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Impact of the Salud Mesoamerica Initiative on adolescent pregnancy in Costa Rica: new evidence on multisectoral interventions

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ABSTRACT

To address the high rates of adolescent pregnancy and reduce its difficult consequences on young mothers and their children, the Costa Rican government (with the support of IDB) implemented in 2013 the Salud Mesoamerica Initiative (SM) in the most vulnerable regions. This program focuses on an improvement in the access and quality of sexual and reproductive health for adolescents. Additionally, the strategy includes strong coordination with multiple public sectors, such as education, nutrition and childcare, and child welfare.

According to the literature on the causes of adolescent pregnancy and the policy evidence, the design of SM promises to be highly effective. In fact, international organizations' last recommendations encourage the implementation of multisectoral programs as an integrated response to prevent this issue. However, this approach is rarely implemented and although there is some evaluation analysis, the evidence is still limited.

This study examines the impact of SM by comparing the improvements in adolescent pregnancy and risk factors in the areas with and without the intervention, using differences in differences analysis. The results suggest that SM had a positive impact as the treated areas had greater reductions in these indicators than the rest of the country.

These findings increase the evidence available on the impact of multisectoral programs and offers a first evaluation of SM in Costa Rica.

Keywords: Adolescent pregnancy, Salud Mesoamerica, multisectoral policy, policy impact

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LIST OF ABBREVIATIONS

AFR	Adolescent fertility rate
CEN-CINAI	Nutrition and Education Child Center
CCSS	Costa Rican Social Security Fund
CSE	Comprehensive Sexual Education
DID	Differences in differences
IDB	Inter – American Development Bank
INEC	Costa Rican National Institute of Census and Statistics
LAC	Latin American and the Caribbean
MEP	Ministry of Public Education
PANI	Costa Rican Child Welfare Agency
SM	Salud Mesoamerica
SR	Sexual and Reproductive
STD	Sexually Transmitted Disease

1. INTRODUCTION

Adolescent pregnancy remains a difficult challenge for developing countries, especially in the Latin American and Caribbean region (LAC) which has one of the slowest declines in the last decades (PAHO et al., 2016). Situating the region as third place with the highest adolescent fertility rate (72 births per 1000 adolescents in 2010) in the world. Among the LAC countries, Costa Rica's rate is higher than the average (AFR of 75.34[1] births per 1000 adolescents) which seems unexpected from a country with overall good health indicators (Ministerio de Salud de Costa Rica, 2014).

According to the literature on the causes of teenage pregnancy, this issue is strongly correlated to high levels of poverty and lack of education (WHO, 2011). The environment that poverty creates, combined with lack of educational and financial opportunities may affect adolescents' expectations of their future. Along with the perception that having a child may be a way to improve their life (Oke, 2010). Vulnerable groups also face greater barriers to access sexual and reproductive education and health services, which inhibits adolescents from obtaining the necessary tools to effectively prevent unplanned pregnancies (Azevedo et al., 2012).

Undertaking action to prevent early childbearing should be one of the main priorities of policymakers. First, because pregnancy at a young age has major health consequences on the mother and child's wellbeing, as studies have found that maternal mortality, child mortality, and lasting health problems are more common in these cases (WHO, 2011). Furthermore, because of the decline of social and employment opportunities for the young mothers that end up affecting the country's productivity and sustainable development (Greene & Merrick, 2005). This is a result of the preexisting vulnerability of adolescents that became pregnant and the further challenges that result from childbearing and pregnancy, such as the difficulty for young mothers to continue their studies or find stable jobs (Regalia, 2016). The low education level and income are the main obstacles that adolescent poor mothers must overcome to develop a productive career or even supplying wellbeing to their families (BID, 2011).

Because of this, is highly relevant to carry out comprehensive and effective policies in regions where adolescent pregnancy is persistent, such as the case of Costa Rica, where the fertility rate of adolescents is declining at a slower pace than the fertility rate of adult women (older than 20 years of age). This situation worsens in rural areas, which have a higher percentage of adolescent pregnancy than the rest of the country (31.30% and 20.68% respectively) (Ministerio de Salud de Costa Rica, 2014).

As a response, in 2013 was implemented the Salud Mesoamerica Initiative (SM) in the two most vulnerable regions of the country. This was a multidimensional approach to reduce pregnancy risk by modifying adolescents' sexual behavior and the use of contraceptives. The main strategy was to create and execute a health reform built around adolescents' needs, that seeks to improve the quality of sexual

[1] Estimated using data from INEC

and reproductive (SR) health services and ensure easy access for this specific group. Additionally, the program offered further action with other institutions to ensure the effective delivery of SR information and the identification and support of adolescents at greater risk. This includes specific actions on adolescent mothers and their children, which can lower the consequences of childbearing and prevent repeated pregnancies. The program provided the group with counseling and guidance, long-lasting contraceptives, economic incentives to stay in school, and access to nutrition and care services for their children. (Ministerio de Salud de Costa Rica, 2016).

Simultaneously, the government implemented Comprehensive Sexual Education (CSE) at a national level in 2012. This policy does not compete with SM but rather strengthen the multisectoral approach in the areas selected since the program recognized the importance of objective and inclusive sexual education. Additionally, the messages on SR information delivered by other institutions under the SM framework are aligned with CSE topics (BID, 2015).

The combination of multiple interventions under one framework directed to adolescents and their families, such as SM, has been encouraged by international organizations because of the promising benefits (Caffe et al., 2017). However, multisectoral interventions are not frequently implemented resulting in limited evidence available (Azevedo et al., 2012).

This study examines if SM had an impact on adolescent pregnancy and other risk factors associated with this challenge. Where adolescent pregnancy is measured using adolescent fertility rate, and risk factors have been identified from the literature review as contraceptive use and other sexual behaviors. This type of evaluation is usually difficult since the results could be caused by systematic trends, however, because SM only intervened in some regions, it offers a unique opportunity to compare the results between areas with the program and the rest of the country. This study uses the differences and differences (DID) method, which provides stronger evidence since it compares both areas and corrects some of the usual limitations such as systematic trends affecting areas with and without the program. If the program is successful, is expected to observe a larger reduction in areas where the program was implemented.

The results suggest that this is the case of SM, since it was possible to perceive a greater improvement in the treated areas than the rest of the country in all indicators: reduction of adolescent pregnancy, along with the improvement of the risk factors targeted by the program, such as the use of contraceptives, reduce sexual activity, early sexual initiation, and marriage. Additionally, the percentage of young mothers with more than one child decreased, as well as school dropout, these indicate a positive influence on young mothers which was a main part of the program as well.

These results are important evidence on the effectiveness of SM, which is essential since it would be expanded to other regions of Costa Rica in the coming years. It also contributes to the international

community as multisectoral interventions targeting adolescent pregnancy are gaining more popularity in LAC countries, but evidence on results is still not available (Espíndola & Paz, 2017).

The outline of this paper is the following: first, a literature review on the causes of adolescent pregnancy, from the socioeconomic variables that are unobservable in the data to the direct factors associated with higher pregnancy risk. Then, the literature review is focused on policy evidence on single interventions and the importance of multisectoral programs such as SM. The next section is the description of SM, including details on the strategy and role of each institution. Then, the methodology includes a description of how DID is carried out and the conceptualization of variables. The last sections are the result's analysis followed by the conclusions.

