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Losing health insurance when young: Impacts on usage of medical services and health in Colombia

PENSEMOS LA SALUD: EVIDENCIA, ANÁLISIS Y DECISIÓN

Losing health insurance when young: Impacts on usage of medical services and health in Colombia

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Content

LOSING HEALTH INSURANCE WHEN YOUNG: IMPACTS ON USAGE OF MEDICAL SERVICES AND HEALTH IN COLOMBIA[1]

ABSTRACT

Nearly 8 percent of the young adults in Colombia are "aged out" from their parents' health insurance coverage when they turn 18 years old, making them the group with the lowest health insurance coverage among all age groups. In this study we exploit a regulation in Colombia that exogenously changes health insurance coverage of young adult dependents to analyze the effects on their usage of medical services and health status. We assess this effect using a regression discontinuity design (RDD) and data from the *Encuesta Nacional de Calidad de Vida* Survey for Colombia from 2010 to 2013. Losing health insurance coverage implies a change in usage within the pool of different medical services, led by a change in their relative prices. As a result, some medical services are prone to be less used (i.e. preventive services), while other medical services are more consumed (i.e. private medical services and emergency department [ED] visits). Additionally, since under Colombian regulation, ED care cannot be denied to anyone if their life is at risk, regardless of health insurance status, uninsured young adults tend to use this service more instead of regular medical services (such as preventive healthcare or visits to physicians or specialists). We find, consistent with the change in relative prices, that losing health insurance when turning 18 years old increases visits to the ED, reduces preventive care visits with a physician, and increases the usage of private medical services (out-of-pocket) for this age group. These results imply a substitution of cheaper medical services for more expensive ones when individuals turn 18 years old in Colombia.

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Keywords: Health Insurance, Young Adults, Healthcare Usage, Emergency Department Visits, Colombia's Healthcare System, Regression Discontinuity, Developing Country.

JEL codes: G22, I13, I18.

1. Introduction

Health insurance coverage has always been a subject of interest in developed countries. In these countries, health insurance status has been shown to influence medical service usage, health status or financial decisions. However, the literature analyzing how health insurance status affects similar medical outcomes in developing countries is scarce. During the 1990s, almost all Latin American (LA) countries introduced healthcare system reforms aimed at universal healthcare coverage. In Colombia, such reforms were undertaken with the implementation of Law 100 of 1993; however, two decades later, there are groups that still have problems accessing health insurance coverage. One of these groups is new young adults, those between 18 and 25 years old, for whom the share of uninsured individuals, was on average around 7 percent in the period 2010-2013 (when the official share of uninsured individuals for the entire population for the same period was around 9.13 percent)[2]. This age group has one of the largest shares of uninsured individuals of all age groups.

In part, lower healthcare coverage is caused by regulations that establish a maximum age until which dependents can have access to health insurance through their parents. Particularly, in Colombia, Decree 806 of 1998, a norm that regulates coverage for dependent children and spouses, states that dependent children under 18 are covered if at least one of the parents is enrolled in the social security system. Once a dependent turns 18, she can remain covered if one parent is enrolled in the system and if she is registered in a full-time study program. This rule applies until dependents turn 25 years old. Data for Colombia shows that between 2010 and 2013 almost 8 percent had lost their health insurance coverage at age 18.

But, is it really a problem for young adults to lose health insurance coverage? On one hand, this group could be considered one of the healthiest in the population, so a fraction of them losing coverage may not be a major problem. But on the other hand, losing coverage implies an increase in the cost of medical services offered by the system, except those services that are regulated in Colombia, because young adults would have to pay for them out-of-pocket. Then, an increase in relative prices of medical services would reduce the consumption of these services.

[2] Source: Ministerio de Salud y Protección social, 2012.

Hence, being uninsured implies altering the manner in which one uses medical services and, eventually, this may lead to a change in health status.

The present study addresses whether a change in the health insurance status of Colombian young adults, which alters the relative prices of medical services, affects their usage of medical services and, potentially leads to a change in their perception about their own health status (in the short term). We analyze this effect at age 18 (216 months), exploiting the discontinuity in health insurance coverage generated by Decree 806 of 1998 as a source of exogenous variation. We estimate the effect on medical service usage and health status of young adults using a regression discontinuity design (RDD). Our data comes from the Colombian National Quality of Life Survey (*Encuesta Nacional de Calidad de Vida* [ENCV]), for the period 2010-2013.

Although the decree generates a decrease in the probability of having health insurance, it is not certain that people losing health insurance, lose access to medical services (for instance private medical service usage increases), meaning, people look for other means to access a physician. From another perspective, the regulation creates a non-optimal usage of medical services since visits to the emergency department (ED) increase and seeing a physician for preventive care decreases. Moreover, those who lose health insurance (uninsured people) are worse o than those who are insured from a financial perspective, since uninsured people have to pay out-of-pocket for medical services.

According to Colombian regulation, ED care cannot be denied to anyone when the person's life is at risk, regardless of health insurance status. Thus, losing health insurance coverage in the Colombian case may entail a substitution of cheaper medical services, such as preventive care, for more expensive ones (from the point of view of the system), such as visits to the ED. This effect could be particularly harmful, as it might produce saturation of EDs due to over-usage, causing stress on the whole system. Moreover, regarding preventive care usage, insured young adults would have more access to a physician than uninsured young adults. As a consequence, individual health status could be affected when insurance is lost.

Our results suggest that turning 18 years old creates a discontinuity in the probability of having health insurance of -8.3 percentage points[3]. Hence, we find that losing health insurance coverage when turning 18 years old increases visits to the ED by 9 percentage points,

[3] Robustness checks were estimated to prove that this discontinuity was not found by chance.

reduces preventive care usage by 53 percentage points, and increases the usage of private medical services by 11 percentage points. In terms of changes in health status, losing health insurance coverage increases the proportion of people reporting having been sick in the month previous to the interview by 41 percentage points. Contrary to what was expected, other results suggest that losing health insurance increases the usage of general medical services and reduces individuals' perception of having poor health status. Also, since turning 18 years old involves diverse changes regarding their involvement in the labor market, studying, living with their parents, and marital status, we control for some of these characteristics that change discontinuously at the threshold and we find that the results are robust.

This study contributes to the current literature on the effects of health insurance status on health insurance coverage, medical service usage, and other health outcomes in developing countries, by using a credible identification strategy. Specifically, in Colombia, studies have focused on diverse effects and used different methodologies using the healthcare expansion caused by Law 100 of 1993, but none of them focus specifically on its impact on young adults. Also, since universal health insurance has been an aim of policy-makers, this study will highlight how some regulations go against this purpose and what the consequences are. Besides, several studies analyzing the same topic in developed countries have found mixed results regarding usage of medical services and health status, hence, the discussion is still in debate in those countries. Our findings indicate that although Decree 806 of 1998 generated a decrease in the probability of having health insurance, it is not totally accurate to say that people losing health insurance lose access to medical services (for instance private medical service usage increases), meaning that people still look for other means to gain access to a physician. From another perspective, the regulation creates non-optimal usage of medical services since visits to the ED increase while seeing a physician for preventive care decreases. Moreover, from a financial perspective, those who lose health insurance (uninsured people) are worse o than those who are insured since uninsured people have to pay out-of-pocket for medical services.

2. Literature Review

Many articles have studied the effects of health insurance coverage on medical service usage for different age groups, especially in developed countries. To estimate the causal effect of being insured/uninsured, the literature has highlighted the fact that randomized experiments or natural experiments can solve problems of endogeneity or reverse causality. This subject remains relevant for policy-makers in developed and developing countries. For instance, some studies have focused on analyzing the effects of expansions of public health insurance programs on take-up rates and crowding-out of private insurance in order to measure the effectiveness of a particular policy for different groups, especially low-income individuals. For the U.S., researchers have found that for different periods and policies, expansions in health insurance coverage increase the take-up rates among newly eligible children, especially for low-income children, while the crowding-out effect is mixed (Currie and Gruber, 1996; Card and Shore-Sheppard, 2004; Ham and Shore-Sheppard, 2005)[4]. Other studies have focused on the substitution of cheaper medical services for more expensive ones, as well as on health status and medical service usage as insurance status changes due to specific health regulations (Anderson et al., 2014; Courtemanche and Zapata, 2014; Kolstad and Kowalski, 2012; Anderson et al., 2012; Miller, 2012a,b).

Studies that exploit discontinuities in health insurance coverage at a specific age threshold, like in the present study, to measure causal effects of health insurance status on medical out-comes in the U.S., are plentiful Witman (2015), Anderson et al. (2014), Anderson et al. (2012), Xiao (2011), Levine et al. (2011), Card et al. (2008), and Card et al. (2007). Card et al. (2008) and Card et al. (2007) exploit a discontinuity generated in coverage when turning 65 years old, due to the availability of universal coverage for individuals 65 and over (Medicare). The first article finds evidence of an increase in the use of healthcare services as coverage increases, with a pattern of gains across groups that varies by the type of service, while the second finds improvements in mortality and an increase in visits to the emergency department (ED). Levine et al. (2011) exploit an immediate change in legislation after the introduction of the State Children's Health Insurance Program (SCHIP) that raised the age limit of eligibility to age 19 between 1997 and 1999; they find that for different levels of family income and in different states, there is a causal impact on

[4] Authors take into consideration expansions for eligibility of those who are limited to essentially three low-income groups: senior citizens, the disabled, and families with dependent children.

health insurance coverage for those under the age of 19. Xiao (2011) uses a discontinuity generated when young adult dependents turn 19 years to analyze health the consequences on health care spending by performing a fuzzy RDD and heterogeneous effects by gender. Anderson et al. (2012) similarly, use the same discontinuity generated when young adult dependents turn 19 years old by performing a RDD. They find that, contrary to expectations, losing health insurance coverage decreases usage of both inpatient and ED care. Authors attribute this result to a short-run response in which individuals may anticipate losing health insurance, thus they may 'stockpile' healthcare shortly before coverage expires. Anderson et al. (2014) complement the previous study by using a discontinuity generated when young adults who kept studying, lost their health insurance upon turning 23 years old, by carrying out a RDD. They found a decrease in ED visits and a decrease in hospital stays. Witman (2015) also exploits an age-based eligibility for Medicare (at 65 years old) to find that eligibility of an older spouse (for Medicare) can lead to crowding out of health insurance coverage for a younger spouse (he finds differentiated effects by gender). Finally, a recent set of articles analyze the effect of the Affordable Care Act of 2010 that expanded coverage to young adults allowing them to remain on their parents' private health insurance until they turn 26 years old. Particularly, Antwi et al. (2015), and Barbaresco et al. (2015) use a difference-in-differences specification to analyze the effect of this expansion on (i) inpatient hospitalizations and mental health related inpatient care (Antwi et al., 2015); and (ii) health care access, preventive care utilization, risky behavior, and self-assessed health (Barbaresco et al., 2015).

Research assessing the effects of healthcare reforms in Colombia is limited and scarce. Academic studies and reports have found that after implementing the reform (Law 100 of 1993), improvements in health (Zambrano et al., 2008), and reductions in out-of-pocket expenses (Ra-mon et al., 2002); other studies have found that after the reform financial protection occurred particularly for people enrolled in the Subsidized System (SS) (Castano and Zambrano, 2007; Giedion and Villar, 2009; Miller et al., 2013). Additionally, health insurance reform has in-creased medical service usage not only for (poor) people enrolled in the SS (Trujillo et al., 2005; Gaviria et al., 2006; Giedion and Villar, 2009; Camacho and Conover, 2013; Miller et al., 2013), but also for those participating in the Contributory System (CS) (Giedion and Villar, 2009). Particularly, Gaviria et al. (2006) found that healthcare reforms appear to have an adverse effect on consumption and labor market participation. However, none of these studies have centered their attention on young adults losing health insurance coverage due to the regulation concerning dependents.

Trujillo et al. (2005) evaluate the impact of the SS on the level of medical care usage using propensity score matching (PSM) methods, where the treatment group is made up of participants in the SS, while the control group is made up of non-participants in the SS. Results support the hypothesis that the SS increases medical care usage among participants (e.g. preventive care, ambulatory consultations, and hospitalizations). Gaviria et al. (2006) evaluate the impact of the SS on health and healthcare usage outcomes using an instrumental variable (IV) method. Results evidence a non-statistically significant effect on self-reported health status and a significant and positive effect on medical service usage (e.g. preventive and illness-related consultations). Giedion and Villar (2009) use the healthcare reform to identify differences in access and health status for the whole population. Their identification strategy relies on an IV method for analyzing the CS and a PSM method for studying the SS, where the treatment group includes insured people while the control group includes uninsured people. Results show a significant increase in medical care usage and a significant reduction in equity gaps (e.g. coverage and access to services).

Miller et al. (2013) use the eligibility program of the *Sistema de Identificación de Beneficiarios* (SISBEN) to study the impact of the SS on financial risk protection, medical service usage, and health outcomes. The authors used their own (un-manipulated) SISBEN score to look for the discontinuity in participation (enrollment) to implement a \fuzzy" RDD. Results suggest a considerable increase in preventive healthcare service usage and no significant changes in enrollment and hospitalizations. Finally, Camacho and Conover (2013), using a RDD, examine if the health insurance coverage accessibility of the poor to the SS, improved health outcomes for newborns and augmented access to medical services for pregnant mothers. The authors exploit a change in eligibility to be in the SS, which is determined discontinuously by the poverty index score SISBEN (which is based on a certain score threshold). They find that the SS had a significant and positive effect on health, reducing the incidence of low birth-weight between 1.7 and 3.8 percentage points, which shows an improvement in newborn health.

3. Institutional Background

The Colombian national healthcare system, established in 1967, was originally conceived as a pay-as-you-go system, in which the main provider was the state and formal workers supported the system by paying for insurance, which was not mandatory. Quickly this system, due to low enrollment rates of formal workers (only 23-25 percent of all formal workers were enrolled in the system), decayed into crisis (Clavijo and Torrente, 2008). As a result, the Colombian government issued Law 100 of 1993, which created a mixed public/private system with the purpose of achieving universal health insurance coverage. Law 100 created a social security system divided into two subsystems: the Contributory System (CS) that covers formal workers, for whom it is mandatory to get health insurance, and the Subsidized System (SS) that provides subsidized coverage to low-income people and underpaid informal workers (those who earn less than the minimum wage per month, which for 2015 is COP 644,350 or approximately USD 270).

After implementing Law 100, the rates of insured people rose from 38.8% in 1994 to 91.7% in 2011. Thus after 20 years of it being implemented, Law 100 has achieved almost full health insurance coverage for all Colombians. However, there are regulations causing friction in the access to health insurance coverage for some groups such as young adults[5].

3.1. Contributory System (CS)

The CS covers formal workers and pensioners who have to pay 12.5% of their monthly income for health insurance[6]. This payment secures health insurance for themselves and their dependents: spouses and children[7]. Workers or salaried employees share the percentage with their employer in a proportion of 8.5% employer and 4% employee. Self-employed workers have to cover the whole percentage if their

[5] Also, recently, the system has evidenced other problems that have led the Ministry of Health and Social Protection to pass a law that modifies and strengths Law 100 in order to solve structural problems; this law is currently under discussion.
[6] Pensioners only pay 12% out their monthly pension.
[7] When the person enrolled is single he can include as dependents parents or siblings. But when married his only dependents can be spouse or children. If the person is married and wants to include an extra member (parent, sibling or even a dependent older than 18 years old), he has to pay a premium called UPC *Unidad de Pago por Capitación* equivalent to the amount of money that the system (FOSYGA) has to give to the EPS for every insured person in his group.

monthly earnings are above the minimum wage[8], otherwise they are eligible for subsidized healthcare. Within the CS there are two special contributory subsystems called "special regimes" that cover the military forces and professors of public universities. These special subsystems are similar to the regular CS, except for some differences in co-payments, deductibles, and which medical centers they use. In the CS each worker chooses a Health Promotion Agency (EPS) and no EPS can deny or reject any person who pays for insurance in the CS[9]. Finally, when a worker enrolled in the CS wants to add another family member outside.

