incidence of the virus. The instrument is the interaction of the predicted incidence with a dummy variable that indicates the start of the outbreak.

We combine information from sexual and reproductive health collected from the *National Demographic and Health Survey* (DHS), a survey that is carried out every 5 years for Colombia, -which is the primary source of detailed information about sexual activity, contraceptive behaviour and couple's choices-. The DHS survey has a specific module on reproductive and sexual health that is implemented exclusively for women in 2009-2010, then, in 2015-2016 this module was also applied to men. The survey contains information on knowledge, use of contraceptive methods and sexual activity. To control for the presence of seasonality and effects specific to each region, we also employ data from 2010-11 DHS wave. We combine this information with administrative data about ZIKV incidence during 2016 at municipality-level that has been collected from the National Service of surveillance in Health (SIVIGILA).

We explored differences across marital status and age groups (13-23; 24-39 and 40-49), as well as education level. Our results suggest that household structure might affect the type of response because single women react differently from married ones. Our main finding shows that single women tend to reduce sexual activity, although the effect is only significant for women aged 40-49. Instead, married women do not reduce sexual activity but tend to increase contraception use. The effect is significant for age groups, 13-23 and 24-39. Looking carefully at substitution among methods, we find that married women substitute barrier methods for other modern methods that are more effective. This substitution is significant for 13-23 more educated women. Interestingly, while 40-49 married women increase their sexual activity, those single women in the same age group reduce their activity.

Given these results, we secondly analyse whether intra-households behaviours change due to the virus outbreak. We look at different forms of violence and changes in expenditure entitlements. We find no effect. We also look at women's partner variables, including whether husbands have other partners. We find no effect, except for partners of married women aged 40-49, who reduce the likelihood of having other sexual partners.

We rationalise the findings for married women using a moral hazard model of contraception. In the model, the members of the couple have contradicting objectives regarding fertility. The husband has strong preferences for having a child, but the wife has information on contraception use (the husband does not). Having a child is part of the marriage contract so that the husband might feel aggrieved for not having a child, and, in consequence, can become a "difficult" husband in that situation. The husband evaluates the likelihood of the wife using contraception. In such a context, the ZIKV outbreak increases the likelihood of contraception use and reduces the likelihood of husband shading.

We contribute with the literature about asymmetric information in the context of fertility choices and intra-household bargaining. As a result of market imperfections, certain actions or attributes became as signals for determining social interactions (Pęski and Szentes, 2013). Apart from the pregnancy and usage of contraceptives presented in Ashraf et al. (2014), there are other behaviours where hidden actions arise. For instance, low levels of testing for HIV in sub-Saharan Africa can be explained by discrimination against HIV, where testing acts as signal of potential infection (Hoffmann et al., 2014; Derksen and van Oosterhout, 2016). Also, perceptions for the 'ideal female body' is substantially different across cultures. In particular, in several African countries such ideal is closer to an overweight person (Holdsworth et al., 2004; Furnham and Baguma, 1994). A theory for this is that obesity its a signal of health and prosperity in the marriage market (Case and Menendez, 2009). We show how a sudden external shock to the system, makes more salient some of these mechanisms.

The structure of the rest of this document is as follows. Section 2 briefly presents the features of the outbreak and the main characteristics of sexual behaviour during 2015-2016. Section 3 provides a conceptual framework and hypotheses. Then, section 4 explains in detail the empirical strategy based on an instrumental variable methodology. Section 5 describes the Demography and Health Survey (DHS) and the sexual and reproductive health module. Section 6 discusses the results, and finally, section 7 concludes.

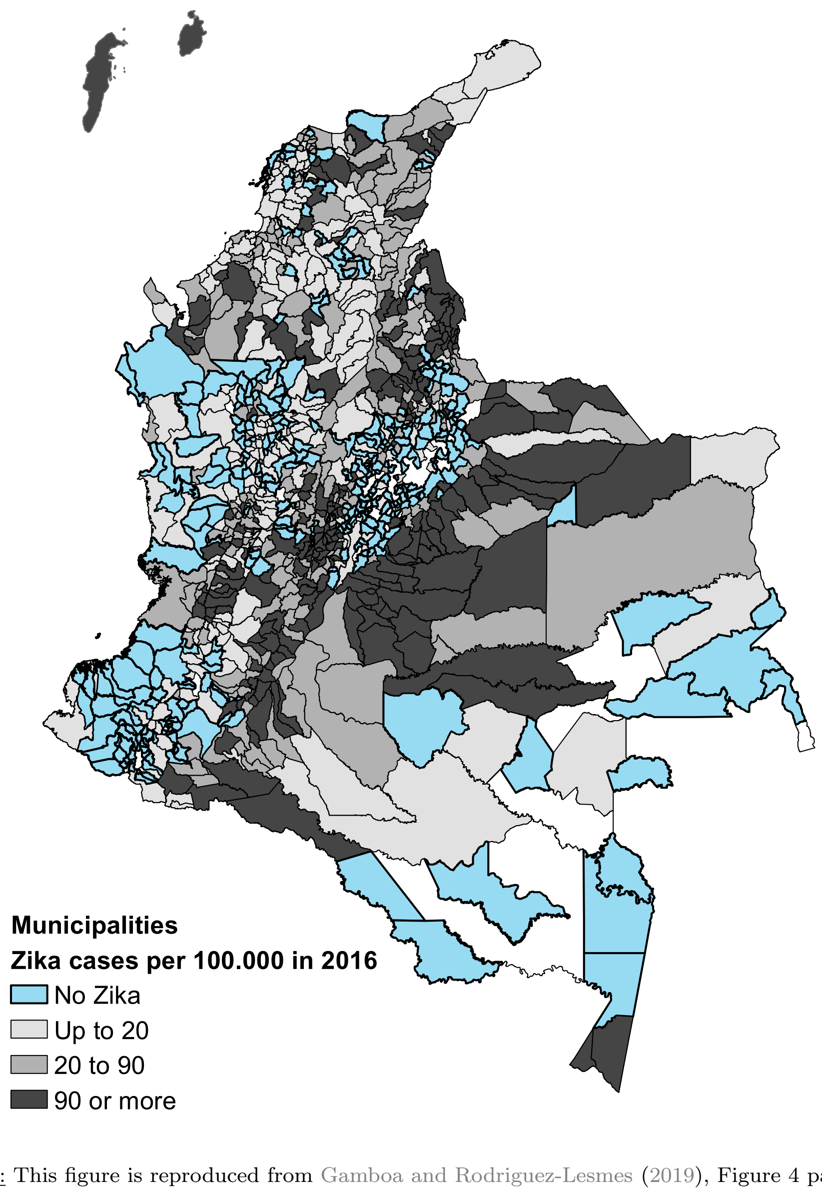
2 Context

2.1 ZIKV in Colombia

ZIKV is transmitted by the *Aedes Aegipty* mosquito which is frequent at warm and humid places. Its main symptoms are fever, headaches and severe pain in muscles and bones, but most of the infected people do not exhibit any symptom (Paniz-Mondolfi et al., 2016). As it can be seen in figure 1, ZIKV was spread along a prominent fraction of the Colombian territory but the number of cases where specifically located in some municipalities.

The diffusion of the ZIKV through the continent responds not only to the presence of the vector, but also to human activity. In particular, places with a high circulation of people from different and distant locations usually are more likely to be affected by new illness (Bogoch et al., 2016). Between January and March 2016, about 6.5% of the population was affected by the ZIKV virus.

Figure 1: Zika Prevalence in Colombia



Notes: This figure is reproduced from Gamboa and Rodriguez-Lesmes (2019), Figure 4 panel B.

However, one of the biggest concerns for public health authorities raised when ZIKV was associated with pregnancy problems, -preterm birth and miscarriage-, (Parra et al., 2016; Cuevas et al., 2016; Rasmussen et al., 2016). Therefore, the World Health Organization (WHO) issued a global alert to address the ZIKV outbreak. In the case of the Colombian government, the Ministry of Health designed campaigns to control the vector and to alert the pregnant women about the virus. ("Plan of Response to the fever by the Virus ZIKA", January 2016). Public health authorities proposed through their campaign to postpone fertility choices: "it is recommended to all inhabitants of the national territory not to become pregnant during this phase, which can go up to July 2016". (Circular No. 2. January- 2016, Ministry of Health).

In consequence, Colombia and Brazil experienced a reduction in fertility rates about 10% as it was documented by Gamboa and Rodriguez-Lesmes (2019) and Quintana-Domeque et al. (2018). These fall in the number of births might be achieved through different strategies. The present document explores the strategies used by households, and their implications, to attain this fertility reduction.

2.2 Sexual health and reproductive behaviour in Colombia

During the last decades, as in other developing countries, fertility rates have been decreasing as a consequence of multiple factors (higher female labour participation, better knowledge about contraceptive methods, childhood economic costs). However, fertility rate remains higher in rural and less developed regions, as well as in the lower quintiles of wealth and human capital. In general terms, Colombian fertility rates have not only decreased in every age group, but the pace of the decline in fertility is becoming slower; from 2.6 in 2000 to 2.0 in 2015 according to the DHS 2015. The total fertility rate of 2.0 children per woman in 2015 is below the replacement level reached in 2010 (2.1 children per woman).

The most recent information about the reported use of contraceptive methods comes from the DHS 2015 survey. According to that survey, there are statistically significant differences in contraceptive use reported by women and men. Most of the policies and actions about the use of contraceptive methods have been focused on women. Among them, there is an emphasis on the younger group because of the prevalence of teenager pregnancy (Vargas et al., 2019).

Among other factors, the knowledge and use of contraception methods explain, at least, a fraction of the declining trend. The knowledge and use of traditional contraceptive methods (*Fertility awareness and withdrawal*) or modern methods are growing in all the areas of the country despite the prevailing cultural patterns as male chauvinism, in which dominate social values that discriminate against women. There have been some crucial changes in the use of contraceptive methods in the recent 15 years in Colombia. However, at the same time, it is still frequent to find people that affirm to know about modern methods but use emergency contraception strategies probably because they do not have similar information about sexual health nor the way their body works.[1]

Also, schooling seems to be the primary protective factor against early pregnancy, since living in areas where there are more significant difficulties in achieving greater educational levels (rural areas), is associated with a greater probability of early pregnancy. This phenomenon is a problem that mainly affects women. About 20% of women between 15-19 years have been pregnant, while only 2.6% of men in this range have faced a pregnancy. Therefore, despite report errors, what it suggests is that there are still many cases where adolescent girls are linked to older men exposing them to asymmetric relationships and bargaining power in that couples (Vargas et al., 2019).

To obtain a better picture of the heterogeneous patterns in sexual activity, we opt to split the population according to the marital status of the women and the type of contraceptives employed. DHS respondents 2009/10 and 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year.

Figure 2 (panel A) shows the differences among women population groups (solid lines represents single people, and dashed lines represent people who live in a couple). As it can be seen, there are notorious differences according to age and the type of method adopted but what is more interesting is the incidence of modern methods before 30 years of age and the substitution from barrier to modern before age 25. The use of an effective contraceptive method decreases over time, but

[1] The current use of contraceptive methods is defined in the DHS survey as the percentage of women/men who reported current use (30 days before the survey) of any contraceptive method, of a modern method of contraception, and some traditional method. Modern methods are: *tubal ligation,vasectomy, the pill, the Depo Provera injection, Intra Uterine Device -IUD, Implants and, condoms.*

Table 1: Reported reasons for not using a contraceptive method (People who had a sexual intercourse in the last 4 weeks)

	Married			Single			
	Youngest (13-23)	Middle (24-39)	Eldest (40-49)	Youngest (13-23)	Middle (24-39)	Eldest (40-49)	Total
Postpartum, breastfeeding	7.5	2.3	0.3	1.1	0.6	0.0	2.2
Wants more children	31.4	41.4	13.5	6.3	20.5	11.1	26.4
Infrequent sex, not sex with men	7.0	5.6	5.1	56.8	47.9	45.5	17.1
Subfecund, infecund	5.5	15.5	25.1	2.1	7.9	16.4	14.0
Health concerns, fear side effects	16.2	14.4	13.2	9.9	10.0	7.4	13.2
Menopausal	0.0	0.4	18.1	0.0	0.3	9.8	4.7
Opposition (own or others)	7.9	4.9	6.1	4.6	1.9	0.8	5.1
Health Services Barriers	14.2	8.4	7.9	10.8	4.8	2.9	8.8
Others	10.2	7.0	10.6	8.3	6.1	6.1	8.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample size	990	2,673	1,616	805	687	244	7,015

Notes: DHS respondents 2009/10 and 2015/16 who report no contraceptive method, had sexual activity in the last three months, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year.

most of this fall is more evident among modern method users. The use of modern contraceptive methods is more frequent than the barrier ones, and this difference raises for married women aged between 20-30 years old. When single women are considered, that difference is higher but decreases monotonically over time. The intensity of sexual activity decreases sharply for single women relative to married women.

In the case of men, the evolution of the use of the different methods does not have the same pattern between single and married men and from women. It is also observed that sexual activity seems to be stable for men older than forty years old which differs from women in the same age (Figure A2, panel A, in the appendix).

Regarding the reasons adduced for avoiding using contraceptive methods, the primary motivations differ between marital status and age range. In particular, the importance of future children and the frequency of sexual relationships varies between the two groups of women (Table 1).

In terms of the expected family size (Figure 2, panel B), for women, it is firstly achieved in people with a higher educational background which might explain the use of contraceptives and sexual activity. But the case of men exhibits a different pattern since the optimal size is achieved after 45 years old even in the case of educated men (Figure A2, panel B). That man have a higher desired family size is not uncommon in low and middle income countries, and is related to the differential cost of childbearing Westoff (2010). These facts suggest that it is not only essential to understand the reduction in the use of contraceptives, but, it is also relevant to know which person responded more actively to the ZIKV fear.

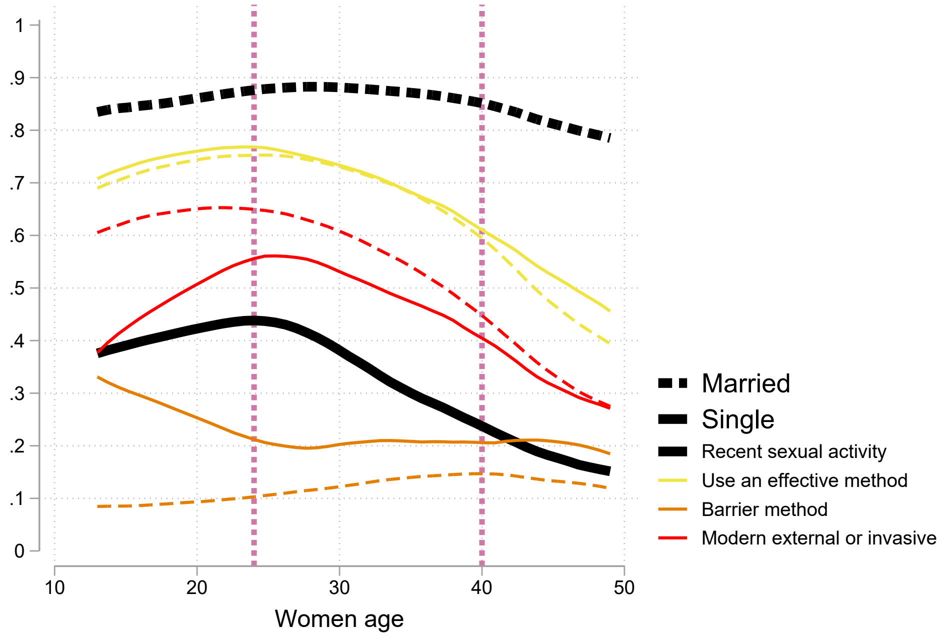
3 Conceptual Framework

To understand how a couple might behave regarding its fertility decisions in the face of the epidemic unleashed by the ZIKV, we develop a moral hazard model where the wife has information on the use of contraception and the husband does not. The type of technology used for contraception can be understood as a hidden action since it is not always observable by both partners. This model is developed in the framework of Hart and Moore (2008) following closely the model developed by Ashraf et al. (2014). According to this framework, contracts may be understood as reference points where some outcomes are embedded within the contract and then not obtaining such outcomes might, ex-post, aggrieve one of the parties. We rationalize marriage as a contract where having children is expected. Independently of preferences, the husband obtains more utility from having a child than from not doing so, and the wife obtains more utility from not having a child than from doing so. This captures the idea that women bear most of the costs of having a child.

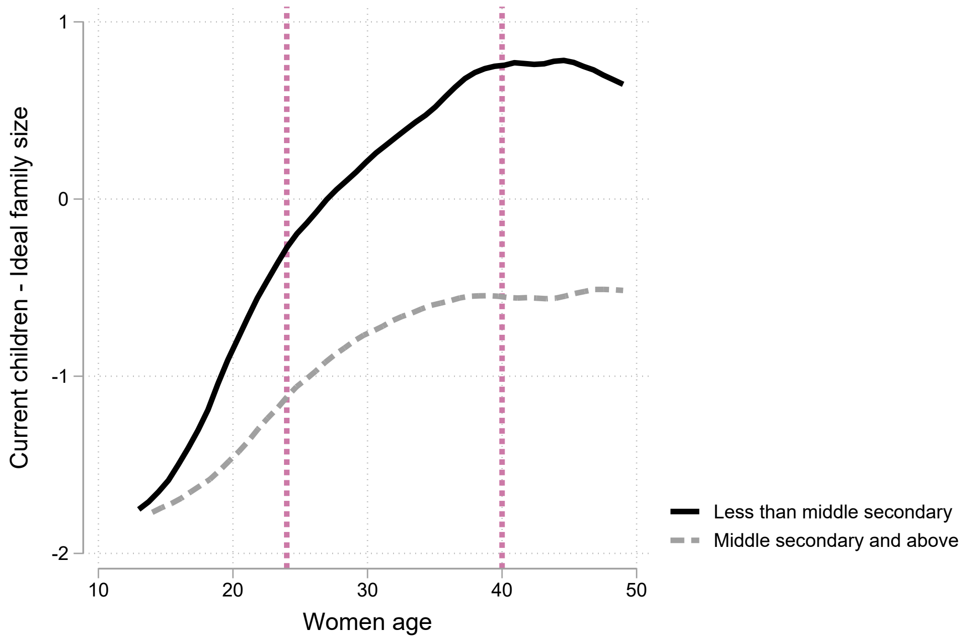
The moral hazard problem in this context emerges when the wife has more information than the husband on the use of contraception. When there is no child, the husband tries to know whether this outcome is due to either the natural chances of not having a child or the use of contraception.

