An analysis of Social Policy, Health and Socioeconomic Mobility in Mexico: Could a conditional cash transfer programme promote mobility?

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To Sandra, Camila & Isabela

Abstract

The overall scope of this thesis is to document the relevance of health capital investments for development, as well as highlighting barriers for the accumulation of health capital in the context of policies and programmes aimed to this.

In order to promote development, Mexico decided to focus its social policy on generating incentives for human capital investments. For this approach to work, returns to human capital, part of which is health, have to be positive and sufficiently high. Using data from a national representative survey, I found that returns to health in Mexico are positive and in order of magnitude similar to those reported for other countries, and that social mobility is present, although still there is an important intergenerational transmission of educational attainments.

One key assumption for interventions and policies aiming promote development through increasing the accumulation of human capital, and in particular health capital is that increasing access and utilization of health services will translate into health capital. The capacity of health services to generate health is related to its quality. Structural quality is a necessary but not sufficient factor for quality. I present results for primary health services in Mexico, showing that magnitude of heterogeneity on structural quality is large, and that is negatively correlated with locality marginalization.

One key element for development is the accumulation of appropriate levels of human capital. Insufficient attention has been paid to factors that may counterbalance investments in human capital. Risk behaviours such as smoking and unprotected sex may reduce both creation of human capital and accumulated stock. Analyzing data from the Mexican CCT programme Oportunidades, I found that this programme may decrease participation in risk behaviours, although among its target population (poor households) they are still highly prevalent.

The analysis reported in this thesis makes the case for increasing investments in health capital among the means through which to increase the accumulation of human capital, but at the same time devoting resources to increase the chances of these investments in translating effectively to human capital. That is, increasing quality of health services and promoting healthy behaviours.

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I have read and understood the School's definition of plagiarism and cheating given in the Research Degrees Handbook. I declare that this thesis is my own work, and that I have acknowledged all results and quotations from the published or unpublished work of other people.

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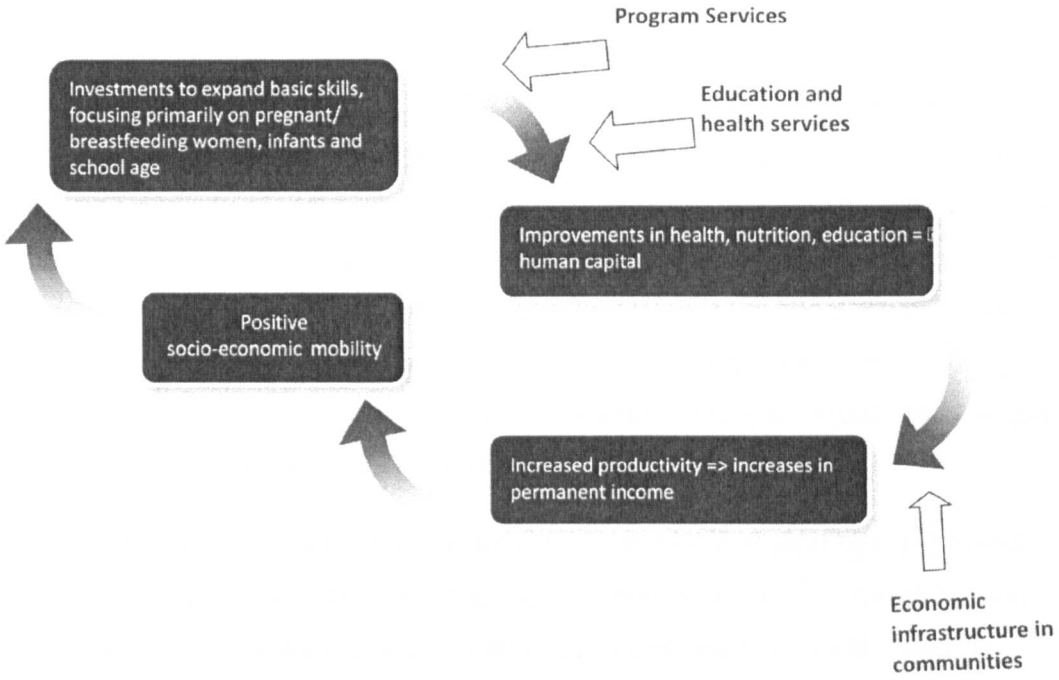
Chapter 1. Introduction

1.1. Setting the problem

Positive socio-economic mobility is linked to development. In economic terms, strengthening the internal market (a necessary condition for economic development) requires increased consumption that is supported by increased individual (household) income. As Kuznets proposed back in the 70´s, economic growth is related to a country capacity to generate the services and goods its population require. Economic growth could result in social unrest, unless conflicts derived from relative adjustment on economic power due to use of better technology and capital investment are appropriately addressed. (Kuznets 1973) In a more broader view of development, human development, such conflicts are addresses with a society perspective, avoiding inequalities by redistribution policies.(Ranis 2004) Positive mobility implies that individuals living in poverty have an expectation of improved living conditions through access to higher income, usually as a result of an increased accumulation of human capital (i.e., education, nutrition and health). If positive mobility is expected for a large enough proportion of the population, then sustainable economic and human development will occur, although the alleviation of poverty requires that positive mobility be extended to those at the bottom of the socioeconomic ladder. Pro-poor growth is mostly related to the rise on average income, implying that with adequate redistribution policies, economic growth could translate into human development.(Kraay 2006)

Promoting positive socioeconomic mobility is thus a way to promote development. Conditional cash transfer programmes (CCTs) are a social intervention that has been designed for this purpose.(DFID 2011) This approach assumes that households facing severe resource constraints are underinvesting in human capital and that to promote human capital, it is necessary to relax budgetary constraints and to incentivise the use of human capital-related services. As described in Figure 1, CCT programmes seek to promote a cycle where trough investment in human capital, positive mobility is promoted; nevertheless, some assumptions are made in order of this to happen.