3.2. Subsidized System (SS)

The SS was created to enroll poor people, informal workers who earn less than the minimum wage, and vulnerable people (including homeless people). The SS is financed by a 1 percent payroll tax paid by formal workers plus a share of general tax revenues. To identify these individuals, the government administers a household survey, *Sistema de Identificación de Potenciales Beneficiarios de Programas Sociales* (ISBEN), to detect whether basic needs are being met. From this information, SISBEN scores each family and classifies them into different categories. The government uses these categories to assign families to different social programs and subsidies. Subsidized health insurance is granted to those people who are classified in SISBEN levels I and II. Before being granted with health insurance, individuals have to go through a selection process that takes several months. After being chosen, the person is assigned to an EPS from a list of providers, which could differ from the list of EPSs in the CS[10].

3.3. Regulation of Dependents' Coverage: Decree 806 of 1998

After Law 100 of 1993, many laws and decrees were issued with the intention of either improving or extending health insurance coverage. We are interested in Decree 806 of 1998 that regulates health insurance coverage for dependents under 18 years old. Under the

[8] Which in 2015 was established at approximately USD 270.
[9] EPS stands for *Entidad Promotora de Salud*, which is a private company in charge of providing health insurance to the people enroll to the system CS or SS. There are more than 50 EPSs to choose from in Colombia. This number has fluctuated between 1993 and 2015.
[10] Within the system there is another group of individuals called *Vinculados*, who are the people not currently insured by the system because they do not want to be enrolled in any subsystem, or they have income capacity for buying a private insurance, or they have been classified by SISBEN but are not eligible for subsidized health insurance. In other words, those who are uninsured by the system.

norm, all dependent children are insured if one of the parents is enrolled in the social security system (CS or SS). Once they turn 18, dependents can remain covered if one parent is enrolled in the CS and if they are enrolled in full-time formal study programs11. This rule applies until they turn 25 years old. This same rule applies for dependents enrolled in the SS, however, dependents that lose health insurance in the SS have the chance to apply for SS as an adult during the same year[12].

3.4. Access to Medical Services

Law 100 of 1993, along with other regulations, set up the obligatory plan which regulates medical procedures, medical treatments, and medicaments for a list of diseases and health conditions that are covered by each system. This obligatory plan of services is called the *Plan Obligatorio de Salud* (POS). The POS of the CS (POS-C) was different to that of the POS of the SS (POS-S) in terms of the packages of services and procedures they covered, the POS-C being more generous than the POS-S. The POS was unified for both systems in 2010[13].

Insured people from both systems have access to medical services through an EPS. The EPS refers people, based on where they live, to an *Institución Prestadora de Servicios* (IPS) that offers basic medical attention: physician visits, dental visits, and laboratory exams (sometimes even x-rays)[14]. Every time insured people, from both systems, use a health service, they pay a deductible based on their monthly income. When the health problem requires specialized procedures, physicians from the IPS refer patients to specialized health service centers, clinics or hospitals (medium or high complexity centers), for which they also pay the deductible[15]. In urban areas, it is common to have different EPSs for the CS and the SS, while in rural areas due to the scarce number of EPSs, both systems would share the same IPS/EPS. By regulation, each EPS has to take some percentage of people from the SS.

Besides deductibles, co-payments are sometimes required, mainly for beneficiaries of the CS, and are basically charged when the beneficiary under treatment requires procedures

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[11] In educational institutions certified by the Ministry of Education.

[12] Parents with enough information and income can pay the premium for an extra member to keep their dependents cover when turning 18 years old, if dependents are not studying nor working.

[13] Due to lawsuits claiming inequality in access to medical services and procedures

[14] An IPSs is an institutions that provides medical services, sometimes to different EPSs or sometimes to only one EPS. Besides, the social security system ranks IPSs according to three levels of complexity: low, medium and high.

[15] Similar to the IPS, some of these centers provide medical services to insured people from one or multiple EPSs.

linked to hospitalizations or surgeries. Income level determines how much individuals have to pay for deductibles and co-payments in the CS[16]. However, within the CS, those enrolled in one of the special regimes do not make co-payments. In the SS those who are classified in SISBEN level I or individuals who present similar socioeconomic conditions of those in SISBEN level I do not pay deductibles or co-payments[17]. All those classified in SISBEN level II have to pay co-payments.

Moreover, when a beneficiary or the principal policy-holder[18] loses health insurance for any reason, the EPS has to provide health services for beneficiaries for at least 30 days if they were continuously insured for 12 months or up to three months when continuously the person was insured for longer than five years[19]. However, this applies to the policy-holder when he loses health insurance, but not to dependents who lose health insurance due to Decree 806. Also when the person is under medical treatment, has any disability or is pregnant, the EPS has to continue providing the services until the condition is overcome[20]. In the case of uninsured people, they do not pay deductibles or co-payments as they only have access to medical services by fully paying for any service and procedure utilized in either a public or private institution, unless it is an emergency. The ED constitutes the cheap option, since following the 'regular' procedure is costlier. Below I will explain this peculiarity.

There is an idiosyncrasy in the Colombian system regarding ED visits. Since health is a constitutional right for all citizens in Colombia, no medical center can deny access to any person to an ED, independent of insurance status, when life is at risk. Another particularity is that in the first 30 days after health insurance enrollment, the person only has access to the ED. Thereafter, the insured person has access to all medical services.

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[16] In any case both co-payment and deductible can be charged together for the same procedure or service.

[17] Also, children under age one, abandoned children, homeless people, forcibly displaced people, seniors living in nursing homes, indigenous people, demobilized people, and Roma are excluded from paying deductibles and co-payments (gitanos).

[18] The principal policy-holder is the person who pays for the insurance, of which extra people are beneficiaries (i.e. spouses or children).

[19] These services are only for ongoing treatment or procedures recommended from an ED visit.

[20] The Colombian Constitution guarantees two principles: continuity and integrity of patients' rights.

When visiting the ED there are differences in the payment of deductibles and co-payments. For instance, after insured people in the CS are attended in the ED and all the necessary medical procedures (exams, x-rays, surgeries, hospitalization, etc.) are performed to stabilize the condition enough to responsibly discharge the patient, the principal policy-holder pays a deductible and the beneficiary pays a co-payment. Insured people in the special regime do not pay deductibles or co-payments in the ED. In the SS, similar to those in the CS, their beneficiaries classified in SISBEN level II have to pay co-payments when visiting the ED. People in SISBEN level I as well as those considered vulnerable (the group listed above in footnote 14) do not have to pay any co-payment. In no case people insured in the SS have to pay a deductible. Uninsured people, when visiting the ED and after all the procedures have been performed, are charged with the full price. If the person does not have the means to pay, the government has to assume the costs.

In practice, for insured people in the CS, when visiting the ED, first there is an initial classification done by a physician (for the purpose of being classified as an emergency or not), which is excluded from deductibles[21], unless the event is classified as a non-emergency, in which case the insured individual has to pay the deductible and make an appointment to see a regular doctor (meaning they are not attended in the ED).

When the event is determined as a non-emergency those insured in the CS have to pay the deductible, the attention is denied and they have to follow the `regular' procedure (make an appointment with a physician)[22]. For those in the SS, if the ED visit is not classified as an emergency, they are denied access and recommended to ask for an appointment with a physician, but they are not charged anything, similar to those that are uninsured.

Under these regulations the cost of going to an EPS physician (regular procedure), relative to an ED visit, is lower for an insured person than for an uninsured person. To illustrate this better, imagine that when one insured individual presents an acute health problem he has to ask for an appointment with a physician and thereafter, another one, if he is referred to a specialist. For each of these appointments, the individual has to pay a deductible or co-payment (if any), besides the time waiting for the appointment. Meanwhile, for an uninsured person with a health problem, she may avoid going to see a private physician

[21] By law, no one can be forced to pay a deductible before being attended in an ED.
[22] For instance by law anyone can be forced to pay deductive before being attended in an ED

and may choose to wait until the condition worsens to go to the ED, hence not paying any deductibles or co-payments[23].

4. Data Sources

4.1. Sample

We perform the analysis using the survey *Encuesta Nacional de Calidad de Vida* (ENCV) for Colombia, which is currently available for 2010, 2011, 2012, and 2013[24].23 The survey has different sections containing information about households, families, and individuals for health, education, household composition, household expenses, labor market, among others. The information is representative at the country level and at the regional level[25] [26]. From these surveys we construct all the variables of interest: age, health insurance coverage, health usage outcomes, health status outcomes, and individual characteristics.

4.2. Age

We define age in months for each individual at the interview date by using the reported birth month and year and the month and year in which the survey was performed. We use another variable that reports the current age in years so as to correct for those cases in which the current age differed from the age in months[27].

4.3. Health Insurance Coverage

Since the interest of the present article is to study the effect of dependents losing health insurance coverage when turning 18 years old, we built different variables accounting for health insurance

23 Some insured workers, using strategic behavior, may prefer to skip the 'regular' procedure of seeing a physician (also getting exams or x-rays or going to see a specialist) and wait until they get worse to go to the ED. This scenario could be explained by reasons such as saving money, saving time or may also be motivated by medical leave payments, among other explanations.
24 ENCV was also available for 2008 but without including the date the survey was taken, key for building the variable age in months, therefore we omitted this year. Also, the survey was not done in 2009.
25 Region is an administrative division, different than Departamento (state).
26 There are other sections, different from the ones listed that are utilized in two or more years but no more. For instance, 'personal expenses' is a section in the survey for years 2010 and 2011 but not for the following years.
27 For instance those who reported being 18 years old, though their age in months was below 216 months (equivalent to 18 years old) and for those reporting being 18 years old and their age in months was 229 months (equivalent to 19 years old and one month).

coverage as follows: a dummy variable indicating if the individual has CS insurance, a dummy variable indicating if the person has SS insurance, and a dummy variable indicating if the person has either of them (CS or SS insurance). We do not consider private insurance because it can only be acquired as 'complementary' insurance to the public option. Usually this private insurance is bought by people enrolled in the CS to complement their health insurance coverage for some medical treatment, health services, and procedures that are not covered by the regular healthcare system. Additionally, the question in which we rely to identify them is only available for 2010 and 2011. Besides, the proportion of people with this complementary insurance is low.

Even though the healthcare system defines dependents as children and spouses of the person enrolled in the CS or SS, we find in our data that for all years, more than 95 percent of the dependents are from people enrolled in the CS.

Since we use self-reported information regarding health insurance coverage, we rely on the fact that people are informed about the regulation, Decree 806 of 1998, explained in the Section 3.3., that regulates dependents in the healthcare system. A challenge is to ensure that inter-viewed people (or their parents) know this specific regulation. There is a possibility in which at the moment of the interview those who turned 18 years old were not aware of the regulation. In this sense a case could arise where the interviewee does not know the regulation and then his/her answer is that they are 'insured', when they are actually not. This lack of information can be possible for those young adults close to the threshold. One correction we perform is to identify those dependents older than 18 years old who reported having health insurance, but that were not studying or working, and change their status to being uninsured. It is possible that, from the group we corrected for above, there are dependents turning 18 years old who are spouses of a principal policy-holder who is not working or studying, as well as dependents whose parents paid the premium to keep them in the system. Also, there are individuals with disabilities (physical and mental) turning 18 years old who are insured under Colombian law as well, without studying or working. For these two groups we did not change their health insurance status so as to capture only the uninformed individuals. By making this correction, we found approximately 154 individuals who reported being an insured dependent but that were not studying or working (for the interval of 18-19 years old)[28].

[28] Divided by socioeconomic strata we found that 114 of 154 belong to the lowest strata (42 for strata 1 and 72 for strata 2), while the rest of the individuals belong to

4.4. Health Service Usage

We build three variables for the usage of medical services using the set of questions about (self-reported) healthcare use. The first dummy variable called medical services general, takes the value of one if the person, after presenting a health problem in the 30 days previous to the interview, consulted a physician within the network of health institutions, and zero if she either did not have a health problem or, if she had had a health problem, but did not consult a physician within the network[29]. The second dummy variable, private medical services, takes the value of one if the person, after presenting a health problem in the 30 days previous to the interview, consulted a physician, specialist or other health worker out-of-pocket, and zero if she either did not have a health problem or, if she had had one, did not consult any health worker out-of-pocket. The last dummy variable, preventive care, takes the value of one if the person visited a physician at least once a year for prevention, and zero otherwise.

For visits to the ED, we create a dummy variable using the question whether the person visited the ED in the last 30 days due to a health problem[30]. For hospitalization, we create a dummy variable using the question whether the person has been hospitalized in the last 12 months.

We expect medical general service usage and preventive care to decrease when people lose health insurance coverage by turning 18 years old. Also, we expect that, at the threshold, private medical service usage increases when people lose health insurance coverage, as well as visits to the ED, and hospitalizations.

4.5. Health Status

We measure short term health status using self-reported information about the perception that the person has about her own current health status. This question is the same for all surveys throughout the years and has four levels: excellent, good, regular, and bad. We build one dummy variable taking the value of one when the person reported

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strata 3 (34) and strata 4 (6). This potentially implies disinformation rather than paying the premium.

[29] Since, the question is not clear whether the person visited a particular IPS or institution from the EPS network he is enrolled with, we cannot discern whether the medical service was provided by his EPS.

[30] This question is not available for 2010. Besides, in 2011 the question of visiting the ED was not asked in a single particular question as in 2012 and 2013, but as one of the options in the question regarding what the person did to treat a health problem that had occurred in the past 30 days.

having either regular or bad health. Additionally, we create a dummy variable that takes the value of one if the individual reports being sick the 30 days previous to the interview and zero otherwise.

4.6. Individual Characteristics

Finally, we construct variables for different characteristics in which we include: gender, marital status, live with parents, work status, and study status. These variables are relevant for the present study since the regulation for young adults states that by turning 18 years old, dependents lose health insurance coverage only if they are not studying. For study status we used a question asking if the person was currently enrolled in a study program at the time of the interview. For work status we build a dummy taking value one if the person spent most of his time the week before the interview working and zero otherwise. But also turning 18 years old involves other changes that have to be analyzed. For instance, been married or living with parents could influence the usage of medical services if these characteristics change discontinuously at the threshold. For been married we create a dummy taking value of one if the person is married or has been living with someone longer than two years and zero otherwise. For living with parents, the dummy variable takes the value of one if the person lives with the mother, the father or both; and zero otherwise[31].

Table 1 presents some descriptive statistics for the differences in means for insured and uninsured people, and for people younger and older than 18 years old. The differences are calculated pooling the whole sample (2010-2013). The sub-sample that we consider to calculate the means and differences is individuals that are 6 months away from 18 years old (or 216 months) on both sides of the threshold. Results show for those younger and older than 18, significant differences in living with parents, marital status, work status, and study status; while for uninsured and insured people, there are differences in gender, live with parents, work status, and study status. In terms of medical service usage and health status we observe differences in the groups uninsured and insured. For instance hospitalizations, visits to the ED, medical service usage, and preventive care significantly differ for insured and uninsured people.

[31] We create a dummy variable taking value one if the person lives with both parents and zero if the person lives alone or with one of the parents. This variable will help us to explain emancipation in Colombia in a further section.

Table 1: Differences in Means for Insured and Uninsured People and for People Younger and Older than 18 years old, for 2010 to 2013.