Figure 2: Age and sexual and reproductive decisions: Women

Panel A. Usage of contraception, martial status and age



Panel B. Age and optimal family size for women according to education level



Notes: Local polynomial smooth. DHS respondents 2009/10 and 2015/16 who are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Recent sexual activity refers to the last 4 weeks. Options related to contraception are conditional on reporting recent sexual activity in the last three months. Effective contraceptive methods are classified as follows. **Barrier** are condoms, foam or jelly, vaginal ring; **External:** pill, injections, patches; **Invasive:** IUD, Norplant; **Permanent:** female and male sterilisation. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks.

Since the husband feels aggrieved for not having a child, he might shade or punish the wife. He might become a "difficult" husband. One caveat to consider is that the meaning of punishment is not only related to intra-household violence. It may be the case that the husband might exert physical or psychological violence against his wife. But, punishment might be understood as other actions such as more verbal disputes and disagreements, being unfaithful, among other unwanted behaviours.

In such a framework, we want to characterise how an epidemics as the ZIKV might affect sexual behaviours. We stick to the case in which access to contraception is large enough, and the scope for moral hazard issues is important.

This model assumes that utility obtained from having a child is different for men and women, and therefore, the use of contraception is a central variable. Exposition to the ZIKV reduces the probability of having a healthy child. This reduces the likelihood of the husband punishing the wife, which in turn makes the wife more likely to use contraception. Therefore, by following the main results from our conceptual framework available in the (appendix B) we can hypothesize the following:

- H1 The ZIKV made women use more contraception. Given that there exist contraceptive methods with different effectiveness, this hypothesis implies that those women that do not use contraception begin to use it and; women that use contraception substitute less effective methods for more effective ones.

- H2 The ZIKV made husbands to better behave regarding their wives. This result might take the form of a reduction in intrahousehold violence or a reduction of extramarital relationships.

4 Empirical Strategy

4.1 Data

The ZIKV crisis occurred during the period 2015-2016 in Colombia and DHS 2015-2016 collected during that moment, and in years 2009-2010 allow us to study individuals behaviour before and during the ZIKV episode. This data lets us cover the first five months after the microcephaly alert, as shown in Figure 3. It shows that the start of the officially recorded outbreak is directly related to the first news of microcephaly, and it finishes around August 2016. This figure also shows that there is substantial variation among municipalities in terms of incidence of the illness. The sample includes both municipalities with low incidence (0 to 0.11 cases per 1000 inhabitants in the first quarter of 2016 -the 25 percentile-) and medium-high incidence (above 0.11 cases per 1000 inhabitants). Data about ZIKV comes from the National system of public health Surveillance (SIVIGILA, for its acronym in Spanish). Yet, this partition is just illustrative as we will see in the next section, we do not use a discrete measure of intensity but a continuous one.

For both waves, there are 92,239 women between the ages of 13 to 49. Given our analysis about fertility, we choose those women who have started their sexual life (15,915 have not), are not pregnant (3,264), have not undergone a hysterectomy (1,241), and who neither their partner nor them were sterilised during the last year (21,207). From this sample of 50612 observations, the sample is further restricted to those women for whom there is information available about sexual and reproductive life and for who there is information on the control variables used in the regression analysis. The resulting sample of 44,037 women is presented in Table 2. It shows the mean characteristics of the included individuals and their municipalities.

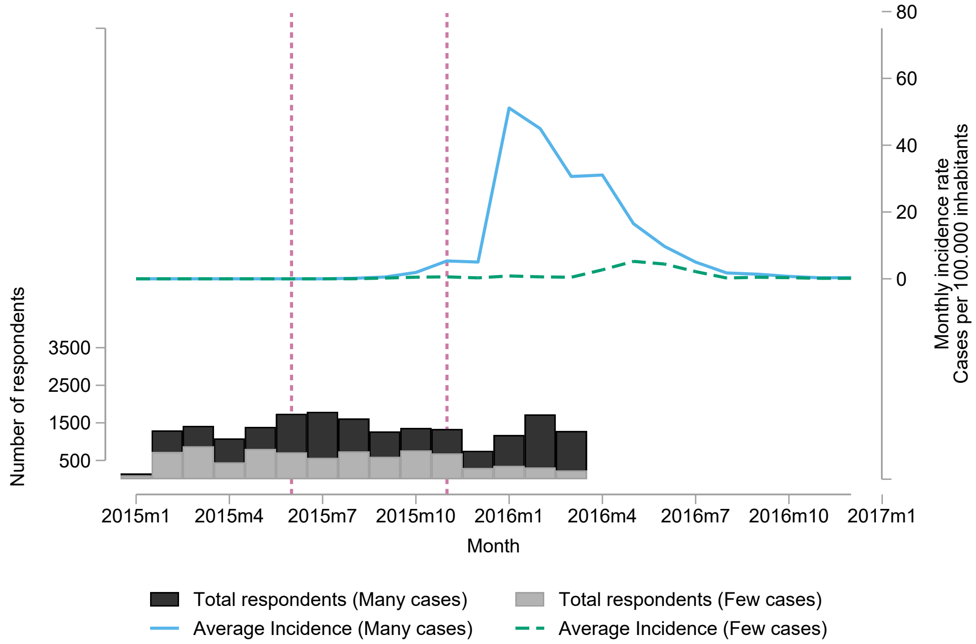
In Table 2, we can see that the regressions sample is not notoriously different in most characteristics from the general sample. However, those differences are significant due to the large sample size. The main observed difference is that our sample is slightly more urban (64% vs 62%) and are more likely to live in areas below 1800 masl (81% vs 74%). That characteristic, is the main difference between municipalities with a high and low incidence in both waves, as also is that they are further away from the capital of the country (which is a low incidence area). Also, women in high incidence areas are less likely to have higher education, their wealth index (calculated by the DHS) is lower, and are more likely to cohabit with their partner. Concerning Zika, 28% of low incidence municipalities reported at least one case in the month of the survey, against 90% in the high incidence. For those with positive cases, the monthly incidence was of 2 per 100,000 inhabitants for the first group, while it was 104 in the high-incidence. As a result, our estimates will consider a variation of incidence of 1 case per 1,000 inhabitants per month; equivalent from moving from low to high incidence areas.

The table also shows the main characteristics that we consider in our analysis. Overall, 32% are between ages 12 and 23 (the *youngest*), 49% are aged 24 to 39 (the *middle*), and 18.5% are aged 40 to 49 (the *eldest*). Women with *low* levels of education are those with no education, primary or basic secondary education (covers grades 1 to 4 of secondary). They correspond to 30.1% of the population, and it corresponds roughly to the education that would be attained by age 15. We refer to the others as those with *high* education. The last characteristic of interest is whether the women live with their partner (*married*), irrespective of their actual civil status. They constitute roughly half of the sample. We will refer to the others as the *single*.

To understand how ZIKV change sexual and reproductive life of women, we will analyze the data based on the characteristics described above and their interactions. Table 3 shows the actual sample size available for this type of analysis, with frequencies according to age and cohabiting status, and age and education status. Here the numbers are split by year as Zika treatment is concentrate in the second last column, areas with high incidence interviewed in 2016. The numbers in each cell tell us that the sample size is enough for understanding what happens in each of them, but also that further partitions of the data are likely to result in substantial reductions of power.

Table 2 also presents information about the primary outcomes: usage of contraceptive methods, and the incidence of IPV during the last year. Physical violence happens to one in three, and physiological violence to two in three. Less common is that women report being forced into sexual activity by their husbands (4%). An index of bargaining power within the household is also presented. It takes the value of 0 if the man takes all decisions related to household budget and expenditures, and the value of 1 if it is the woman instead. As the variables include specific components for women, the average is around 0.66.

Figure 3: Zika 2015 and 2016 monthly incidence and DHS date of interview



Notes: This figure presents two pieces of information. First, the line plots present the total number of reported Zika cases per 100.000 inhabitants per month (incidence rate) for the set of municipalities included in the DHS below and above the 25th percentile of the first quarter of 2016 incidence of Zika. That percentile was calculated for municipalities that reported at least one case of Zika (67% of all municipalities). The categories are **Few cases** which corresponds to municipalities from 0 to 0.11 cases per 1000 inhabitants, and **many cases** that represents those with an incidence above 0.11 cases per 1000 inhabitants. Such cut-off splits roughly in half the total municipalities of the country for which data is available and provides us with a sample of about 331 municipalities. Observed rates were derived from SIVIGILA official epidemiological records and DANE population data. Second, the bars show the total number of women interviewed for the DHS survey per month according to the categories expressed above. The vertical lines correspond to June 2015, when the Ministry of Health issued an alert of the arrival of ZIKVto Colombia; and November 2015, when the first news regarding the potential link between ZIKV and microcephaly appeared.

Table 2: DHS variables means according to wave and Zika intensity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Both waves		2009/10		2015/16	
Variable	ALL	Estimation	p-val	Low I	High I	Low I	High I
Individual level variables							
Youngest (13-23)	0.318	0.321	0.041	0.320	0.321	0.306	0.337
	(0.003)	(0.003)		(0.006)	(0.004)	(0.010)	(0.007)
Middle (24-39)	0.497	0.495	0.088	0.480	0.490	0.521	0.495
	(0.003)	(0.004)		(0.006)	(0.005)	(0.011)	(0.008)
Eldest (40-49)	0.185	0.185	0.805	0.200	0.189	0.173	0.168
	(0.003)	(0.003)		(0.005)	(0.004)	(0.007)	(0.006)
No education	0.014	0.014	0.411	0.010	0.019	0.010	0.016
	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)	(0.001)
Primary education	0.173	0.171	0.001	0.178	0.220	0.122	0.145
	(0.002)	(0.002)		(0.004)	(0.004)	(0.005)	(0.005)
Basic secondary education	0.117	0.116	0.064	0.118	0.140	0.092	0.107
	(0.002)	(0.002)		(0.004)	(0.003)	(0.005)	(0.004)
Middle secondary education	0.351	0.351	0.430	0.359	0.375	0.326	0.335
	(0.003)	(0.003)		(0.006)	(0.005)	(0.010)	(0.007)
Higher education	0.345	0.348	0.002	0.336	0.245	0.450	0.396
	(0.004)	(0.004)		(0.006)	(0.004)	(0.012)	(0.008)
Wealth index	3.11	3.15	0.00	3.35	2.94	3.33	2.90
	(0.01)	(0.01)		(0.02)	(0.01)	(0.03)	(0.02)
Cohabits with her partner	0.511	0.504	0.000	0.477	0.537	0.482	0.524
	(0.003)	(0.004)		(0.006)	(0.005)	(0.012)	(0.008)
Household head	0.172	0.178	0.000	0.179	0.174	0.186	0.171
	(0.003)	(0.003)		(0.005)	(0.004)	(0.008)	(0.006)
Recent sexual (last 4 weeks)	0.628	0.626	0.069	0.616	0.635	0.611	0.643
	(0.003)	(0.004)		(0.006)	(0.005)	(0.011)	(0.007)
Method: No use or traditional	0.295	0.286	0.000	0.270	0.325	0.234	0.313
	(0.004)	(0.004)		(0.007)	(0.006)	(0.015)	(0.009)
Method: Barrier	0.158	0.158	0.868	0.171	0.173	0.129	0.147
	(0.003)	(0.003)		(0.006)	(0.005)	(0.008)	(0.007)
Method: External, invasive and permanents	0.547	0.557	0.000	0.558	0.503	0.638	0.540
	(0.004)	(0.005)		(0.008)	(0.006)	(0.015)	(0.009)
Spouse physically forced sex last year	0.042	0.042	0.471	0.051	0.048	0.031	0.033
	(0.001)	(0.002)		(0.003)	(0.002)	(0.003)	(0.003)
Physical violence last year	0.326	0.326	0.724	0.349	0.344	0.298	0.298
	(0.004)	(0.004)		(0.007)	(0.005)	(0.012)	(0.008)
Psychological violence last year	0.673	0.676	0.027	0.720	0.719	0.614	0.616
	(0.004)	(0.004)		(0.007)	(0.005)	(0.014)	(0.009)
Expenditure decisions at the HH index	0.661	0.661	0.724	0.655	0.659	0.672	0.662
	(0.002)	(0.002)		(0.003)	(0.002)	(0.005)	(0.003)
Number of women	50612	44037		10368	15699	7699	10271
Municipality level variables							
Urban	0.618	0.648	0.010	0.675	0.582	0.622	0.728
	(0.026)	(0.028)		(0.055)	(0.051)	(0.063)	(0.054)
Distance to capital	97.87	98.84	0.59	89.71	111.23	91.11	102.84
	(5.34)	(5.94)		(10.99)	(10.13)	(13.57)	(12.49)
Distance to market	328.82	326.24	0.37	321.10	327.25	320.29	337.73
	(6.68)	(6.88)		(13.22)	(11.78)	(16.37)	(13.55)
Unsatisfied basic needs index	35.86	35.27	0.26	35.69	36.71	33.44	35.02
	(1.12)	(1.20)		(2.67)	(1.88)	(2.89)	(1.97)
Metropolitan area	0.084	0.084	0.990	0.080	0.085	0.063	0.111
	(0.014)	(0.015)		(0.034)	(0.025)	(0.027)	(0.034)
Municipality area	836.37	849.23	0.79	584.79	1007.09	644.99	1194.23
	(71.19)	(62.35)		(94.07)	(112.00)	(116.30)	(166.96)
Municipality below 1800 masl	0.745	0.810	0.000	0.655	0.970	0.670	0.950
	(0.025)	(0.024)		(0.057)	(0.020)	(0.061)	(0.029)
Avg (1990-2015) Precipitation (1000 mm)	4.39	4.48	0.09	4.91	4.20	4.46	4.37
	(0.14)	(0.15)		(0.29)	(0.28)	(0.24)	(0.39)
At least one case of zika in the month (2016)	0.690	0.690	.			0.283	0.898
	(0.084)	(0.084)				(0.134)	(0.057)
Zika monthly incidence per 1.000 inhabitants (2016)	0.90	0.90	.			0.02	1.04
	(0.40)	(0.40)				(0.01)	(0.46)
Number of municipalities	549	457		98	130	110	119

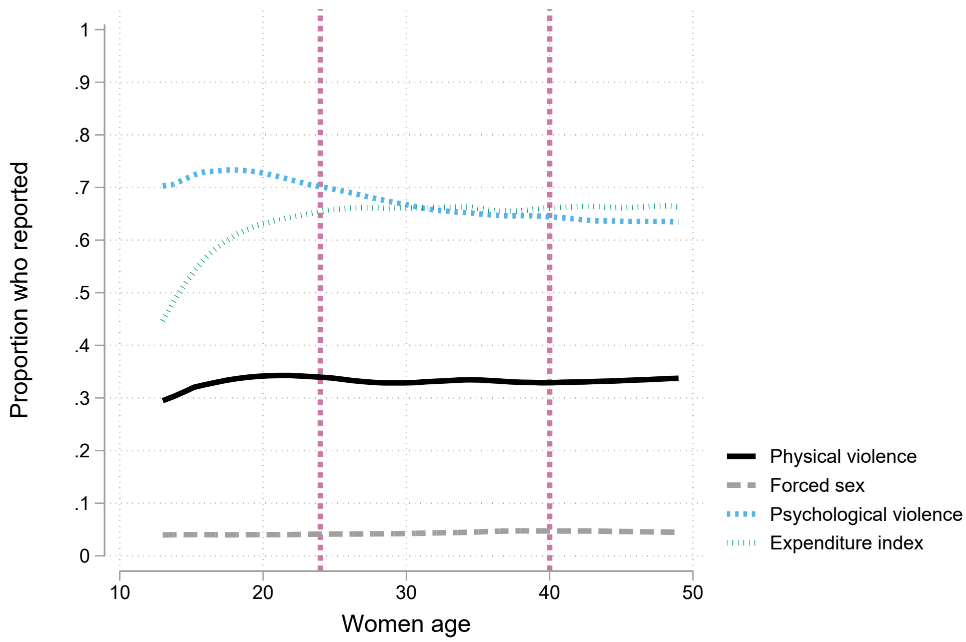
Notes: DHS respondents 2009/10 and 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. The p-value in column 3 corresponds to a test of difference of means between the general DHS sample (Col 1) and the sample used in the main regressions (Col 2). The sample used in the main regressions is split according to the wave of the interview and the ZIKV incidence of the municipality. *Low incidence:* 0 ZIKV cases or less than 0.11 cases per 10.000 inhabitants in the first quarter of 2016. *High incidence:* 0.11 or above. This number corresponds to the 25 percentile of the 2016 first quarter incidence distribution.