Figure 1. Intended cycle promoted by CCT programmes and assumptions



There are several barriers to socioeconomic mobility; some are more evident (and in that sense, subject to interventions) than others. For example, social programmes could target those individuals lacking access to services promoting human capital formation. Programmes may also provide individuals (households) with additional resources, relaxing their budgetary constraint. Interventions are more difficult when they seek to relax rigid social structures that generate entry barriers to better employment (and income) opportunities, that is, when "family capital" (i.e., inherited social networks) plays a strong role in economic opportunities. When these barriers are associated with clearly defined characteristics, such as race in the USA or castes in India, they can be addressed with specific anti-discrimination legislation or affirmative action. In Latin America, family capital is more subtle and thus, more difficult to address.

Many factors affect the accumulation of human capital. Access to and quality of services is one key element, but equally important are factors affecting an individual's ability to take advantage of those services. Examples of the latter include a family's ability to understand and adhere to medical advice or a situation in which a child's hunger or need to work reduces her ability to focus on her homework. Nutrition is affected by the availability of

foodstuffs and a household's ability to purchase them. In the case of health, services promote the accumulation of health capital not only by preventing disease (e.g., via vaccination, safer sex, family planning, preventative dentistry and the early detection of cancer) but also by blunting the effect of health shocks via insurance mechanisms that ideally protect against both health care costs and periods of reduced productivity. Contextual factors can also increase health risks, such as environments that promote unhealthy diets or the abuse of tobacco, alcohol and drugs. Other contextual factors that affect educational attainment either by reducing performance or promoting school dropout might be viewed as producing a negative accumulation of human capital. Household seasonal migration is one such example.

The overall theme of this thesis is the role of health and health-related behaviours in promoting (or affecting) socioeconomic mobility through human capital accumulation (or de-accumulation). For this analysis, I will focus on Mexico, an upper-middle-income country with a high degree of inequity that may reflect low socioeconomic mobility. Mexico has implemented a large CCT programme that is generally viewed as the best example of such programmes. Oportunidades, formerly Progresa, is a key element of Mexican social development policy, and it aims to interrupt the intergenerational transmission of poverty (i.e., promote positive socioeconomic mobility among the poor). Using data from the Oportunidades evaluation and from the most recent Mexican National Health and Nutrition Survey, I will show that there is room for socioeconomic mobility in Mexico and that this mobility could be promoted through health capital investments.

To achieve this objective, I will discuss in Chapter 2 how health capital stock is related to income and thus show that mobility is feasible through human capital accumulation. I will also discuss the relation between parental education level and individual education level, which is strongly related to income. I will then discuss in Chapter 3, in the context of Oportunidades, risk behaviours and human capital accumulation to show how development (i.e., an exogenous rise in income resulting in the greater availability of resources and a modified youth outlook) affects risk behaviours. Finally, in Chaper 4, I discuss the importance of health service quality in human capital accumulation. The main focus of this

section is to present evidence of the heterogeneous quality of human capital-related services in rural Mexico and how this varying quality may be affecting socioeconomic mobility.

1.2. Mexico in context

Mexico, the only Latin-American member of the Organization for Economic Cooperation and Development (OECD), is a very diverse country with high income inequality. Although its per capita income is about US$9,000, a GINI of 49.5 places the country among those with the worst income distribution: dividing the population in income deciles, the bottom 10% receive approximately 3% of the total income, whereas the top 10% receive 43%.(World-Bank 2004) As a result, approximately 40% of Mexican households are living in poverty, and 10% even live in food poverty.(Coneval 2006)

Health status in Mexico is also extremely unequal, but to a far lesser degree than income; the probability of death for an infant born in the poorest states is 80% higher than those born in the wealthiest ones. (Secretaria-de-Salud-Ministry-of-Health 2006) An analysis of aggregated data suggests that there is a strong correlation between health and income in Mexico, with GDP per capita at the county (*municipalidad*) level explaining 60% of the variations in infant mortality rate.[1]

Mexico is a Latin American country located between the USA and Central America. It has a population of 103 million inhabitants living in approximately 188 thousand communities; half of the population is under 25 years old, and the female to male ratio is 1.05.(INEGI 2006)

Mexico is a country with wide economic and health diversity. Classified among upper-middle income countries by the World Bank, it has a per capita gross national income (GNI) of US$7,310 (US$10,030 PPP adjusted) that is highly concentrated among a small, wealthy group. (World-Bank 2007) Current estimations place 40% of households in patrimony poverty[2], 20% in capacities

[1] I performed a regression of municipality GDP per capita on infant mortality rate following this model $\ln(IMR)_m = \alpha + \beta \ln(GDPpercapita_m) + \varepsilon$, using data from 2,442 municipalities in the country; β is -0.23057 (p-value < 0.001), and the adjusted R^2 is 0.568.

[2] Patrimony poverty refers to a lack of resources to cover basic requirements such as food, clothing, housing, health, education and transport.

poverty[3] and 14% in food poverty[4] (these are inclusive definitions, so patrimony poverty includes those in capacities and food poverty, and capacities poverty includes those in food poverty). In terms of individuals, almost 20 million Mexicans are living in food poverty, which is almost one fifth of the total population.