2. LITERATURE REVIEW

As mentioned, adolescent pregnancy is a relevant topic for policymakers because of the difficult economic, social, and health consequences. However, since this study is focused on the impact of a specific program, this literature review does not explore further the consequences, instead, it addresses the causes of adolescent pregnancy, programs to prevent it and evidence on their effectiveness, and the relatively new approach that SM proposes.

The causes are divided into three sections, following the logical order of how they influence adolescent pregnancy, however, it is important to recognize that causes are highly connected and can affect the outcome in many ways. First, there are socio-economic drivers (poverty, inequality, and cultural norms) that are deeply rooted in society, these are harder to address for policymakers since it takes more time to correct. Then, it explains how these drivers generate a lack of opportunities that lead to pregnancy by creating barriers to access essential services or influencing adolescents' aspirations. Policies can intervene at this level by immediately improving the access and quality of these services. And lastly, the risk factors, which are the two main components that increase the likelihood of pregnancy, these are the behavioral patterns that policies intend to modify to reduce adolescent pregnancy.

2.1 Socio-economic drivers

Globally, poverty has been acknowledged as the deepest cause of adolescent pregnancy (Azevedo et al., 2012; Greene & Merrick, 2005; Jose et al., 2017; Oke, 2010; PAHO et al., 2016), however, the interaction with social and gender norms and lack of opportunities also plays an important role. Comparing international data, countries with lower income per capita have higher adolescent fertility rates, however, LAC countries do not follow this trend, since the adolescent fertility rate is higher than expected among those with similar socioeconomic characteristics (Regalia, 2016). Instead, the relatively higher rate in the region can be explained by inequality indicators, specifically the inequality of opportunities (Azevedo et al., 2012).

Evidence from LAC countries demonstrates that poverty, inequality, public health expenditure, and female employment are related to high adolescent fertility rates in the region (Azevedo et al., 2012). And at the individual level, numerous characteristics have been identified as drivers, such as low education levels and lack of access to health information and services, but also living in rural areas, living outside the parent's house, low self-esteem, and cultural and social gender norms such as acceptance of early pregnancy, early unions and gender-violence and sexual abuse (PAHO et al., 2016). Along with cultural beliefs, the combination of poverty and lack of opportunities is the underlying factor that changes adolescents' expectations and sexual behaviors leading to higher pregnancy risk (Azevedo et al., 2012).

Understanding these drivers is useful in this study to comprehend the mechanisms that increase the risk of adolescent pregnancy and to recognize that many of these variables are unobservable in this analysis. This means that they could be identified as external factors that might influence the results.

2.2 How socio-economic drivers lead to adolescent pregnancy?

The causes of adolescent pregnancy are deeply intertwined and can influence pregnancy simultaneously though different ways, this is the main reason isolating and measuring the effect of each driver through a causal relationship is a challenging task (Azevedo et al., 2012). However, even if it is not possible to claim causality in many cases, understanding the mechanisms in which economic, social, and cultural factors affect pregnancy is possible.

This is highly relevant in policy evaluations since many interventions intend to directly correct these mechanisms, as it is the case of SM. A literature review on this topic provides evidence on how addressing these specific limitations could reduce adolescent pregnancy.

2.2.1 Low expectations

As stated, inequality has an important role in adolescent fertility rate in Latin America, but the relationship is not always direct, for example, inequality could affect adolescents' expectations and modify their fertility choices. A study from the United States explores this relationship and determined that being poor in an unequal society affects teenagers' aspirations in life which makes them seek short-term satisfaction as early pregnancy (Kearney & Levine, 2011). According to Oke (2010), the environment that poverty creates could incline adolescents to perceive a lack of future opportunities to continue their studies or find a job, reducing the cost of childbearing. This means they would not have enough incentives to prevent pregnancy, whether actively pursue to have a child as a way for personal achievement (Oke, 2010), or they engage in risky sexual behaviors such as early sexual initiation and absence of contraceptive use, increasing the likelihood of unwanted pregnancy (Azevedo et al., 2012). This evidence has also been found in LAC countries such as Peru and Paraguay, where a study affirms that girls are more likely to become mothers when they face challenges such as poor education quality

that disincentivizes their educational achievement and high aspirational goals (Näslund-Hadley & Binstock, 2010). Additionally, in Latin America, lack of expectations is also connected to cultural beliefs, gender norms, and poor family relationships that encourage girls to perceive marriage and childbearing as an opportunity to gain autonomy and improve their social status (PAHO et al., 2016).

2.2.2 Lack of sexual and reproductive education

In Latin America, SR information is mostly delivered in schools, however, structural inequalities and vulnerable socio-economic environments could lead to adolescents dropping out of school, particularly in the higher grades where SR information is usually delivered (WHO, 2011). Similarly, as it was stated, low expectations could also drive adolescents to drop school, and this way depriving girls of receiving this information, additional factors include early pregnancy and formal unions, and low quality of education (Näslund-Hadley & Binstock, 2010).

Lack of SR education reduces the adolescents' capacity to make informed decisions regarding the effective use of contraceptives (PAHO et al., 2016) and their sexual behavior such as negotiation of reproductive desires and demand for the use of contraceptives (Liang & UNFPA, 2013). This is supported by the evidence, as according to studies, girls that continue in school have a lower likelihood of initiating sexual intercourse at an early age and are more likely to want to use contraceptives (Darroch et al., 2016).

2.2.3 Lack of sexual and reproductive health

Poor marginalized adolescents face more challenges to access SR health and information since they are more likely to be out of the education system and have poor family and community relationships. This means that interventions addressed to adolescents through these spaces may not reach the most vulnerable group (PAHO, 2013). Additionally, adolescents may perceive barriers at the personal, social and cultural levels, for example, because of lack of awareness or understanding of services, shame, and fear of been seeing due to lack of confidentiality in clinics or lack of an adolescent-friendly environment (PAHO, 2013).

Furthermore, in many occasions, health services fail to provide modern[2] and effective contraceptive methods, emergency contraception, and abortion services (Caffe et al., 2017).

According to evidence, Latin America's high fertility rate could be associated to the lack of access to sexual and reproductive health services as more than half of the sexually active adolescents have an unmet demand for modern contraception (Darroch et al., 2016). Additionally, the region has a lack of

[2] Modern methods are defined in Azevedo et al. (2012) as: "female sterilization (tubal ligation, laparectomy), male sterilization (vasectomy), the contraceptive pill (oral contraceptives), intrauterine contraceptive device (IUD), injectables (DepoProvera), implants (Norplant), female condom, male condom, diaphragm, contraceptive foam and contraceptive jelly, lactational amenorrhea method (LAM) and emergency contraception. Traditional methods include periodic abstinence (rhythm, calendar method) and withdrawal (coitus interruptus). Folkloric methods include herbs, amulets, gris-gris, etc." (Azevedo et al., 2012)

services directed specifically to adolescents, such as health professionals trained to work with adolescents and adolescent-friendly infrastructure in health clinics (Regalia, 2016).

2.3 Risk factors

All the socio-economic drivers affect the likelihood of planned or unplanned pregnancy by increasing the presence of risk factors: contraceptive use and sexual risky behaviors. These two are recognized as the immediate or direct causes of adolescent pregnancy (Azevedo et al., 2012; Boonstra, 2014; Darroch et al., 2001). The correct identification of these factors based on statistical evidence is helpful in this study when selecting variables to examine the effect of the policy.