Table 3: Number of observations per DHS wave and Zika Incidence

	2009 Low	2009 High	2010 Low	2010 High	2015 Low	2015 High	2016 Low	2016 High	Total
	Year of interview and zika incidence of the municipality								
Married (cohabiting with the partner)	290	993	5,101	7,713	3,550	3,824	389	1,707	23,567
Youngest (13-23)	55	165	1,061	1,846	742	900	82	401	5,252
Middle (24-39)	159	592	2,915	4,369	2,054	2,204	226	972	13,491
Eldest (40-49)	76	236	1,125	1,498	754	720	81	334	4,824
Single (not cohabiting with the partner)	211	766	4,766	6,227	3,306	3,419	454	1,321	20,470
Youngest (13-23)	86	346	2,225	2,851	1,538	1,582	221	617	9,466
Middle (24-39)	82	288	1,782	2,417	1,276	1,339	187	508	7,879
Eldest (40-49)	43	132	759	959	492	498	46	196	3,125
Second. incomplete or less (8 yrs-)	170	739	3,955	5,719	2,183	2,131	266	939	16,102
Youngest (13-23)	43	183	1,139	1,675	591	618	93	258	4,600
Middle (24-39)	69	341	1,757	2,587	922	866	113	400	7,055
Eldest (40-49)	58	215	1,059	1,457	670	647	60	281	4,447
Basic secondary or above (9yrs+)	331	1,020	5,912	8,221	4,673	5,112	577	2,089	27,935
Youngest (13-23)	98	328	2,147	3,022	1,689	1,864	210	760	10,118
Middle (24-39)	172	539	2,940	4,199	2,408	2,677	300	1,080	14,315
Eldest (40-49)	61	153	825	1,000	576	571	67	249	3,502
Sample size	501	1,759	9,867	13,940	6,856	7,243	843	3,028	44,037

Notes: DHS respondents 2009/10 and 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. *Low incidence:* 0 ZIKV cases or less than 0.11 cases per 10.000 inhabitants in the first quarter of 2016. *High incidence:* 0.11 or above. This number corresponds to the 25 percentile of the 2016 first quarter incidence distribution.

Figure 4: Age and intra-household behaviours



Notes: Local polynomial smooth. DHS respondents 2009/10 and 2015/16 who are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Physical and psychological violence, and whether the spouse physically forced sex last year, refer to last year behaviour.

4.2 Main procedure: IV estimation

The estimation of the effect of the Zika epidemic on sexual behaviour in Colombia is done by means of two outcome variables: Sexual activity and contraception use. These are represented by $reph_{ijt}$, which is a dummy variable for recent sexual activity and current use of contraceptive methods for an individual i living in a municipality j who is interviewed in month t. Then, the equation to be estimated is the following:

$$reph_{ijt} \quad = \quad \beta_0 + \beta_1 * ZIKV_{jt} + \gamma * X_{ijt} + \mu_t + \epsilon_{ijt} \qquad (1)$$

The variable of interest $ZIKV_{jt}$ represents the number of Zika cases per 1.000 inhabitants reported in month t in the municipality j. The vector X_{ijt} is composed by several variables as follows: ethnicity, educational level, wealth index, number of children, distance to the capital, distance to the nearest market and a set of dummy variables for pregnant women, marital status, household head, urban area, NBI (poverty variable), metropolitan area and municipality area. The estimated model also includes time-fixed effects μ_t, and age group μ_a fixed effects. Notice that we do not use municipality fixed effects as DHS collects information from different areas of the country each month.

However, a particular concern emerges from the fact that sexual activity and contraceptive use might be correlated to the Zika expansion. Contrary to endemic diseases such as Dengue, Zika was a new illness, and its outbreak spread responds to a particular dynamic. The sources are the passengers in flights travelling from Brazil into Colombian airports, and the movement of infected individuals into Colombian cities where the *Aedes Aegypti* mosquito lives. Then, infected individuals move into smaller towns and residential neighbours, and then the outbreak cycle would work as Dengue. Thus, while ecological conditions are relevant, it is also essential the role of each town on local, national and international trade. Such characteristics are also related to the age, education level, and other observed and unobserved characteristics of the municipalities which might be correlated to differential trends on sexual and contraceptive activity. As it was stated by Gamboa and Rodriguez-Lesmes (2019), areas below 1800 masl have a significantly lower birth rate, and they deal with endogeneity by using a synthetic control strategy. This strategy is not available in this setup as constructing parallel trends is problematic given that DHS municipalities above and below 1800 masl are not evenly sampled every month during the study period. Instead, we rely on an instrumental variables approach. These effects are estimated via two-stage least squares, where $ZIKV_{jm}$ is the endogenous variable.

4.3 The Instrument: predicted Zika incidence

As it was mentioned previously, the diffusion patterns of the ZIKV depends on factors such as *i.* presence of the vector -Aedes mosquito- and *ii.* travelling patterns of locals and visitors of a certain area. Given that these features are explained by human activity and geography, the main challenge is to predict 2016 incidence-based only natural factors which cannot be handled (in the short run) by human activity. This avoids the transmission channel based on movements of individuals which might hide characteristics correlated with different sexual and contraceptive trends.

Therefore, we estimate the predicted Zika incidence, $\hat{P}_j$, by means of a non-parametric model that combines ecological characteristics (altitude above the sea level, average temperature, and rurality (rural/urban)) at a municipality level using a *Multivariate Mixed Data Local Constant Regression* with optimal bandwidths.[2] This procedure allows accounting for highly non-linear relationships which may be latent under that type of phenomenon. For instance, mosquitoes prefer certain temperature range; they are not monotonically better of with growing temperatures. Notice that variable $\hat{P}_j$ is fixed on time. Thus it is not capturing specific weather events that might be related to economic shocks contemporaneous to the ZIKV crisis. Figure 5 shows the conditional relationship between the four ecological characteristics considered and the incidence of ZIKV. It shows that, as is well known, municipalities below 1800 masl have on average a higher incidence, but as documented in Barron et al. (2018) for Dengue, the relationship is non-monotonic. Average rainfall connection with ZIKV is as well non-monotonic, with a first decreasing and then increasing pattern. The relationship is even noisier for temperature, where a specific range seems to be ideal. Conditional on those characteristics, the more rural is the municipality, fewer cases of ZKIV are reported. These three variables capture nearly 40% of the total variation, as shown by the R^2 of the non-parametric regression.

Therefore, ZIKV incidence -$\hat{P}_j$- is used in the first stage after its estimation at municipality-year level, as presented in equation 2. Hence, the instrument is the predicted incidence $\hat{P}_j$ interacted

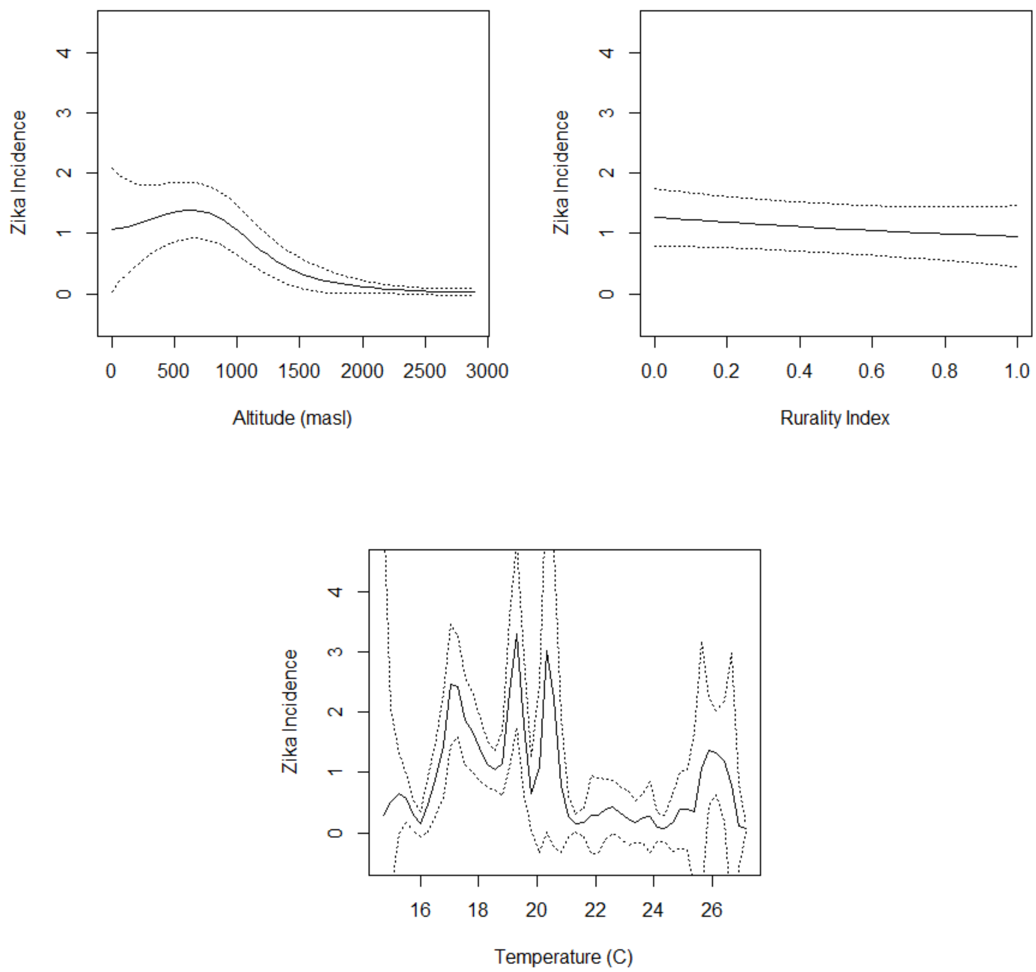
[2]This model is estimated by means of the routine `npreg` command available in `np` package for free software `R` (Hayfield et al., 2008).

with *time-dummy* variable and $\hat{P}_j$ is also added to the X_{ijt} matrix. The dummy takes the value of 1 between January 2016 and March 2016. This period was selected because of the public knowledge generated about the suspicious relationship between the ZIKV and microcephaly by November 2015 in Colombia. This increased the concern of citizens and especially of pregnant women or who were looking to be pregnant.

$$ZIKV_{jt} \quad = \quad \alpha_0 + \alpha_1 \hat{P}_j \times \mathbb{1}(y = 2016) + \alpha_2 \hat{P}_j + \eta * X_j + \mu_t + \epsilon_{jt} \tag{2}$$

Under this specification, standard errors are clustered at the municipality level, and DHS individual weights are considered. The estimated incidence is an indicator of the importance of geographical conditions for each town. As it can be seen in Table 4, ZIKV is associated to lower places, but it decreases when temperatures are so high as it also shows non-linearities plotted in Figure 5.

Figure 5: 2016 incidence of Zika and ecological variables



Notes: Estimates from a local-constant non-parametric regression using a second-order gaussian kernel. Bandwidths of 264.5882 masl for altitude, 0.3112892 Kelvin grades for temperature, and 0.08794013 for rurality index (ranges from 0 to 1).

Table 4: First step results

.	ZIKV incidence for the first three months of 2016 (1)	(2)	Monthly ZIKV incidence (3)
Altitude (masl)	-0.001^{***}		
	(0.000)		
Temperature (C)	-0.192^{***}		
	(0.037)		
Rurality Index	-1.142^{***}		
	(0.270)		
$\hat{P}_j$ (Predicted incidence)		1.211^{***}	0.001
		(0.080)	(0.004)
Instrument: $\hat{P}_j \times \mathbb{1}(y = 2016)$			1.115^{***}
			(0.100)
Observations	331	331	809
Municipalities	331	331	331
Adjusted R Squared	0.16	0.68	0.87

Notes: The dependent variable is the Zika virus incidence for the first three months of 2016 in municipalities for which there are at least one surveyed women (incidence takes the value of 0 before January 2016). The instrument is the interaction between predicted values of Zika incidence and a dummy variable equal to one for January 2016 to March 2016 period. Controls include dummies for being urban and of being part of the metropolitan area, distance to the department capital, distance to the nearest market, poverty index, whether the municipality is located below 1800 masl, average historic rainfall, and the total area of the municipality. Municipality clustered/robust standard errors are presented in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

$$\begin{aligned} reph_{ijt} &= \beta_0 + \sum_{k=1}^{2} \left(\beta_k * ZIKV_{jt} \times AGE^k_{ijt} + \iota_k AGE^k_{ijt}\right) + \beta_2 \hat{P}_j \\ & +\gamma * X_{ijt} + \mu_t + \epsilon_{ijt} \end{aligned} \tag{3}$$

The second stage is carried out by recognizing the distinct patterns of people sub-populations. Regarding on women's fertility choices are related to age, the specification (see equation 3) includes the interaction between the incidence of $ZIKV_{jm}$ and a categorical variable for two *age-groups* AGE^k_{ijt}: 13 to 19 years and more than 19 years, and two *marital status-groups*.

5 Results

5.1 Contraception

We consider the impacts related to contraception for women who had already started their sexual life and who were not sterilised. Table 5 presents in columns 1 to 4 if the woman reports recent sexual activity (last four weeks), and for those who had any sexual activity in the last three months, columns 5 to 8 present results on whether a contraceptive method was in use. On the rows, coefficients for Zika incidence are presented. Bear in mind that we are considering an increase in 1 case per 1,000 inhabitants per month, which is like moving from *low* to *high* incidence areas where the virus was detected. Columns 1 and 5 correspond to the specification with no interactions, columns 2 and 6 for the interaction with the age group, and columns 3 and 7 present the interactions with cohabiting status. Finally, columns 4 and 8 present the interaction with the combination of the two characteristics. Second, we enter into further detail of the type of contraception method in Table 6: columns 1 to 4 are for barrier methods, and 5 to 8 for modern externals and invasive. Both tables also present the F-test for the first stage for each endogenous variable (ZIKV incidence interactions). At the bottom of the tables, there are four p-values corresponding to different hypotheses depending on the model. In columns 2 and 6, it tests the equivalence of the coefficients of youngest with middle (tests 1) and the middle with the eldest (test 2). In columns 3 and 7, the first test corresponds to the equivalence between single and married coefficients. Finally, in columns 4 and 8, the test is between ages but within the cohabiting status; in columns 1 and 2 for married, and in columns 3 and 4 for single.

First, concerning sexual activity, there is an increase in the probability of reporting sexual intercourse during the last four weeks for married women aged 40 to 49 (+ 5.3 pp per 1 SD of ZIKV incidence), and a reduction for single women of the same age (- 5.9 pp). For younger women, there is no difference. As shown in Figure A2, on average 80% of married women report recent sexual activity regardless of the age, while for single women the proportion is around 20% for the 40-49 age group. Therefore the increase in sexual activity for married women is relatively small, but the reduction for single ones is of around a quarter.

Second, we observe that there is an increase on the usage of modern contraceptive methods different to the barrier (*others*, henceforth): an extra 4 pp from an average of 52% of all women that reported sexual activity in the last four weeks. As described above, this corresponds mainly to oral contraceptives, patches and injections (64%), but also invasive methods such as DIU (32%) and recent cases (within a year) of sterilisation (3%). The increase is observed significantly in the youngest (+4.9pp) and middle age groups (4.2 pp), but we cannot reject all three age-group coefficients to be the same. As well, the increase seems also larger for married women, especially the youngest ones (nearly 9 pp). Appendix E presents a detailed analysis of what happens within the *others* category, showing that external methods increase for the youngest women, while for the middle group it is the invasive methods which grow. However, those large increases are related to reductions on barrier methods in the youngest age group (- 4 pp), both married and single. The reduction in barrier methods usage is considerable, just 10% of married women used it, 20% of single ones who are 25 and older, and nearly 30% in the youngest age group.

Third, the net result is that contraception usage increased for married women of all ages in almost the same magnitude (4 pp). As mentioned above, married women report more frequent sexual activity, but Figure A2 shows that they are less likely to be under any modern contraceptive method. For single women, there is no evidence of an increase or decrease in contraceptive usage. If anything, there is a substitution of the barrier methods for *others*.

Lastly, when splitting the data by education level (Table 7), we find that increases on contraceptive usage are especially crucial for the middle and eldest age groups with at most basic secondary education. For women with upper secondary and above, substitution of the barrier methods for *others* appear to be more common. Yet, the main result here is the lack of response for the youngest low educated women. Not only the coefficient cannot be rejected to be equal to zero, but also the point estimate is negative. Yet, large standard errors limit our ability to provide strong conclusions over this dimension.