Although a major health reform that lead to the creation of a national health insurance system has been underway since 2002, in 2005, almost half of the population was still not covered by health insurance.(Frenk 2006; INEGI 2006) The health status of Mexicans is extremely heterogeneous within age groups, and it tends to be related to socio-economic status. (Barraza-Llorens, Bertozzi et al. 2002) This is not only the case for conditions that are traditionally viewed as linked to a lack of resources, such as infectious diseases that cause a high proportion of infant mortality and maternal mortality; recent data show that overweight and obesity are highly prevalent among individuals living in poverty, with a prevalence almost identical to the national average, and some preliminary analysis suggests that there is a negative correlation between obesity and income.[5] (Gonzalez-Villalpando, Rivera-Martinez et al. 2003; Fernald, Gutierrez et al. 2004)

With respect to infant mortality rate (IMR), an analysis of aggregated data shows that there is a negative correlation between average income and infant mortality. Variations in GDP per capita at the municipality level explain almost 60% of the variations in IMR. On average, a 10% change in GDP per capita is related to a 2.3% change in IMR.[6]

1.3. Previous results from Oportunidades evaluation

Oportunidades is a CCT program implemented by the Mexican government in 1997. The program is the foundation of Mexico's social policy, covering approximately 5 million households across the country (20% of all households) with a budget of approximately 1,400 million dollars, which represents

[3] Capacities poverty refers to a lack of resources to cover basic requirements such as food, health and education.
[4] Food poverty is the lack of resources to cover basic food requirements.
[5] Estimation by the author using data from the National Health Survey 2000.
[6] Estimation by the author using data from the Mexican Population Council. A log-log regression with IMR as a dependent variable and GDP per capita as an explanatory variable resulted in a coefficient of -0.23, with an adjusted R^2 of 0.568.

approximately 0.4% of the country's gross national product.

The overall goal of the program is to interrupt the intergenerational transmission of poverty by generating incentives to invest in children's human capital among households living in poverty. Designed according to the human capital model, *Oportunidades* is based on monetary transfers to households that are conditional upon visiting health facilities for preventive interventions and on school attendance among children from 9 to 18 years old.

The evaluation of the programme's impact on health care utilisation and health outcomes reveals some preliminary evidence on the link between income and health. Although it is clear that increases in the utilisation of preventive services are related to programme requirements that, in turn, could be affecting health indicators, because some evidence suggests that the quality of services is particularly low in health facilities serving poor populations, it could be argued that the effects on health status are at least partially related to increases in income.(Barber, Bertozzi et al. 2007)

In the next sub-sections, I present first a brief summary of the results on medium-term effects in rural areas and short-term effects in urban areas is presented in which I was involved. These results and the methods are extensively described in two documents that were produced by the programme managers. (Gutierrez, Bautista et al. 2005; Gutierrez, Bautista et al. 2006) Then, I discuss the results from other published studies on Oportunidades related to health outcomes.

1.3.1 Mid-term effect in rural areas

In terms of health services utilisation, we expected an increase in both preventive services and curative services as a result of *Oportunidades*. The former should reflect compliance with co-responsibilities, whereas the latter are related to improved health care.

Individuals in households participating in *Oportunidades* reported a higher use of public ambulatory health services relative to comparison households. Similarly, *Oportunidades* households reported a lower utilisation of private services, which is also reflected in lower expenses. On average, *Oportunidades* households received 2.7 more consultations per year in public

services, both preventive and curative ($p<0.05$), representing a positive difference of 35% with respect to comparison households.

In terms of health status, we expected *Oportunidades* households to present fewer illness days and less acute illness when it occurred. The analysis reported a negative difference with comparison households of 20% in illness days in individuals from 0 to 5 years and from 16 to 49 years ($p<0.05$). These reductions represented a mean of two fewer days of illness in children from 0 to 5 years and close to six fewer days of illness in individuals from 16 to 49 years. The average decrease in days of disability was 1.6 days for the 6 to 15 year group and 1.3 for the 16 to 49 year group ($p<0.05$).

Another indicator of health status is the ability to perform daily activities. A larger proportion of individuals between 18 to 49 years in the intervention group reported being able to easily perform heavy activity vs. those of non-beneficiary households, although the difference was only 1.2 percentage points ($p<0.05$). This indicator also suggests a better state of health, as the ability to perform activities involving physical effort depends on the state of health.

1.3.2 Short-term and mid-term effect in urban areas

In urban areas, the analysis reported a negative trend in terms of illness days and disability for individuals in *Oportunidades* households with respect to the comparison group after 2 years of intervention. Significant results were found in the under 6 year group and in the 19 to 49 year group for sick days (-1 day and -0.22 day, respectively, both with $p < 0.05$) and among those between 6 to 19 and 19 to 49 years for disability days (-0.17 & -0.24, respectively, also $p < 0.05$).

Regarding indicators related to ability to perform daily activities, positive and significant results were observed for all variables (basic activities, light activities and heavy activities) for both age groups analysed: those 19 to 49 years and those 50 years or older. The effects in the latter group, the older one, are larger, with 5%, 13% and 12% more individuals reporting being able to easily perform the activities in the same order (basic, light and heavy, respectively), whereas in the younger group, these figures were 1%, 7% & 8%, respectively. In all cases, the p value was < 0.05, and the analysis is with

respect to individuals in the comparison group.

Additionally, individuals in intervention areas were more likely to obtain diabetes testing and blood pressure measurements than those in the comparison group (10% & 16% more, respectively, for those 19 to 49 years, and 17% & 11% more for those 50 years or older).

In terms of health care utilisation, there was also a trend for higher utilisation of public services, but this was significant only for individuals from 6 to 18 years (higher public services utilisation) and 19 to 49 years (lower private services utilisation).

As expected, individuals in intervention households reported a much larger use of preventive services, with at least 25% more utilisation for all individuals and up to 50% for children under 6 years.

After 7 years of exposure, an analysis using propensity score matching to compare individuals in households that have been incorporated to the programme at some point between 2002 & 2009 were compared to those that were close to the eligibility score. Results suggested an exhaustion of the effects observed in the short-term in terms of general health services utilization, but a continuation on the positive effect on sick-days (reduction of those for young individuals) and in the utilization of preventive health services among adults. (Angeles, Gutierrez et al. 2011)

1.3.3 Other studies

Other several analysis have reported impacts of Oportunidades on health outcomes, including some systematic reviews of the available literature. For example, Gaarder & Glasman discuss health related outcomes in general for CCT programmes, including Oportunidades.