	Difference people older than 18 and younger than 18 Years 2010 to 2013 +- 6 months				Differences for uninsured and insured people Years 2010 to 2013 -+6 months			
	Younger than 18	Older than 18	Differ	P value	Uninsured	Insured	Differ	P value
Health insurance any					0.9136	0.8774	0.0361	0.0002
Health insurance any adj					0.9136	0.8463	0.0673	0.0000
CS					0.2859	0.2451	0.0407	0.0033
SS					0.6277	0.6323	-0.0046	0.7601
Male	0.5579	0.4966	0.0614	0.0169	0.5154	0.4898	0.0256	0.1017
Work status	0.2553	0.1946	0.0608	0.0031	0.2705	0.3227	-0.0522	0.0003
Study status	0.4208	0.5653	-0.1445	0.0000	0.5823	0.5172	0.0651	0.0000
Married	0.0449	0.0530	-0.0081	0.4774	0.0438	0.0608	-0.0171	0.0143
Live with parents	0.6927	0.7966	-0.1040	0.0000	0.7984	0.7731	0.0253	0.0488
Sick last month	0.0946	0.0800	0.0146	0.2991	0.0842	0.0783	0.0059	0.4897
Hospitalized last year	0.0426	0.0720	-0.0294	0.0237	0.0640	0.0743	-0.0103	0.1941
ED visits	0.0071	0.0223	-0.0152	0.0380	0.0207	0.0204	0.0002	0.9562
Medic services EPS	0.0284	0.0528	-0.0244	0.0297	0.0510	0.0489	0.0021	0.7546
Medic private services	0.0071	0.0038	0.0032	0.3279	0.0038	0.0045	-0.0006	0.7513
Bad health status	0.1253	0.1182	0.0071	0.6681	0.1218	0.1162	0.0055	0.5847
Preventive physician	0.0969	0.1473	-0.0504	0.0050	0.1434	0.1411	0.0023	0.8363

Note: The sub-sample used is individuals whose age is +- 6 months from 216 months (18 years old). Column A shows differences between people older than 18 and younger than 18 years old. Column B shows differences for insured and uninsured people.

5. Empirical Strategy

To address the causal effect of losing health insurance coverage on medical service usage, it is necessary to solve endogeneity problems associated with adverse selection. In the present study, as a natural experiment, we exploit the enactment of Decree 806 of 1998 which generates an exogenous change in the probability of being insured when an individual turns 18 years old. We are interested in disentangling how people's medical service usage and health status are altered (MS_i) due to losing health insurance coverage (HI_i) when turning 18 years old ($A_i \geq 18$) in a developing country with a mixed healthcare system.

Let $P_r(HI_i = 1|A = a)$ be the conditional probability of having health insurance coverage given the age. We expect that, due to Decree 806, the probability of having health insurance coverage after turning 18 years old would be lower than the probability of having health insurance coverage before turning 18 years old. This means that the limit when getting closer to 18 years old from the right is lower than the limit coming from the left ($lim_{A\downarrow c} P_r(HI_i = 1|A = a) < lim_{A\uparrow c} P_r(HI_i = 1|A = a)$). For a sharp RDD these limits will take the values zero and one.

However, in our case, there is no perfect compliance since many dependents keep their coverage after turning 18 years old, for they remain enrolled in educational programs or some of them find a formal job. Thus, the probability of having health insurance generates a discontinuity when turning 18 years old, meaning that the difference between the limits of the probability of having health insurance when close to 18 years old, from both sides, is less than one $[lim_{A\downarrow c}P_r(HI_i = 1|A = a) \neq lim_{A\uparrow c}P_r(HI_i = 1|A = a)]$ and so we estimate a fuzzy RDD. Let Y_i be the outcomes of interest (measure of health care use or health status)[32]. We estimate how the usage of medical services and health status change for those turning 18 years old as a consequence of losing health insurance coverage at that age (threshold).

The estimation of losing health insurance for a fuzzy RDD, following Hahn et al. (2001), is similar to finding the Wald estimator in the vicinity of the threshold (used in the Two Stage Least Square) in which the difference in the conditional expected values of medical service usage, Y_i, just before and just after turning 18 years old (numerator), is divided (weighted) by the difference in the conditional expected values of losing health insurance coverage, HI_i, just before and just after turning 18 years old (denominator). Then, assuming that there are no other factors different to health insurance changing at the threshold, the causal effect of losing health insurance coverage on the usage of medical services and health status when turning 18 years old can be estimated[33] as follows:

$$Wald_{est} = \tau_{fuzzy} = \lim_{A\downarrow c} E[Y_i|HI_i = 0, A = a] - \lim_{A\uparrow c} E[Y_i|HI_i = 0, A = a]$$

$$= -\frac{\lim_{A\downarrow c} E[Y_i|A=a] - \lim_{A\uparrow c} E[Y_i|A=a]}{\lim_{A\downarrow c} E[HI_i|A=a] - \lim_{A\uparrow c} E[HI_i|A=a]} \qquad (1)$$

[32] Our data is a repeated cross section, which means we use data at the individual level from surveys from different years, but the individuals are not followed along years (different samples and individuals for each year). All equations below should have both subscripts: one identifying individuals and one identifying year, but since we are not following the same individual across years we decided to omit the year indicator without changing the nature of the analysis. Although we control for year fixed effects in all our estimations.

[33] Formally, we are making two assumptions: *(i)* that the expected value for medical service usage and health status (Y_i) is a continuous function of age close to the threshold (Local Continuity Assumption) such that $E[Y_i|HI_i = 1, A_i]$ and $E[Y_i|HI_i = 0, A_i]$ are continuous in A at a_0; and *(ii)* age provokes the probability of having health insurance to increase or decrease (causing a discontinuity at a_0), meaning that the probability of having health insurance is a monotonic function of age (Monotonicity Assumption). The monotonicity can go either direction $HI_i(1) \leq HI_i(0)$ or $HI_i(1) \geq HI_i(0)$) but since the probability of having health insurance reduces when turning 18 we assume $HI_i(1) \leq HI_i(0)$ for all i.

Where c is the threshold which takes the value of 216 months (18 years). Since the denominator is always negative in our case, to estimate the effect of interest value of the effect we multiplied the numerator of (1) by -1[34]. In this expression the numerator is the reduced form and the denominator is the first stage.

Thus, the fuzzy estimator estimates the Local Average Treatment Effect (LATE) for the group of people at the cut-off. With a relevant number of observations close to the threshold a non-parametric approach is recommended. For the analysis we grouped individuals into a number of identical intervals using the assignment variable, age, in months. This is often referred to in the literature as 'bin'. The simplest non-parametric approach in our case will compare the conditional means of the two closest bins, one at each side of the threshold, if the number of observations is big enough to do so. In the present study we use a small bandwidth around the threshold. To estimate the parameter of interest we estimate the following specification with a Local Linear Regression (LLR) for the numerator and denominator of Equation 1 as follows:

$$Y_i = \alpha + \beta_0 D_i + \beta_1 f(A_i - 216) + \beta_2 f(A_i - 216)D_i + \beta_3 X_t + \theta_i \quad (2)$$
$$HI_i = \alpha + \pi_0 D_i + \pi_1 f(A_i - 216) + \pi_2 f(A_i - 216)D_i + \pi_3 X_t + \mu_i \quad (3)$$

Where D_i is an indicator for the assignment variable such that $D_i = 1$ if $A \geq 216$ and $D_i = 0$ if $A < 216$. $A_i - 216$ is the age centered at 216 months. $f(.)$ represents the association between the age of individuals and the outcome of interest (usage of medical services or health status). We assume that the association is lineal at both sides of the cutoff but allowing it to be different at both sides; X_t is a vector containing year and month fixed effects, so as to control for unobservable characteristics by year and month of birth. Since the assignment variable is discrete we follow Lee and Card (2008) and we estimate the standard error with clusters at the age (measured in months).

We limit the analysis to observations located within a close vicinity of the cut-off. Since the assignment variable is discrete there is not a specific rule to follow for the bandwidth selection, but to avoid asymptotic biases, we use the smallest optimal bandwidth in the LLR by using as a criterion of selection the Plug-in Approach, proposed by

[34] This happens because the treated people should have lower rates of health insurance coverage than the control people, in other words: $lim_{A\downarrow c} E[HI_i = 1, A = a] < lim_{A\uparrow c} E[HI_i = 0, A = a]$.

Imbens and Lemieux (2008) (See Section 5.1)[35]. Besides, we estimate different models for other bandwidths.

Additionally, we make different estimations using parametric methods, particularly we perform an Instrumental Variable (IV) Approach following Hahn et al. (2001), which is basically a Two Stage Least Square (2SLS), in which D_i, the age indicator, is the instrument for HI_i (first stage). Then in the second stage we use the estimated coefficients for HI_i to estimate the causal effect of HI_i on medical service usage and health status (Y_i) as follows:

First stage:

$$HI_i = \gamma_0 + \gamma_1 D_i + \gamma_2 f^k(A_i - 216) + \gamma_3 f^k(A_i - 216)D_i + \gamma_4 X_t + v_i \quad (4)$$

Second stage:

$$Y_i = \rho_0 + \rho_1(\widehat{HI_i}) + \rho_2 f^k(A_i - 216) + \rho_3 X_t + \varepsilon_i \quad (5)$$

In the IV specification, $f^k(.)$ is a lineal polynomial $(k = 1)$ and the standard errors are clustered by age in months. We choose the same bandwidths used in the non-parametric approach, while X_t represents the vector for year fixed effects which is included in both stages.

5.1. Optimal Bandwidth Selection

Table 2 presents results for the estimation of the optimal bandwidth following the plug-in criteria suggested by Imbens and Kalyanaraman (2012). We observe that the optimal bandwidth chosen is close to the threshold (bandwidth 2) for all variables, except poor health[36].

Table 2: Optimal Bandwidth Selection: Plug-in Procedure

	Imbens optimal 'bandwidth'
Variables / Years	2010, 2012 and 2013
Any health insurance	2
Insurance CS	2
Insurance SS	2
ED visits	2
Hosp last year	2
Medical services by EPS	2
Alternative medical services	2
Private medical services	2
Poor health	1
Sick last month	2

[35] The same optimal bandwidth is used of the numerator and denominator.
[36] We also performed optimal bandwidth selection for all the heterogeneous effects in 7.4. See Appendix A.1.

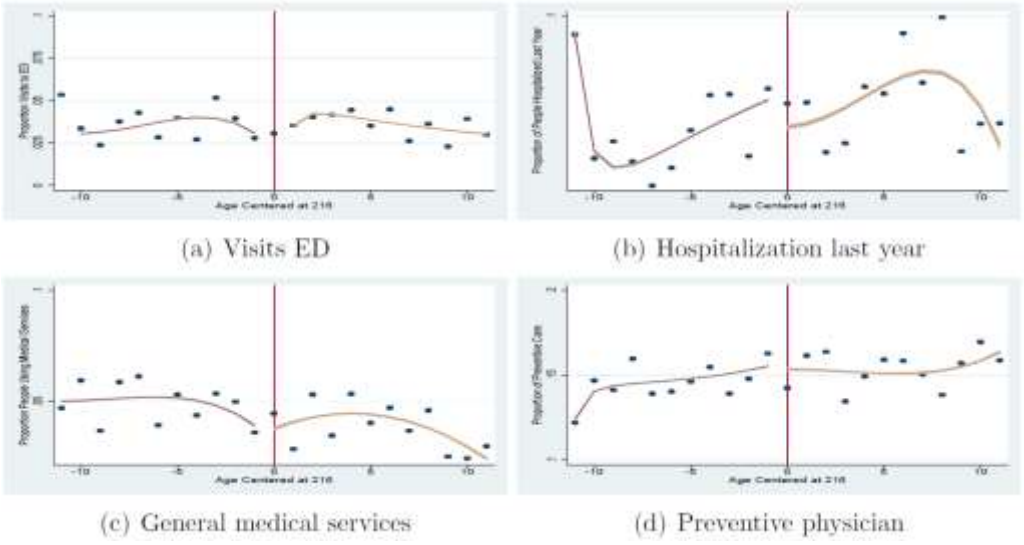
	Imbens optimal 'bandwidth'
Prev physician	2
Prev dentist	2
Study status	2
Work status	2
Male	2
Married	2
Live with parents	2

6. Results

6.1. Visual Analysis of Medical Service Outcomes

All the graphs in Figures 1 and 2 show the proportion of individuals at each age (measured in months and centered at 216) that used different types of medical services. In Figure 1 we observe small discontinuities going down for hospitalizations in the year previous to the interview (Graph (b)). For visits to the ED (Graph (a)) it seems there is a small increase, while for the usage of general medical services (Graph (c)) and seeing a physician for preventive care (Graph (d)), there is no clear evidence of discontinuities at the threshold. This visual result seems daunting since we were expecting to see more clear discontinuities for the medical service outcomes.

Figure 1: Proportion of Usage of Different Health Services by Age in Months.

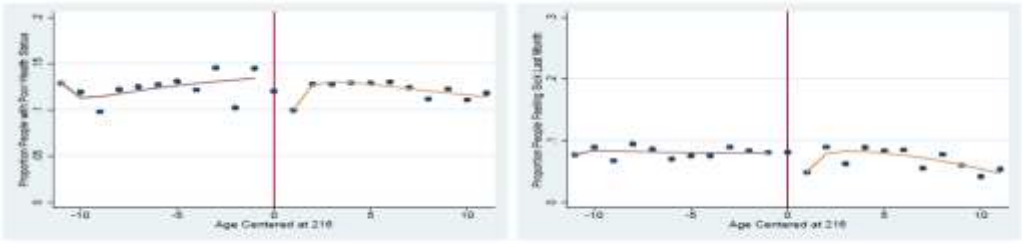


Source: ENCV 2010, 2012, and 2013.

Figure 2 shows small discontinuities going down for health status outcomes in both cases: self-reported poor health (Graph (a)) and

being sick last month (Graph (b)). However, further analysis is required.

Figure 2: Proportion of People with Poor Health Status and Sick Last Month



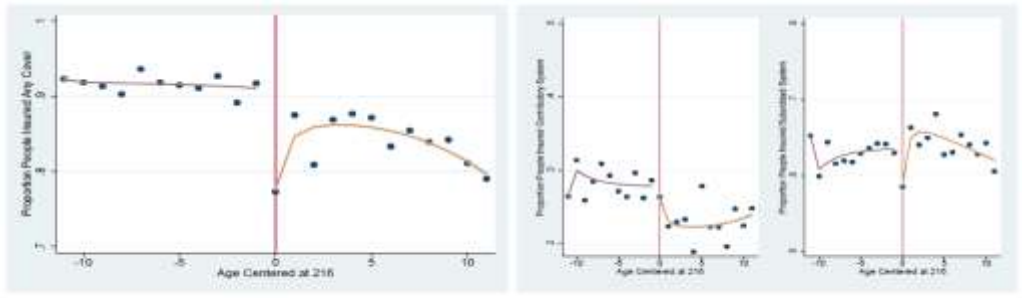
(a) Poor health status (b) Sick last month

Source: ENCV 2010, 2012, and 2013.

6.2. Discontinuity in the Probability of Having Health Insurance at the Threshold

One of the assumptions of the fuzzy RDD is the existence of a discontinuity in the probability of having health insurance coverage at the threshold. For checking this we first perform a graph analysis. All graphs in Figure 1 show the proportion of individuals at each age (measured in months and centered at 216) that have any health insurance coverage (Graph (a)), have health insurance in the CS (left graph of Figure (b)), or have health insurance in the SS (right graph of Figure (b)). All variables are aggregated using information from the ENCV[37]. As expected, we observe a discontinuity at 216 months, right when individuals turn 18 years old, in the probability of having any coverage. This reduction is explained by a reduction in the probability of having either CS or SS coverage.

Figure 3: Health Insurance Coverage by Age



(a) Any health insurance (b) CS coverage (left) & SS coverage (left)

Source: ENCV 2010, 2012, and 2013.

[37] For 2010, 2012, and 2013. See results in Table 3.

Results in Table 3 present the estimation of the discontinuity in the probability of having health insurance coverage at the threshold (denominator of Equation (1)) for bandwidths 2 to 4. Based on the results in Section 5.1, this analysis will emphasize the results obtained using a bandwidth of 2 for each separate year (Panels A to D) and pooling together all years (Panels E and F).