Table 5: Results on reproductive health (IV)

	Recent sexual activity				Usage of a contraceptive method			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Zika Incidence	-0.003				0.020			
	(0.009)				(0.022)			
Youngest (13-23) × Zika I		-0.010				0.010		
		(0.013)				(0.028)		
Middle (24-39) × Zika I		-0.002				0.026		
		(0.010)				(0.024)		
Eldest (40-49) × Zika I		0.004				0.027		
		(0.013)				(0.020)		
Married=0 × Zika I			-0.015				-0.010	
			(0.012)				(0.037)	
Married=1 × Zika I			0.012				0.040**	
			(0.012)				(0.018)	
Youngest (13-23), married × Zika I				-0.002				0.046**
				(0.014)				(0.022)
Middle (24-39), married × Zika I				0.000				0.041*
				(0.013)				(0.024)
Eldest (40-49), married × Zika I				0.053***				0.031
				(0.020)				(0.020)
Youngest (13-23), single × Zika I				-0.013				-0.006
				(0.018)				(0.040)
Middle (24-39), single × Zika I				-0.006				-0.010
				(0.012)				(0.035)
Eldest (40-49), single × Zika I				-0.059***				-0.026
				(0.012)				(0.136)
Observations	44,037	44,037	44,037	44,037	27,658	27,658	27,658	27,658
N Municip	330	330	330	330	330	330	330	330
Y bar	0.63	0.63	0.63	0.63	0.71	0.71	0.71	0.71
F-1st	35.0				37.3			
F-1st step G1		22.0	16.2	11.4		38.2	21.2	7.92
F-1st step G2		25.3	15.9	12.8		21.0	14.0	12.5
F-1st step G3				9.24				9.51
F-1st step G4				17.1				24.4
p-val test 1		0.54	0.039	0.83		0.50	0.11	0.86
p-val test 2		0.56		0.013		0.96		0.57
p-val test 3				0.62				0.82
p-val test 4				0.0013				0.90

Notes: DHS respondents 2009/10 and 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Usage of contraceptives is conditional on women who reported any sexual activity in the last three months. Estimates come from a 2SLS estimation of the IV model, where ZIKV incidence is instrumented with predicted incidence. **Zika incidence** refers to the municipality number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include ethnicity, educational level, wealth index, a dummy for cohabiting with the partner, head of the household dummy, age group dummies, number of children, and if her spouse (if it is the case) is at least five years older. At the municipality level, the predicted incidence based on ecological conditions is included, poverty index (NBI), distances to the capital of the department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area. The estimates also include month-year of interview fixed effects. The four p-values correspond to different hypotheses depending on the model: Cols 2 and 6: the equivalence of the coefficients of youngest with middle (test 1) and of the middle with eldest (test 2); Cols 3 and 7: the equivalence between single and married coefficients (test 1); Cols 4 and 8: same as with columns 2 and 6, but within the cohabiting status, tests 1 and 2 for married, tests 3 and 4 for single. Clustered standard errors at the municipality level are presented in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Results on usage of contraceptive methods (IV)

	Barrier methods				Modern externals, invasive and permanents			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Zika Incidence	-0.020*				0.040*			
	(0.011)				(0.020)			
Youngest (13-23) × Zika I		-0.039***				0.049*		
		(0.012)				(0.027)		
Middle (24-39) × Zika I		-0.016				0.042**		
		(0.017)				(0.020)		
Eldest (40-49) × Zika I		0.007				0.019		
		(0.014)				(0.024)		
Single × Zika I			-0.033*				0.023	
			(0.020)				(0.025)	
Married × Zika I			-0.012				0.052**	
			(0.010)				(0.021)	
Youngest (13-23), married × Zika I				-0.039**				0.085***
				(0.018)				(0.025)
Middle (24-39), married × Zika I				-0.010				0.052**
				(0.016)				(0.022)
Eldest (40-49), married × Zika I				0.006				0.025
				(0.014)				(0.025)
Youngest (13-23), single × Zika I				-0.040**				0.034
				(0.020)				(0.032)
Middle (24-39), single × Zika I				-0.030				0.020
				(0.028)				(0.020)
Eldest (40-49), single × Zika I				-0.027				0.000
				(0.093)				(0.132)
Observations	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658
N Municip	330	330	330	330	330	330	330	330
Y bar	0.16	0.16	0.16	0.16	0.56	0.56	0.56	0.56
F-1st	37.3				37.3			
F-1st step G1		38.2	21.2	7.92		38.2	21.2	7.92
F-1st step G2		21.0	14.0	12.5		21.0	14.0	12.5
F-1st step G3				9.51				9.51
F-1st step G4				24.4				24.4
p-val test 1		0.091	0.23	0.24		0.73	0.18	0.081
p-val test 2		0.29		0.44		0.13		0.092
p-val test 3				0.60				0.58
p-val test 4				0.97				0.88

Notes: DHS respondents 2009/10 and 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Contraceptive methods are classified as follows. **Barrier** are condoms, foam or jelly, vaginal ring; **External:** pill, injections, patches; **Invasive:** IUD, Norplant; **Permanent:** female and male sterilization. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks. Estimates come from a 2SLS estimation of the IV model, where ZIKV incidence is instrumented with predicted incidence. **Zika incidence** refers to the municipality number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include educational level, wealth index, and head of the household dummy. At the municipality level, the predicted incidence based on ecological conditions is included, average precipitation, municipality area, poverty index (NBI), distances to the capital of the department and the nearest market, as well as dummies for being on an urban area, a metropolitan area, being below 1800 masl. The estimates also include month-year of interview fixed effects. The four p-values correspond to different hypotheses depending on the model: Cols 2 and 6: the equivalence of the coefficients of youngest with middle (test 1) and the middle with eldest (test 2); Cols 3 and 7: the equivalence between single and married coefficients (test 1); Cols 4 and 8: same as with columns 2 and 6, but within the cohabiting status, tests 1 and 2 for married, tests 3 and 4 for single. Clustered standard errors at the municipality level are presented in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Results according to education level (IV)

	Recent		Usage		Barrier		OtherM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low education × Zika	-0.001		0.041*		-0.008		0.050*	
	(0.017)		(0.025)		(0.017)		(0.026)	
High education × Zika	-0.002		0.018		-0.025**		0.043**	
	(0.008)		(0.022)		(0.012)		(0.021)	
Youngest (13-23), low educ × Zika		-0.069		-0.029		-0.002		-0.027
		(0.046)		(0.060)		(0.052)		(0.095)
Middle (24-39), low educ × Zika		0.029		0.067		-0.010		0.076*
		(0.026)		(0.047)		(0.022)		(0.041)
Eldest (40-49), low educ × Zika		0.009		0.048**		-0.007		0.054**
		(0.017)		(0.023)		(0.018)		(0.023)
Youngest (13-23), high educ × Zika		-0.004		0.022		-0.046***		0.068**
		(0.013)		(0.029)		(0.015)		(0.031)
Middle (24-39), high educ × Zika		-0.005		0.019		-0.018		0.038**
		(0.008)		(0.021)		(0.017)		(0.019)
Eldest (40-49), high educ × Zika		0.001		0.004		0.020		-0.016
		(0.011)		(0.030)		(0.020)		(0.030)
Observations	44,037	44,037	27,658	27,658	27,658	27,658	27,658	27,658
N Municip	330	330	330	330	330	330	330	330
Y bar	0.63	0.63	0.71	0.71	0.16	0.16	0.56	0.56
F-1st								
F-1st step G1	38.5	11.4	38.6	4.55	38.6	4.55	38.6	4.55
F-1st step G2		15.6		15.0		15.0		15.0
F-1st step G3		22.4		15.2		15.2		15.2
F-1st step G4		21.1		56.0		56.0		56.0
p-val test 1	0.91	0.052	0.054	0.25	0.24	0.87	0.71	0.35
p-val test 2		0.37		0.65		0.90		0.49
p-val test 3		0.92		0.89		0.088		0.26
p-val test 4		0.58		0.62		0.18		0.040

Notes: Low education: less than middle secondary school (*Octavo* or less, eight years of basic education). **High education:** middle secondary school or above (*Noveno* or above, nine years of basic education). DHS respondents 2009/10 and 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Contraceptive methods are classified as follows. First, **barrier** are condoms, foam or jelly, vaginal ring. Sencond, **OtherM** are *External:* pill, injections, patches; *invasive:* IUD, Norplant; and *permanent:* female and male sterilization. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks. Estimates come from a 2SLS estimation of the IV model, where ZIKV incidence is instrumented with predicted incidence. **Zika incidence** refers to the municipality number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include educational level, wealth index, and head of the household dummy. At the municipality level, the predicted incidence based on ecological conditions is included, average precipitation, municipality area, poverty index (NBI), distances to the capital of the department and the nearest market, as well as dummies for being on an urban area, a metropolitan area, being below 1800 masl. The estimates also include month-year of interview fixed effects. The four p-values correspond to the equivalence of the coefficients of youngest with middle (test 1 and 2) and of the middle with eldest (tests 2 and 4), being tests 1 and 2 for individuals with low education, and tests 3 and 4 for high education. Clustered standard errors at the municipality level are presented in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2 Intra-household behaviour

Table 8 shows that changes on contraception had almost no impact on violence within married couples. Also, there is no evidence of a change in bargaining power within the household. At the 90% confidence level, the eldest women are less likely to report to be forced into sexual activity by their partner (- 1.1 pp). The women increased their sexual activity as well as their usage of contraceptive methods. Alternative constructions of the intra-household variables are presented in appendix D. There is suggestive evidence of reduced decision power for married women, but this result is sensible to the specification. In the appendix, we also explore economic violence without evidence of an impact.

Table 8: Married women: intra-household outcomes (IV)

	Physical violence			Forced sex			Psychological			Expenditure		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
Zika Incidence	0.003			-0.000			-0.010			-0.006		
	(0.008)			(0.005)			(0.030)			(0.006)		
Youngest (13-23) × Zika		0.032			0.012			-0.040			-0.004	
		(0.034)			(0.012)			(0.044)			(0.012)	
Middle (24-39) × Zika		-0.004			-0.001			-0.005			-0.010	
		(0.013)			(0.007)			(0.030)			(0.009)	
Eldest (40-49) × Zika		-0.007			-0.009*			0.006			0.004	
		(0.016)			(0.005)			(0.022)			(0.007)	
Low education × Zika			0.014			0.007			-0.012			-0.004
			(0.015)			(0.012)			(0.035)			(0.015)
High education × Zika			-0.003			-0.001			-0.012			-0.005
			(0.008)			(0.004)			(0.029)			(0.006)
Observations	23,145	23,145	23,145	23,145	23,145	23,145	23,145	23,145	23,145	19,350	19,350	19,350
N Municip	330	330	330	330	330	330	330	330	330	330	330	330
Y bar	0.14	0.14	0.14	0.024	0.024	0.024	0.63	0.63	0.63	0.66	0.66	0.66
F-1st	27.8			27.8			27.8			25.0		
F-1st step G1		10.1	25.9		10.1	25.9		10.1	25.9		5.93	22.1
F-1st step G2		16.9			16.9			16.9			11.6	
p-val test 1		0.39	0.18		0.38	0.47		0.13	0.98		0.72	0.92
p-val test 2		0.82			0.25			0.52			0.0034	

Notes: DHS respondents 2009/10 and 2015/16 who are cohabiting with their partners, report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. **Physical violence** takes the value of one if the woman reports that during the last year the spouse has either (i) pushed, shook or threw something to her; (ii) slapped her; (iii) punched her with the fist or something harmful; (iv) kicked or dragged her; (v) tried to strangle or burn her; (vi) threatened her with knife/gun or other weapon; or (vii) attacked her with knife/gun or other weapon. **Forced sex** takes the value of one if the spouse physically forced sex when she did not want during the last year. **Psychological violence** takes the value of one if any of the next nine items were reported: the husband is (i) jealous if she is talking with other men; (ii) accuses her of unfaithfulness; (iii) does not permit her to meet her girlfriends; (iv) tries to limit her contact with family; (v) insists on knowing where she is; (vi) does not trust her with money; (vii)ignores or don't address her. The **expenditures index** is based on who has the final say on the following items: (i) how to spend the money the woman earns; (ii) how to spend the money the partner earns; (iii) woman health care; (iv) making large household purchases; (v) making household purchases for daily needs; (vi) visits family or relatives; (vii) food to be cooked each day; (viii) whether the woman studies; and (ix) having sex. Possible answers are that the man takes the decision alone (0 points), both take the decision (1 point) or the woman alone (2 points). Items are added up and the results scaled between 0 (woman holds all power) and 1 (woman holds all power). Estimates come from a 2SLS estimation of the IV model, where ZIKV incidence is instrumented with predicted incidence. **Zika incidence** refers to the municipality number of cases per 100.000 inhabitants in the month the respondent was surveyed. **Low education:** less than middle secondary school (*Octavo* or less, 8 years of basic education). **High education:** middle secondary school or above (*Noveno* or above, 9 years of basic education). Controls, interacted with age-cohabiting status groups, include educational level, wealth index, and head of the household dummy. At the municipality level, the predicted incidence based on ecological conditions is included, average precipitation, municipality area, poverty index (NBI), distances to the capital of the department and the nearest market, as well as dummies for being on an urban area, a metropolitan area, being below 1800 masl. The estimates also include month-year of interview fixed effects. Clustered standard errors at the municipality level are presented in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

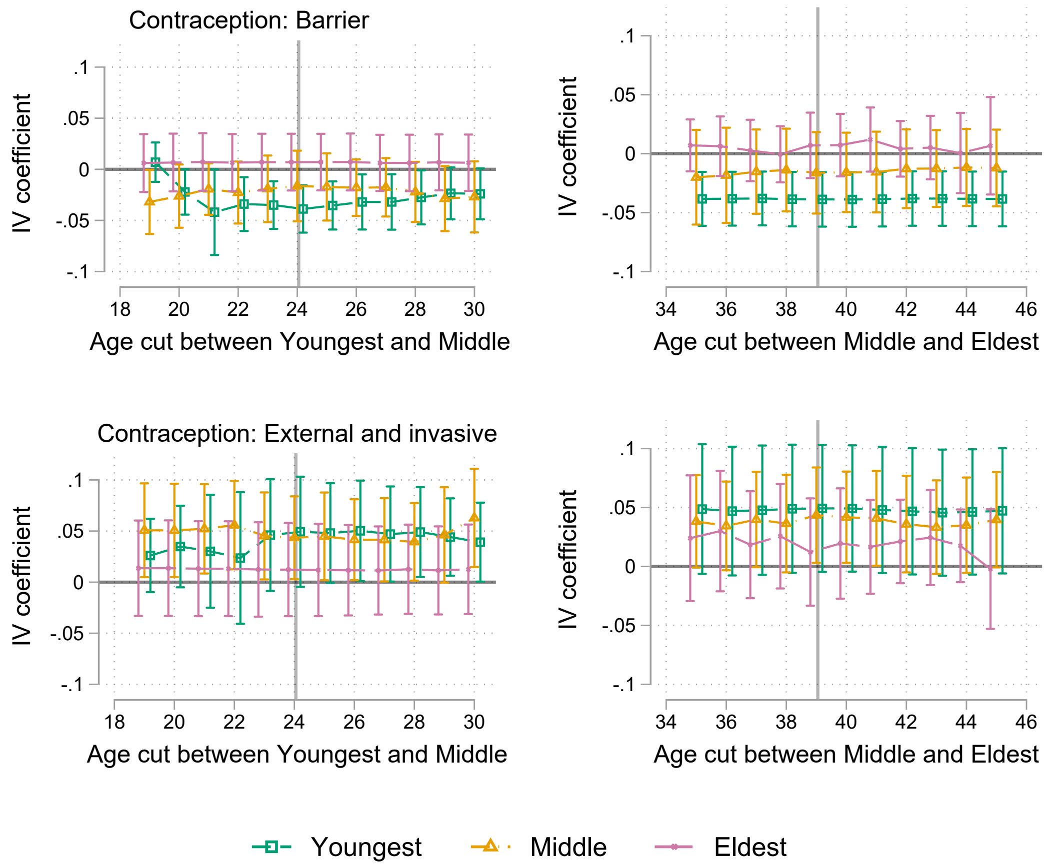
6 Robustness analysis

One feasible caution with estimated results might emerge from the choice of the age cuts defined along with the previous estimations. Then, Figures 6 and 7 present several alternative estimates to the ones presented in columns 2 and 6 of tables 5 and 6 in which estimations are obtained for different age range definitions. Overall, most coefficients are stable, and main results hold. We also consider estimates using only the 2015/16 sample, where most findings, though with more imprecise estimates, hold (see appendix C). The 2015/16 DHS survey includes men responses as well, allowing us to check if the findings are the same from their alternative results. Unfortunately, the reduced sample size results on imprecise estimates that allow us to draw solid conclusions. These results, presented in appendix C, also suggest that men of the eldest group reduce the odds of having more than one sexual partner, and that low educated young men increased their sexual activity.

7 Discussion and Conclusions

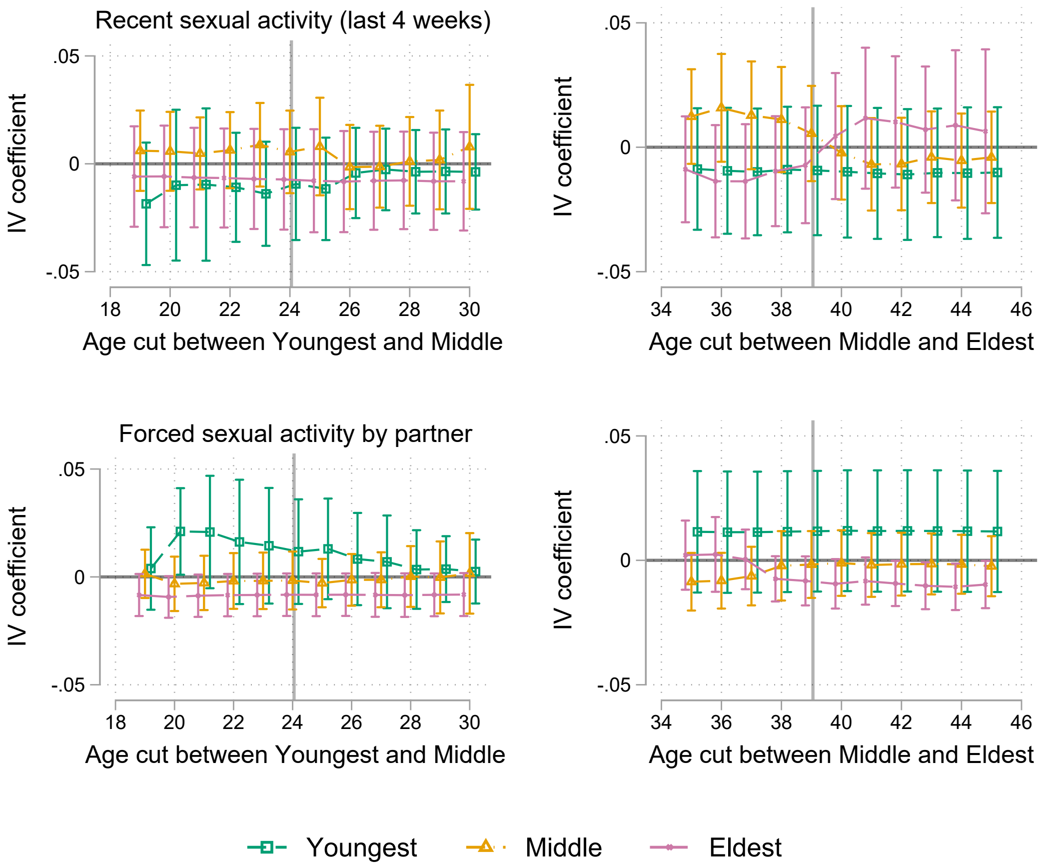
The primary purpose of our approach is to provide new evidence of heterogeneous responses of people to the presence of an unexpected outbreak and its consequences on sexual behaviour under an ideal scenario for the use of hidden actions by the partners in a moral hazard model. The theoretical model followed through this document helps us to study people behaviour with opposite goals toward sexual activity and fertility choices. Given that, having a child is part of the marriage contract, so that the husband might feel aggrieved for not having a child, and, in consequence, can become a "difficult" husband in that situation. The husband evaluates the likelihood of the wife using contraception. In such a context, the ZIKV outbreak increases the likelihood of contraception use and reduces the likelihood of husband shading. Therefore, single and married people respond differently.