For child health, Gerlter in the first analysis with the experimental evaluation 1998-2000, reported both an increase on health services utilization, particularly healthy child monitoring, as well as a positive effect on child growth, of about 1 cm, a reduction of 23% on morbidity measured in a 4-weeks period, as well as a reduction in anaemia of about 25%. (Gertler 2004) In terms of growth and anaemia, similar results were reported by Rivera et al, that found a

effect on growth of 1.1 cm among child of 6 months or less at the baseline after 2 years of intervention, but they did not find an effect on anaemia. (Rivera JA 2004) Effects in growth were also found urban settings, with similar magnitude. (Leroy, García-Guerra et al. 2008) Barber & Gerltler reported a positive effect on birhtweight using an instrumental variables approach, and a reduction on low birthweight. (Barber and Gertler 2008) Barham reported a reduction on infant mortality associated with the programme, supporting in general the positive effects of Oportunidades on child health. (Barham 2011) Moreover, Todd reported that these effects on child health and nutrition are then reflected in education outcomes latter in life, increasing human capital accumulation. (Todd and Winters 2011)

In terms of reproductive health, Sosa-Rubi et al reported a small 2.1% difference in pre-natal care visits between beneficiaries and non-beneficiaries after about 10 years of intervention in rural areas, result that suggest a exhaustion on the effects. Nevertheless, they also reported an indirect effect that may influence quality of care, a increase in the delivery by trained personnel. (Sosa-Rubí, Walker et al. 2011) An analysis of health effects of the programme after 7 years in urban areas reported also exhaustion of the impacts, reflected in smaller differences between beneficiaries and non-beneficiaries. (Angeles, Gutierrez et al. 2011)

A systematic review by Gaarder, Glassman & Todd found that Oportunidades positively affect health services utilization in general, but effects on effective prevention services are less conclusive. In the other hand, Oporunidades have affected other health outcomes, as mental health, by improving general living conditions. (Gaarder, Glassman et al. 2010) In that sense, aligning programme strategies could have a larger effect on health.

Another systematic review by Leroy, Ruel & Verhofstadt reported a positive effect of Oportunidades in the nutrition status of children measured by anthropometrics that may be related to an increase in health services utilization, supplements and overall improvements in health status. (Leroy, Ruel et al. 2009)

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Chapter 2: Height, income and intergenerational education mobility: evidence for Mexico

Juan Pablo Gutierrez

2.1 Abstract

To promote development, Mexico decided to focus its social policy on generating incentives for human capital investments primarily using conditional cash transfer programs. To make these types of programmes effective, two important issues must be considered. First, the returns on human capital have to be positive and sufficiently high. Although there is important evidence that this is the case for education, less conclusive evidence exists for health in general and Mexico in particular. Because health capital may reflect aspects of productivity different from labour specialisation (that are related to education), it is important to have positive returns on health investments (that is, not only human capital in general). In addition, these investments will increase development only if social mobility is feasible, as human capital returns implied that increasing human capital would then result in increased labour income and thus mobility that would represent development. This study attempts to provide a better understanding of the importance of mobility in Mexican society. In this analysis, using data from a national representative survey, I found that the returns on health in Mexico are positive and at an order of magnitude similar to those reported for other countries. I also found that social mobility is present, although there is still an important intergenerational transmission of educational attainments.

Keywords: health capital, socioeconomic mobility, height, Mexico

JEL Classification: I15, I25, I38

2.2 Introduction

Health capital represents a key component of human capital, and in that sense, an important factor in individual wellbeing throughout the lifespan. Investments made during childhood and adolescence, that is, during the phases in human development when individuals are accumulating human capital, are essential to allow them to achieve their full capacity and their desired

functionalities[7]. From this perspective, development may be promoted by investing in human capital generation.

Positive socioeconomic mobility requires such investments; it requires that individuals growing up in resource-constrained environments accumulate an amount of human capital that allows them to choose a better functional set for their livelihood. Although there is extensive evidence on the role of education in this accumulation, specifically, the returns on completed years of education, there is a relatively less complete data set regarding other forms of human capital. One such form of capital is health capital, representing the returns on better health and nutrition. One approach to investigating health capital would be to assume that health (including nutrition) is a necessary condition to accumulate years of education. Although education plays a key role in health status, this approach assumes that this is the only channel through which health affects human capital accumulation. However, it could be argued that health is also affected by physical capacity and non-school-related skills. Health also affects future outlook, as being healthy in the present increases the probability of being healthy in the future; thus, the issue of perceived life expectancy becomes relevant. In the end, a combination of these factors represents the return on health capital, but some portion of this return may be captured through education, under the assumption that health is a necessary condition to increase education. To capture all other aspects of health capital, it is necessary to estimate it using a measure of health capital, i.e not schooling.

For human capital accumulation to play a role in human development, mobility needs to be possible. In other words, if social and/or socioeconomic status is pre-determined by origin, there is no room for human development. In societies with a large intergenerational transmission of socioeconomic status, low-income individuals will remain in poverty despite an increase in human capital. Measuring the level of intergenerational transmission is then related to the ability of human (and health) capital to incentivise human development.

For countries such as Mexico, human (and health) capital are particularly

[7] Using Sen's approach, I am referring here to the *doings* and *beings* of individuals, that is, "their ability to do certain things and to achieve certain types of beings": a specific functionality is a measure of individual well-being.

relevant in the sense that these countries are still trying to produce adequate living conditions for a large, poverty-stricken portion of the population. Despite its important achievements in terms of human development and despite being the 13th-largest economy in the world, Mexico has been unable to close the wide social gaps that are reflected by the large differential in income between the richest and the poorest Mexicans: the GINI index in Mexico is 51.7, making it the 18th most unequal country in the world. In Mexico, the lowest 20% of the population only receives approximately 4.3% of the national income.(World-Bank 2007)

The approach used by Mexico since the end of the 1990s has been to generate incentives for human capital accumulation, assuming that these investments would result in social mobility (that is, increasing socioeconomic status) and thus, human development. Using conditional cash transfers as a key element of this social policy, more than 20% of the country's population are now enrolled in these types of programs, and some households also receive support from federal and local governments.[8]

Two different but related elements must thus be analysed. First, the magnitude of the returns on health must be investigated, under the assumption that although an important part of these returns could be captured by education, there is a fraction (that may be large) of health capital that may result in other benefits. For this analysis, it is important to rely on an indicator of health capital that may capture items that are relevant to economic productivity and income. It is thus relevant to understand the potential for social mobility. In other words, we must understand whether it is possible for individuals who have accumulated human capital to increase their income relative to their parents, particularly those from poor households.