There is a statistically significant reduction of 11.3 percentage points at the threshold in the probability of having any coverage (Column 1, Panel A) for year 2010. For 2012 the reduction is 5.5 percentage points (Column 1, Panel C). For 2013 it drops by 9 percentage points (Column 5, Panel D). For bandwidth 2 there is no effect for the year 2011. For the aggregated data, in Panels E and F, we observe that the probability of having health insurance shows a statistically significant reduction of 6.5 percentage points for years 2010 to 2013 (Column 1, Panel E). The group without year 2011 shows a statistically significant decrease of 8.3 percentage points (Column 5, Panel F). This reduction is comparable with the one seen in Figure 1.

The above results are robust across bandwidths for all years and groups except for 2011. The effect in 2011 seems to be small and only significant for bandwidth 3. Indeed, when we re-estimate the model excluding the year 2011, the estimated discontinuity is larger but not by much (an increase of only 1.8 percentage points). By looking at any health insurance adjusted, which corrects for dependents who reported having health insurance after turning 18 years old and whom were neither studying nor working (this correction is explained in detail in Section 4.3), we see that the estimated effect is bigger than that for any health insurance. This could reflect that we are underestimating the actual effect of Decree 806 on health insurance coverage.

For health insurance coverage in the CS we observe statistically significant decreases for 2010 and 2012 of 11.4 and 1.8 percentage points respectively (Column 1, Panel A and C). For 2013 there is no significant effect (Column 4). For the pooled years of 2010 to 2013, and of 2010, 2012, and 2013 (Panels E and F), there are statistically significant decreases in the probability of having health insurance coverage in the CS of 1.9 and 2.7 percentage points respectively (Columns 1 and 4, respectively). These results are comparable to those seen in the left part of Figure 1 (b)).

For health insurance coverage in the SS, there is a small statistically significant decrease in the probability of having coverage for all years except for 2011, for which there is no significant effect. Also, for the group of years 2010 to 2013 and the group excluding 2011 there are statistically significant effects.

Table 3: Estimates for the Probability of Having Health Insurance for Each Year, and Group of Years

	A. Year 2010			B. Year 2011		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
Health insurance (any)	-0.113***	-0.107***	-0.107***	-0.0162	-0.0128***	-0.00202
	(0.00001)	(0.00620)	(0.0110)	(0.0659)	(0.000370)	(0.00504)
CS	-0.114***	-0.0786***	-0.103***	0.0853	-0.0338***	0.00340
	(0.00001)	(0.0106)	(0.0177)	(0.0911)	(0.00157)	(0.0227)
SS	0.00168***	-0.0284***	-0.00321	-0.101	0.0210***	-0.00542
	(0.00001)	(0.00441)	(0.00979)	(0.101)	(0.00194)	(0.0220)
Observations	456	632	803	751	1,036	1,326
	C. Year 2012			D. Year 2013		
Health insurance (any)	-0.0547***	-0.100***	-0.0334	-0.0903***	-0.0808***	-0.0625**
	(0.00001)	(0.0122)	(0.0324)	(0.00001)	(0.0241)	(0.0249)
CS	0.0178***	-0.0770***	-0.00725	0.0100***	-0.00808	-0.0210
	(0.00001)	(0.0188)	(0.0423)	(0.00001)	(0.0302)	(0.0334)
SS	-0.0724***	-0.0234	-0.0262	-0.100***	-0.0727	-0.0415
	(0.00001)	(0.0310)	(0.0369)	(0.00001)	(0.0543)	(0.0579)
Observations	620	858	1,079	541	776	1,021
	E. Years 2010 to 2013			F. Years 2010, 2012, 2013		
Health insurance (any)	-0.0651***	-0.0710***	-0.0445***	-0.0827***	-0.0973***	-0.0644***
	(0.00250)	(0.00983)	(0.0148)	(0.000693)	(0.0140)	(0.0201)
CS	-0.0191***	-0.0479***	-0.0248	-0.0275***	-0.0574***	-0.0392**
	(0.00115)	(0.00756)	(0.0176)	(0.00243)	(0.0116)	(0.0169)
SS	-0.0459***	-0.0230	-0.0197	-0.0553***	-0.0399	-0.0252
	(0.00338)	(0.0172)	(0.0242)	(0.00313)	(0.0254)	(0.0301)
Observations	2,368	3,302	4,229	1,617	2,266	2,903

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. All coefficients are estimates of the parameter 0 in Equation (3). All regressions in Panels A to D control for month of birth fixed effects. All regressions in Panel E and F control for year and month of birth fixed effects.

6.3. Regression Analysis

Table 4 presents the baseline results of the effect of losing health insurance coverage on medical service usage and health status for the pooled sample[38] [39].3738

Panel A of Table 4 reports the estimates for the discontinuity in the probability of having health insurance coverage at the threshold for the sample under analysis. These results are the same as those presented in Table 3, Panel F.

[38] Similar to the results in Section 6.2, in which 2011 does not show a robust significant discontinuity for the probability of having health insurance, the following analysis considers only the years 2010, 2012, and 2013. We estimate the same regressions including the year 2011 and results are robust (see Appendix A.3, Table 14).

[39] The estimated coefficients in Table 4 were obtained using the 'rd' command in STATA 13.

Panels B and C show the estimated results for the treatment effect of Equation (1) where the outcomes are different measures for the usage of medical services and health status. Results show that losing health insurance coverage at age 18 increases visits to the ED by 9 percentage points (in a range of 9 to 16.2). This result is statistically significant for all bandwidths considered.

Table 4: Estimations for the Effect of Losing Health Insurance, on Different Medical Services and Health Status for Bandwidth 2 to 4, Years 2010, 2012, and 2013

	Bandwidth 2	Bandwidth 3	Bandwidth 4
Variables	A. Health insurance status		
Health insurance (any)	-0.0827***	-0.0973***	-0.0644***
	(0.000693)	(0.0140)	(0.0201)
Health insurance (any) adj	-0.138***	-0.140***	-0.106***
	(0.00104)	(0.0280)	(0.0334)
CS	-0.0275***	-0.0574***	-0.0392**
	(0.00243)	(0.0116)	(0.0169)
SS	-0.0553***	-0.0399	-0.0252
	(0.00313)	(0.0254)	(0.0301)
	B. Medical service outcomes		
ED visit([a])	0.0906***	0.0623**	0.162*
	(0.0182)	(0.0268)	(0.0834)
Hospitalizations	0.175***	-0.0723***	0.171
	(0.0500)	(0.0213)	(0.179)
Medical services (general)	0.298***	0.383***	0.426***
	(0.0318)	(0.0253)	(0.0808)
Medical services private	0.109***	0.117***	0.112***
	(0.0224)	(0.00888)	(0.0173)
Preventive care	-0.533***	-0.612***	-0.866***
	(0.0316)	(0.0218)	(0.208)
	C. Health status outcomes		
Poor health (reported)	-0.128***	-0.184***	-0.231***
	(0.0151)	(0.0291)	(0.0579)
Sick last month	0.413***	0.332***	0.360*
	(0.0251)	(0.0726)	(0.201)
Observations	1,617	2,266	2,888

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). In Panels B and C, coefficients are estimated using Equation (1). All regressions control for year and month of birth fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013. The rest of the outcomes are available for all years.

We classify medical services into three categories: general medical services, private medical services, and preventive care services (visiting a physician for preventive care) (Panel B). The fuzzy RDD estimates show that losing health insurance when turning 18 years old increases the usage of private medical services by 10.9 percentage points (in a range of 10.9 to 11.7), while showing a statistically significant decrease in the visits to a physician for prevention purposes of 53 percentage points (in a range of 53 to 86) (all results are robust across bandwidths). Furthermore, the usage of general medical

services does not decrease as expected. Instead, we observe that losing health insurance coverage increases the usage of general medical services by 29.8 percentage points (in a range of 29.8 to 42.6).

Finally, for health status outcomes, we find a statistically significant decrease in the perception of having poor health by 12.8 percentage points (in a range of 12.8 to 23.1). Also, losing health insurance coverage increases the proportion of people who were sick in the month previous to the interview by 41.3 percentage points (in a range of 36 to 41.3). All results are statistically significant across bandwidths.

The above results are in accordance with the ones suggested in the literature (except for medical services by EPS which are less robust) and are consistent with the incentives that the Colombian system introduces once an individual loses health insurance coverage, arguing that when individuals lose coverage they tend to increase visits to the ED and the usage of private medical services, as well as tend to reduce seeing a physician for preventive purposes. There could be several possible explanations for the unexpected result regarding general medical services, explained by the nature of the health care system. For example, one of the survey questions asks whether the person visited a healthcare center after having a health problem within the 30 days prior to the interview, but we cannot observe if the person was actually attended by a physician; as well, we cannot observe if the person was attended in the IPS/EPS where they are registered, or whether they were in another healthcare institution.

Also, it is important to highlight a certain particularity of the system. When dependents lose health insurance, parents can make an additional monthly payment in order to include another member under the insurance umbrella. This is common among parents who are aware of the rules and do not want their dependents to lose insurance. However, this cannot be tested analyzing the data used in this study. Another explanation is that the question used for this outcome, which asks whether or not the person went to the formal system to resolve a health problem, but it does not necessarily mean that they used the services of the IPS (or EPS) from which they were insured. It is possible that they went to see a doctor but ended up paying out-of-pocket.

7. Internal Validity and Robustness

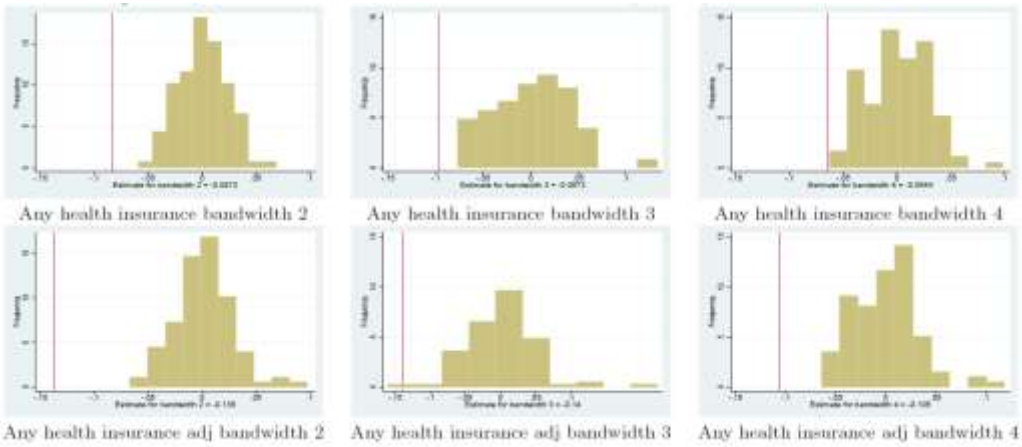
In this section we perform a series of checks to ensure that the assumptions, on which the fuzzy RDD are based, hold. In this sense

we carry out validity checks for: *(i)* discontinuities in the probability of having health insurance at the threshold; *(ii)* discontinuities in the probability of having health insurance at placebo cut-off points as recommended in Imbens and Lemieux (2008) and Jacob et al. (2012); and finally, *(iii)* discontinuities in characteristics at the threshold.

7.1. Discontinuity in the Probability of Having Insurance at Placebo Cut-off Points

In order to check that the estimated discontinuity in the probability of having health insurance coverage at the threshold is not found just by chance, we estimate a series of placebo tests for 108 different placebo cut-o points going from 14 years old (168 months) to 23 years old (276 months) for a bandwidth of 2, 3 and 4 months. In Figure 4 we plot the distribution of the discontinuity estimates at the placebo thresholds. In all of the 108 estimations, no other month has a higher value than month 216 for bandwidth 2; for bandwidth 3 and 4, two cut-o points (1.85%) are above the absolute estimated value and both values for both bandwidths are positive values (meaning an increase in health insurance); moreover, considering the health insurance coverage which was adjusted, the estimation calculated at the threshold is the biggest of all in both cases (see lower panels in Figure 4). All these results indicate that undoubtedly, the discontinuity found in the probability of having health insurance at the threshold of 216 months, did not happen by chance.

Figure 4: Distribution of Estimated Coefficients for Any Health Insurance and Any Health Insurance Adjusted, for 108 Cut-o Points for Years 2010, 2012, and 2013.



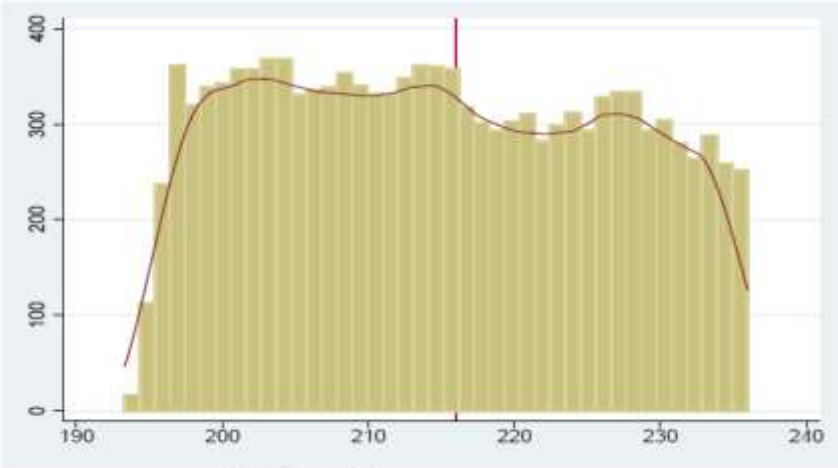
Source: Own calculations based on ENCV 2010, 2012, and 2013.

7.2. Manipulation of the Running Variable

Since our running variable, age in months, is a discrete variable the possibility of applying the McCrary test is substantially more di cult. Despite this, we present arguments and evidence that there is no manipulation of the age in the ENCV survey. Age by itself is hard to manipulate since every person has an official document certifying his age, meaning manipulation will imply counterfeiting the official document. Moreover, the nature of the survey it is not to ask about health insurance status, or medical services usage, meaning the interviewer is independent of the health insurance system. Thus, at first sight the existence of manipulation for the purpose of the present article (being insured or not) can be ruled out.

Figure 5 presents the distribution of age in months for each year and the pooled years. We observe jumps in the frequency of people having 215 months of age for 2010, 2011 and 2013 (graphs a to d, figure 5). This jump is also noticeable in the pooled sample in both cases, years 2010 to 2013, and years 2010, 2012, 2013 (graphs e and f, figure 5).

Figure 5: Distribution of age in months for the pooled years. Threshold of 216 months, window of 20 months both sides.



(a) Kden&Hist 2010, 2012, 2013

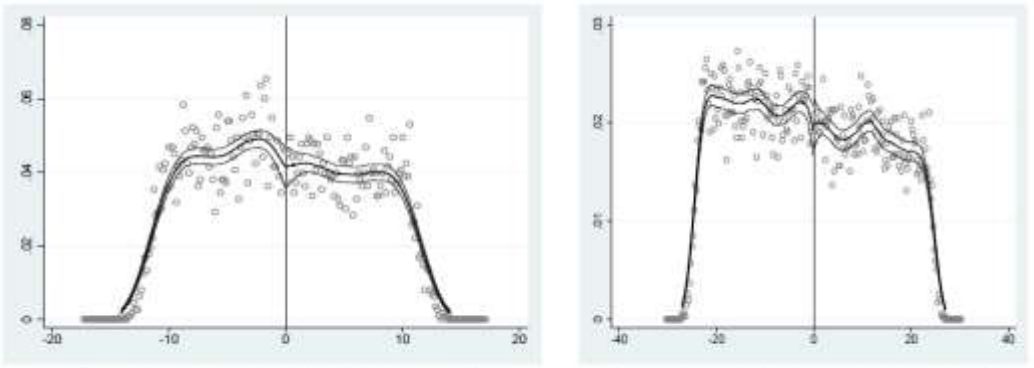
Source: Own calculations based on ENCV 2010, 2012 and 2013.