Figure 6: Main estimates of zika incidence impact and alternative definitions of age groups: contraceptive method



Notes: These graphs present the coefficients of the coefficients *Youngest x Zika I*, *Middle x Zika I*, and *Eldest x Zika I* presented in tables 5 and 6. Graphs on the left column set the *Eldest* group to start at 40 years of age and allowing the *Middle* starting age to change. graphs on the right fix the *Middle* start age at 24 and allows the cut of *Eldest* to change. The main estimates are at the solid vertical lines (24 on the right and 39 on the left). Each point estimate is presented with a 95% confidence interval. Point estimates are slightly moved from the exact age only for illustrative purposes. Estimates come from a 2SLS estimation of the IV model, where ZIKV incidence is instrumented with predicted incidence.

Figure 7: Main estimates of zika incidence impact and alternative definitions of age groups: sexual activity and forced sex



Notes: These graphs present the coefficients of the coefficients *Youngest x Zika I*, *Middle x Zika I*, and *Eldest x Zika I* presented in tables 5 and 6. Graphs on the left column set the *Eldest* group to start at 40 years of age and allowing the *Middle* starting age to change. graphs on the right fix the *Middle* start age at 24 and allows the cut of *Eldest* to change. The main estimates are at the solid vertical lines (24 on the right and 39 on the left). Each point estimate is presented with a 95% confidence interval. Point estimates are slightly moved from the exact age only for illustrative purposes. Estimates come from a 2SLS estimation of the IV model, where ZIKV incidence is instrumented with predicted incidence.

From our estimations emerge the following facts. First, the increase on contraception use is not as large as expected, just 5 pp from an original figure around 65% for women aged 13 to 40 who had recent sexual intercourse. Thus, nearly one in three sexually active women in those ages were still exposed to the unknown new risk. Second, the youngest single women did not respond at all to the new scenario, on average. In this group, 40 out of 100 women had recent sexual activity, and 28 were under any contraceptive method. The other 12 do not seem to react to this particular scenario. Our education level based analysis shows that this lack of responses seems to be on women with low levels of education (completed less than upper secondary school). This indicates that these women are commonly vulnerable ones. Finally, the third main message is the lack of response on intra-household variables. There is no evidence of an increase or reduction of physical, psychological or economic violence as a result of the adjustments on contraception. As well, there is no firm evidence of a change of bargaining power within the household in compensation for the temporal loss of fertility.

This article enriches the literature about how viruses' outbreaks trigger strong short and middle term responses on an ample range of human behaviours (Adda, 2007), economic activity (Adda, 2016), performance on standardised school tests (Barron et al., 2018), and fertility (Gamboa and Rodriguez-Lesmes, 2019). But at the same time, provide new evidence to understand how people behave in response to situations where hidden actions are latent. The most recent epidemic, COVID-19 virus, still has limited evidence of how households behave in the face of unknown risks. Additionally, the vast majority of countries have implemented restrictions on mobility that may have implications on sexual activity and the demand for fertility by households given that there is limited information about the virus' consequences on newborns.

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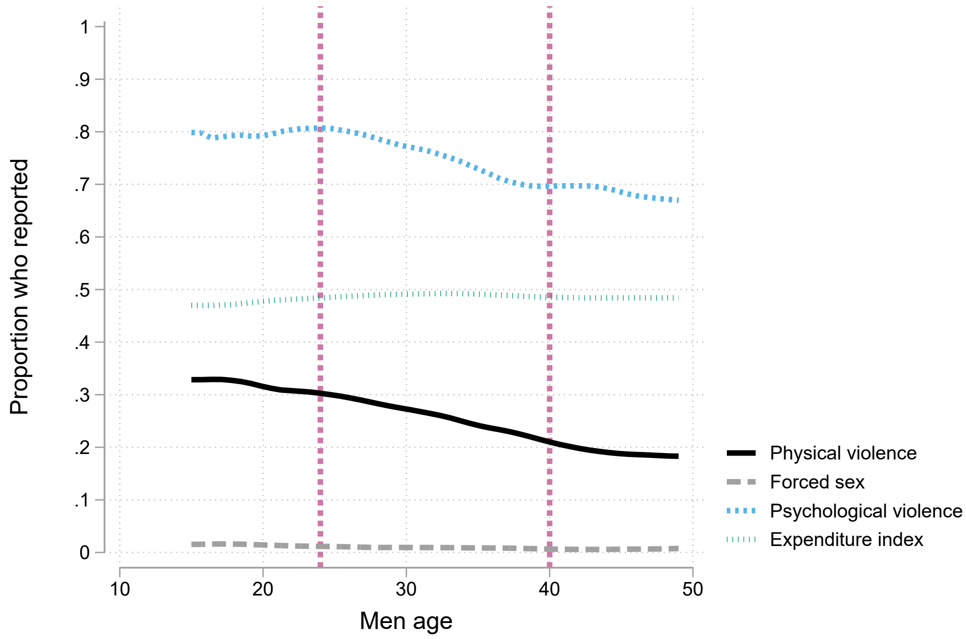
A Men behaviours

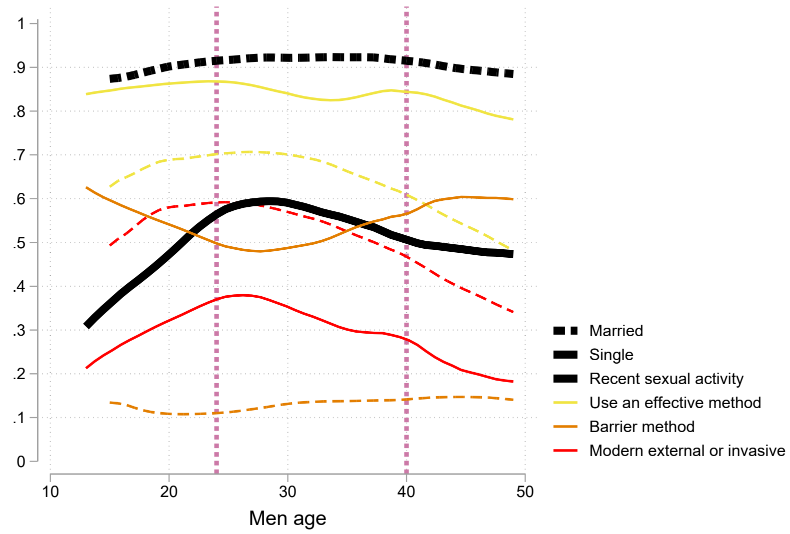
Figure A1: MEN: Age and intra-household behaviours



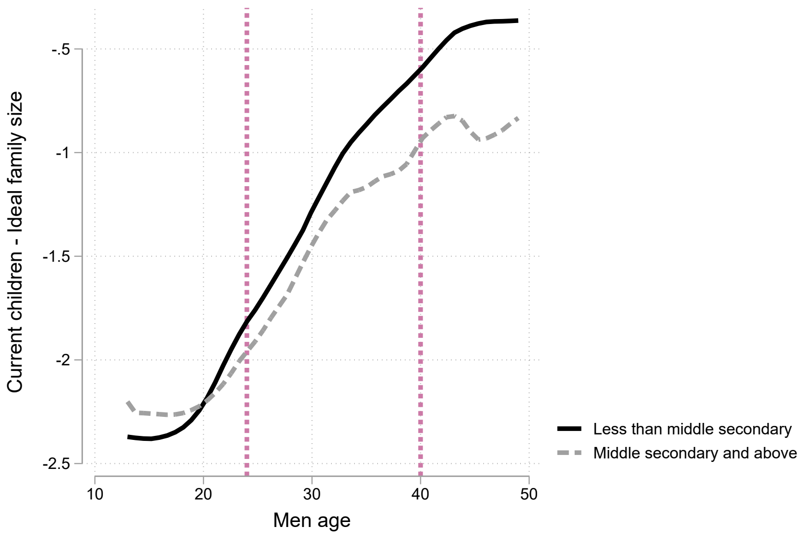
Notes: Local polynomial smooth. DHS respondents 2015/16 who neither their partner nor they were sterilised during the last year. Physical and psychological violence, and whether the spouse physically forced sex last year, refers to last year behaviour.

Figure A2: MEN: Age and sexual and reproductive decisions

Panel A. Usage of contraception, martial status and age

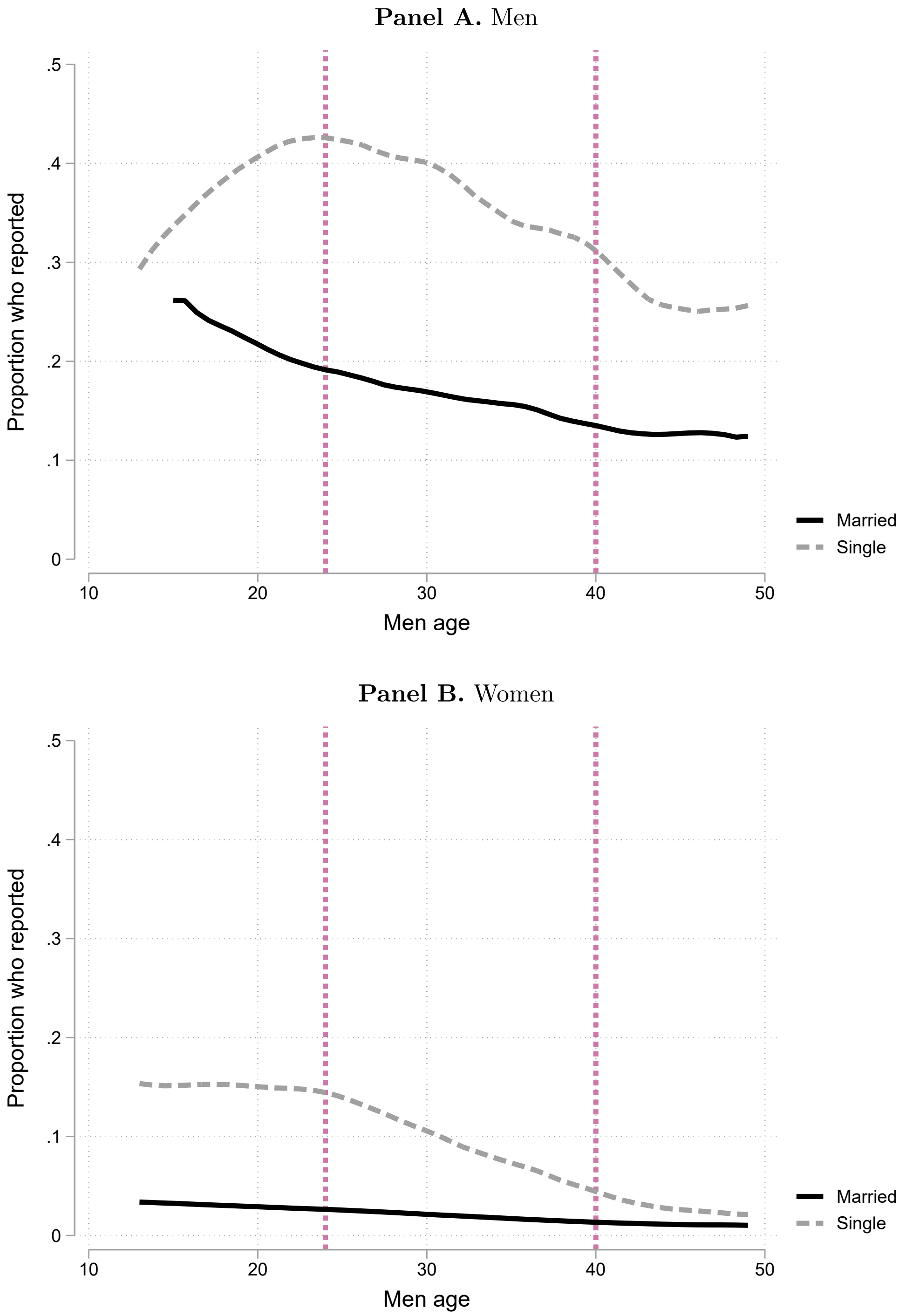


Panel B. Age and optimal family size for men according to education level



Notes: Local polynomial smooth. DHS respondents 2015/16 who neither their partner nor they were sterilised during the last year. Recent sexual activity refers to the last four weeks. Options related to contraception are conditional on reporting recent sexual activity in the last three months.

Figure A3: Proportion of respondents with more than one sexual partner by age



Notes: Local polynomial smooth. DHS respondents 2015/16 who neither their partner nor they were sterilised during the last year.

B The moral hazard model

To understand how the zika virus (ZIKV) might affect the choices of women, we present a static moral hazard model of contraception for a couple. The model is largely based on Ashraf et al. (2014). We assume that both agents, the husband (h) and the wife (w), are risk-neutral. The husband obtains a positive utility from having a child $\bar{u}_h > 0$. If not, the utility is normalized to zero. The wife obtains positive utility from not having a child $\bar{u}_w > 0$. Otherwise, the utility is normalized to zero. This reflects the fact that the wife bears most of the cost of having a child.

Contraception is available with probability β. If available, the wife might choose to use it, with probability c. Contraception works well with probability one and has cost K for the wife. If no contraception is used the probability of having (a healthy) child is v. The husband does not know whether contraception is available, nor the wife uses contraception. He only observes whether the child is born or not. When there is no child, the husband might choose to misbehave (or not) with his wife. In this simple model, the husband' bad behaviour captures a wide range of behaviours toward the wife, from simple complaints to physical or psychological punishment or infidelity. The husband obtains utility form punishing the wife only if she has used contraception. For this reason, when there is no child, he elicits the probability of wife' use of contraception using the Bayes rule. With probability p the husband punishes the wife and causes on her a cost l. He perceives utility b from doing so.

The order of events is as follows. First, Nature draws whether contraception is available or not. Second, when contraception is available, the wife chooses whether to use it or not. Afterwards, the child is born or not. If there is no child, the husband chooses whether to punish or not.

Formally the wife utility is a function of both the probability of using contraception c and the probability of being punished p:

$$U_w(c,p) = \left[c\beta + (1-c\beta)(1-v)\right](\bar{u}_w - pl) - cK \tag{4}$$

The husband utility is also a function of the probability of the wife use of contraception and the probability to punish her p:

$$U_h(c,p) = (1-c\beta)\, v\bar{u}_h + \left[1-(1-c\beta)\, v\right] pbU^*$$

where

$$U^* = \left[Prob\left[\text{contraception}|\text{no child}\right] - Prob\left[\text{no contraception}|\text{no child}\right]\right]$$

These probabilities are husband beliefs on the use (or not) of contraception given that there is no child. Following the Bayes rule, we have that,

$$Prob\left[\text{contraception}|\text{no child}\right] = \frac{c\beta}{\left[c\beta + (1-c\beta)(1-v)\right]} \tag{5}$$

and

$$Prob\left[\text{no contraception}|\text{no child}\right] = \frac{(1-c\beta)(1-v)}{\left[c\beta + (1-c\beta)(1-v)\right]}$$

Denoting the belief of using contraception when there is no child as ρ, then the husband utility boils down to:

$$U_h(c,p) = (1-c\beta)\, v\bar{u}_h + \left[1-(1-c\beta)\, v\right] pb(2\rho - 1) \tag{6}$$

An equilibrium in this model is given by a pair (c^*, p^*) that maximises both U_w and U_h. Notice from Equation (6) that the husband punishes ($p > 0$) only if $2\rho - 1 \geq 0$. Using Equation (5), this condition holds if and only if $c\beta \geq \frac{1-v}{(2-v)}$. Then, we have two possible equilibrium:

Case 1 When $\beta < \frac{1-v}{2-v}$

In this case, the husband never punishes ($p^* = 0$) and the wife always uses contraception ($c^* = 1$) when available.

Case 2 When $\beta \geq \frac{1-v}{2-v}$

In this case, the equilibrium is given in strictly mixed strategies by

$$(c^*, p^*) = \left(\frac{1-v}{\beta(1-v)}, \frac{\bar{u}_w - \frac{K}{\beta v}}{l} \right)$$

Case 1 holds when contraception is relatively unlikely to be available. Since we are analysing the Colombian case, a country in which contraception has been available for decades (Miller, 2010), we focus on case 2, when contraception is above the threshold $\frac{1-v}{2-v}$.

ZIKV affects this equilibrium through the probability of having a healthy child v. Knowing that the ZIKV reduces the probability of having a healthy child, we can characterise how the exposure to the virus affects the equilibrium behaviour of both the wife and the husband. We summarise the results in the following proposition.