In terms of social policy, two key assumptions are relevant to any approach to development that is focused on promoting investments in human capital: the magnitude of the returns on health capital and how health increases

[8] In an unpublished study that I led in 2011 to evaluate a social program in one of the most populous states in Mexico, the State of Mexico, about 68% of all households that self-identified as beneficiaries of the state program also reported being beneficiaries of the federal program Oportunidades. Although these data are only representative of rural areas in 1 of the 32 states in the country, they highlight the fact that there are no exclusion criteria related to participation in different levels of government programs.

this capital other than by educational attainments. Even if positive returns on schooling are a given, they may not be enough, as an economy needs not only highly specialised human resources but also skilled resources in all aspects of economic activity.

2.2.1 The link between health and income

Estimating the returns on health assumes that there is a causal relation from health to income. This assumption is not a given, as there is still an important theoretical and empirical debate regarding two issues: i) assuming that there is actually a causal relation between health and income, what is the direction of this relation? and ii) it may be the case that no causal relation exists, but what empirical data has shown is the effect of a third variable or factor that is affecting both health and income These discussions regarding endogeneity and selection are crucial, as both reverse causality and omitted variables bias can affect the potential estimation. (Adler and Ostrove 1999; Smith 1999; Cutler, Lleras-Muney et al. 2008; Stowasser, Heiss et al. 2011)

Several authors have argued that economic status (some combination of income and wealth) is the most important determinant of health.(Adler and Ostrove 1999; Case, Lubotsky et al. 2002; Adda, Chandola et al. 2003; Cutler, Lleras-Muney et al. 2008) Greater wealth implies better access to health-related goods and services. Wealthy people have access to a better diet, have better housing, are generally more educated, have more specific information regarding healthy habits, have better access to health services in general, and have access to better quality services in particular. All of these factors contribute to producing better health. When measuring the returns on health, it may be that we are observing wealth begetting health rather than the reverse. What matters here is the temporal sequence. In an ideal analytical case, we would like to examine individuals who are originally from a similar socioeconomic background and have different health investments, which would allow us to determine if differential health endowments are correlated with future income.

There is also a discussion regarding how intrinsic factors affect both health and income, which would make any observed relation among them spurious. For example, in a society where family links and background

determine one's set of labour opportunities, social organisation determines income. If this social organisation also affects access to health-related goods and services, it may also affect health. This type of society would be one in which there are limited opportunities for social mobility.

The approach that I follow in this analysis is based on Grossman's extension of the human capital model: the health capital model. (Grossman 1972; Grossman 1999) According to his model, health is both a commodity and an investment: individuals not only appreciate health for its intrinsic utility but also because it allows them to have more usable time for labour and leisure. In this model, income and education increase investment in health, and in return, health increases available time and could thus further increase income (if more time is used for labour).

In Grossman's model, health is a determinant of inter-temporal utility:

$$U = U(\phi_t H_t, Z_t),\ t = 0, 1, \ldots, n \quad \ldots\ldots(1)$$

where H_t is the stock of health at age t, ϕ_t is the service flow per unit stock, and Z_t is the consumption of other commodities. Extending this formula, Strauss and Thomas derived how income and health are expected to be interlinked.(Strauss and Thomas 1998) In their extension, health is a function of health inputs (N), labour supply (L), individual socio-demographic characteristics (A), parental characteristics (B'), and environment (which includes health infrastructure and practice as well as epidemiological setting, D):

$$H=H(N,L;A,B`,D,\mu,e_h) \quad \ldots\ldots(2)$$

where there are several unobservables: μ, the healthiness of the individual, and the measurement error, e_h. Individual income (wage) is a function of health status, socio-demographic characteristics, schooling, parental characteristics, and community variables:

$$w=w(H;A,S,B,D) \quad \ldots\ldots(3)$$

Grossman's model suggests that there is a synergistic interaction between income and health, such that an improvement in one would result in an improvement in the other. Poverty alleviation programs could have larger effects

if they integrated a health component, and health interventions should be expected to improve wellbeing beyond directly improving health status.

This proposition implies that there is a causal link in both directions, from income to health and from health to income. To correctly estimate the effect of health on income, it is most important to establish the temporality of the proposed indicators. According to Grossman's model, reversal causality is not ruled out, but the causality from health to income establishes the temporal order of the indicators, so it can be assumed that health capital was determined before the income measure. As discussed below, because investments in health capital could also be related to parental decisions that determine income, it is still important to use estimation alternatives that control for this variable.

In terms of the third variable issue (i.e., a third factor, such as parental decisions, that determines both health and income), our analysis assumes that by working with a relatively homogeneous population in terms of genetic background and controlling for observable indicators of relative access to services and family wealth, the coefficient of the rate of return on health investments can be determined. The absence of better data on the socioeconomic status SES of the individual's childhood home is an important limitation of the present study.

2.2.2 How to measure health: using height

The basic assumption underlying the role of health capital is that individuals require adequate health (and nutrition) for adequate school performance and progression. Improving health will then generate returns both because it allows time for studying (and work) and because of its synergic relationship to education. If health has an influence beyond its role in education, it would be possible to estimate a separate rate of return for health independent of education.

One methodological concern is how to measure health capital. Although the accumulation of education is directly observed through years of schooling (even this measure is far from perfect because school quality varies widely), the measurement of health requires an indicator reflecting both current health and the accumulation of health capital. Adult height has been proposed as a

measure of health capital accumulated during childhood and adolescence, as it reflects prior investments (once reached, adult height does not increase). If this assumption is true, it could be argued that the correlation between height and income reflects the effect of the former on the latter and provides one way in which causality could be established. Height is also an imperfect measure of health capital, as it is a function of both an individual's genetic height potential and his or her health status in childhood.