To gauge the McCrary test with a discrete variable we first make the variable, age in months, continuous by adding up a small error uniformly distributed between zero and one. Then, we run the test and results are presented in Figure 6 (using DCdensity command in Stata 13.1). We observe that in both cases there is not a discontinuity

in the running variable (for the analysis we use 12 and 24 months away from the threshold)[40].

The below graphs show that there is no evidence of manipulation of the running variable, age in months, which validates the results found.

Figure 6: McCrary density distribution for 12 and 24 months away from the threshold for both sides.



Source: Own calculations based on ENCV 2010, 2012 and 2013.

7.3. Discontinuities in Characteristics at the Threshold

To ensure that all the assumptions of the fuzzy RDD hold, it is important that the conditional expected values of other characteristics different from health insurance status, do not change discontinuously at the threshold[41].

Table 5 presents estimates for different characteristics where we pooled the sample. We observe for optimal bandwidth 2, statistically significant changes for study status, work status, gender, and whether or not they live with their parents (Column 1, Table 5), but not for marital status. At a firsthand glance, discontinuous changes at the threshold of characteristics such as male, married, and live with parents could threaten the validity of the RDD. Given the potential threat of certain characteristics changing discontinuously at the threshold, we estimate Equation (2) including these characteristics as controls and we find that the results do not change significantly from

[40] This was also corroborated when calculating the t-statistic for H_0: there is a discontinuity for age at the threshold, which result is to reject H_0.
[41] First we carried out a graphical analysis where we evidenced tendencies, yet there were no significant discontinuities (see Figure 5, Appendix A.2).

those found in Table 4 (Section 6.3)[42]. Besides, when looking at all bandwidths, we observe that these results only hold for living with both parents (which is positive, meaning that young adults tend to live with both parents).

Table 5: Estimates for Different Characteristics for Bandwidths 2 to 4, for 2010, 2012, and 2013

Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4
Study status	-0.0150***	-0.00443	0.0190
	(0.00470)	(0.0226)	(0.0243)
Work status	-0.0198***	-0.0536***	-0.0205
	(0.000376)	(0.00361)	(0.0145)
Male	-0.0359***	-0.0814***	-0.0286
	(0.00239)	(0.00715)	(0.0229)
Married	0.00242	0.0354***	-0.0200
	(0.00293)	(0.0129)	(0.0265)
Live with one parent	-0.0372***	-0.0623***	-0.0300
	(0.00555)	(0.0158)	(0.0210)
Live with both parents	0.0222***	0.0404***	0.0489***
	(0.00667)	(0.00985)	(0.0111)
Observations	1,617	2,266	2,903

Another concern is related to changes in health habits when individuals turn 18 years old in Colombia due to the fact that alcohol and tobacco become legal for them to consume. One could imagine that turning 18 years old may involve an increase in the consumption of alcohol and tobacco. This new behavior could potentially affect medical service usage. In the ENCV there are no questions asking about alcohol and tobacco consumption at the individual level. Thus, we use other data and arguments that can inform us about whether after turning 18 years old there is a sudden change in these habits. One argument is related to emancipation. By living with their parents, young adults could be subject to `parent-child control' (my house, my rules) even after turning 18 years old. Besides, many young adults in Colombia, as in other developing countries, are socially and economically dependent on their parents, even after turning 18 years old. This would delay a sudden change in alcohol and tobacco consumption, different from those who emancipate immediately after turning 18 years old. Thus the variable, live with parents, could potentially inform us of sudden changes or the lack thereof in tobacco and alcohol consumption for young adults. The results in Table 5 (Column 1) indicate that almost all the dependents of the sample continue to live with their parents after turning 18 years old.

By using data from the United Nations Office on Drugs and Crime (UNODC) and their 2011 survey performed in Colombia on the consumption of psychoactive substances (tobacco, alcohol, marijuana, cocaine, etc.) by high school students (between 13 and 17 years old), habits regarding alcohol and tobacco consumption are made clear (the

[42] See Table 14-15, Appendix A.4

survey is representative at the national level). For instance, the data shows that tobacco consumption in the year prior to the interview, among 16, 17, and 18-year olds, was 16.4%, 16.2%, and 11.7% respectively[43].

Moreover, alcohol consumption in the year prior to the interview among the same ages was: 63%, 62%, and 58.5% respectively[44]. Thus for the present study, alcohol and tobacco consumption are not considered a major threat for the validity of our identification strategy, since 'bad habits' are clearly not suddenly formed when turning 18 years old.

Furthermore, we explore the idea that parents who indulge in tobacco and alcohol could be more permissive towards minors regarding their consumption. We use information from the 2010 ENCV that show the weekly expenses on tobacco and alcohol by each household (only year available). We estimate Equation (1) controlling for this, but the sample is significantly reduced and there are no significant effects[45].

7.4. Heterogeneous Effects

In this section we analyze several heterogeneous effects. We evaluate whether there are different effects by gender, by studying/not-studying, by working/not-working and socioeconomic strata.

7.4.1. Heterogeneous Effects by Gender

Table 6 shows the estimates of Equation (1) by gender. There is a statistically significant decrease in the probability of having any health insurance of 12 percentage points for males and 4.5 percentage points for females (Columns 1 and 4, Panel A of Table 6, respectively). The effect is comparable to that seen in Figure 6 (Appendix A.5.1)[46].

Panels B and C present estimations for medical service usage and health status outcomes. For males who lose coverage when turning 18 years old, there is a statistically significant decrease in preventive care by 38.8 percentage points, and an increase in hospitalizations

[43] When considering consumption in the last month prior to the interview, the proportions were: 13.6%, 13.1%, and 9.2% respectively.
[44] Also when considering alcohol consumption in the last month prior to the interview, the proportions were: 37%, 33%, and 32% respectively.
[45] The results are not reported here but are available upon request.
[46] A graphical analysis is provided in Appendix A.5.1. Moreover, for the heterogeneous effects, the optimal bandwidth is still two months. Characteristics such as married, live with parents, and studying do not change discontinuously for females, while for males; only studying does not change discontinuously when turning 18 years old (see Tables 18 to 20, Appendix A.5.3).

and private medical services by 16.4 and 6.2 percentage points, respectively (Column 1, Panel B). These results are robust across bandwidths, except for private medical services. Moreover, there is a decrease in their perception of having poor health by 11 percentage points (Column 1, Panel C). This result is robust across bandwidths.

For females who lose health insurance coverage when turning 18 years old, there are statistically significant increases in: *(i)* visits to the ED by 52 percentage points, *(ii)* EPS medical service usage by 4.3 percentage points, and *(iii)* private medical service usage by 24.6 percent-age points; while there is a decrease in preventive care by 4.8 percentage points (Column 4, Panel B). Furthermore, for females who lose coverage when turning 18 years old, there is a statistically significant decrease in their perception of having poor health by 16.6 percentage points and a statistically significant increase in the proportion of females feeling sick in the 30 days prior to the interview (Column 4, Panel C)[47]. These results are robust when controlling for marital status, which changes discontinuously at the threshold (Tables 17 to 19, Appendix A.5.3).

Furthermore, we estimate coefficients for the sample of pregnant females, so as to corroborate whether the effect is driven by pregnant young women (or that already have a baby). Results are presented in Table 7 for the group of pregnant women and non-pregnant women. Results for pregnant women are consistent with the results found in the base model and the heterogeneous effect by gender, which show that women are driving the effect. Even though results suggest that the effect is driven by pregnant women, the number of observations is very low, challenging the results from being completely conclusive. Also, there are statistically significant results for non-pregnant women, though it is not robust across bandwidths. These results indicate that the effects are not necessarily driven by pregnant young women (or those that already have a child).

[47] Some of the estimations are "too big to be true" because the effect of the treatment variable (denominator) weights the reduced form (numerator), which thereby inflates the effect even over the value of one.

Table 6: Estimates for Heterogeneous Effects by Gender, Pooled Years

	Males			Females		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
A. First stage (denominator)						
Health insurance (any)	-0.121***	-0.157***	-0.0907***	-0.0454***	-0.0388***	-0.0368***
	(0.00241)	(0.0164)	(0.0318)	(0.00279)	(0.0124)	(0.0119)
B. Medical service outcomes						
ED visit	-0.0670***	0.0151	-0.00346	0.520***	0.266**	0.627**
	(0.00661)	(0.0120)	(0.0139)	(0.116)	(0.131)	(0.317)
Hospitalizations	0.164***	0.181**	0.400*	-0.0395	-1.500***	-0.637
	(0.0288)	(0.0716)	(0.225)	(0.251)	(0.455)	(0.534)
Medical services general([a])	-0.00275	0.160***	0.163***	0.0430***	0.0430***	0.0365***
	(0.0254)	(0.0120)	(0.0254)	(0.00108)	(0.00937)	(0.0141)
Medical services private	0.0629***	0.0477***	0.0225	0.246***	0.415***	0.365***
	(0.0123)	(0.0136)	(0.0356)	(0.0616)	(0.0848)	(0.0885)
Preventive care([a])	-0.388***	-0.224***	-0.540**	-0.0478***	-0.0926***	-0.0683***
	(0.0562)	(0.0490)	(0.223)	(0.00939)	(0.00920)	(0.0135)
C. Health status outcomes						
Poor health (reported)	-0.114***	-0.0968***	-0.163***	-0.166***	-0.529***	-0.422***
	(0.00512)	(0.0170)	(0.0581)	(0.0414)	(0.146)	(0.0992)
Sick last month	0.0767***	0.182***	0.109	1.155***	0.740***	0.879
	(0.00978)	(0.0188)	(0.0851)	(0.113)	(0.182)	(0.554)
Observations	1,035	1,447	1,832	995	1,399	1,788

Note: Coefficients were estimated by using fixed effects by year, and standard errors clustered by age in months. Columns 1 to 3 are for males; columns 4 to 6 are for females. ([a]) for females, we use reduced form estimates (numerator).

7.4.2. Heterogeneous Effects by Studying/Not-Studying

Here we divide the sample into young adults studying and not studying for all years. We are interested in observing this group due to the fact that the regulation we exploit in this study depends on the study status of the young adult. The optimal bandwidth is still two months away from the threshold. The estimated coefficients are presented in Table 8 where we see statistically significant decreases in the probability of having any health insurance by 9 percentage points for people not studying, while there is no effect for the group of young adults who are studying (Columns 1 and 4, Panel A, respectively).

We highlight some insights from the estimated coefficients. It seems that the story of young adults in Colombia is reflected here since losing health insurance for the non-studying group, increases visits to the ED, and decreases preventive care; as well, we see a statistically significant effect on hospitalizations in the last year prior to the interview. For the group of people studying, there is also a decreasing

(but not significant effect) on visits to the ED when losing health insurance (where the magnitude increases and turns statistically significant when increasing the bandwidth to 3 and 4). Also, there is a statistically significant effect on private medical service usage, which is robust across bandwidths. Interestingly, for young adults who study, while visits to the ED decrease, they more frequently visit private physicians as well as use medical services by EPSs (however this result is not robust across bandwidths). This result holds when controlling for characteristics that change discontinuously at the threshold (see Tables 20 to 23, Appendix A.6.2).

Table 7: Estimated Heterogeneous Effects, Pregnant Women for Years 2010, 2012, and 2013

	Pregnant women			Non-pregnant women		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance			
Health insurance	-0.0468***	-0.0437***	-0.0366***	-0.0302***	0.00327	-0.0211
	(0.00523)	(0.0106)	(0.0126)	(0.00700)	(0.0143)	(0.0190)
			B. Medical service outcomes			
ED visits[a]	0.0667***	0.0488***	0.0754**	0.0167***	0.00641	0.0153**
	(0.000264)	(0.0164)	(0.0347)	(0.00300)	(0.00646)	(0.00741)
Hospitalizations	0.105***	0.0376***	0.131**	-0.0191	-0.0850***	-0.0544***
	(0.00647)	(0.0144)	(0.0525)	(0.0136)	(0.00861)	(0.0170)
Medical services general	0.0662***	0.110***	0.105***	0.0382***	0.0319***	0.0257**
	(0.000405)	(0.00757)	(0.0178)	(0.00249)	(0.00954)	(0.0127)
Medical services private	0.0667***	0.0550***	0.0470**	-0.000202	0.00838***	0.00671***
	(0.000264)	(0.0102)	(0.0185)	(0.000225)	(0.00112)	(0.00214)
Preventive care	-0.108***	-0.141***	-0.0962***	-0.0341***	-0.0927***	-0.0601***
	(0.00593)	(0.00905)	(0.0263)	(0.0100)	(0.0108)	(0.0138)
			C. Health status outcomes			
Poor health (reported)	0.00150	0.0160	0.0187	-0.00740**	-0.0237***	-0.0202***
	(0.00162)	(0.0171)	(0.0190)	(0.00333)	(0.00265)	(0.00469)
Sick last month	0.204***	0.246***	0.238***	0.0263***	-0.00737	-0.00251
	(0.00338)	(0.0406)	(0.0572)	(0.00277)	(0.0116)	(0.0178)
Observations	133	193	246	657	909	1,174

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. ([a]) is only available for years 2012 and 2013. The rest of the outcomes are available for all years. All regressions control for year fixed effects, and standard errors clustered by age in months.

7.4.3. Heterogeneous Effects for Working/Not-Working

For this analysis we divide the sample into those working and those not working[48]. Similarly, we are interested in this group to observe

[48] A visual inspection was performed in Appendix A.7, Figure 8. Furthermore, the optimal bandwidth for these sub-samples are still two months away from the threshold. Being married and being a male change discontinuously at the threshold,

whether working young adults are less affected by the regulation when turning 18 years old.

Estimates from Equations (2) and (3) for people working/not-working with year fixed effects for pooled years are presented in Table 9. There are statistically significant decreases in health insurance for both groups for the selected bandwidth. Interestingly, for the optimal bandwidth (two months), there is a statistically significant decrease in the probability of having health insurance (by 14.7 percentage points), which fades away once we expand the bandwidths to three and four months. This may reflect individuals who are working albeit informally. Evidence of this can be seen in the effects mainly driven by losing health insurance in the SS (which shows a statistically significant decrease of 17.6 percentage points, while health insurance in the CS increases by 2.3 percentage points). Young adults who work may be informal workers and some of those, after turning 18 years old, could change from the SS to the CS. According to Decree 806, after turning 18 years old, one cannot remain insured unless the person studies or works (then the person would be able to afford health insurance). Regarding medical service outcomes, for the not-working group, results are similar to those of the baseline estimates.

Table 8: Estimated Heterogeneous Effects Studying, Pooled Years

	Studying			Not studying		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance			
Health insurance	-0.0445	-0.0762***	-0.0974***	-0.0903***	-0.0879***	-0.0958***
	(0.0295)	(0.00283)	(0.0168)	(0.00730)	(0.00259)	(0.00532)
			B. Medical services outcomes			
ED visit	-0.0503	-0.0823***	-0.0578***	0.283*	0.269***	0.196*
	(0.0403)	(0.0109)	(0.0173)	(0.158)	(0.0692)	(0.114)
Hospitalizations	-0.462	-0.0525	-0.306***	0.596***	0.422***	0.235***
	(0.329)	(0.0507)	(0.0538)	(0.218)	(0.0319)	(0.0879)
Medical services EPS	0.442	0.129***	0.277***	0.423	0.499***	0.528***
	(0.328)	(0.00967)	(0.0711)	(0.281)	(0.0828)	(0.191)
Medical services private	0.267**	0.124***	0.198***	0.0104	0.0995***	0.0149
	(0.126)	(0.0168)	(0.0185)	(0.0533)	(0.0292)	(0.0381)
Preventive care	0.0363	-0.0616	-0.0873	-1.398***	-1.072***	-1.286***
	(0.529)	(0.0422)	(0.192)	(0.191)	(0.0375)	(0.122)
			C. Health status outcomes			
Poor health (reported)	-0.167	-0.0344	-0.00204	-0.271***	-0.238***	-0.416***
	(0.159)	(0.0271)	(0.0157)	(0.0652)	(0.00686)	(0.0113)
Sick last month	0.311	0.0436***	0.257***	0.383	0.837***	0.442
	(0.273)	(0.00904)	(0.0961)	(0.505)	(0.0837)	(0.340)
Observations	880	1,243	1,588	737	1,023	1,300

Note: All coefficients were estimated by using the Wald estimator using fixed effects by year, and standard errors clustered by age in months.

however. We control for these characteristics and results do not change drastically (See Tables 24 to 27, Appendix A.7).