2.3.1 Use of contraceptives

Researchers have found that the reduction of adolescent pregnancy is highly correlated with an increase in contraceptive use (Boonstra, 2014; Kearney & Levine, 2009; Santelli et al., 2007). Evidence suggests that 86% of the reduction of adolescent pregnancy in the United States since 1990 is a consequence of the improvements in contraceptive use, while the rest is attributed to a decrease in sexual activity (Boonstra, 2014).

The most common variable to measure contraceptive use is the frequency and use of modern methods, but others have been recognized as a proxy, for example, contraceptive use during first sexual intercourse, as girls that used contraceptives during the first sexual intercourse are less likely to become pregnant (Azevedo et al., 2012; Baumgartner et al., 2009)

2.3.2 Sexual activity and risky behaviors

Sexual activity such as initiating sexual intercourse at a young age has demonstrated a positive correlation with the probability of pregnancy (Azevedo et al., 2012). A study from developed countries found that those countries where the percentage of adolescents who had their **first sex before age 15** had higher adolescent fertility rates, such as the United States and Sweden. This is highly relevant as according to the evidence LAC is the region with the highest percentage of girls (22%) that initiate sexual intercourse before age 15 (Regalia, 2016).

Additionally, evidence from Jamaica suggests that most girls that initiated sexual intercourse at age 14 had a partner at least 5 years older (Baumgartner et al., 2009). This is an important behavior to analyze, as the evidence demonstrates that the greater the **age difference** between younger girls and their partners increases the probability of pregnancy (Näslund-Hadley & Binstock, 2010). Relationship with large age differences could also be associated with adolescents **living with their partners or getting married** in Latin America (Regalia, 2016), which has been also identified as a risk factor related to adolescent pregnancy (Baumgartner et al., 2009). For example, in France and Sweden, half of the adolescent births correspond to girls that are currently cohabitating with their partners or married (Darroch et al., 2001)

Other sexual behaviors may include the number of partners and **frequency of sexual intercourse**, both factors are associated with a higher risk of pregnancy and contagion of sexually transmitted diseases (Baumgartner et al., 2009).

2.4 Policy evidence

Policy interventions intend to modify adolescent's risky behavior by increasing opportunities, expectations, and capacity of decision making. This usually means access to SR health services such as contraceptives and adolescent-friendly environment, and quality education and SR information (Azevedo et al., 2012).

The most intuitive intervention is habilitating **access to SR health services**, especially increasing the distribution of contraceptives. As discussed, the use of contraceptives is one of the direct factors that lead to pregnancy, however, adolescents' behavior may not necessarily improve due to an increase in contraceptives supply. Many authors sustain that adolescents could engage in risky behaviors because of a sense of security due to the contraceptives, for example, they could increase the frequency of sexual intercourse, and as a result, the policy could end up having the opposite effect and increasing the likelihood of pregnancy; another example could simply be that adolescents are not motivated to use contraceptives, regardless of the increase in the supply (Kearney & Levine, 2009). Paton (2002) summarized several studies from the United States and the United Kingdom that found low evidence on the impact of family planning access in the reduction of pregnancy; where in some cases the evidence suggest that areas with higher quality contraceptives had lower reductions than other areas, others claim that the reduction on fertility rate is due to an increase in abortions, and others provided evidence that emergency contraception access has no effect reducing pregnancy or abortions.

According to Azevedo et al. (2012), it may be difficult to find evidence on only contraceptive access because it is usually accompanied by SR information. Another possibility is that increasing the supply of contraceptives may not be effective since adolescents could still face barriers to reach health clinics such as lack of knowledge, interest, or shame (PAHO, 2013). Additionally, interventions should look for more than just providing condoms as it is usually the case, but to improve to long term and modern contraceptives, more information, and an adolescent-friendly environment that increases confidentiality and inclusion (Azevedo et al., 2012). Kearney and Levine (2014) did find positive results when policies improve modern contraceptive access and expanded educational opportunities for young women. Boonstra (2014) concluded that although it may not be enough evidence on access to contraceptives, it is clear that sexually active adolescents do need health services that guarantee easy access to contraceptives and confidentiality.

Similarly, the effect of **school-based sexual education** on behavioral changes such as contraceptive use and delaying sexual intercourse is ambiguous, where opponents affirm that sex education can increase risky behaviors. Sabia (2006) affirms that both sides, opponents and proponents are correct in some

sense, he concluded that education does not increase risky sexual behavior but there is also no evidence that it influences measurable health benefits.

These conclusions will depend mainly on the policies' design, for example, the curriculum may vary by focusing on abstinence-only education or comprehensive-based including contraceptive use. Similarly, the implementation period, year of exposure to SR education, and preparation of educators may affect the impact (Paton et al., 2020), also, if the comparison is performed based on a new guideline or no sexual education at all (Azevedo et al., 2012). For example, Kirby (2007) did find an improvement in sexual behavior but only on intensive and long-term programs that improve the adolescent's capacity to make decisions and negotiate, while abstinence-only education has not enough evidence of efficacy.

Besides improvements on SR education and health services, other interventions have demonstrated a positive effect on the reduction of adolescent pregnancy such as peer education programs and policies to maintain girls in school, both included in the strategy of SM.

Peer education could be a meaningful tool to deliver SR messages to adolescents since they can relate with the educators because of their age, language, background, and interests; and trained adolescents will also be less prompt to engage in risky behavior. (Azevedo et al.,2012). But this is only if the policies are well designed and include adolescents in the design of the activities, otherwise, the policy will not have an effect as it was the case in Mexico (Espíndola & Paz, 2017). Evidence from a randomized controlled trial (RCT) of seven years shows that the intervention was not only highly popular among adolescents, but also reduced childbearing and did not increase abortions, which means it was proven a successful prevention policy (Stephenson et al., 2008).

Another positive preventive measure is creating incentives to **maintain adolescents in school**, whether it is by increasing education quality, or through cash transfers (Azevedo et al.,2012). Adolescents that complete their studies are not only more informed about SR knowledge, but can also have higher aspirations and further opportunities (PAHO et al., 2016)

An RCT evaluation in Kenya shows that education subsidies (free uniforms) reduced the dropout rate by 18 percent, significant reduction in early childbearing, and a delay in marriage (Duflo et al., 2015). The authors concluded that maintaining girls in the higher grades of secondary school is a meaningful and inexpensive intervention that modifies the motivation of girls to have a child and get married.

2.5 Importance of Salud Mesoamerica: multisectoral strategy

From the previous sections, two conclusions are clear, first, evidence on individual policies is indeed ambiguous, for example, those that increase access to contraceptives or sexual education. But at the same time, it is recognized that is precisely the lack of knowledge and access to health services that prevent adolescents from the necessary tools to delay pregnancy. It seems that many programs fail to efficiently increase the actual use of these services, whether it is because adolescent's motivation

remained the same, or there are other barriers to access these services. Although there is sexual education, maybe adolescents do not have the resources to go to school, or an increase in the supply of contraceptives is ineffective if adolescents do not know about the services or refuse to visit the health clinics because of shame.

Because of this evidence, recent global policy recommendations encourage the adoption of multisectoral interventions, which can simultaneously improve economic, health, and social opportunities and guarantee a better response to the challenges that surround adolescent pregnancy (Azevedo et al., 2012). This has gained popularity with the declaration of the Sustainable Development Goals agenda for 2030, since a multisectoral action could be effective targeting multiple challenges on the health sector, such as adolescent pregnancy, reproductive, maternal, and newborn and child health (Rasanathan et al., 2015). Therefore, it is expected that SM has a positive impact on the regions of the intervention.