Height is related to both physical and mental capacity. Individuals with adequate health and nutrition conditions will physically achieve growth at their potential measured at an adequate high level of height, and would also have an adequate mental growth. The latter is then related to both schooling achievements and general skills. Physical and mental capacity are both related to productivity, and thus to income. Individuals with more physical strength are able to perform adequately for longer periods, and individuals with more mental strength are more resourceful that translate into better performance(Case and Paxson 2008).

As previously discussed for the general case, there are several concerns with using height as an indicator of health capital that are related to the potential endogeneity of adult height with respect to wage. As noted by Schultz, height could also reflect unobserved differences in endowments and parental preferences that may be related to labour income. If individual parents have, for example, a higher IQ, they may tend to provide better health care and nutrition for their child, which will be reflected in his or her stature. They will also tend to be better connected socially, so she will have better job opportunities (better in the sense of higher wage). In econometric terms, this would imply that in the estimation of the returns on health, height could be correlated with the error term in the wage equation. In his analysis, Shultz addressed these issues with an instrumental variables (IV) approach. However, such an approach is not necessarily generally applicable because an IV needs to reflect the conditions that existed during childhood development (i.e., at least 10 years before adult height is measured). For studies in Ghana and Brazil, the key result from the instrumental variables approach is that OLS tends to underestimate the returns on health (i.e., estimations from the IV models are higher). (Schultz 2002)

Using the IV approach as a tool to address endogeneity caused by omitted variables, reverse causation or measurement errors, which will result in a correlation between the error term and the explanatory variable, assumes that there is an alternative indicator (or set of indicators), the instrument(s), that is highly correlated with the independent term but not directly related to the dependent one. If this condition is satisfied, it is possible to instrument the independent variable and remove the estimation bias. (McFadden 1999) The most relevant issue with the IV approach is finding an appropriate set of instruments. In this case, an indicator is needed that is correlated with height but not with income.

Nevertheless, as Weil discussed, although it is clear that height is not a perfect indicator, it is a good proxy measure of health accumulation because variations in stature in a genetically stable population are highly related to nutrition and health conditions during childhood. (Weil 2007) In this sense, there are strong arguments in favour of using height as a measure of health capital, although it would be important to positively address the potential limitations of this approach.

The health to income link has been previously tested, and in most cases, adult height is used as an explanatory variable for income. Because height is a result of genetic endowment and childhood nutrition and health, it can be viewed as a measure of health stock. Thomas and Strauss presented results from Brazil showing that height is a significant predictor of earnings for both men and women and that the link is stronger among those with more education, suggesting a synergistic effect. (Thomas and Strauss 1997)

Croppenstedt and Muller reported that in the case of Ethiopia, height is associated with farmers' productivity and income. (Croppenstedt and Muller 2000) More recently, Dinda et al. presented similar results for coalminers in India, showing a significantly higher income for taller workers. This paper highlights the policy implications of this finding: health interventions focused on promoting health capital investment are an important strategy to increase productivity and generate economic growth. (Dinda, Gangopadhyay et al. 2006)

For Colombia, Ribero and Nuñez also found a significant and positive coefficient of height on wages, using a Mincerian equation and an instrumental

variables approach. As with Schultz, the instrumental variables approach leads to larger coefficients in the returns on health. (Ribero and Nuñez 2000) The main concern with this analysis is that instrumental variables are not actually measured at the time the child's future stature was determined, so there could be limitations to this approach.

In Mexico, Mayer used the 2000 National Health Survey to estimate the returns on human capital, finding a strong effect of education on income and a weak one for health, using height as a health indicator. The primary limitation of this analysis is the data set used, the National Health Survey 2000, which lacks reliable data on income. In addition, it could be argued that not taking height into account may have resulted in the small coefficients found for health. (Mayer-Foulkes 2003)

In general, there is limited evidence for Mexico on the returns on health capital and on the degree of intergenerational transmission of socioeconomic status. As previously discussed, both estimations are crucial for a country that has actively decided to implement development policies based on incentivising human capital investments, assuming that these policies would lead to human development.

An alternative measure for health is the body mass index (BMI), a measure that related height and weight. The main concern with BMI is that it reflects current health status, in the sense that weight is a measure that may be affected during the life-course responding to short-term modifications and investments. That is, while adult height is set once certain age is reached, weight may change (decrease or increase) responding to changes on investments in health at present time.

2.2.3 Health rate of return and intergenerational mobility in Mexico

Although there is extensive evidence showing that there is a positive effect of height on labour income, as previously discussed, the data for Mexico are less conclusive. To address this lack of evidence, the analysis reported here is based on more recent data, the National Health & Nutrition Survey 2005/6 (NHNS 2005/6), which gathered better data on income and anthropometrics. Although there are some surveys in the country with more detailed data on the

income side, the NHNS is the largest survey collecting anthropometric data in which the measurements are taken by a highly trained team (in contrast to other surveys that collect self-reported height and weight).

To explicitly considering whether the expected differences related to household wealth are a reflection of parental choices, I include a measure of socioeconomic status in the estimation of return on health capital, which is a relative measure of wealth that is assumed to reflect the individual's family/network capital. In terms of the potential estimation problems previously described, including a measurement of SE status is an attempt to avoid bias due to omitted variables. This is a conservative approach that is likely to underestimate the returns on health because if health capital is a determinant of current income, it most likely also affected the household's prior ability to accumulate wealth.

One important feature of this specific analysis is the relative homogeneity of the Mexican population. Although there are different ethnic groups in the population, the vast majority of Mexicans are *mestizos*[9], that is, a mix of the original population and the Europeans who arrived in the XV century. This feature reflects the fact that these groups mixed extensively over the course of the last 400 years. For the purpose of this analysis, it is assumed that basic genetic endowments (height potential, intelligence, etc.) are similar across SE classes. This would imply that observed differences in wage related to variation in height are more likely to be causal and are not related to a common third factor.