Heterogeneous Effects by Socioeconomic Strata Using information from the survey regarding socioeconomic strata (henceforth strata), we aggregate five levels of strata into two groups: one group of people from strata 1 and 2, and another group with people from strata 3 and 4[49].48 This division allows us to observe whether the effect of losing health insurance is affecting poorer or wealthier young adults at the threshold. Table 10 presents estimated coefficients for health insurance status, as well as medical service and health status outcomes. Results for health insurance status show that losing health insurance when turning 18 has a bigger impact on young adults from strata 3 through 6, than the impact on young adults from strata 1 and 2 (Panel A, Table 10).

Table 9: Estimated Heterogeneous Effects Working, Pooled Years

	Working			Not-working		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance			
Health insurance (any)	-0.147***	-0.0562	-0.0733	-0.0701***	-0.107***	-0.0623***
	(0.00231)	(0.0439)	(0.0481)	(0.000807)	(0.00845)	(0.0201)
			B. Medical service outcomes			
ED visits	-0.0669***	-0.414	-0.281	0.161***	0.111***	0.280**
	(0.0124)	(0.370)	(0.244)	(0.0302)	(0.0257)	(0.140)
Hospitalizations	0.0972***	0.438	0.236	0.193***	-0.150***	0.146
	(0.0188)	(0.439)	(0.172)	(0.0656)	(0.0150)	(0.225)
Medical services EPS	-0.126***	-1.280	-0.584	0.488***	0.563***	0.697***
	(0.0400)	(1.176)	(0.545)	(0.0246)	(0.0200)	(0.133)
Medical services private	-0.0669***	-0.390	-0.257	0.192***	0.178***	0.215***
	(0.0124)	(0.307)	(0.195)	(0.0353)	(0.0147)	(0.0344)
Preventive care	-0.739***	-2.531	-2.074	-0.438***	-0.395***	-0.541**
	(0.0365)	(1.996)	(1.319)	(0.0725)	(0.0846)	(0.261)
			C. Health status outcomes			
Poor health (reported)	-0.240***	-1.255	-0.740	-0.0665***	-0.0532***	-0.0891***
	(0.00380)	(0.972)	(0.505)	(0.0213)	(0.0103)	(0.0244)
Sick last month	-0.0197	-1.882	-0.920	0.601***	0.565***	0.703***
	(0.0188)	(1.892)	(1.049)	(0.0289)	(0.0354)	(0.188)
Observations	326	461	572	1,291	1,805	2,316

Note: All coefficients were estimated by using the Wald estimator using fixed effects by year, and standard errors clustered by age in months.

Results in Panel B for young adults in strata 1 and 2 that lose health insurance demonstrate statistically significant increases in ED visits, usage of private medical services as well as general medical services; the results also show statistically significant reductions in hospitalization and preventive care visits. Thereafter, results for young adults in strata 3 through 6 that lose health insurance show

[49] We aggregated strata 5 and 6 into the group with 3 and 4, since the number of observations was too small. With or without this change, the results are similar.

statistically significant reductions in ED visits, and preventive care visits; they also display statistically significant increases in hospitalizations and usage of general medical services (Panel B, Table 11). Regarding health status outcomes, we observe that while for young adults in strata 1 and 2, there are increases in the proportion of people feeling sick the last month prior to the interview, while opposite results present themselves for young adults in strata 3 through 6 (Panel C, Table 11).

Table 10: Estimated Heterogeneous Effects, Socioeconomic Strata

	Socioeconomic strata 1 & 2			Socioeconomic strata 3, 4 5 & 6		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance status			
Health insurance (any)	-0.0799***	-0.0827***	-0.0571***	-0.104***	-0.168***	-0.0987***
	(0.000603)	(0.0160)	(0.0206)	(0.00280)	(0.00172)	(0.0287)
			B. Medical service outcomes			
ED visits	0.137***	0.198***	0.262***	-0.334***	-0.433***	-0.584***
	(0.0277)	(0.0175)	(0.0606)	(0.0178)	(0.00656)	(0.0982)
Hospitalizations	-0.164***	-0.289***	-0.0607	0.952***	0.464***	0.723**
	(0.0621)	(0.0423)	(0.154)	(0.0580)	(0.0460)	(0.290)
Medical services EPS	0.199**	0.541***	0.372***	0.537***	0.00579	0.429
	(0.0790)	(0.0450)	(0.0886)	(0.109)	(0.0718)	(0.377)
Medical services private	0.174***	0.136***	0.116*	-0.0152	0.169***	0.170**
	(0.0392)	(0.0367)	(0.0652)	(0.0171)	(0.0357)	(0.0781)
Preventive care	-0.499***	-0.574***	-0.687***	-0.321***	-0.328***	-0.819**
	(0.0423)	(0.0806)	(0.227)	(0.0352)	(0.0438)	(0.346)
			C. Health status outcomes			
Poor health (reported)	-0.185***	-0.193***	-0.248***	-	-	-
	(0.0136)	(0.0198)	(0.0452)	-	-	-
Sick last month	0.397***	0.430***	0.319	-0.118*	-0.470***	-0.296*
	(0.0947)	(0.107)	(0.231)	(0.0706)	(0.0439)	(0.167)
Observations	1,262	1,779	2,265	222	303	400

Note: All coefficients were estimated by using the Wald estimator using fixed effects by year, and standard errors clustered by age in months.

7.5. Parametric Estimations

In this section we estimate the Wald estimator with a parametric Instrumental Variable (IV) approach as suggested by Hahn et al. (2001), in which the probability of having health insurance is instrumented by the change in age [1(Di 216)], in other words, when individuals turn 216 months (18 years old). This Two Stage Least Square (2SLS) method uses the estimated coefficients for the probability of having health insurance (first stage, Equation (4)) in a second stage (Equation (5)), which estimates the effect of losing health insurance on medical service and health outcomes. Table 11 presents estimations for first stage Equation (4) of 2SLS described in Section 5. We see statistically significant decreases in the probability

of having health insurance when people turn 18 years old of 7.9 percentage points for optimal bandwidth 2 (Column 1). Also we see no statistically significant changes in the probability of having health insurance in either the CS or SS.

Estimations for the second stage (Table 12) evidence similar results as those found in Table 3 (Section 6) for optimal bandwidth 2. Losing health insurance increases the usage of medical services provided by the EPS as well as the usage of private medical services in a statistically significant way by 30.4 and 12.7 percentage points respectively (Column 1, Panel A). Also, losing health insurance produces statistically significant reductions in the probability of preventive care visits by 54.7 percentage points (Column 1, Panel A). Moreover, losing health insurance increases the proportion of individuals feeling sick in the month prior to the interview by 46.5 percentage points, while reducing their perception of having poor health status by 17.1 percentage points (Column 1, Panel B). For visits to the ED, there is a positive, but not statistically significant effect. Similar results were found in the non-parametric analysis.

Table 11: 2SLS Estimates for the Probability of Having Health Insurance, First Stage, Years 2010, 2012, and 2013

Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4
Health insurance (any)	-0.0792**	-0.0636*	-0.0628**
	(0.0258)	(0.0296)	(0.0248)
CS	-0.0436	-0.0335	-0.0175
	(0.0329)	(0.0227)	(0.0210)
SS	-0.0356	-0.0301	-0.0453
	(0.0551)	(0.0490)	(0.0422)
Observations	1,609	2,255	2,888

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. All coefficients are estimates of the parameter $_1$ in Equation (4). All regressions control for yearly fixed effects, and standard errors clustered by age in months.

Table 12: 2SLS Estimates for the Effect of Losing Health Insurance on Medical Service Usage and Health Status, Second Stage, Years 2010, 2012, and 2013.

Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4
	A. Medical services outcomes		
ED visits([a])	0.0368	0.0884	-0.0610
	(0.0512)	(0.121)	(0.137)
Hospitalizations	0.363	0.360	0.155
	(0.309)	(0.276)	(0.255)
Medical services EPS	0.304***	0.242	-0.0274
	(0.0450)	(0.208)	(0.271)
Medical services private	0.127***	0.0967***	0.0937***
	(0.00959)	(0.0220)	(0.0253)
Preventive care	-0.547***	-0.560	-0.320
	(0.0285)	(0.420)	(0.371)
	B. Health status outcomes		
Poor health (reported)	-0.171**	-0.190*	-0.172**

	(0.0692)	(0.112)	(0.0729)
Sick last month	0.465**	0.275	-0.0949
	(0.207)	(0.296)	(0.443)
Observations	1,609	2,255	2,888

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A and B, all coefficients are estimates of the parameter $_1$ in Equation (5). All regressions control for yearly fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013. The rest of the outcomes are available for all years.

8. Discussion

The enactment of Decree 806 of 1998 in Colombia, which regulates health insurance for dependents, creates a discontinuity in the probability of having health insurance. This natural experiment allows us to understand the causal effect of losing health insurance coverage on the lives of young adults, and how relevant this is for this population. Although the decree generates a decrease in the probability of having health insurance, it is not totally accurate that people losing health insurance also lose access to medical services; for instance private medical service usage increases, meaning, people look for other means to get access to a physician. From another perspective, the regulation creates non-optimal usage of medical services since visits to the ED increase and seeing a physician for preventive care decreases. This result is exacerbated by the regulation that states that ED attention when life is at risk, cannot be denied by any EPS regardless of the person's health insurance status. It motivates overusing the ED, saturating the system and causing adverse consequences for the rest of the population because more people have to be treated because they are not given access to normal medical services. Moreover, from a financial perspective, those who lose health insurance (uninsured people) are worse o than those that are insured since uninsured people have to pay out-of-pocket for medical services. If one of the aims of implementing Law 100 of 1993 was to pursue universal health coverage, this regulation introduces a limitation in this regard for this particular group of people. Even though young adults on average are one of the healthiest age groups, this is only true for the short term; in the long term as this group ages, the adverse effects caused by this regulation, which have been highlighted by this study, could have long term consequences on health (for example because of how usage of preventative care services was affected).

Young adults in Colombia are the most affected group regarding health insurance coverage. When looking at diverse characteristics, young adults who are not studying nor working, and lose health insurance, visit the ED more often, reduce their preventive care visits, and see more private physicians. We see a similar tendency for young adult women. Our results confirm what has been stated in the literature on developed countries concerning uninsured people: their preferences

show they tend to use medical services that are relatively cheaper for them. But also, our results introduce evidence that highlights potential long term health status risks. Reducing preventive care, which removes `prevention' and instead welcomes treatment of acute symptoms, means that uninsured people may be more prone to have future health problems, in comparison to those who do not reduce preventive care visits. Also, this potentially raises the costs for the system, as prevention is typically cheaper than treating advanced illnesses, which in turn negatively affects the quality of healthcare, as well as the number of people who have access to it. However, further analysis and research is required.

Moreover, we provide evidence that uninsured young adults make decisions about the pool of medical services they use based on their relative prices, instead of what is good for their health in the long term. In this case, for young adults, ED visits are, relative to general medical services, cheaper for uninsured young adults than for insured young adults. Besides, we show evidence of the financial strain imposed on uninsured young adults when turning 18 years old, who on average will be more likely to use private medical services, paying out-of-pocket, than similar young adults who remain insured. We have already highlighted some arguments that support this.

Thus, opposite to the results found by Anderson et al. (2012) for the U.S., here we find evidence that dependents in Colombia (a developing country), when losing health insurance coverage, increase their usage of ED services. As highlighted above, this result is driven by poor young adults and women, which enforces the idea that this type of regulation implicitly affects young adults, unequally. For future policy reform, this regulation should be modified to allow young adults to remain insured, so as to avoid differential access to healthcare of any individuals over others and increase universal coverage. Lastly, it would be of interest to further analyze how this regulation introduces short and long term financial consequences and risks for young adults and their families, as well as the system as a whole.

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Apendix

A.1. Optimal bandwidth selection for heterogeneous effects

Table 13 presents the optimal bandwidth selection using the plug-in approach suggested by Imbens and Kalyanaraman (2012) for different heterogeneous effects. We observe that the optimal bandwidth is 2 regardless of the effect considered.

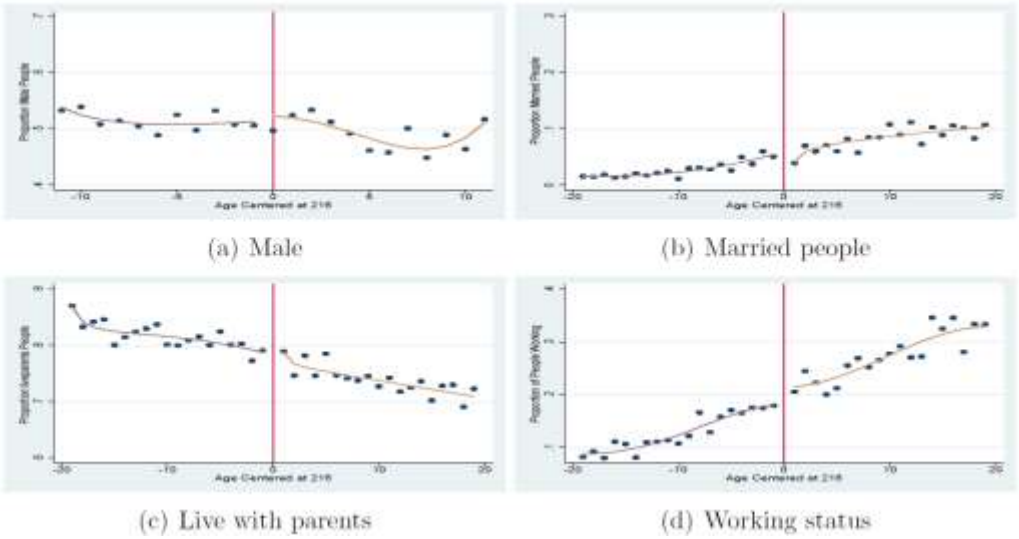
Table 13: Optimal Bandwidth Selection for Different Heterogeneous Effects

	Imbens optimal bandwidth					
Variables/Groups	Male	Female	Working	Studying	Live with parents	Married
ED visits	2	2	2	2	2	2
Hospitalization	2	2	2	2	2	2
Medical services general	2	2	2	2	2	2
Private medical services	2	2	2	2	2	1
Preventive physician	2	2	2	2	2	2
Poor health	1	2	1	2	2	2
Sick last month	2	2	2	2	2	2
Health insurance (any)	2	2	2	2	2	2
CS	2	2	2	2	3	2
SS	2	2	2	2	2	2
Study status	2	2	2	-	2	2
Work status	2	2	-	2	2	2
Gender (male=1)	-	-	2	3	3	2
Married	2	2	2	2	2	-
Live with parents	2	2	2	2	-	2

A.2. Graphs for different characteristics for the pooled years (2010, 2012 and 2013)

Figure 5 presents different characteristics. As we observe for male (Graph (a)) and live with parents (Graph (c)), there is no evidence of discontinuities at the threshold, while for married, there is a small discontinuity going down (Graph (b)) and for work status there is a small discontinuity going up (Graph (d)). Seeing the big picture, it looks like being married and work status follow increasing patterns, more than a discontinuous tendency; however, further regression analysis is required for more accurate understanding. We note how work status increases with age around the threshold, allowing us to depict labor market participation.