Proposition B.1. *When the exposure to the ZIKV increases, the wife is more likely to use contraception, and the husband is less likely to punish her.*

Proof. We just need to characterize how the equilibrium changes when the ZIKV exposition increases. Let us denote the ZIKV exposition as z. We can define the probability of having a healthy child v as a function of z, that is, $v(z)$ and $\frac{dv}{dz} < 0$. We know that the equilibrium when the contraception availability is relatively high is given by

$$(c^*, p^*) = \left(\frac{1 - v(z)}{\beta(1 - v(z))}, \frac{\bar{u}_w - \frac{K}{\beta v(z)}}{l} \right)$$

Taking the first derivative of c^* and p^* with respect to z, we obtain that

$$\frac{\partial c^*}{\partial z} = -\frac{(1 - \beta c^*)}{\beta(2 - v)} \frac{\partial v}{\partial z} > 0$$

and

$$\frac{\partial p^*}{\partial z} = \frac{K}{\beta l v^2} \frac{\partial v}{\partial z} < 0.$$

□

C Results only with DHS 2015/16

C.1 Women results

We restricted the analysis only to the DHS 2015/16. This reduces the sample size substantially, so we can expect more imprecise estimates. We assess this in order to check if findings were driven by the comparison against a previous cohort with very different behaviours. The following results show that adding the 2009/10 sample only increase the precision of the estimates. If anything, it removes results that could be driven by idiosyncratic large variations over a small number of individuals per cell (marital group per age, or education level per age).

Table C1 presents the main estimates relative to sexual and reproductive behaviours, conditional on age and cohabiting status. With respect to sexual activity, the increase for the married eldest and the reduction for the single eldest are found in this reduced sample as well. On top of this, there is a reduction on sexual activity of the youngest. For usage of contraceptive methods, coefficients are very similar but less precisely estimated. This also happens for the findings relative to usage of barrier vs other modern contraceptive methods. This is also the case when we consider heterogeneity on education level. Table C2 replicates the results in the main text with the restricted sample.

For the case of intra-household behaviours, Table C3 shows that as the main estimates, there is no evidence of solid impacts. In this table there is an important reduction on psychological violence of the youngest age group. The number is negative as the point estimate of Table C3 but is almost four times larger. The coefficient for the eldest on forced sexual activity in the main table is almost the same in the reduced sample estimates, but is not significant.

C.2 Men results

Now we move to men. DHS 2015/16 interviewed men for the first time. One view could be to consider men as an alternative measurement of the same phenomenon. However, there are two important elements that tell us that results could be different. First, men are at least three times more likely to have more than one sexual partner than women. Second, men might not be sure (or even know) if their partner is using a contraceptive method. Also, our benchmark here are the DHS 2015/16 results for women, which were already imprecise.

Table C4 presents, if we consider only the signs, the same story as Table C1: an increase on externals and invasive methods that compensates a reduction of barrier methods. Standard errors are large, making it hard to confirm the findings. There are only two particular differences to consider. First, the probability than an elder men report having more than one sexual partner is reduced by 5 pp. Second, there is an important substitution between barrier and other methods for the eldest. That was not observed for women. Whether this different impact is related to multiple sexual partners or is a false positive arising from the sample size remains unclear. With respect to education heterogeneity, Table C5 shows also the multi-partner result for the eldest, and a particular finding for the youngest age group. Low education single men increase their sexual activity, which is it not the case of the highly educated that, if anything, reduce it. For women, Tables C2 and C5 do not show this pattern. Again, it remains open the question if this is particular different behaviour of young men.

Lastly, Table C6 shows no particular impact on their perceived intra-household variables. Not only because of large estimates, but also point estimates are in general very close to zero.

Table C1: Women 2015/16 data: Results on sexual and reproductive behaviours (IV)

	Recent sexual activity				More than one sex partner				Usage of a contraceptive method				Barrier methods				Modern externals, invasive and permanents			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Zika Incidence	-0.016				-0.007				0.039				-0.042*				0.081*			
	(0.021)				(0.015)				(0.040)				(0.025)				(0.042)			
Youngest (13-23) × Zika Incidence		-0.064*				-0.019				0.038				-0.063*				0.101*		
		(0.035)				(0.023)				(0.041)				(0.037)				(0.056)		
Middle (24-39) × Zika Incidence		-0.002				-0.001				0.041				-0.040				0.080**		
		(0.023)				(0.013)				(0.040)				(0.028)				(0.035)		
Eldest (40-49) × Zika Incidence		0.014				-0.005				0.050				-0.008				0.058		
		(0.030)				(0.015)				(0.058)				(0.043)				(0.054)		
Married=0 × Zika Incidence			-0.038				-0.009				0.004				-0.055*				0.059	
			(0.024)				(0.019)				(0.051)				(0.031)				(0.047)	
Married=1 × Zika Incidence			0.017				-0.003				0.069				-0.030				0.099*	
			(0.028)				(0.011)				(0.050)				(0.024)				(0.055)	
Youngest (13-23), married × Zika Incidence				-0.042				-0.009				0.079				-0.062				0.140
				(0.042)				(0.018)				(0.063)				(0.045)				(0.094)
Middle (24-39), married × Zika Incidence				0.010				-0.003				0.066				-0.032				0.098**
				(0.028)				(0.013)				(0.047)				(0.027)				(0.047)
Eldest (40-49), married × Zika Incidence				0.078*				0.000				0.079				-0.006				0.085
				(0.046)				(0.014)				(0.073)				(0.040)				(0.072)
Youngest (13-23), single × Zika Incidence				-0.069*				-0.023				0.030				-0.064				0.094
				(0.038)				(0.026)				(0.048)				(0.042)				(0.061)
Middle (24-39), single × Zika Incidence				-0.013				0.003				-0.008				-0.056				0.047
				(0.027)				(0.017)				(0.055)				(0.038)				(0.042)
Eldest (40-49), single × Zika Incidence				-0.051*				-0.011				-0.062				-0.092				0.030
				(0.031)				(0.021)				(0.134)				(0.103)				(0.141)
Observations	17,970	17,970	17,970	17,970	17,963	17,963	17,963	17,963	11,386	11,386	11,386	11,386	11,386	11,386	11,386	11,386	11,386	11,386	11,386	11,386
N Municip	229	229	229	229	229	229	229	229	229	229	229	229	229	229	229	229	229	229	229	229
Y bar	0.63	0.63	0.63	0.63	0.063	0.063	0.063	0.063	0.73	0.73	0.73	0.73	0.14	0.14	0.14	0.14	0.59	0.59	0.59	0.59
F-1st	10.8				10.8				8.76				8.76				8.76			
F-1st step G1		6.32	12.4	2.29		6.32	12.5	2.30		4.11	20.8	1.79		4.11	20.8	1.79		4.11	20.8	1.79
F-1st step G2		4.63	3.22	3.43		4.65	3.22	3.44		3.82	3.56	3.77		3.82	3.56	3.77		3.82	3.56	3.77
F-1st step G3				3.21				3.22				3.18				3.18				3.18
F-1st step G4				8.34				8.32				16.4				16.4				16.4
p-val test 1		0.062	0.016	0.18		0.35	0.71	0.70		0.94	0.12	0.76		0.55	0.24	0.56		0.58	0.35	0.48
p-val test 2		0.49		0.046		0.64		0.83		0.81		0.78		0.44		0.48		0.49		0.74
p-val test 3				0.12				0.23				0.21				0.87				0.34
p-val test 4				0.19				0.34				0.64				0.74				0.90

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Contraceptive methods are classified as follows. **Barrier** are condoms, foam or jelly, vaginal ring; **External:** pill, injections, patches; **Invasive:** IUD, Norplant; **Permanent:** female and male sterilization. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks. Estimates from 2SLS of the IV model, where zika incidence is instrumented with predicted zika incidence. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include ethnicity, educational level, wealth index, if cohabiting with the partner, head of household dummy, age group dummies, number of children, and if her spouse (if it is the case) is at least 5 years older. At municipality level, the predicted incidence based on ecological conditions is included, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area. The estimates also include month-year of interview fixed effects. The four p-values correspond to different hypotheses depending of the model: Cols 2 and 6: the equivalence of the coefficients of youngest with middle (test 1) and of middle with eldest (test 2); Cols 3 and 7: the equivalence between single and married coefficients (test 1); Cols 4 and 8: same as with columns 2 and 6, but within cohabiting status, tests 1 and 2 for married, tests 3 and 4 for single. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C2: Women 2015/16 data: Results according to education level (IV)

	Recent		Multi-partner		Usage		Barrier		OtherM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Second. incomplete or less (8 yrs-) × Zika Incidence	-0.006		0.002		0.037		-0.059		0.096	
	(0.043)		(0.020)		(0.070)		(0.046)		(0.064)	
Basic secondary or above (9yrs+) × Zika Incidence	-0.019		-0.009		0.040		-0.038*		0.079**	
	(0.019)		(0.015)		(0.035)		(0.023)		(0.040)	
Youngest (13-23), low educ × Zika Incidence		-0.104		0.016		-0.065		0.040		-0.105
		(0.085)		(0.053)		(0.137)		(0.133)		(0.219)
Middle (24-39), low educ × Zika Incidence		0.006		0.023		0.057		-0.063		0.120*
		(0.049)		(0.017)		(0.071)		(0.041)		(0.062)
Eldest (40-49), low educ × Zika Incidence		0.025		-0.019		0.040		-0.087		0.127
		(0.048)		(0.025)		(0.101)		(0.066)		(0.101)
Youngest (13-23), high educ × Zika Incidence		-0.062*		-0.023		0.048		-0.070*		0.118**
		(0.033)		(0.023)		(0.040)		(0.038)		(0.059)
Middle (24-39), high educ × Zika Incidence		-0.004		-0.004		0.036		-0.033		0.069**
		(0.021)		(0.015)		(0.034)		(0.028)		(0.032)
Eldest (40-49), high educ × Zika Incidence		0.003		0.006		0.044		0.038		0.006
		(0.021)		(0.011)		(0.042)		(0.035)		(0.047)
Observations	17,970	17,970	17,963	17,963	11,386	11,386	11,386	11,386	11,386	11,386
N Municip	229	229	229	229	229	229	229	229	229	229
Y bar	0.63	0.63	0.063	0.063	0.73	0.73	0.14	0.14	0.59	0.59
F-1st										
F-1st step G1	4.22	3.03	4.22	3.02	4.06	1.65	4.06	1.65	4.06	1.65
F-1st step G2	5.69	8.13	5.70	8.22	5.07	8.66	5.07	8.66	5.07	8.66
F-1st step G3	.	8.56	.	8.54	.	7.01	.	7.01	.	7.01
F-1st step G4	.	10.8	.	10.8	.	5.09	.	5.09	.	5.09
p-val from equality of coeffs test, group 1	0.71	0.19	0.49	0.90	0.93	0.47	0.54	0.41	0.66	0.35
p-val test 2		0.68		0.10		0.83		0.73		0.94
p-val test 3		0.068		0.28		0.69		0.37		0.29
p-val test 4		0.75		0.49		0.80		0.074		0.14

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks. Contraceptive methods are classified as follows. First, **barrier** are condoms, foam or jelly, vaginal ring. Sencond, **OtherM** are *External:* pill, injections, patches; *invasive:* IUD, Norplant; and *permanent:* female and male sterilization. Usage of contraceptives is conditional on women who reported any sexual activity in the last three months. *Low education* corresponds to having 8 years or education of less, while *high education* corresponds to at least 9 years of education (complete basic secondary education or above). Estimates from 2SLS of the IV model, where zika incidence is instrumented with predicted zika incidence. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include educational level, wealth index, and head of household dummy. At municipality level, the predicted incidence based on ecological conditions is included, average precipitation, municipality area, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area, being below 1800 masl. The estimates also include month-year of interview fixed effects. The four p-values correspond to the equivalence of the coefficients of youngest with middle (test 1 and 2) and of middle with eldest (tests 2 and 4), being tests 1 and 2 for individuals with low education, and tests 3 and 4 for high education. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C3: Married women 2015/16 data: intra-household outcomes (IV)

	Physical violence			Forced sex			Psychological			Expenditure		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Zika Incidence	-0.008			0.007			-0.041			-0.012		
	(0.031)			(0.010)			(0.049)			(0.012)		
Youngest (13-23) × Zika Incidence		0.009			0.028			-0.155**			-0.012	
		(0.040)			(0.033)			(0.078)			(0.030)	
Middle (24-39) × Zika Incidence		-0.003			0.011			-0.019			-0.019	
		(0.035)			(0.009)			(0.052)			(0.013)	
Eldest (40-49) × Zika Incidence		-0.038			-0.016			-0.038			0.008	
		(0.046)			(0.014)			(0.050)			(0.013)	
Second. incomplete or less (8 yrs-) × Zika Incidence			0.001			0.012			-0.066			-0.025
			(0.048)			(0.024)			(0.069)			(0.024)
Basic secondary or above (9yrs+) × Zika Incidence			-0.011			0.007			-0.035			-0.009
			(0.029)			(0.007)			(0.047)			(0.010)
Observations	9,258	9,258	9,258	9,258	9,258	9,258	9,258	9,258	9,258	7,930	7,930	7,930
N Municip	229	229	229	229	229	229	229	229	229	228	228	228
Y bar	0.13	0.13	0.13	0.019	0.019	0.019	0.56	0.56	0.56	0.67	0.67	0.67
F-1st	4.28			4.28			4.28			4.23		
F-1st step G1		2.23	2.63		2.23	2.63		2.23	2.63		1.85	2.37
F-1st step G2		3.63	3.00		3.63	3.00		3.63	3.00		5.29	2.94
p-val from equality of coeffs test		0.81	0.72		0.57	0.77		0.038	0.46		0.81	0.44
testInter2		0.27			0.074			0.57			0.016	

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Estimates from 2SLS of the IV model, where zika incidence is instrumented with predicted zika incidence. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include educational level, wealth index, and head of household dummy. At municipality level, the predicted incidence based on ecological conditions is included, average precipitation, municipality area, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area, being below 1800 masl. The estimates also include month-year of interview fixed effects. Clustered standard errors at municipality level in parenthesis.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C4: MEN: Results on sexual and reproductive behaviours (IV)

	Recent sexual activity				More than one sex partner				Usage of a contraceptive method				Barrier methods				Modern externals, invasive and permanents			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Zika Incidence	-0.026				-0.027				0.055				-0.129				0.184			
	(0.037)				(0.066)				(0.050)				(0.088)				(0.116)			
Youngest (13-23) × Zika Incidence		-0.042				-0.015				0.059				-0.232				0.291		
		(0.059)				(0.094)				(0.148)				(0.175)				(0.276)		
Middle (24-39) × Zika Incidence		-0.020				-0.018				0.058				-0.111				0.169		
		(0.034)				(0.069)				(0.040)				(0.102)				(0.120)		
Eldest (40-49) × Zika Incidence		-0.015				-0.055*				0.044				-0.110*				0.154*		
		(0.039)				(0.033)				(0.039)				(0.066)				(0.080)		
Married=0 × Zika Incidence			-0.034				-0.031				0.039				-0.158				0.197	
			(0.047)				(0.085)				(0.057)				(0.098)				(0.130)	
Married=1 × Zika Incidence			-0.012				-0.023				0.071				-0.104				0.175	
			(0.027)				(0.039)				(0.050)				(0.079)				(0.108)	
Youngest (13-23), married × Zika Incidence				-0.210				0.028				-0.069				-0.282				0.212
				(0.218)				(0.110)				(0.196)				(0.279)				(0.394)
Middle (24-39), married × Zika Incidence				-0.015				-0.009				0.084				-0.109				0.193
				(0.026)				(0.035)				(0.051)				(0.099)				(0.128)
Eldest (40-49), married × Zika Incidence				0.024				-0.044				0.071				-0.079				0.150
				(0.038)				(0.041)				(0.050)				(0.069)				(0.094)
Youngest (13-23), single × Zika Incidence				-0.027				-0.012				0.082				-0.219				0.301
				(0.060)				(0.090)				(0.141)				(0.164)				(0.252)
Middle (24-39), single × Zika Incidence				-0.030				-0.027				0.019				-0.111				0.130
				(0.059)				(0.114)				(0.042)				(0.122)				(0.132)
Eldest (40-49), single × Zika Incidence				-0.086				-0.068				0.030				-0.123**				0.153***
				(0.081)				(0.048)				(0.033)				(0.061)				(0.053)
Observations	16,974	16,974	16,974	16,974	16,932	16,932	16,932	16,932	11,432	11,432	11,432	11,432	11,432	11,432	11,432	11,432	11,432	11,432	11,432	11,432
N Municip	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230
Y bar	0.68	0.68	0.68	0.68	0.28	0.28	0.28	0.28	0.75	0.75	0.75	0.75	0.29	0.29	0.29	0.29	0.46	0.46	0.46	0.46
F-1st	3.05				3.07				2.66				2.66				2.66			
F-1st step G1		5.79	2.44	1.83		5.11	2.46	1.77		3.49	2.23	2.09		3.49	2.23	2.09		3.49	2.23	2.09
F-1st step G2		2.18	2.02	3.48		2.26	2.02	3.18		2.65	1.81	1.89		2.65	1.81	1.89		2.65	1.81	1.89
F-1st step G3				4.62				3.61				4.83				4.83				4.83
F-1st step G4				5.50				4.73				2.42				2.42				2.42
p-val test 1		0.57	0.53	0.34		0.93	0.89	0.71		0.99	0.19	0.40		0.19	0.17	0.39		0.47	0.64	0.95
p-val test 2		0.90		0.16		0.53		0.21		0.62		0.69		0.99		0.56		0.79		0.38
p-val test 3				0.96				0.68				0.62				0.35				0.25
p-val test 4				0.56				0.77				0.81				0.93				0.85