However, although this type of interinstitutional intervention is broadly recognized as critical on the reduction of adolescent pregnancy, they are usually not implemented (Azevedo et al., 2012). This could be a result of the many limitations for proper implementation, such as capacity building of the health sector to work with others and identifying mutual interests, governance, technical and financial challenges (Rasanathan et al., 2015), and the possibility to successfully scale-up these complex interventions (PAHO et al., 2016).

The rare implementation of multisectoral interventions to prevent adolescent pregnancy and the lack of correctly tracked and documented results leave a lack of evidence on its potential benefit (Azevedo et al., 2012; Rasanathan et al., 2015). One successful experience is a multisectoral program implemented in Malawi using a Randomized Controlled Trial, the evaluation proved a reduction in adolescent pregnancy of 29% and early marriage was reduced 32% (Rasanathan et al., 2015).

Other LAC countries have recently implemented this type of intervention, such as Mexico, Peru, Chile, and Honduras; however, they are still ongoing and there are no formal evaluations yet (Espíndola & Paz, 2017).

This study on the impact of SM not only provides the first evidence of a multisectoral intervention targeting adolescent pregnancy in Costa Rica, but also a useful set of suggestions for a relatively new policy that has been widely recommended in developing countries, especially in Latin America.

3. INTERVENTION

3.1 Salud Mesoamerica: Design

Salud Mesoamerica Initiative is a program created by the Inter-American Development Bank (IDB) aiming to improve health indicators for vulnerable women and children in LAC countries. It was implemented in Costa Rica from July 2013 until July 2018 under the coordination of the national institute of health (CCSS) and the collaboration of other public institutions (MEP et al., 2015). In this case, it is oriented to prevent adolescent[3] pregnancy through two main objectives: 1) reduce births from adolescents aged 10-19, and 2) reduce the percentage of women with two or more children before 20 years of age (Vargas, 2017)**.**

The program was implemented in two (out of six) planning regions in Costa Rica: Huetar Atlántica Region and Brunca Region, encompassing poor rural and indigenous communities where adolescent fertility rates were higher. The specific cantons selected are 11: Osa, Golfito, Corredores, Coto Brus, Buenos Aires, Talamanca, Matina, Siquirres, Guacimo, and the districts Valle de la Estrella and Cariari (Vargas, 2017)**, c**overing 46 districts in total and benefiting approximately 90,000 girls (PROMED, 2019). The next implementation stage will cover the rest of the country, and it is planned to start in the following years (Vargas, 2017).

To ensure an approach centered on adolescents' needs, the design of the intervention's activities was consulted and validated by adolescents from the regions through focus groups and participatory methods (UNPFA & Viceministerio de Juventud Costa Rica, 2018). IDB offered financial support, technical assistance, and monitoring and evaluation services to Costa Rican public institutions for this intervention (PROMED, 2019).

3.2 Salud Mesoamerica: Strategy

The first component was the improvement in the quality and supply of the SR health sector (CCSS). SM focused on promoting visits to the community health clinics and offering modern and long-lasting contraceptive methods for young mothers and adolescents that claimed to be sexually active. Also, health clinics delivered messages of safe sexual behavior and relationships through learning materials and educational activities, covering topics such as abuse, limits, decision making, negotiation, and effective contraceptive use. All the health professionals were trained to have a stronger sensibility towards adolescents, provide objective information, and avoid discrimination due to sexual diversity, ethnicity, nationality gender, or age. Along with this, the service was improved by offering adolescent-friendly accommodations, this means different painting and signalization, different attention hours, and individual and private appointments.

[3] The World Health Organization define adolescents as the population group between 10 and 19 years of age (WHO, 2018). The Salud Mesoamerica Initiative targeted this specific group.

The second component was the multisectoral approach through inter-institutional coordination to enhance communication, and coherence and a fast response in services and actions offered by each institution. SM authorities identified the institutions that offered services to children and adolescents and implemented improvements or complementary practices to specifically address adolescent pregnancy.

The institutions involved, besides CCSS (the institution in charge of health clinics and SM coordinator) were the Ministry of Public Education (MEP), Nutrition and Education Child Center (CEN-CINAI), and National Child Welfare Agency (PANI), where:

- MEP habilitated safe spaces that allowed privacy and confidentiality to receive students that need counseling. Also, implemented efforts to maintain young mothers in the education system, by creating spaces for safe lactation and economic incentives.
- CEN-CINAI provided preferential access to nutritional and care services for the children of adolescent mothers that continue their studies as an incentive to maintain them in school (MEP et al., 2015).
- PANI oversaw the new activity proposed by SM called "Learn from peers", which consisted of training 400 adolescents that participated in community and school activities to deliver preventive messages and promote health visits (UNPFA & Viceministerio de Juventud Costa Rica, 2018).

SM also provided a framework that guided and allowed for better coordination between institutions to link those services depending on the specific needs of each adolescent at risk. All institutions followed a protocol to identify, support, and provide follow-up to adolescents in vulnerable conditions and greater risk of pregnancy, and connect them with other institutions depending on their situation. Similarly, institutions indicated to the adolescents the importance of visiting the local health clinics at least once a year. And all the professionals that directly supported adolescents were trained to improve their service to this group. (MEP et al., 2015).

3.3 Additional National Intervention: Comprehensive Sexual Education (2012)

In 2012, Costa Rica incorporated a sexual education course (CSE-Comprehensive Sexual Education) for secondary school (adolescents aged 13-17 years) into the formal education system. The course guideline included information regarding HIV prevention, sexual reproductive rights, contraception methods, relationship education, and related topics with the objectives of reducing adolescent pregnancy and HIV infections (Semanario Universidad, 2018). This means that the areas intervened by SM also received an improvement in sexual education, while the rest of the country only received CSE. Therefore, there is an interaction between CSE and SM that strengthens the multisectoral strategy, so it is not part of this study to isolate the effect of each. MEP (which oversaw CSE) was highly involved with SM in the areas of the intervention and the SR information delivered by SM was aligned with CSE.

4. METHODOLOGY

4.1 Research question and hypotheses

Q: Did SM cause a reduction of adolescent pregnancy and other risk factors?

As it has been mentioned, the main goal of SM is to reduce adolescent pregnancy, this also includes specific action to avoid repeated pregnancy in young mothers. The literature review suggests that the multisectoral design of SM has the appropriate strategy to cause a positive impact on these indicators. To examine further evidence on the possible impact is also interesting to examine the improvements in risky sexual behaviors that the program is aiming to reduce.

Hypotheses:

H0. There is a greater improvement of indicators in the treated areas than the controlled, reducing the difference between groups.

H1. There is no significant improvement in the treated areas.

Alternative explanation: As stated in the literature review, several underlying socio-economic drivers affect adolescents' sexual activity and use of contraceptives. It is important to recognize that better results on either group could be influenced by these unobserved variables, such as better education quality, poverty reduction, and better employment and education opportunities, etc.

4.2 Research design

4.2.1 Evaluation design

To evaluate the impact of the SM initiative this study compared changes in outcomes and risk factors between the regions where the program was implemented (treatment group) and the rest of the country (control group). The outcomes have been identified as the two main objectives of the program: reduction of adolescent pregnancy (using the fertility rate[4]) and reduction in repeated pregnancy[5] which is measured by the percentage of adolescents with more than one child. The risk factors are related to the likelihood of adolescent pregnancy (risky behavior and contraceptive use) according to the literature review.