In terms of the concerns that have driven the use of instrumental variables, the approach taken in this analysis is to use both approaches: to include height despite not having information from the same individuals in previous periods, as with most other studies, and to control for household socioeconomic status, which is assumed to reflect unobserved variations in endowments, prices and parental preferences. I choose to report both IV and non-IV results, recognising the limitation of the contemporaneous IV but also interested in seeing whether the difference between the IV and non-IV results I

[9] According to Census data, about 7% of Mexicans are considered indigenous, whereas the other 93% are mestizos.

obtain are consistent with the differences observed in previous studies. The additional approach assumes that the past variables that co-determined an individual's health and relevant characteristics are reflected in his or her current socioeconomic status.

As presented below, using the NHNS 2006, I am able to find a strong return to health capital even after controlling for socioeconomic status and education. That is, for all income deciles, height has a positive effect on labour income, suggesting that health capital accumulation could contribute to socioeconomic mobility and that even in the absence of mobility, health capital contributes to improved status. As in previous studies, I also found that the estimation using instrumental variables leads to higher coefficients, suggesting that a failure to control for endogeneity in the height/wage relation could result in an underestimation in the rate of return: the rate of return is 3 to 5 times higher with IV & Heckman corrections than with Heckman corrections alone.

As previously discussed, an additional related issue regarding human capital transmission is how parental education affects individuals' schooling. Because education is a key factor in human capital (both as a determinant of income and because it affects health capital), if children of poorly educated individuals tend to also be poorly educated, it will diminish socioeconomic mobility. Social development policies regarding education should recognise that children of poorly educated parents will need additional support and/or incentives to perform as well as the children of parents with more education.

The data from the NHNS 2005/6 suggest that there is still an important degree of transmission of education level in Mexico: head of household education remains an important predictor of the educational attainment of the children in the household.

2.3 Models

2.3.1 Health rate of return

The general approach to estimating a rate of return is to determine the marginal effect of any additional unit of the capital (stock) on the outcome, which in this case is the labour income. It is assumed that human capital stock increases productivity and, therefore, labour income. If wages are a proxy measure of

permanent income, a marginal increase in wages will increase wellbeing. This is the expected outcome when investing in human capital and indicates socioeconomic mobility.

In the literature, the usual approach to estimate the rate of return on human capital follows the model proposed by Jacob Mincer in his seminal work (Mincer 1974). The approach in the Mincerian model is to report the rate of return on human capital indicators using the labour wage as a measure of productivity:

$$\ln W_i = f(S_i, H_i, X_i) \quad (4)$$

where W is the individual monthly labour wage, S is years of schooling completed, H is the individual height, and X is a set of other individual characteristics for individual i.

Although the literature recommends using hourly wage to avoid the additional issue of working hours, the lack of sufficient data to estimate an hourly wage is assumed not to bias the results because wage is generally defined on a monthly basis in Mexico.

Although this model could be estimated using a standard OLS because labour wage depends on work condition, there is potential selection bias because labour supply is a decision made while considering the trade-off between labour income and the associated cost of working. In particular, when there are children at the household, taking care of them also requires time. This selection bias means that the outcome variable (wage) could be estimated only in a subset of the sample because we do not have wage information for those not working. (Heckman 1977)

To model this individual process, selection models were developed that first estimate the probability of working based a set of characteristics and then estimate the adjusted rate of return. The Heckman model estimates the outcome variable, conditional on the probability of being employed. It is modelled as a latent variable that is observed only above a certain threshold.(Heckman 1979) The model then becomes:

$$\ln W_i = \beta S_i + \delta H_i + \phi X_i + \varepsilon_i \quad (5)$$

$$E^*_i=\gamma Z_i+\upsilon_i \quad (6)$$

where E* is the employment status that is a function of Z individual characteristics. The Heckman model thus provides a way to estimate wage, assuming that Ki = f(S_i,H_i,X_i):

$$\ln W_i = \beta S_i+\delta H_i+\phi X_i+E(\varepsilon_i|\ K_i\ \upsilon_i) \quad (7)$$

Heckman's approach is to treat this as an omitted variable problem, that is, first modelling the probability of working and using these results to calculate the inverse of Mill´s ratio, which is defined as a function of the probability that an observation is selected in the sample. That probability is then used as a regressor for the outcome variable. To model labour participation, under the assumption that in particular women's labour participation is related to marriage and maternity, the correction model use these characteristics, in the form of not only formal marriage, but living with a partner, and having children in general. Additionally, age and schooling years are included.

The data available include an additional potential selection bias because not all heads of household were selected for the anthropometric measures. To explore this bias, an additional model was estimated excluding health indicators from the independent variables; the assumption was that if the remaining variable coefficients are consistent with the full model, then the bias is random and would therefore not affect the results. This randomness is also supported by the fact that adults were randomly selected for anthropometric measures.

In addition, to test potential differences in wages between subjects with complete data and those without anthropometric measures, a Blinder-Oaxaca decomposition analysis was implemented. The test was implemented looking at the potential gap in log wages, using the same set of additional independent variables as in the main models, and including the Heckman selection correction.

The idea behind the Blinder-Oaxaca decomposition method is to identify mean outcome differences that are not due to differences in other explanatory variables; in the specific case of wage, this includes gaps that are not related to differences in human capital. Although commonly used to examine gaps that

may be related to discrimination (such as differences in wages by sex or race), it can be used to identify differences from any other characteristic. (Oaxaca 1973) The implementation was performed using a specific application for Stata. (Jann 2008) The results, reported in table 1, indicate that there are no differences in wages among those with and without anthropometric data, reinforcing the idea that selection was random.