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks. Contraceptive methods are classified as follows. **Barrier** are condoms, foam or jelly, vaginal ring; **External:** pill, injections, patches; **Invasive:** IUD, Norplant; **Permanent:** female and male sterilization. Usage of contraceptives is conditional on women who reported any sexual activity in the last three months. Estimates from 2SLS of the IV model, where zika incidence is instrumented with predicted zika incidence. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include ethnicity, educational level, wealth index, if cohabiting with the partner, head of household dummy, age group dummies, number of children, and if her spouse (if it is the case) is at least 5 years older. At municipality level, the predicted incidence based on ecological conditions is included, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area. The estimates also include month-year of interview fixed effects. The four p-values correspond to different hypotheses depending of the model: Cols 2 and 6: the equivalence of the coefficients of youngest with middle (test 1) and of middle with eldest (test 2); Cols 3 and 7: the equivalence between single and married coefficients (test 1); Cols 4 and 8: same as with columns 2 and 6, but within cohabiting status, tests 1 and 2 for married, tests 3 and 4 for single. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C5: MEN: Results according to education level (IV)

	Recent		Multi-partner		Usage		Barrier		OtherM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Second. incomplete or less (8 yrs-) × Zika Incidence	0.050		-0.031		0.058		-0.122		0.180	
	(0.056)		(0.071)		(0.082)		(0.098)		(0.121)	
Basic secondary or above (9yrs+) × Zika Incidence	-0.064		-0.025		0.055		-0.133		0.188	
	(0.050)		(0.064)		(0.039)		(0.095)		(0.119)	
Youngest (13-23), low educ × Zika Incidence		0.172*		0.054		0.363		-1.026		1.389
		(0.093)		(0.132)		(1.503)		(2.778)		(4.184)
Middle (24-39), low educ × Zika Incidence		0.035		-0.025		0.066		-0.075		0.142
		(0.060)		(0.088)		(0.094)		(0.175)		(0.247)
Eldest (40-49), low educ × Zika Incidence		0.001		-0.073**		0.016		-0.145		0.162
		(0.042)		(0.030)		(0.107)		(0.126)		(0.172)
Youngest (13-23), high educ × Zika Incidence		-0.097		-0.023		0.047		-0.197		0.245
		(0.063)		(0.081)		(0.134)		(0.215)		(0.325)
Middle (24-39), high educ × Zika Incidence		-0.036		-0.011		0.067		-0.155		0.222
		(0.039)		(0.063)		(0.067)		(0.208)		(0.264)
Eldest (40-49), high educ × Zika Incidence		-0.035		-0.037		0.070		-0.119		0.189
		(0.062)		(0.038)		(0.058)		(0.146)		(0.196)
Observations	16,974	16,974	16,932	16,932	11,432	11,432	11,432	11,432	11,432	11,432
N Municip	230	230	230	230	230	230	230	230	230	230
Y bar	0.68	0.68	0.28	0.28	0.75	0.75	0.29	0.29	0.46	0.46
F-1st										
F-1st step G1	3.51	2.97	3.49	2.79	2.73	2.04	2.73	2.04	2.73	2.04
F-1st step G2		2.96		2.78		3.50		3.50		3.50
F-1st step G3		5.17		4.74		3.78		3.78		3.78
F-1st step G4		6.05		5.80		2.70		2.70		2.70
p-val from equality of coeffs test, group 1	0.063	0.044	0.82	0.26	0.96	0.84	0.90	0.72	0.90	0.75
p-val test 2		0.49		0.59		0.48		0.52		0.83
p-val test 3		0.099		0.69		0.80		0.47		0.77
p-val test 4		0.99		0.63		0.90		0.62		0.67

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks. Contraceptive methods are classified as follows. First, **barrier** are condoms, foam or jelly, vaginal ring. Sencond, **OtherM** are *External:* pill, injections, patches; *invasive:* IUD, Norplant; and *permanent:* female and male sterilization. Usage of contraceptives is conditional on women who reported any sexual activity in the last three months. *Low education* corresponds to having 8 years or education of less, while *high education* corresponds to at least 9 years of education (complete basic secondary education or above). Estimates from 2SLS of the IV model, where zika incidence is instrumented with predicted zika incidence. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include educational level, wealth index, and head of household dummy. At municipality level, the predicted incidence based on ecological conditions is included, average precipitation, municipality area, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area, being below 1800 masl. The estimates also include month-year of interview fixed effects. The four p-values correspond to the equivalence of the coefficients of youngest with middle (test 1 and 2) and of middle with eldest (tests 2 and 4), being tests 1 and 2 for individuals with low education, and tests 3 and 4 for high education. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C6: Married MEN: intra-household outcomes (IV)

	Physical violence			Forced sex			Psychological			Expenditure		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Zika Incidence	0.008			-0.002			-0.009			0.014		
	(0.032)			(0.006)			(0.068)			(0.020)		
Youngest (13-23) × Zika Incidence		0.236			0.031			0.002			-0.012	
		(0.249)			(0.036)			(0.147)			(0.054)	
Middle (24-39) × Zika Incidence		-0.039			-0.005			-0.016			-0.000	
		(0.037)			(0.005)			(0.082)			(0.016)	
Eldest (40-49) × Zika Incidence		0.047			-0.002			-0.004			0.039*	
		(0.030)			(0.005)			(0.060)			(0.024)	
Second. incomplete or less (8 yrs-) × Zika Incidence			-0.007			0.001			-0.048			0.010
			(0.039)			(0.007)			(0.070)			(0.023)
Basic secondary or above (9yrs+) × Zika Incidence			0.021			-0.004			0.027			0.018
			(0.037)			(0.006)			(0.083)			(0.021)
Observations	7,082	7,082	7,082	7,082	7,082	7,082	7,082	7,082	7,082	7,198	7,198	7,198
N Municip	228	228	228	228	228	228	228	228	228	228	228	228
Y bar	0.12	0.12	0.12	0.0052	0.0052	0.0052	0.73	0.73	0.73	0.49	0.49	0.49
F-1st	2.32			2.32			2.32			2.51		
F-1st step G1		3.36	6.87		3.36	6.87		3.36	6.87		2.79	6.73
F-1st step G2		1.43			1.43			1.43			1.40	
p-val from equality of coeffs test		0.27	0.43		0.31	0.27		0.89	0.24		0.83	0.60
testInter2		0.0027			0.43			0.82			0.018	

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Estimates from 2SLS of the IV model, where zika incidence is instrumented with predicted zika incidence. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include educational level, wealth index, and head of household dummy. At municipality level, the predicted incidence based on ecological conditions is included, average precipitation, municipality area, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area, being below 1800 masl. The estimates also include month-year of interview fixed effects. Clustered standard errors at municipality level in parenthesis.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

D Violence and bargaining power variables

We consider that there is evidence of physical violence if during the last year there is evidence of either less severe or severe violence (according to DHS classification). *Less severe physical violence* takes the value of one if during the last year the spouse has

- pushed, shook or threw something to her
- slapped her
- punched her with fist or something harmful
- kicked or dragged her

Severe physical violence is indicated when the spouse

- tried to strangle or burn her
- threatened her with knife/gun or other weapon
- attacked her with knife/gun or other weapon

Psychological violence takes the value of one if it is the case that the husband

- is jealous if talking with other men,
- accuses her of unfaithfulness
- does not permit her to meet her girl friends
- tries to limit her contact with family
- insists on knowing where she is
- doesn't trust her with money
- ignores/don't address her
- hasn't request opinion for family/social gatherings
- hasn't request opinion on important family matters

The *expenditures index* is based on who has the final say on the following items:

- how to spend the money the woman earns
- how to spend the money the partner earns
- own health care
- making large household purchases
- making household purchases for daily needs
- visits to family or relatives
- food to be cooked each day
- studying
- having sex

Answers could be that the man (score 0), both (score 1), or the woman (score 2) takes the decision. In the main results we add the nine items together (at most 18 points), and scale the variable between 0 (man holds all decision power) and 1 (woman holds all decision power).

Other indexes considered in the DHS such as properties or whether husband does not allow usage of contraception or sexual health, are either available only for 2015/16 or do not vary considerably. Therefore we do not explore them in detail.

Table D1 considers alternative constructions of the indexes of psychological violence and the expenditure index. Instead of considering a binary indicator, for psychological violence we summed up the positive answers of the 9 measures (SUM). This gives all variables the same weight. We also pursue a technique that aslo aggregate variables but giving more weight to those ones with the greater variation (i.e. add more information), the Anderson Anderson (2008) index (AND).[3] These variables are transformed so they lie withing the $[0, 1]$ interval, just to compare them with the original binary variable. As with the main results, no evidence of a change is observed. For the expenditure index, coefficients are negative (evidence of less bargaining power for women) and significant at 90% level.

Table D2 considers alternative measures of violence. Physical violence ever (not only last year), and economic violence during the last year. As stated above, less severe violence consider only a subset of the questions. Economic violence occurs if the spouse has threaten to withdraw economic support, did not allow her to study/work, has spent the household money or, has taken away her money or real state

As an alternative, we considered as well the sum and the Anderson indexes of both measures. No evidence of an impact is found on any of them.

[3]Implemented using Soledad Giardilli's stata command *aindex*.

Table D1: Alternative definitions of violence 1 (IV)

	Psychological AND			Psychological SUM			Expenditure AND		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Zika Incidence	0.008			0.013			-0.014*		
	(0.011)			(0.012)			(0.009)		
Youngest (13-23) × Zika Incidence		0.010			0.018			-0.010	
		(0.022)			(0.027)			(0.012)	
Middle (24-39) × Zika Incidence		0.011			0.013			-0.019*	
		(0.010)			(0.010)			(0.011)	
Eldest (40-49) × Zika Incidence		-0.002			0.009			-0.005	
		(0.009)			(0.009)			(0.010)	
Second. incomplete or less (8 yrs-) × Zika Incidence			-0.004			0.005			-0.011
			(0.012)			(0.013)			(0.013)
Basic secondary or above (9yrs+) × Zika Incidence			0.012			0.016			-0.014*
			(0.011)			(0.012)			(0.008)
Observations	23,145	23,145	23,145	23,145	23,145	23,145	23,567	23,567	23,567
N Municip	330	330	330	330	330	330	330	330	330
Y bar	0.21	0.21	0.21	0.22	0.22	0.22	0.65	0.65	0.65
F-1st	27.8			27.8			27.6		
F-1st step G1		10.1	25.9		10.1	25.9		10.5	25.8
F-1st step G2		16.9			16.9			16.9	
p-val test 1		0.97	0.025		0.82	0.19		0.51	0.80
testInter2		0.071			0.54			0.0057	

Notes: DHS respondents 2015/16 who cohabit with the partner, report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. **Psychological violence** is defined over the next nine items: if the husband is (i) jealous if she is talking with other men; (ii) accuses her of unfaithfulness; (iii) does not permit her to meet her girl friends; (iv) tries to limit her contact with family; (v) insists on knowing where she is; (vi) does not trust her with money; (vii)ignores or don't address her. Also if he (viii) does not request opinion for family/social gatherings, or (ix) request opinion on important family matters. The *expenditures index* is based on who has the final say on the following items: (i) how to spend the money the woman earns; (ii) how to spend the money the partner earns; (iii) woman health care; (iv) making large household purchases; (v) making household purchases for daily needs; (vi) visits to family or relatives; (vii) food to be cooked each day; (viii) whether the woman studies; and (ix) having sex. Possible answers are that the man takes the decision alone (0 points), both take the decision (1 point) or the woman alone (2 points). Items are added up and the results scaled between 0 (woman holds all power) and 1 (woman holds all power). **SUM:** sum of the variables that are included in the index. **AND:** aggregation index that provides more weight to variables with the greater variation (Anderson, 2008). Both indexes are transformed so they lie withing the $[0, 1]$ interval. Estimates from 2SLS of the IV model, where zika incidence is instrumented with predicted zika incidence. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include ethnicity, educational level, wealth index, if cohabiting with the partner, head of household dummy, age group dummies, number of children, and if her spouse (if it is the case) is at least 5 years older. At municipality level, the predicted incidence based on ecological conditions is included, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area. The estimates also include month-year of interview fixed effects. The four p-values correspond to different hypotheses depending of the model: Cols 2 and 6: the equivalence of the coefficients of youngest with middle (test 1) and of middle with eldest (test 2); Cols 3 and 7: the equivalence between single and married coefficients (test 1); Cols 4 and 8: same as with columns 2 and 6, but within cohabiting status, tests 1 and 2 for married, tests 3 and 4 for single. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table D2: Alternative definitions of violence 2 (IV)

	Physical Ever			Physical Ever AND			Physical Ever SUM			Economic			Economic AND			Economic SUM		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Zika Incidence	0.016			-0.000			0.001			0.010			0.004			0.004		
	(0.011)			(0.004)			(0.005)			(0.024)			(0.010)			(0.011)		
Youngest (13-23) × Zika Incidence		0.033			-0.003			0.002			-0.013			0.009			0.004	
		(0.045)			(0.009)			(0.014)			(0.043)			(0.025)			(0.023)	
Middle (24-39) × Zika Incidence		0.015			0.002			0.002			0.020			0.002			0.004	
		(0.014)			(0.004)			(0.006)			(0.027)			(0.012)			(0.013)	
Eldest (40-49) × Zika Incidence		0.001			-0.003			-0.002			-0.011			0.002			0.001	
		(0.023)			(0.006)			(0.008)			(0.030)			(0.011)			(0.012)	
Second. incomplete or less (8 yrs-) × Zika Incidence			0.030			0.001			0.004			-0.000			0.003			-0.001
			(0.031)			(0.008)			(0.008)			(0.043)			(0.018)			(0.019)
Basic secondary or above (9yrs+) × Zika Incidence			0.009			-0.002			-0.001			0.014			0.005			0.006
			(0.013)			(0.004)			(0.007)			(0.022)			(0.009)			(0.010)
Observations	23,145	23,145	23,145	23,145	23,145	23,145	23,145	23,145	23,145	9,258	9,258	9,258	9,258	9,258	9,258	9,258	9,258	9,258
N Municip	330	330	330	330	330	330	330	330	330	229	229	229	229	229	229	229	229	229
Y bar	0.26	0.26	0.26	0.055	0.055	0.055	0.083	0.083	0.083	0.18	0.18	0.18	0.057	0.057	0.057	0.067	0.067	0.067
F-1st	27.8			27.8			27.8			4.28			4.28			4.28		
F-1st step G1		10.1	25.9		10.1	25.9		10.1	25.9		2.23	2.63		2.23	2.63		2.23	2.63
F-1st step G2		16.9			16.9			16.9			3.63			3.63			3.63	
p-val test 1		0.72	0.57		0.58	0.69		0.98	0.60		0.44	0.68		0.79	0.92		0.99	0.63
testInter2		0.48			0.46			0.68			0.30			0.97			0.81	

Notes: DHS respondents 2015/16 who cohabit with the partner, report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. **Physical violence ever** is based on the following seven items: the woman reports that the spouse has ever (i) pushed, shook or threw something to her; (ii) slapped her; (iii) punched her with fist or something harmful; (iv) kicked or dragged her; (v) tried to strangle or burn her; (vi) threatened her with knife/gun or other weapon; or (vii) attacked her with knife/gun or other weapon. **Economic violence** is based on four items: whether during the last year the spouse (i) has threaten to withdraw economic support; (ii) did not allow her to study/work; (iii) has spent the household money; or (iv) has taken away her money or real state. **SUM:** sum of the variables that are included in the index. **AND:** aggregation index that provides more weight to variables with the greater variation (Anderson, 2008). Estimates from 2SLS of the IV model, where zika incidence is instrumented with predicted zika incidence. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include ethnicity, educational level, wealth index, if cohabiting with the partner, head of household dummy, age group dummies, number of children, and if her spouse (if it is the case) is at least 5 years older. At municipality level, the predicted incidence based on ecological conditions is included, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area. The estimates also include month-year of interview fixed effects. The four p-values correspond to different hypotheses depending of the model: Cols 2 and 6: the equivalence of the coefficients of youngest with middle (test 1) and of middle with eldest (test 2); Cols 3 and 7: the equivalence between single and married coefficients (test 1); Cols 4 and 8: same as with columns 2 and 6, but within cohabiting status, tests 1 and 2 for married, tests 3 and 4 for single. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

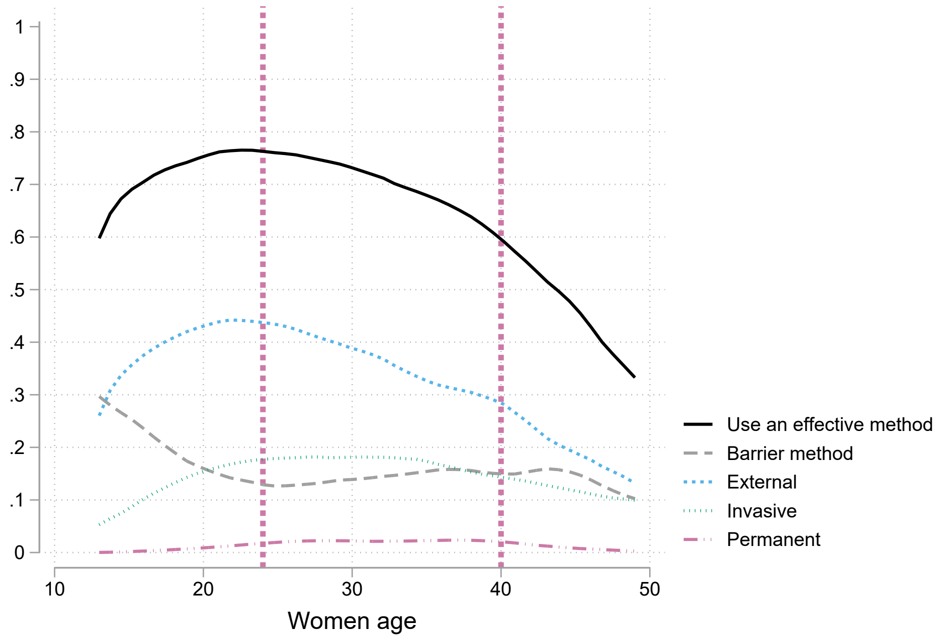
E Specific contraceptive methods

Table E1 opens the results of columns 5 to 8 in Table 7. Columns 1 to 4 reproduce the results of the main document table, 5 to 8 present results on external methods (pill, injections, patchs, injectables 3 months), 9 to 12 on invasive methods (iud, norplant), and 13 to 16 the permanent ones (female and male sterilization). Figure E1 shows the proportion of usage of these methods according to age. The table shows that for youngest married women external methods increase, but for the middle aged (both single and married) it is the invasive methods which increase. These two methods are the most common for this age group.