The outcomes were reviewed by measuring changes through time by simple descriptive comparison between groups, using the national statistics on births and population. On the other hand, to analyze changes in intermediate variables from the 2013 and 2018 surveys, it was used the Differences in Differences (DID) method, which calculates the average changes over time on the dependent variable

[4] It is used the fertility rate instead of pregnancy rate because the data only provides information on births and not actual pregnancies. Birth data does not include abortions, which pregnancy data does. (Azevedo et al., 2012)

[5] Using the number of children alive, including the newborn.

for both groups, treated communities and untreated. This comparison concedes a better understanding of the changes through time, where the results from the controlled group serve as an example of what could have happened in case the intervention was not implemented.

$$DID = (Y_{T1} - Y_{T2}) - (Y_{C1} - Y_{C2}) \quad (1)$$

The DID equation is represented in (1), where the period *1* is before the intervention (2013) and *2* is the period when the intervention finished (2018). *Y* represents the average of each independent variable studied. The treatment group (*T*) includes all the girls from the sample that belong to the regions chosen for the program, and the control group (*C*) encompasses the girls from the rest of the country.

The intervention was implemented in the most vulnerable zones and not chosen randomly, which is how most of the evaluations that use this method are designed. A baseline analysis is important in this context to understand the gap or difference between both groups at the beginning of the implementation. DID under these conditions is still useful to perceive the impact of the program by analyzing the gap reduction through time since it was confirmed a parallel behavior between groups the years before the intervention. However, these results should be interpreted carefully as heterogeneity issues and external unobserved variables could have an impact as well.

To test the difference in difference coefficients, a linear regression (2) as following was used:

$$y_{it} = a + B_{1*} group_i + B_2 * year + B_3 * group_i * year + e \quad (2)$$

Where *y* are the dependent variables (risk factors), *the group* is 1 if the individual belongs to the treated areas or 0 otherwise, and *the year* is 1 if is after the intervention (2018), or 0 if it is data from before the intervention (2013). B_i are the coefficients, where B_3 indicates the effect of the program. Running a linear regression is important to check statistical significance and test the hypothesis, if the intervention is effective, the groups will have a significant difference.

4.2.2 Control and Treatment groups

CR is organized in 6 geo-economic planning regions, based on economic activity and social indicators to create effective strategies: Central Region, Chorotega Region, Huetar Norte Region, Pacífico Central Region, Brunca Region, and Huetar Atlántica Region. The area selected for the intervention was Brunca and Huetar Atlántica (treatment group), which include the poorest and most vulnerable population of the country. On the other hand, the rest of the country (control group) is heterogenous; while the coastal regions are more vulnerable, the Central Region is the most urbanized region, including the capital of the country which represents 64.1% of the countries´ population. It also includes the population with the highest income and social development indicators. *Figure 4.2.2* shows the division by regions, where the treatment group (where SM was implemented) is the grey area, and the white area represents the other regions that will serve as the comparison group.

Figure 4.2.2. Planification regions in Costa Rica.

Notes: SM was implemented in the regions highlighted

4.2.3 Data sources and variables

Three data sources[6] are used in this study:

1. **National Database of Births** from the Costa Rican National Institute of Census and Statistics (INEC). This database includes information on women aged 10-19 that have given birth during the period 2000-2019, which provides the exact number of children born from adolescents each year. Additional information available includes the mother's residency area and the number of children alive. The total sample is 264,669 girls.
2. **Population Projections Data** from INEC as well, which has the total amount of girls aged 10-19 in each region and year from 2000-2019. This is essential to weight the number of births according to the population of each area.
3. **National Surveys to Adolescents** from the Ministry of Youth. These surveys were conducted in two different periods: 2013 and 2018. It contains information on sexual activity, relationships, school dropouts, and the use of condoms, which is essential in this study to evaluate the impact on intermediary variables (risk factors targeted by SM). The sample includes only women aged 15-19 (no data available on girls of 10-15 years of age), having a total of 525 girls. Is important to mention that there is no follow up on the same individuals (no longitudinal panel).

The dependent variables considered in this study are listed in *Table 4.2.3*. The first column indicates the data source and method used, the second indicates the nature of the variable, the third indicates the name that will be used in this study, and lastly, the concept of each variable. The outcome variables are the two main objectives stated in the documentation of SM, while the risk factors were selected based on

[6] Obtained from the respective institutions via email.

data availability and evidence from the literature review that identified them as risky behaviors linked to adolescent pregnancy.

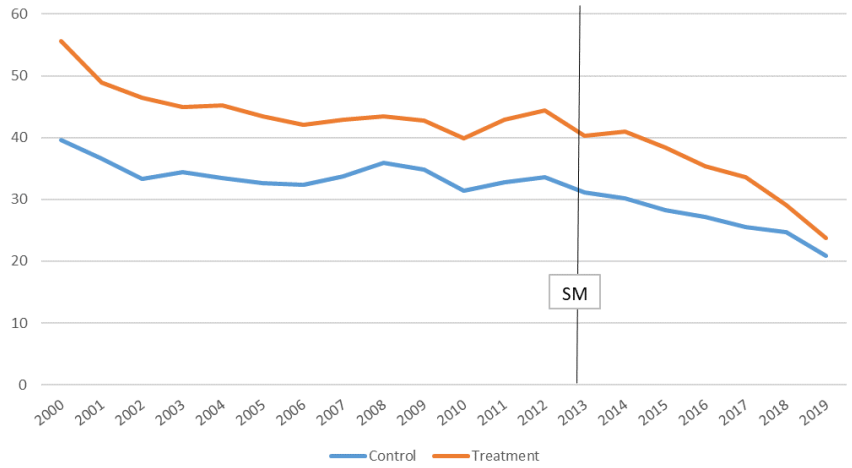
Table 4.2.3. List of variables

Data/ Method	**Indicator**	**Variable**	**Definition**
1 and 2 Descriptive	Outcome: AFR	Adolescent Fertility Rate	$\frac{Births\ from\ women\ aged\ 10-19}{Total\ population\ of\ women\ aged\ 10-19}$*1000
1 and 2 Descriptive	Outcome: Repeated pregnancy	Percentage of young mothers with two or more children	$\frac{Mothers\ aged\ 10-19\ with\ 2\ or\ more\ children}{Total\ population\ of\ \ women\ aged\ 10-19}$ *1000
3 DID regression	Risk factor: Sexual behavior	a) Sexually active	a) Had sexual intercourse: Yes (1) / No (0)
		b) Early sex	b) Age of first intercourse less than 15: Yes (1) / No (0)
		c) Married	c) Living with a partner or married: Yes (1) / No (0)
		d) Older partner	d)Current partner age diff 5 years or more: Yes (1) / No (0)
		e) High sex frequency	e) Frequency of sex in the last 12 months: low (0) = none or occasionally / high (1) = at least once in the last two months to everyday
3 DID regression	Risk factor: Contraceptive use	f) Condom use	f) Frequency of condom use in the last 12 months: Always (1) / Otherwise (0)
3 DID regression	Risk factor: Other	g) School dropouts	g) Dropout: Yes: main activity is Work, Housework or None / No: Study or Both: work and study

5. RESULTS

5.1 Results: evolution of adolescent fertility rate and repeated pregnancy

Figure 5.1.1. Adolescent Fertility Rate trend 2000-2019.