Figure 7: Proportion of Different Characteristics by Age in Months for 2010, 2012, and 2013



(a) Male (b) Married people

(c) Live with parents (d) Working status

Source: ENCV 2010, 2012, and 2013.

A.3. Estimates for measuring the effect of losing health insurance on medical outcomes and health status for the pooled years to 2010 to 2013

Table 14 presents estimations when including year 2011 in the pooled years 2010, 2012, and 2013. Results do not drastically change from those obtained in Table 5.

Table 14: Estimations for the Effect of Losing Health Insurance on Medical Services and Health Status for Bandwidths 2 to 4, Pooled Years 2010 to 2013

Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4
	A. Health insurance status		
Health insurance (any)	-0.0651***	-0.0710***	-0.0445***
	(0.00250)	(0.00983)	(0.0148)
CS	-0.0191***	-0.0479***	-0.0248
	(0.00115)	(0.00756)	(0.0176)
CS	-0.0459***	-0.0230	-0.0197
	(0.00338)	(0.0172)	(0.0242)
	B. Medical service outcomes		
ED visits([a])	0.0118	0.143***	0.270**
	(0.0347)	(0.0173)	(0.110)
Hospitalizations	-0.0599***	-0.311***	-0.0898
	(0.00916)	(0.0140)	(0.163)
Medical services EPS	0.209***	0.305***	0.350***
	(0.0395)	(0.0713)	(0.0790)
Medical services private	0.0331	0.0494	-0.0115
	(0.0278)	(0.0321)	(0.0647)
Preventive care	-0.341***	-0.528***	-0.631***
	(0.0541)	(0.0474)	(0.161)
	C. Health status outcomes		
Poor health status	-0.136***	-0.204***	-0.243***
	(0.0152)	(0.0172)	(0.0429)
Sick last month	0.132**	-0.00244	-0.0153
	(0.0603)	(0.202)	(0.304)
Observations	2,368	3,302	4,205

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013.

A.4. Estimated baseline model controlling different characteristics

Table 15 presents estimates for the baseline model, controlling for characteristics that seem to be changing at the threshold and possibly can challenge the main results presented in Table 5.

Table 15: Estimates for the Baseline Model Controlling for Male and Live with Parents

	Controlling for male			Controlling for live with parents		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance status			
Health insurance (any)	-0.0649***	-0.0840***	-0.0994***	-0.0626***	-0.0814***	-0.0937***
	(0.0207)	(0.00150)	(0.0153)	(0.0188)	(0.00288)	(0.0146)
CS	-0.0393**	-0.0275***	-0.0579***	-0.0350*	-0.0220***	-0.0485***
	(0.0167)	(0.00165)	(0.0109)	(0.0187)	(0.00250)	(0.0153)
SS	-0.0256	-0.0565***	-0.0415	-0.0275	-0.0594***	-0.0452
	(0.0303)	(0.00307)	(0.0260)	(0.0325)	(0.00498)	(0.0296)
			B. Medical service outcomes			
ED visits(ª)	0.154*	0.0797***	0.0451**	0.171**	0.101***	0.0746**
	(0.0862)	(0.0138)	(0.0222)	(0.0832)	(0.0148)	(0.0299)
Hospitalizations	0.149	0.146***	-0.116***	0.153	0.149***	-0.112***
	(0.194)	(0.0502)	(0.0189)	(0.193)	(0.0497)	(0.0255)
Medical services EPS	0.412***	0.280***	0.352***	0.445***	0.312***	0.411***
	(0.0829)	(0.0241)	(0.0162)	(0.0778)	(0.0190)	(0.0199)
Medical services private	0.111***	0.108***	0.113***	0.113***	0.105***	0.115***
	(0.0166)	(0.0213)	(0.00840)	(0.0167)	(0.0212)	(0.00848)
Preventive care	-0.872***	-0.546***	-0.633***	-0.891***	-0.542***	-0.638***
	(0.201)	(0.0248)	(0.0164)	(0.199)	(0.0165)	(0.0171)
			C. Health status outcomes			
Poor health (reported)	-0.232***	-0.130***	-0.185***	-0.239***	-0.134***	-0.194***
	(0.0580)	(0.0158)	(0.0302)	(0.0555)	(0.0175)	(0.0295)
Sick last month	0.343*	0.389***	0.296***	0.375*	0.424***	0.356***
	(0.197)	(0.0153)	(0.0643)	(0.208)	(0.0157)	(0.0709)
Observations	1,617	2,266	2,888	1,617	2,266	2,888

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. (ª) is only available for years 2012 and 2013.

Table 16: Estimates for the Baseline Model Controlling for Interaction of Male with Live with Parents

Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4
	A. Health insurance status		
Health insurance (any)	0.0907***	0.0569**	0.163*
	(0.0108)	(0.0258)	(0.0862)
CS	0.124**	-0.148***	0.136
	(0.0519)	(0.0267)	(0.206)
SS	0.294***	0.378***	0.431***
	(0.0133)	(0.0154)	(0.0800)
	B. Medical service outcomes		
ED visit	0.104***	0.112***	0.111***

Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4
	(0.0203)	(0.00863)	(0.0163)
Hospitalizations	-0.553***	-0.654***	-0.895***
	(0.0116)	(0.0178)	(0.194)
Medical services EPS	-0.135***	-0.194***	-0.239***
	(0.0177)	(0.0300)	(0.0557)
Medical services private	0.401***	0.318***	0.359*
	(0.00626)	(0.0643)	(0.204)
Preventive care	-0.0826***	-0.0960***	-0.0631***
	(0.00356)	(0.0156)	(0.0194)
	C. Health status outcomes		
Poor health (reported)	-0.0223***	-0.0498***	-0.0354*
	(0.00197)	(0.0146)	(0.0185)
Sick last month	-0.0603***	-0.0461	-0.0277
	(0.00496)	(0.0298)	(0.0326)
Observations	1,617	2,266	2,888

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. (ª) is only available for years 2012 and 2013.

A.5. Heterogeneous effects by Gender

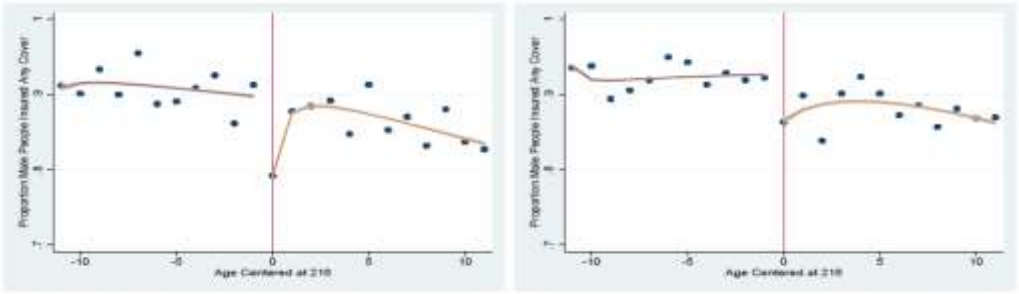
A.5.1. Graphical analysis

A visual inspection of the probability of having health insurance coverage by gender (Figure 6) evidences a decreasing discontinuity for both groups, which is bigger for males than females (Graphs (a) and (b) of Figure 6, respectively).

A.5.2. Characteristics for heterogeneous effects by Gender

Table 17 shows the estimated coefficients for the different characteristics for the male and female groups. We observe for the male group that for bandwidth 2, work status, married, and live with parents change discontinuously at the threshold. For the female group the 'rd' command did not estimate coefficients for bandwidth 2. This only happens when estimating characteristics since it calculates coefficients for the probability of having health insurance.

Figure 8: Proportion of Insured People: Healthcare, CS and SS, by Gender, for Years 2010, 2012, and 2013.



(a) Any health insurance male (b) Any health insurance female

Source: Own calculations based on ENCV 2010-2013.

Table 17: Estimated Different Characteristics, Heterogeneous Effects by Gender, Pooled Years

	Male			Female		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
Studying	-0.00702	0.0132	0.0276	-0.091	-0.0168	0.0176
	(0.0118)	(0.0160)	(0.0183)	(0.110)	(0.0329)	(0.0405)
Working	0.0279***	0.00740	0.0205**	-0.112**	-0.0919***	-0.0572***
	(0.00621)	(0.00483)	(0.0102)	(0.057)	(0.00688)	(0.0202)
Married	-0.0241***	-0.0356***	-0.0343***	-0.043	-0.00421	-0.0219**
	(0.00260)	(0.00321)	(0.00217)	(0.048)	(0.00507)	(0.00902)
Live with parents	-0.111***	-0.122***	-0.100***	0.043	0.0232**	0.0546***
	(0.00440)	(0.0248)	(0.0290)	(0.093)	(0.0101)	(0.0181)
Observations	1,035	1,447	1,832	995	1,399	1,788

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. All coefficients are estimates of the parameter π_0 in Equation (2), using fixed effects by year, and standard errors clustered by age in months.

A.5.3. Estimates for heterogeneous effects by Gender controlling for married and live with parents

Even though we do not have estimates for live with parents and married for the female group, we control for these characteristics (Table 18). We observe that the main results obtained in Section 7.3.1 do not change for either group, male or female.

Table 18: Estimated Heterogeneous Effects by Gender, Controlling for Interaction of Married and Live with Parents, Pooled Years

	Male			Female		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance status			
Health insurance (any)	-0.118***	-0.149***	-0.0817**	-0.0450***	-0.0399***	-0.0388***
	(0.0110)	(0.0220)	(0.0330)	(0.00585)	(0.0118)	(0.0118)
			B. Medical service outcomes			
ED visits([a])	-0.0641***	0.0222	0.0213	0.489***	0.248*	0.571*
	(0.00744)	(0.0155)	(0.0238)	(0.139)	(0.139)	(0.299)
Hospitalizations	0.121**	0.164*	0.427	0.0265	-1.418***	-0.502
	(0.0495)	(0.0913)	(0.278)	(0.285)	(0.403)	(0.507)
Medical services EPS	0.00433	0.185***	0.225***	0.941***	1.064***	0.931***
	(0.0120)	(0.0256)	(0.0638)	(0.123)	(0.122)	(0.304)
Medical services private	0.0364***	0.0321***	0.00290	0.275***	0.403***	0.351***
	(0.00516)	(0.00762)	(0.0321)	(0.104)	(0.0790)	(0.0898)
Preventive care	-0.445***	-0.280***	-0.666***	-1.094***	-2.325***	-1.766***
	(0.0746)	(0.0483)	(0.258)	(0.361)	(0.542)	(0.475)
			C. Health status outcomes			
Poor health (reported)	-0.115***	-0.105***	-0.184**	-0.157***	-0.507***	-0.396***
	(0.0111)	(0.0245)	(0.0759)	(0.0415)	(0.130)	(0.0852)
Sick last month	0.0660***	0.191***	0.139**	1.186***	0.704***	0.822
	(0.0181)	(0.0136)	(0.0706)	(0.245)	(0.199)	(0.557)
Observations	1,035	1,447	1,832	995	1,399	1,788

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013.

Table 19: Estimated Heterogeneous Effects by Gender, Controlling for Married, Pooled Years

	Male			Female		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance status			
Health insurance (any)	-0.123***	-0.160***	-0.0923***	-0.0432***	-0.0386***	-0.0358***
	(0.00362)	(0.0174)	(0.0329)	(0.00409)	(0.0125)	(0.0121)
			B. Medical service outcomes			
ED visits	-0.0675***	0.0127	0.00442	0.531***	0.265**	0.625*
	(0.00629)	(0.0122)	(0.0184)	(0.137)	(0.133)	(0.329)
Hospitalizations	0.155***	0.171**	0.391*	-0.0317	-1.504***	-0.617
	(0.0291)	(0.0700)	(0.223)	(0.314)	(0.456)	(0.548)
Medical services EPS	-0.00815	0.151***	0.161***	1.006***	1.114***	1.023***
	(0.0262)	(0.0138)	(0.0346)	(0.0953)	(0.162)	(0.342)
Medical services private	0.0619***	0.0468***	0.0213	0.291**	0.420***	0.385***
	(0.0124)	(0.0135)	(0.0352)	(0.113)	(0.0871)	(0.103)
Preventive care	-0.411***	-0.253***	-0.584**	-1.122***	-2.401***	-1.898***
	(0.0609)	(0.0417)	(0.232)	(0.334)	(0.616)	(0.548)
			C. Health status outcomes			
Poor health (reported)	-0.114***	-0.0978***	-0.164***	-0.184***	-0.532***	-0.441***
	(0.00446)	(0.0170)	(0.0580)	(0.0395)	(0.151)	(0.104)
Sick last month	0.0631***	0.166***	0.0970	1.266***	0.746***	0.915
	(0.00767)	(0.0183)	(0.0835)	(0.255)	(0.182)	(0.612)
Observations	1,035	1,447	1,832	995	1,399	1,788

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013.

Table 20: Estimated Heterogeneous Effects by Gender, Controlling for Live with Parents, Pooled Years

	Male			Female		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance status			
Health insurance (any)	-0.117***	-0.148***	-0.0821***	-0.0470***	-0.0398***	-0.0396***
	(0.00980)	(0.0197)	(0.0312)	(0.00556)	(0.0117)	(0.0117)
			B. Medical service outcomes			
ED visits([a])	-0.0639***	0.0234*	0.00752	0.472***	0.248*	0.565*
	(0.00761)	(0.0142)	(0.0157)	(0.128)	(0.139)	(0.290)
Hospitalizations	0.136***	0.177**	0.430	0.0349	-1.422***	-0.498
	(0.0491)	(0.0899)	(0.266)	(0.245)	(0.405)	(0.499)
Medical services EPS	0.00944	0.190***	0.214***	0.887***	1.068***	0.909***
	(0.0115)	(0.0210)	(0.0450)	(0.0952)	(0.124)	(0.284)
Medical services private	0.0407***	0.0361***	0.00839	0.242***	0.405***	0.339***
	(0.00364)	(0.00772)	(0.0321)	(0.0675)	(0.0795)	(0.0836)
Preventive care	-0.413***	-0.238***	-0.591**	-1.042***	-2.331***	-1.735***
	(0.0633)	(0.0578)	(0.239)	(0.324)	(0.546)	(0.446)
			C. Health status outcomes			
Poor health (reported)	-0.115***	-0.102***	-0.179**	-0.139***	-0.509***	-0.384***
	(0.0102)	(0.0227)	(0.0709)	(0.0447)	(0.129)	(0.0858)

	Male			Female		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
Sick last month	0.0823***	0.207***	0.146*	1.096***	0.708***	0.798
	(0.0116)	(0.0107)	(0.0763)	(0.148)	(0.204)	(0.522)
Observations	1,035	1,447	1,832	995	1,399	1,788

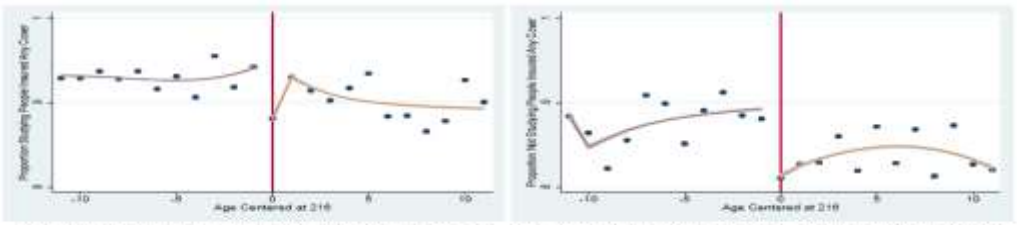
Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. (ª) is only available for years 2012 and 2013.

A.6. Heterogeneous effects by studying/not-studying

A.6.1. Graphical analysis

A visual inspection of the probability of having health insurance coverage by studying/not studying people (Figure 7) evidences a decreasing discontinuity for both groups, which is much bigger for not studying people than studying people (Graphs (b) and (a) of Figure 7, respectively).