With respect to sterilization (done during the last year), there is a reduction for the middle-aged women (-0.8 pp). New cases of sterilization are more common precisely for this age group; 2.25% reported to have undergo such procedure in the last year. The most common is female sterilization ,between 8 and 9 cases for each procedure for males. One possibility for the observed substitution between permanent and invasive methods for married is that couples are requesting information about contraceptive options as a result of Zika. Thus, they are trying new alternatives before going into permanent decisions.

With respect to the youngest single women there is a small increase, as well as for eldest women. However, it is important to consider that sterilisation is very uncommon for these two groups (year incidence below 1%). Therefore conclusions over this method for them should be taken carefully.

Figure E1: Age and contraceptive methods



Notes: Local polynomial smooth. DHS respondents 2009/10 and 2015/16 who are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Options related to contraception are conditional on reporting recent sexual activity in the last four weeks. Effective contraceptive methods are classified as follows. **Barrier** are condoms, foam or jelly, vaginal ring; **External:** pill, injections, patches; **Invasive:** IUD, Norplant; **Permanent:** female and male sterilization.

Table E1: Contraceptive methods

	Invasive and external				External				Invasive				Permanent			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Zika Incidence	0.040*				0.014				0.028**				-0.002			
	(0.020)				(0.019)				(0.011)				(0.002)			
Youngest (13-23) × Zika Incidence		0.049*				0.031				0.017				0.002		
		(0.027)				(0.025)				(0.011)				(0.003)		
Middle (24-39) × Zika Incidence		0.042**				-0.004				0.054***				-0.008***		
		(0.020)				(0.023)				(0.017)				(0.003)		
Eldest (40-49) × Zika Incidence		0.019				0.029				-0.016				0.007**		
		(0.024)				(0.025)				(0.014)				(0.003)		
Married=0 × Zika Incidence			0.023				-0.001				0.019				0.005*	
			(0.025)				(0.023)				(0.012)				(0.003)	
Married=1 × Zika Incidence			0.052**				0.024				0.033**				-0.006**	
			(0.021)				(0.022)				(0.016)				(0.002)	
Youngest (13-23), married × Zika Incidence				0.085***				0.072***				0.016				-0.003
				(0.025)				(0.026)				(0.019)				(0.004)
Middle (24-39), married × Zika Incidence				0.052**				0.005				0.058**				-0.012***
				(0.022)				(0.026)				(0.024)				(0.004)
Eldest (40-49), married × Zika Incidence				0.025				0.027				-0.007				0.005
				(0.025)				(0.025)				(0.013)				(0.003)
Youngest (13-23), single × Zika Incidence				0.034				0.013				0.017				0.005*
				(0.032)				(0.032)				(0.013)				(0.003)
Middle (24-39), single × Zika Incidence				0.020				-0.021				0.040***				0.001
				(0.020)				(0.019)				(0.013)				(0.003)
Eldest (40-49), single × Zika Incidence				0.000				0.065				-0.084**				0.020
				(0.132)				(0.130)				(0.042)				(0.013)
Observations	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658
N Municip	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330
Y bar	0.56	0.56	0.56	0.56	0.36	0.36	0.36	0.36	0.18	0.18	0.18	0.18	0.017	0.017	0.017	0.017
F-1st	37.3				37.3				37.3				37.3			
F-1st step G1		38.2	21.2	7.92		38.2	21.2	7.92		38.2	21.2	7.92		38.2	21.2	7.92
F-1st step G2		21.0	14.0	12.5		21.0	14.0	12.5		21.0	14.0	12.5		21.0	14.0	12.5
F-1st step G3				9.51				9.51				9.51				9.51
F-1st step G4				24.4				24.4				24.4				24.4
p-val test 1		0.73	0.18	0.081		0.14	0.29	0.000054		0.035	0.45	0.016		0.020	0.0037	0.12
p-val test 2		0.13		0.092		0.19		0.42		0.00079		0.012		0.0018		0.0023
p-val test 3				0.58				0.30				0.095				0.13
p-val test 4				0.88				0.52				0.0033				0.15

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Contraceptive methods are classified as follows. **Barrier** are condoms, foam or jelly, vaginal ring; **External:** pill, injections, patches; **Invasive:** IUD, Norplant; **Permanent:** female and male sterilization. Usage of contraceptives is conditional on women who reported any sexual activity in the last three months. Estimates from 2SLS of the IV model, where zika incidence is instrumented with predicted zika incidence. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include ethnicity, educational level, wealth index, if cohabiting with the partner, head of household dummy, age group dummies, number of children, and if her spouse (if it is the case) is at least 5 years older. At municipality level, the predicted incidence based on ecological conditions is included, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area. The estimates also include month-year of interview fixed effects. The four p-values correspond to different hypotheses depending of the model: Cols 2 and 6: the equivalence of the coefficients of youngest with middle (test 1) and of middle with eldest (test 2); Cols 3 and 7: the equivalence between single and married coefficients (test 1); Cols 4 and 8: same as with columns 2 and 6, but within cohabiting status, tests 1 and 2 for married, tests 3 and 4 for single. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

F OLS Results

Table F1: Results on sexual and reproductive behaviours (OLS)

	Recent sexual activity				More than one sex partner				Usage of a contraceptive method				Barrier methods				Modern externals, invasive and permanent			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Zika Incidence	0.000				0.005**				0.009				-0.002				0.011			
	(0.004)				(0.002)				(0.009)				(0.004)				(0.007)			
Youngest (13-23) × Zika Incidence		0.006				0.005**				0.025**				-0.011				0.036***		
		(0.006)				(0.002)				(0.012)				(0.008)				(0.010)		
Middle (24-39) × Zika Incidence		-0.003				0.008*				0.007				0.000				0.006		
		(0.005)				(0.005)				(0.005)				(0.006)				(0.008)		
Eldest (40-49) × Zika Incidence		-0.000				-0.001				-0.011				0.008				-0.019		
		(0.007)				(0.003)				(0.019)				(0.013)				(0.013)		
Married=0 × Zika Incidence			-0.006				0.010***				0.006				-0.005				0.011	
			(0.007)				(0.003)				(0.010)				(0.011)				(0.008)	
Married=1 × Zika Incidence			0.007				0.001				0.011				-0.001				0.012	
			(0.005)				(0.002)				(0.009)				(0.004)				(0.010)	
Youngest (13-23), married × Zika Incidence				0.002				0.002				0.026				-0.017***				0.043**
				(0.006)				(0.002)				(0.016)				(0.006)				(0.017)
Middle (24-39), married × Zika Incidence				0.003				0.002				0.015***				0.004				0.011
				(0.006)				(0.003)				(0.005)				(0.008)				(0.008)
Eldest (40-49), married × Zika Incidence				0.019***				-0.001				-0.011				0.005				-0.016
				(0.004)				(0.002)				(0.019)				(0.013)				(0.014)
Youngest (13-23), single × Zika Incidence				0.009				0.006**				0.026***				-0.004				0.031**
				(0.007)				(0.003)				(0.009)				(0.015)				(0.012)
Middle (24-39), single × Zika Incidence				-0.011				0.017*				-0.020				-0.011				-0.009
				(0.012)				(0.009)				(0.014)				(0.010)				(0.009)
Eldest (40-49), single × Zika Incidence				-0.033***				-0.001				-0.027				0.139				-0.166*
				(0.011)				(0.005)				(0.100)				(0.162)				(0.096)
Observations	44,037	44,037	44,037	44,037	44,018	44,018	44,018	44,018	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658
N Municip	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks. Contraceptive methods are classified as follows. **Barrier** are condoms, foam or jelly, vaginal ring; **External:** pill, injections, patches; **Invasive:** IUD, Norplant; **Permanent:** female and male sterilization. Usage of contraceptives is conditional on women who reported any sexual activity in the last three months. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include ethnicity, educational level, wealth index, if cohabiting with the partner, head of household dummy, age group dummies, number of children, and if her spouse (if it is the case) is at least 5 years older. At municipality level, the predicted incidence based on ecological conditions is included, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area. The estimates also include month-year of interview fixed effects. The four p-values correspond to different hypotheses depending of the model: Cols 2 and 6: the equivalence of the coefficients of youngest with middle (test 1) and of middle with eldest (test 2); Cols 3 and 7: the equivalence between single and married coefficients (test 1); Cols 4 and 8: same as with columns 2 and 6, but within cohabiting status, tests 1 and 2 for married, tests 3 and 4 for single. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F2: Results according to education level (OLS)

	Recent		Usage		Barrier		OtherM			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Second. incomplete or less (8 yrs-) × Zika Incidence	0.001		-0.017		-0.001		-0.016			
	(0.010)		(0.018)		(0.006)		(0.015)			
Basic secondary or above (9yrs+) × Zika Incidence	0.001		0.016**		-0.003		0.019***			
	(0.004)		(0.007)		(0.005)		(0.007)			
Youngest (13-23), low educ × Zika Incidence		-0.024***		0.006		-0.027		0.033		
		(0.009)		(0.013)		(0.018)		(0.024)		
Middle (24-39), low educ × Zika Incidence		0.030		0.017		0.010		0.006		
		(0.018)		(0.026)		(0.013)		(0.018)		
Eldest (40-49), low educ × Zika Incidence		-0.005		-0.044***		-0.004		-0.040***		
		(0.010)		(0.014)		(0.008)		(0.012)		
Youngest (13-23), high educ × Zika Incidence		0.009		0.031**		-0.011		0.042***		
		(0.006)		(0.012)		(0.010)		(0.011)		
Middle (24-39), high educ × Zika Incidence		-0.005		0.006		-0.001		0.008		
		(0.004)		(0.005)		(0.006)		(0.010)		
Eldest (40-49), high educ × Zika Incidence		0.004		0.019		0.018		0.001		
		(0.006)		(0.019)		(0.019)		(0.023)		
Observations	44,037	44,037	27,658	27,658	27,658	27,658	27,658	27,658		
N Municip	330	330	330	330	330	330	330	330		

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks. Contraceptive methods are classified as follows. First, **barrier** are condoms, foam or jelly, vaginal ring. Sencond, **OtherM** are *External:* pill, injections, patches; *invasive:* IUD, Norplant; and *permanent:* female and male sterilization. Usage of contraceptives is conditional on women who reported any sexual activity in the last three months. *Low education* corresponds to having 8 years or education of less, while *high education* corresponds to at least 9 years of education (complete basic secondary education or above). **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include educational level, wealth index, and head of household dummy. At municipality level, the predicted incidence based on ecological conditions is included, average precipitation, municipality area, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area, being below 1800 masl. The estimates also include month-year of interview fixed effects. The four p-values correspond to the equivalence of the coefficients of youngest with middle (test 1 and 2) and of middle with eldest (tests 2 and 4), being tests 1 and 2 for individuals with low education, and tests 3 and 4 for high education. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F3: Intra-household outcomes (OLS)

	Physical violence			Forced sex			Psychological			Expenditure		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Zika Incidence	0.007*			0.000			0.002			0.000		
	(0.004)			(0.003)			(0.024)			(0.003)		
Youngest (13-23) × Zika Incidence		0.002			0.002			-0.041			0.008	
		(0.011)			(0.004)			(0.036)			(0.008)	
Middle (24-39) × Zika Incidence		0.007			0.001			0.008			-0.006*	
		(0.006)			(0.005)			(0.022)			(0.003)	
Eldest (40-49) × Zika Incidence		0.011			-0.004**			0.026			0.007***	
		(0.008)			(0.002)			(0.019)			(0.002)	
Second. incomplete or less (8 yrs-) × Zika Incidence			0.010			-0.004*			0.016*			-0.001
			(0.011)			(0.002)			(0.010)			(0.005)
Basic secondary or above (9yrs+) × Zika Incidence			0.005			0.002			-0.003			0.001
			(0.004)			(0.003)			(0.029)			(0.004)
Observations	23,145	23,145	23,145	23,145	23,145	23,145	23,145	23,145	23,145	19,350	19,350	19,350
N Municip	330	330	330	330	330	330	330	330	330	330	330	330
Y bar												

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. **Zika incidence** refers to the Municipio's number of cases per 100.000 inhabitants in the month the respondent was surveyed. Controls, interacted with age-cohabiting status groups, include educational level, wealth index, and head of household dummy. At municipality level, the predicted incidence based on ecological conditions is included, average precipitation, municipality area, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area, being below 1800 masl. The estimates also include month-year of interview fixed effects. Clustered standard errors at municipality level in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table F4: Results on sexual and reproductive behaviours (IV)

	Recent sexual activity				More than one sex partner				Usage of a contraceptive method				Barrier methods				Modern externals and invasive			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Zika Incidence	-0.003				-0.001				0.020				-0.020*				0.040*			
	(0.009)				(0.006)				(0.022)				(0.011)				(0.020)			
Youngest (13-23) × Zika Incidence		-0.010				-0.008				0.010				-0.039***				0.049*		
		(0.013)				(0.010)				(0.028)				(0.012)				(0.027)		
Middle (24-39) × Zika Incidence		-0.002				0.006				0.026				-0.016				0.042**		
		(0.010)				(0.005)				(0.024)				(0.017)				(0.020)		
Eldest (40-49) × Zika Incidence		0.004				-0.007				0.027				0.007				0.019		
		(0.013)				(0.006)				(0.020)				(0.014)				(0.024)		
Married=0 × Zika Incidence			-0.015				-0.000				-0.010				-0.033*				0.023	
			(0.012)				(0.008)				(0.037)				(0.020)				(0.025)	
Married=1 × Zika Incidence			0.012				-0.002				0.040**				-0.012				0.052**	
			(0.012)				(0.005)				(0.018)				(0.010)				(0.021)	
Youngest (13-23), married × Zika Incidence				-0.002				-0.012*				0.046**				-0.039**				0.085***
				(0.014)				(0.006)				(0.022)				(0.018)				(0.025)
Middle (24-39), married × Zika Incidence				0.000				0.001				0.041*				-0.010				0.052**
				(0.013)				(0.005)				(0.024)				(0.016)				(0.022)
Eldest (40-49), married × Zika Incidence				0.053***				-0.002				0.031				0.006				0.025
				(0.020)				(0.006)				(0.020)				(0.014)				(0.025)
Youngest (13-23), single × Zika Incidence				-0.013				-0.008				-0.006				-0.040**				0.034
				(0.018)				(0.012)				(0.040)				(0.020)				(0.032)
Middle (24-39), single × Zika Incidence				-0.006				0.010				-0.010				-0.030				0.020
				(0.012)				(0.008)				(0.035)				(0.028)				(0.020)
Eldest (40-49), single × Zika Incidence				-0.059***				-0.013*				-0.026				-0.027				0.000
				(0.012)				(0.008)				(0.136)				(0.093)				(0.132)
Observations	44,037	44,037	44,037	44,037	44,018	44,018	44,018	44,018	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658	27,658
N Municip	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330
Y bar	0.63	0.63	0.63	0.63	0.057	0.057	0.057	0.057	0.71	0.71	0.71	0.71	0.16	0.16	0.16	0.16	0.56	0.56	0.56	0.56
F-1st	35.0				35.1				37.3				37.3				37.3			
F-1st step G1		22.0	16.2	11.4		21.9	16.2	11.5		38.2	21.2	7.92		38.2	21.2	7.92		38.2	21.2	7.92
F-1st step G2		25.3	15.9	12.8		25.2	15.9	12.5		21.0	14.0	12.5		21.0	14.0	12.5		21.0	14.0	12.5
F-1st step G3				9.24				9.24				9.51				9.51				9.51
F-1st step G4				17.1				16.8				24.4				24.4				24.4
p-val test 1		0.54	0.039	0.83		0.069	0.72	0.013		0.50	0.11	0.86		0.091	0.23	0.24		0.73	0.18	0.081
p-val test 2		0.56		0.013		0.012		0.51		0.96		0.57		0.29		0.44		0.13		0.092
p-val test 3				0.62				0.12				0.82				0.60				0.58
p-val test 4				0.0013				0.0050				0.90				0.97				0.88

Notes: DHS respondents 2015/16 who report no contraceptive method, are not pregnant, did not undergo a hysterectomy, and neither their partner nor them were sterilised during the last year. Usage of contraceptives is conditional on women who reported any sexual activity in the last four weeks. Estimates come from a 2SLS estimation of the IV model, where ZIKV incidence is instrumented with predicted incidence. Controls, interacted with age-cohabiting status groups, include ethnicity, educational level, wealth index, if cohabiting with the partner, head of household dummy, age group dummies, number of children, and if her spouse (if it is the case) is at least 5 years older. At municipality level, the predicted incidence based on ecological conditions is included, poverty index (NBI), distances to the capital of department and to the nearest market, as well as dummies for being on an urban area, a metropolitan area. The estimates also include month-year of interview fixed effects. The four p-values correspond to different hypotheses depending on the model: Cols 2 and 6: the equivalence of the coefficients of youngest with middle (test 1) and the middle with eldest (test 2); Cols 3 and 7: the equivalence between single and married coefficients (test 1); Cols 4 and 8: same as with columns 2 and 6, but within the cohabiting status, tests 1 and 2 for married, tests 3 and 4 for single. Clustered standard errors at the municipality level are presented in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$