Notes: Based on databases of Births and Population Projections from INEC

Figure 5.1.1 shows the trend of AFR since the year 2000 for both groups. It is possible to confirm that the treatment area had higher cases of births from a teen mother which is the main reason why the program was implemented there. The graph shows a decline for both groups during the whole period while following a similar behavior, maintaining almost the same difference between groups with only small gap reductions at the beginning of the period. *Table 5.1.1* shows these differences, by comparing 6 years before the intervention and 6 years after, which was the duration of the program. According to these results, from 2007 to 2013, both groups reduced their AFR relatively the same, with no gap reduction. When SM was implemented in 2013, the treated area had 40.26 births per 1000 girls, while the control group had a lower rate of 31.16, this means that there was a difference of 9.10 births between the two groups (same difference as in 2007), however, this behavior changes after the intervention. While both groups had a rapid decline after 2013, the gap between groups was also significantly reduced due to a steeper reduction in the treatment group. In 2019, the AFR for the treated area and the rest of the country were 23.78 and 20.89 respectively, which means a gap of only 2.89 births per 1000 adolescents. The total gap reduction between groups was -6.22 births per 1000 adolescents, where the AFR of the treatment group was reduced by 41% while the control 33%.

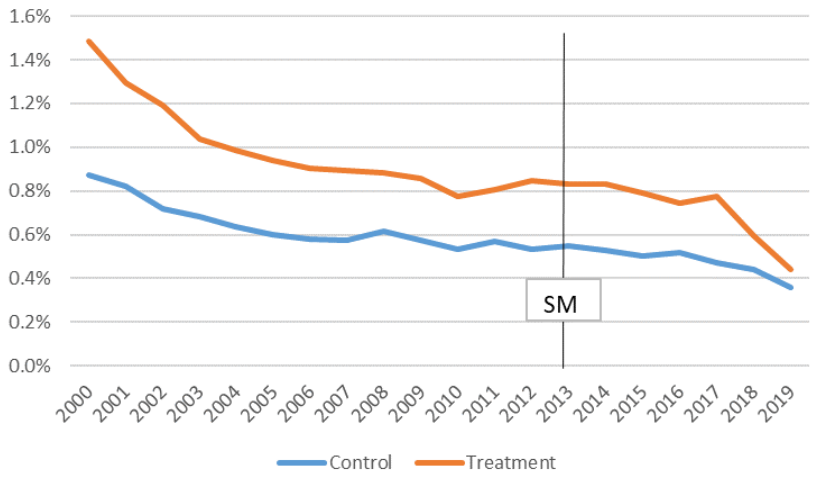
Table 5.1.1 Changes in Adolescent Fertility Rate

	Control	Treatment	Diff	Gap reduction
2007	33.77	42.87	9.10	
2013	31.16	40.26	9.10	0.00
2019	20.89	23.78	2.89	-6.22

Notes: Simple comparison between adolescent fertility rates

A similar analysis is done to explore the second objective of SM which is to lower the cases of repeated adolescent pregnancy, specifically to **reduce the percentage of adolescent mothers with two or more children before 20 years of age.**

Figure 5.1.2. Percentage of adolescent mothers with two children or more



Notes: Based on databases of Births and Population Projections from INEC

Analyzing the evolution of young mothers with more than 1 child, it is possible to observe a decline in both groups, however, ending the period of the study, the gap seems to be smaller, suggesting that SM had a positive impact reducing repeated pregnancies as well (see Figure *5.1.2*). *Table 5.1.2* shows that 6 years before the program there were more young mothers with more than one child in the treated area (8.93 per 1000 adolescents younger than 20 or 0.8% of the adolescents from the same age group), while in the control group there were 5.72 per 1000 adolescents, which means there was a gap between groups of 3.21 mothers with more than 1 child per 1000. This behavior was similar at the time of the implementation in 2013 when both groups had a small decline in repeated pregnancy, and the gap between them remains similar, with only a reduction of -0.38 mothers with more than 1 child per 1000.

However, 6 years after the program, while both groups had an important decline, the treatment group experienced a greater reduction (47%), 13% more than the control group. As a result, the gap between groups was reduced -2.04 young mothers with more than 1 child per 1000 adolescents, which could be a result of SM efforts to maintain young mothers in school and the high coordination to secure a fast response on access to long-lasting contraceptives to this particular group.

Table 5.1.2. Changes in adolescents with two or more children per 1000 adolescents

	Control	Treatment	Diff	Gap reduction
2007	5.72	8.93	3.21	
2013	5.48	8.31	2.83	-0.38
2019	3.59	4.38	0.79	-2.04

Notes: Multiplied by 1000. Simple comparison

For both indicators, a sharper change in the trend after 2013 is a good indicator that the program might have a positive impact.

5.2 Results: risk factors

Besides the evaluation of the direct outcomes targeted by the policy, it is interesting to evaluate the intermediate variables to examine the possible mechanism in which SM could impact the decision-making of adolescents that led to a reduction of fertility rates. Using survey data, it was possible to explore these behavioral characteristics for girls 15-19 years of age. The conceptualization of each indicator has been stated in the variable section of the methodology and was parametrized based on evidence from the literature.

Table 5.2.1 offers a baseline analysis to understand the starting point of each group. Although it is not precisely a balance test, it is possible to perceive differences between groups before the implementation of the program. The first part of the table provides information on some observable socio-economic variables that were available in the data. The results suggest that the treated area has higher poverty levels and encompass more rural districts than the rest of the country altogether. According to the literature these factors are recognized as the underlying drivers of adolescent pregnancy (among others), this is consistent with the previous evidence that demonstrated a higher AFR in the treatment group before the intervention. Similarly, when comparing variables identified as risk factors (at the end of *Table 5.2.1*), the regions where the program was implemented have higher values for every variable, with only a small difference in contraceptive use.

Table 5.2.1. Baseline Data:2013

	Control	Treatment	Diff
Sample	432	93	
Descriptive			
Urban	71,1%	35,5%	-35,6
Costa Rican	93,3%	98,9%	5,6
Average age	16,8%	16,8%	0,0
Low income	15,6%	21,6%	6,0
Risk factors			
Sexually active	36,4%	45,2%	8,8
Early sex	50.3%	64.3%	14,0
Condom use	40,2%	41,2%	1,0
High sex frequency	48.7%	64.3%	15.6
Older partner	21,2%	39,4%	18,2
School dropout	34,2%	45,5%	11,2
Married	18,7%	38,2%	19,5

Although evidence indicates that the groups are heterogeneous, it is possible to analyze the gap reduction between groups as the previous section, additionally, the use of DID regressions are useful to examine if the difference coefficient is significant (see regression tables in the annex section, *Figure 8.1*)

Table 5.2.2 summarizes the results of risk factors. The first columns show the comparison of before and after the intervention for the control and treatment groups, while the *coefficient column* is the difference through time and between groups (DID), this was calculated by simply using the DID formula, and confirmed using regressions. The last column is the p-value of the regressions, which indicates statistical significance.