Figure 9: Proportion of People Studying/Not-Studying Having Any Health Insurance, Age in Months, Pooled Years



(a) Any health insurance, studying people (b) Any health insurance, not-studying people

Source: ENCV 2010-2013.

A.6.2. Estimates for different characteristics for heterogeneous effects, studying/not-studying

Table 21: Estimated Coefficients, Different Characteristics, Heterogeneous Effects, Studying/Not-Studying, Pooled Years

	Studying			Not-studying		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
Working	-0.0123***	-0.00546	-0.00458***	-0.112***	-0.0286	-0.0615
	(0.00114)	(0.00610)	(0.000677)	(0.0246)	(0.0456)	(0.0414)
Married	0.00682***	0.00338*	0.00596***	-0.0411***	-0.0589***	-0.0113
	(0.000759)	(0.00202)	(0.00125)	(0.0103)	(0.0104)	(0.0273)
Live with parents	-0.0976***	-0.0674***	-0.0577***	-0.0136	0.0141	-0.0271
	(0.0120)	(0.0164)	(0.00118)	(0.0132)	(0.0200)	(0.0430)
Observations	880	1,243	1,588	737	1,023	1,300

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. All coefficients are estimates of the parameter π_0 in Equation (2). All regressions control for year fixed effects, and standard errors clustered by age in months.

A.6.2. Estimates for heterogeneous effects for studying/not-studying, controlling for characteristics changing at the threshold

Table 22: Estimates for Heterogeneous Effects for Studying/Not-Studying, Controlling for Interaction Between Married and Live with Parents, Pooled Years

	Studying			Not-studying		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance			
Health insurance	-0.0758***	-0.0941***	-0.0416	-0.0795***	-0.0896***	-0.0847***
	(0.00346)	(0.0168)	(0.0284)	(0.000467)	(0.00658)	(0.00827)
			B. Medical service outcomes			
ED visits([a])	-0.0662***	-0.0507*	-0.0511	0.295***	0.210*	0.297*
	(0.0120)	(0.0298)	(0.0617)	(0.0734)	(0.123)	(0.173)
Hospitalizations	-0.106*	-0.385***	-0.572	0.447***	0.243**	0.660**
	(0.0573)	(0.0536)	(0.377)	(0.0623)	(0.113)	(0.258)
Medical services EPS	0.159***	0.318***	0.507	0.592***	0.584***	0.474
	(0.00889)	(0.0870)	(0.384)	(0.134)	(0.202)	(0.314)
Medical services private	0.104***	0.188***	0.266*	0.154*	0.0307	0.0250
	(0.0141)	(0.0312)	(0.141)	(0.0799)	(0.0553)	(0.0743)
Preventive care	-0.0796***	-0.0989	0.0346	-1.207***	-1.388***	-1.508***
	(0.00277)	(0.202)	(0.575)	(0.0306)	(0.169)	(0.234)
			C. Health status outcomes			
Poor health (reported)	-0.0436**	-0.0105	-0.188	-0.277***	-0.452***	-0.298***
	(0.0175)	(0.0105)	(0.172)	(0.00881)	(0.0187)	(0.0683)
Sick last month	0.0543***	0.281**	0.344	1.027***	0.509	0.448
	(0.00844)	(0.114)	(0.316)	(0.218)	(0.389)	(0.582)
Observations	880	1,243	1,588	737	1,023	1,300

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). In Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013.

Table 23: Estimates for Heterogeneous Effects for Studying/Not-Studying, Controlling for Married, Pooled Years

	Studying			Not-studying		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance			
Health insurance	-0.0768***	-0.0974***	-0.0445	-0.0814***	-0.0925***	-0.0861***
	(0.00307)	(0.0171)	(0.0296)	(0.00441)	(0.00536)	(0.00886)
			B. Medical service outcomes			
ED visits([a])	-0.0793***	-0.0562***	-0.0484	0.281***	0.197*	0.289*
	(0.0112)	(0.0186)	(0.0416)	(0.0853)	(0.119)	(0.167)
Hospitalizations	-0.0619	-0.320***	-0.473	0.461***	0.252**	0.656***
	(0.0449)	(0.0660)	(0.336)	(0.0591)	(0.102)	(0.252)
Medical services EPS	0.133***	0.281***	0.446	0.575***	0.561***	0.464
	(0.00877)	(0.0717)	(0.329)	(0.156)	(0.203)	(0.303)
Medical services private	0.124***	0.199***	0.267**	0.147*	0.0282	0.0240
	(0.0164)	(0.0194)	(0.127)	(0.0810)	(0.0502)	(0.0710)
Preventive care	-0.0647***	-0.0886	0.0313	-1.186***	-1.345***	-1.485***
	(0.0236)	(0.190)	(0.528)	(0.0538)	(0.147)	(0.236)
			C. Health status outcomes			
Poor health (reported)	-0.0332	-0.00144	-0.166	-0.268***	-0.435***	-0.292***
	(0.0270)	(0.0157)	(0.159)	(0.0139)	(0.0145)	(0.0641)
Sick last month	0.0518***	0.264***	0.317	0.991***	0.483	0.436

	Studying			Not-studying		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
	(0.00762)	(0.0978)	(0.274)	(0.248)	(0.374)	(0.562)
Observations	880	1,243	1,588	737	1,023	1,300

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). In Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013.

Table 24: Estimates for Heterogeneous Effects for Studying/Not-Studying, Controlling for Liv-ing with Parents, Pooled Years

	Studying			Not-studying		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance			
Health insurance	-0.0754***	-0.0940***	-0.0416	-0.0878***	-0.0953***	-0.0915***
	(0.00341)	(0.0166)	(0.0284)	(0.00206)	(0.00500)	(0.00662)
			B. Medical service outcomes			
ED visits	-0.0675***	-0.0512*	-0.0513	0.269***	0.199*	0.276*
	(0.0112)	(0.0293)	(0.0610)	(0.0655)	(0.118)	(0.160)
Hospitalizations	-0.103	-0.380***	-0.571	0.422***	0.231**	0.597***
	(0.0640)	(0.0462)	(0.377)	(0.0315)	(0.0937)	(0.215)
Medical services EPS	0.157***	0.317***	0.507	0.499***	0.532***	0.416
	(0.00918)	(0.0867)	(0.384)	(0.0805)	(0.195)	(0.284)
Medical services private	0.103***	0.187***	0.266*	0.0995***	0.0148	0.0105
	(0.0145)	(0.0309)	(0.141)	(0.0288)	(0.0384)	(0.0521)
Preventive care	-0.0784***	-0.0985	0.0353	-1.072***	-1.293***	-1.382***
	(0.0131)	(0.202)	(0.574)	(0.0342)	(0.119)	(0.182)
			C. Health status outcomes			
Poor health (reported)	-0.0449***	-0.0110	-0.188	-0.238***	-0.418***	-0.267***
	(0.0173)	(0.0104)	(0.171)	(0.00667)	(0.00973)	(0.0651)
Sick last month	0.0493***	0.279**	0.343	0.838***	0.446	0.375
	(0.00702)	(0.112)	(0.316)	(0.0772)	(0.346)	(0.504)
Observations	880	1,243	1,588	737	1,023	1,300

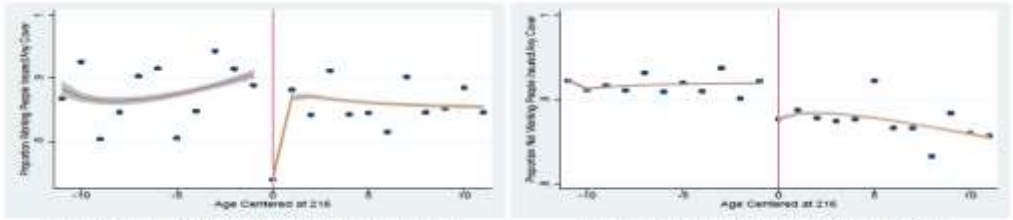
Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). In Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. (ª) is only available for years 2012 and 2013.

A.7. Heterogeneous effects for people working/not-working

A.7.1. Graphical analysis

The graphical analysis shows a decreasing discontinuity at the threshold for those people insured in the CS (Graph (a) of Figure 8), while for those insured in the SS, there does not seem to be any discontinuity (Graph (b) of Figure 8).

Figure 10: Proportion Working/Not-Working, Insured People, Age in Months, Pooled Years



(a) Health insurance, working people (b) Health insurance, not-working

Source: ENCV 2010, 2012, and 2013.

A.7.2. Estimates for different characteristics for heterogeneous effects for working/not-working

Table 25 shows that the only characteristics changing discontinuously at the threshold are married, live with parents and gender for working group. While for the not-working group, only gender.

Table 25: Estimated Characteristics, Working/Not-Working, Pooled Years

	Working			Not-working		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
Studying	-0.00309	0.00763	0.00583	0.00897	-0.0309***	-0.0401
	(0.00376)	(0.00820)	(0.0171)	(0.0364)	(0.00493)	(0.0288)
Married	-0.0855***	-0.109***	-0.105***	-0.00663	-0.00608***	0.0103*
	(0.00519)	(0.00493)	(0.0172)	(0.00853)	(0.00207)	(0.00564)
Live with parents	-0.0600***	-0.0329	-0.0298	-0.0314	-0.0339***	-0.0731***
	(0.00341)	(0.0372)	(0.0348)	(0.0210)	(0.00585)	(0.0115)
Male	0.106***	0.120***	0.0960***	-0.0612***	-0.109***	-0.0510**
	(0.0126)	(0.0147)	(0.0316)	(0.00355)	(0.00900)	(0.0258)
Observations	326	461	572	1,291	1,805	2,316

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. All coefficients are estimates of parameter π_0 in Equation (2). All regressions control for year fixed effects, and standard errors clustered by age in months.

A.7.3. Estimates for heterogeneous effects by working/not-working, controlling for characteristics at the threshold

Table 26: Estimates for Heterogeneous Effect for Working/Not-Working, Controlling for Inter-action between Married and Male

	Working			Not-working		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance			
Health insurance	-0.136***	-0.0442	-0.0647	-0.0701***	-0.108***	-0.0623***
	(0.0118)	(0.0444)	(0.0472)	(0.00100)	(0.00952)	(0.0206)
			B. Medical service outcomes			
ED visits([a])	-0.0636**	-0.513	-0.317	0.138***	0.0908***	0.261*
	(0.0268)	(0.586)	(0.300)	(0.0202)	(0.0201)	(0.138)
Hospitalizations	0.189***	0.868	0.442	0.140*	-0.203***	0.116
	(0.0421)	(0.854)	(0.284)	(0.0763)	(0.0120)	(0.250)
Medical services EPS	-0.154***	-1.687	-0.703	0.460***	0.527***	0.677***
	(0.0374)	(1.898)	(0.680)	(0.0186)	(0.0135)	(0.139)
Medical services private	-0.0807***	-0.521	-0.301	0.199***	0.174***	0.216***
	(0.0137)	(0.520)	(0.245)	(0.0458)	(0.0127)	(0.0372)
Preventive care	-0.821***	-3.231	-2.412	-0.464***	-0.415***	-0.552**
	(0.00995)	(3.252)	(1.735)	(0.0714)	(0.0856)	(0.261)
			C. Health status outcomes			
Poor health (reported)	-0.273***	-1.630	-0.862	-0.0784***	-0.0599***	-0.0958***
	(0.0176)	(1.605)	(0.639)	(0.0221)	(0.00934)	(0.0238)
Sick last month	-0.0467	-2.462	-1.105	0.578***	0.524***	0.683***
	(0.0331)	(2.966)	(1.279)	(0.0282)	(0.0222)	(0.192)
Observations	326	461	572	1,291	1,805	2,316

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). In Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013.

Table 27: Estimates for Heterogeneous Effect for Working/Not-Working, Controlling for Married

	Working			Not-working		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance			
Health insurance	-0.144***	-0.0525	-0.0697	-0.0696***	-0.107***	-0.0620***
	(0.00822)	(0.0472)	(0.0496)	(0.000493)	(0.00892)	(0.0204)
			B. Medical service outcomes			
ED visits	-0.0723***	-0.459	-0.310	0.161***	0.112***	0.279**
	(0.0143)	(0.459)	(0.278)	(0.0312)	(0.0256)	(0.140)
Hospitalizations	0.138***	0.629	0.357	0.197***	-0.154***	0.154
	(0.0426)	(0.614)	(0.241)	(0.0716)	(0.0144)	(0.239)
Medical services EPS	-0.150***	-1.441	-0.667	0.496***	0.558***	0.702***
	(0.0447)	(1.471)	(0.627)	(0.0304)	(0.0155)	(0.141)
Medical services private	-0.0723***	-0.427	-0.280	0.198***	0.174***	0.218***
	(0.0143)	(0.385)	(0.223)	(0.0421)	(0.0106)	(0.0378)
Preventive care	-0.841***	-2.935	-2.334	-0.439***	-0.396***	-0.540**
	(0.0335)	(2.605)	(1.600)	(0.0805)	(0.0838)	(0.262)

	Working			Not-working		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			C. Health status outcomes			
Poor health (reported)	-0.261***	-1.380	-0.803	-0.0679***	-0.0520***	-0.0906***
	(0.00596)	(1.217)	(0.582)	(0.0214)	(0.0107)	(0.0263)
Sick last month	-0.0587***	-2.137	-1.062	0.616***	0.557***	0.711***
	(0.0122)	(2.343)	(1.193)	(0.0463)	(0.0257)	(0.198)
Observations	326	461	572	1,291	1,805	2,316

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). In Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013.

Table 28: Estimates for Heterogeneous Effects for Working/Not-Working, Controlling for Male

	Working			Not-working		
Variables	Bandwidth 2	Bandwidth 3	Bandwidth 4	Bandwidth 2	Bandwidth 3	Bandwidth 4
			A. Health insurance			
Health insurance	-0.138***	-0.0470	-0.0675	-0.0709***	-0.108***	-0.0627***
	(0.00844)	(0.0411)	(0.0457)	(0.00151)	(0.00926)	(0.0203)
			B. Medical service outcomes			
ED visit	-0.0572**	-0.463	-0.287	0.140***	0.0903***	0.264*
	(0.0254)	(0.475)	(0.265)	(0.0193)	(0.0191)	(0.139)
Hospitalizations	0.152***	0.655	0.322	0.138**	-0.203***	0.108
	(0.00488)	(0.629)	(0.214)	(0.0648)	(0.0127)	(0.237)
Medical services EPS	-0.129***	-1.507	-0.619	0.452***	0.528***	0.671***
	(0.0348)	(1.527)	(0.595)	(0.0122)	(0.0135)	(0.132)
Medical services private	-0.0759***	-0.480	-0.279	0.189***	0.175***	0.212***
	(0.0121)	(0.421)	(0.217)	(0.0352)	(0.0149)	(0.0334)
Preventive care	-0.714***	-2.774	-2.143	-0.459***	-0.415***	-0.552**
	(0.00834)	(2.493)	(1.444)	(0.0600)	(0.0860)	(0.259)
			C. Health status outcomes			
Poor health (reported)	-0.253***	-1.493	-0.799	-0.0753***	-0.0602***	-0.0930***
	(0.0176)	(1.293)	(0.561)	(0.0219)	(0.00869)	(0.0217)
Sick last month	-0.00538	-2.177	-0.957	0.557***	0.526***	0.674***
	(0.0537)	(2.403)	(1.131)	(0.00691)	(0.0243)	(0.180)
Observations	326	461	572	1,291	1,805	2,316

Note: *** p < 0:01, ** p < 0:05, * p < 0:1. In Panel A, all coefficients are estimates of the parameter π_0 in Equation (3).
Coefficients reported in part A are for the denominator of the Wald estimator (first stage). In Panel B and C, coefficients are estimated using Equation (1). All regressions control for year fixed effects, and standard errors clustered by age in months. ([a]) is only available for years 2012 and 2013.