Table 5.2.2. Impact of SM on risk factors

	Control			Treatment			Regression results	
	Before	After	Diff	Before	After	Diff	Coeff	p-value
Sexually active	36.4%	41.6 %	5.2	45.2%	43.0 %	-2.2	-7.4	0.255
	157	321		42	160			
Early sex	50.3%	51.3 %	0.9	64.3%	49.7 %	-14.6	-15.5	0.120
	78	163		27	78			
High sex frequency	48.7%	44.7 %	-4.0	64.3%	41.5 %	-22.8	-18.8	0.059*
	76	143		27	66			
Married	18.7%	35.8 %	17.1	38.2%	26.9 %	-11.3	-28.4	0,003**
	32	96		13	39			
Older partner	21.2%	20.9 %	-0.3	39.4%	27.1 %	-12.3	-12.1	0.191
	33	56		13	39			
Condom use	40.2%	33.5 %	-6.7	41.2%	44.7 %	3.5	10.2	0.341
	53	83		14	59			

Notes: p-value calculated through Differences in Differences regression. See individual regression tables in the annex section

**** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.*

According to these results (see *Table 5.2.2*), girls who received the intervention are engaging less in sexual intercourse in 2018 than those from the same group interviewed in 2013, with a reduction of -2.2 percentage points (pp). This is interesting since the control group experienced the opposite effect, with an increase of 5.2 pp. Similarly, the percentage of girls that had their first sexual intercourse under the

age of 15 had an important reduction in the treatment group (-14.6 pp), while the control group had a small increase. As a result, after the implementation, the percentage of girls that engage in sexual activity at an early age is slightly better in the treated areas.

According to the literature reviewed, engaging in sexual activity and especially at a young age are closely linked to adolescent pregnancy. An important reduction of these factors is a good indicator of the efficacy of the SM program reaching the younger girls and delaying sexual intercourse.

Additional behavior changes as the frequency of sexual intercourse, being married or living with their partner, and having older partners (5 years older), have been identified in the literature as events that increase the likelihood of pregnancy. The results in *Table 5.2.2* suggest a significant improvement in these variables, for example, having older partners did not change in the control group while in the treatment it was reduced more than -12 pp. The frequency of sexual intercourse was reduced in both groups; however, it is perceived a statistically significant reduction in the treatment group. On the other hand, while the proportion of adolescents living with their partners was reduced in the treated areas, the rest of the country experienced an important increase. The overall effect of SM in girls cohabitating with their partners was a reduction of -28.4pp, which is a statistically significant difference, providing strong evidence on the efficacy of the program.

The result is also positive on condom use (see end of *Table 5.2.2*), since in the treated area the percentage of adolescent girls that affirm to have used a condom in every sexual intercourse increased 3.5 pp, while in the control group reduced in -6.7 pp, for a total effect of more adolescents that always use condoms of 10.2 pp. In terms of avoiding pregnancy, this result is positive, however is not necessarily linked to less contraceptive use since adolescents could be substituting condoms with other modern methods. It could still represent a positive impact of SM since the program also promoted condoms as a way to reduce HIV contagions (although is not part of this analysis).

The results suggest that the program was effective since, after the implementation of SM, all the variables analyzed had a greater improvement in the treatment group than the control. Although most coefficients are not significant, which could be due to the sample size or other factors, the coefficients indicate the expected effect, as all the coefficients of risk factors are negative while the coefficient of use of condoms is positive. Which implies, according to the literature, a reduction of the risk of pregnancy.

Table 5.2.3. Other variables: School Dropout

	Control			Treatment			Regression results	
	Before	After	Diff	Before	After	Diff	Coefficient	p-value
School Dropout								
All the girls	18.1%	21.4 %	3.3	21.5%	17.7%	-3.8	-7.1	0.173
	78	165		20	66			
School Dropout by group								
Mother or pregnant	61.9%	61.0 %	-0.9	71.4%	50.0%	-21.4	-20.5	0.237
	26	75		10	25			
Other girls (excluding mothers or pregnant)	13.3%	13.9 %	0.5	12.7%	12.7%	0.1	-0.5	0.924
	52	90		10	41			
Reason (for all girls)								
Because of pregnancy or childcare	24.7%	28.8 %	4.1	27.8%	21.4%	-6.3	-10.49	0.426
	19	51		5	15			

Notes: p-value calculated through Differences in Differences regression. See individual regression tables in the annex section

**** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.*

Additionally, as SM encourages adolescents to continue their studies, especially pregnant girls and young mothers, it is important to examine the percentage of girls that dropped out of school. According to the literature, attending to school is related to fewer pregnancies because of many possibilities: access to SR information (in this case CSE), an increase of expectations, or because it reduces the time that girls spend out of a controlled environment.

Table 5.2.3 shows that school dropouts were more common in the treated areas before the program, however, this situation was reversed in 2018 after a decline of -3.8pp in the treatment group, while the controlled area increased 3.3pp.

In 2013, half of the girls that dropped out of school in the treatment group were either pregnant or mothers, while in the control group the proportion was lower, 33%. As SM focused on this specific group, it is noteworthy to analyze the effect on only young mothers. According to the results (see the second part *Table 5.2.3*), while the control group experienced just a small improvement (-0.9) from 2013 to 2018, the treatment group had a reduction of -21.4pp. On the other hand, this same variable for non-mothers (or girls currently pregnant) had no perceivable change in either group through time, while the gap between groups is just -0.5 pp.

Although the results are not statistically significant, this evidence suggests that the efforts made by SM coordinating with MEP and CENCINAI to provide economic incentives to keep young mothers in school and the childcare to this vulnerable group had a positive effect on reducing dropouts, which is highly positive to reduce the consequences linked to early childbearing. This evidence is supported when exploring the reasons for dropout (at the end of *Table 5.2.3*), where the percentage of girls that left school because of pregnancy or childcare, was reduced more than 10 pp. It is not possible to affirm that this improvement influences repeated pregnancy, however, it could be a possibility.

6. CONCLUSION

Studies have found that programs aiming to avoid adolescent pregnancy may not be efficient if there is no real access to opportunities and changes in the behavior of adolescents. Because of this, international organizations are promoting the implementation of multisectoral interventions that tackle the problem from different fronts through simultaneous efforts, such as the Salud Mesoamerica initiative. This innovative program was implemented in only two regions of Costa Rica, which are the most vulnerable and with the highest fertility rates. The program was centered on an improvement in the health sector related to adolescents' sexual and reproductive services. Additionally, there was strong coordination with other institutions to provide SR information through educational activities, peer education, risk identification, follow-up, and special attention to young mothers to motivate them to stay in school. The program did not include an improvement in sexual education since the government already implemented CSE at a national level a year before SM, which means that the areas where SM was implemented also received an improvement in sexual education, while the rest of the country only received CSE.

This study analyzes the effect of SM through a DID design since it allows the comparison of results of the treated area with the rest of the country. The evidence is divided in two, first by outcomes, which are the immediate results such as the reduction in adolescent pregnancy (measured by adolescent fertility) and the decline of young mothers with multiple children. And the other part examines the behavioral changes using variables identified as risk factors, such as contraceptive use, early sexual initiation, frequency of sex, marriage, and having an older partner.

According to the results, it is possible to observe a greater improvement of all indicators in the areas where SM was implemented than the rest of the country. The two main outcomes have an important decrease in both groups, however, the decline in the treated area surpasses the decline in the controlled, which causes a convergence between groups. This pattern is also perceived when examining the results of the risk factors, although most of the coefficients are not statistically significant. Another important evidence of SM effectiveness was the reduction of school dropouts among adolescent mothers, which only improved in the treated areas.

These results are useful since it is the first evaluation of SM in Costa Rica. Understanding the reach of the program is essential as it will be expanded to other regions in the coming years. Additionally, it offers important insights on the possible impact of multisectoral interventions directed to adolescent pregnancy in the Latin American context, where is has been highly recommended.

Although the overall results suggest that the program had a positive effect, it is important to recognize that adolescent pregnancy is a result of multiple socioeconomic and cultural drivers, which are omitted from this analysis. Therefore, it cannot be discarded the possibility of an external factor unrelated to SM affecting the results, for example, better education quality, poverty reduction, better employment, and education opportunities. Additionally, the DID method on interventions that were not randomly selected could bias the results, as there are important differences between groups. An alternative approach could have been a Regression Discontinuity design around the border of the treatment districts to have a better comparison between similar regions, however, it was not possible in this analysis because of data limitations.

Further analysis of the impact of SM is possible by examining changes in other variables linked to the services delivered, for example, the knowledge of SR topics, the number of health clinic visits, the use of other contraceptives (besides condoms), and satisfaction with the services. Currently, this information is only available for 2013, but surveys from 2019 will be soon published on the SM website. Additionally, a cost-benefit analysis would be highly relevant to support the financing of multisectoral programs, this can be done by calculating the benefits of the pregnancies averted (using extra schooling years and the economic value it represents in girls' future income) and compare it with the cost of the program.

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8. ANNEX

Figure 8.1. Individual regression tables of all dependent variables

Sexually active

Source	SS	df	MS		
Model	1.22977396	3	.409924655	Prob > F	0.1653
Residual	401.552001	1,664	.241317308	R-squared	0.0031
				Adj R-squared	0.0013
Total	402.781775	1,667	.241620741	Root MSE	.49124

	Number of obs =	1,668
	F(3, 1664) =	1.70

sex_relat	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
group						
Treatment	-.0873438	.0561668	-1.56	0.120	-.1975088	.0228213
yr2018						
After	-.051534	.0295379	-1.74	0.081	-.1094693	.0064014
group#yr2018						
Treatment#After	.0730393	.0641561	1.14	0.255	-.0527958	.1988744
_cons	1.635731	.0236622	69.13	0.000	1.58932	1.682142

Early sex

Source	SS	df	MS		
Model	.761853059	3	.25395102	Prob > F	0.3853
Residual	167.089337	668	.250133739	R-squared	0.0045
				Adj R-squared	0.0001
Total	167.85119	671	.250150805	Root MSE	.50013

	Number of obs =	672
	F(3, 668) =	1.02

cat_age_sex_in~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
group						
Treatment	-.1396313	.0870019	-1.60	0.109	-.3104615	.0311988
yr2018						
After	-.0093528	.0489934	-0.19	0.849	-.1055523	.0868467
group#yr2018						
Treatment#After	.1553947	.0997453	1.56	0.120	-.0404574	.3512467
_cons	1.496774	.0401717	37.26	0.000	1.417896	1.575652

High sex frequency

Source	SS	df	MS	Number of obs	=	677
				F(3, 673)	=	2.56
Model	1.8948384	3	.6316128	Prob > F	=	0.0543
Residual	166.317865	673	.247129071	R-squared	=	0.0113
				Adj R-squared	=	0.0069
Total	168.212703	676	.24883536	Root MSE	=	.49712

sex_freq_cat	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
group						
Treatment	.1556777	.0864187	1.80	0.072	-.014005	.3253603
yr2018						
After	-.0403045	.0485432	-0.83	0.407	-.1356188	.0550098
group#yr2018						
Treatment#After	-.1874583	.0989684	-1.89	0.059	-.3817822	.0068656
_cons	.4871795	.0398015	12.24	0.000	.4090294	.5653296

Married

Source	SS	df	MS	Number of obs	=	618
				F(3, 614)	=	5.62
Model	3.40942274	3	1.13647425	Prob > F	=	0.0008
Residual	124.163393	614	.202220509	R-squared	=	0.0267
				Adj R-squared	=	0.0220
Total	127.572816	617	.206763072	Root MSE	=	.44969

living_relat_t~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
group						
Treatment	.1952184	.0844407	2.31	0.021	.0293908	.3610461
yr2018						
After	.1710745	.0440128	3.89	0.000	.0846405	.2575084
group#yr2018						
Treatment#After	-.2844619	.0963297	-2.95	0.003	-.4736376	-.0952862
_cons	.1871345	.0343886	5.44	0.000	.119601	.2546681

Older partner

Source	SS	df	MS	Number of obs	=	601
				F(3, 597)	=	2.40
Model	1.286107	3	.428702334	Prob > F	=	0.0669
Residual	106.634026	597	.178616459	R-squared	=	0.0119
				Adj R-squared	=	0.0070
Total	107.920133	600	.179866889	Root MSE	=	.42263

cat_age_diff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
group						
Treatment	.1824009	.080979	2.25	0.025	.0233626	.3414393
yr2018						
After	-.0025832	.0425612	-0.06	0.952	-.0861711	.0810047
group#yr2018						
Treatment#After	-.1205228	.0920025	-1.31	0.191	-.3012108	.0601652
_cons	1.211538	.0338375	35.80	0.000	1.145083	1.277993

Use of condom

Source	SS	df	MS	Number of obs	=	546
				F(3, 542)	=	1.69
Model	1.19261534	3	.397538446	Prob > F	=	0.1690
Residual	127.805553	542	.235803604	R-squared	=	0.0092
				Adj R-squared	=	0.0038
Total	128.998168	545	.236693887	Root MSE	=	.4856

condom_always	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
group						
Treatment	.0102496	.0933905	0.11	0.913	-.1732022	.1937013
yr2018						
After	-.0668377	.0523184	-1.28	0.202	-.1696093	.0359339
group#yr2018						
Treatment#After	.1020427	.1070467	0.95	0.341	-.1082346	.31232
_cons	.4015152	.0422657	9.50	0.000	.3184905	.4845398

School dropout

Source	SS	df	MS	Number of obs	=	1,669
				F(3, 1665)	=	1.06
Model	.505825389	3	.168608463	Prob > F	=	0.3629
Residual	263.64037	1,665	.158342565	R-squared	=	0.0019
				Adj R-squared	=	0.0001
Total	264.146195	1,668	.158361028	Root MSE	=	.39792

dropout	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
group						
Treatment	.0344982	.0454878	0.76	0.448	-.0547211	.1237176
yr2018						
After	.033175	.023909	1.39	0.165	-.0137199	.0800699
group#yr2018						
Treatment#After	-.0708094	.0519606	-1.36	0.173	-.1727244	.0311055
_cons	.1805556	.0191451	9.43	0.000	.1430046	.2181065

Reason to dropout: Pregnancy or childcare

Source	SS	df	MS	Number of obs	=	342
				F(3, 338)	=	0.52
Model	.302191019	3	.10073034	Prob > F	=	0.6717
Residual	66.0135985	338	.195306504	R-squared	=	0.0046
				Adj R-squared	=	-0.0043
Total	66.3157895	341	.194474456	Root MSE	=	.44193

dropout_child	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
group						
Treatment	.0310245	.1157014	0.27	0.789	-.1965609	.25861
yr2018						
After	.0413823	.0603314	0.69	0.493	-.0772899	.1600546
group#yr2018						
Treatment#After	-.1048744	.1314547	-0.80	0.426	-.3634467	.1536979
_cons	.2467532	.0503632	4.90	0.000	.1476885	.345818