Table 1. Gap in log wage by data completeness, by sex

	(1)	(2)
VARIABLES	Female	Male
No anthropometric data	7.79***	8.12***
	(7.75 - 7.84)	(8.11 - 8.13)
Complete data	7.62***	10.71***
	(7.49 - 7.75)	(7.38 - 14.03)
Difference	0.17**	-2.59
	(0.03 - 0.31)	(-5.91 - 0.74)
Endowments	0.07***	0.01
	(0.04 - 0.10)	(-0.03 - 0.05)
Coefficients	0.11	-2.59
	(-0.03 - 0.24)	(-5.91 - 0.73)
Interaction	-0.00	-0.01
	(-0.02 - 0.02)	(-0.05 - 0.04)

ci in parentheses
***** p<0.01, ** p<0.05, * p<0.1**

2.3.2 Instrumental variables for rate of return

As an additional method to control the potential endogeneity in the wage and height relation, height was instrumented using locality characteristics from approximately 6 years before the height data were collected. In particular, the marginalisation index, an aggregate measure of living conditions in each locality in the country that is estimated by the National Population Council (CONAPO, by its Spanish acronym) using Census data, was used. As they could also be related to the measured variable, the state and locality size were also included as instruments.

Because marginalisation could be related to overall living conditions at the time of its estimation and before (the index was generated by CONAPO using data from the 2000 Census), it is assumed that it could be related to health investments.

Similarly, because access to health services and the quality of the services are related to supply conditions, location matters. In Mexico, public health services are either provided by the State level authorities (that is, the case of the services for the non-formal workers that cover approximately 50% or 60% of the population) or managed by state level offices from the central formal workers services. This implies that there could be an important variation in the quality of the services[10] that would affect health investments, as provision is heterogeneous.

Locality size[11] affects health services in two ways: accessibility and capacity. Access to health facilities tends to be limited in small localities that share facilities among several localities, whereas in larger localities, there are several facilities. In rural localities, there is a higher concentration of non-Spanish speaking individuals and cultural heterogeneities that may also limit access to services. Because of population size, larger communities lead to more crowded facilities, even when the number of facilities is large. In this sense, locality size is also related to health investments.

For the IV approach to be valid, not only the instruments should be related to the instrumented variable, but also it is expected that it only affects the outcome variable by their effect on the instrumented variable. While it could be argued that locality characteristics are related to wages, thus with any type of prices, the price itself is exogenous to individual characteristics. That is, there are wage variations across localities, that may suggest a direct relation, that may be more an spurious relation, as individuals could move to another locality for work and get a different wage. In that sense, it is not the residence locality of the individual that determines the wage level, but those wages are related to the labour supply in the locality, that include both in- and out-locality individuals.

In order to be consistent, schooling years, also human capital measure, was also instrumented, as the same potential endogeneity arises for this

[10] As discussed in chapter 4, evidence from first-level services indicates that there is significant heterogeneity in the quality of health services, which would imply that the relevance of health facilities depends on the specific facility attended.
[11] Size in terms of population, not territory.

variable. Following a similar approach, locality level variables were used to instrument schooling years. In particular, the number of schools in the locality (or in the municipality if no data for locality was available), the average score in standardized test as those schools, another measure of the quality of the schools (multi-grade classrooms), and locality size were used. The assumption is availability and quality of schools determine school attainment, but are not directly related to wages for the same reasons discussed above: individuals could offer their labour in other localities.

It is important to highlight that finding appropriate instruments is in general hard; the proposed instruments for this analysis may have limitations, so, it is useful to compare with the standard OLS´s estimations as well as to check plausibility on the variables of interest and other variables. This approach was followed in this analysis.

The predicted value of height using these instruments is then used in a Heckman model similar to that described before. Following the logic of a two-stage model, an initial OLS provides the estimated variable that is then used in the Heckman; due to expected differences by sex, this first stage was implemented by sex.

2.3.3 Intergenerational education mobility

The approach to measuring the degree of intergenerational education mobility follows a model commonly used in the literature for intergenerational mobility, assuming that for a given outcome estimate, changes in the outcome for children are based on the outcome of the parents.(Machin 2004) The general model is therefore

$$Y_i^{Child}=\alpha+\beta Y_i^{Parents}+\varepsilon_i \quad \text{.......(8)}$$

where Y is the outcome. The intergenerational mobility is measured by β, where a value close to 0 implies complete mobility, in the sense that parents´ outcome level is not correlated with children outcome, and 1 represents complete immobility. An important feature of this estimation is that the outcome has to be observed (i.e., it is not truncated).

While a common approach is to estimate mobility in terms of income, data available in the survey used for this analysis did not allow for that, school years were used. School years is also a variable used in other studies, so it allow to compare results. The estimation of intergenerational education mobility was implemented using OLS models for out-of-school individuals reported as offspring of the head of household. The models were run for individuals considered at legal age (18 and above), 25 and above, and 35 and above, to account for generational differences. Models were also run separately for males and females. The estimated model is:

$$Schooling_i^{Child}=\alpha+\beta Schooling_i^{Parents}+\varepsilon_I \quad (9)$$

2.4 Data

The data used are from the National Health & Nutrition Survey 2005/6, a multi-thematic survey with a sample representative of Mexican households and individuals. The survey visited approximately 48,000 households in Mexico and selected a sub-sample of individuals for anthropometric measures (height and weight). The sample for the survey was selected following a multi-stage procedure and stratified by locality size. Additional details regarding the sampling are published elsewhere. (Olaiz-Fernández, Rivera-Dommarco et al. 2006) Because the analysis is related to the effect of height on wage, I restricted the sample to adults (individuals 20 or more years old) with anthropometric information. In addition, to avoid biases related to decisions about workforce participation within households, I only used data from heads of households. The standard definition of head of household in Mexican surveys is the person that the members of households recognize that role; usually, it is the individual with the largest contribution to household income. Restricting the sample to these individuals provide a more homogeneous sample for the estimation, in the sense that are individuals expected to have economic activity.

Additional data were taken from the 2000 Locality Marginalisation Index, estimated by the National Population Council (CONAPO) from the Census 2000. The index is an aggregate measure of general living conditions, including schooling (literacy and primary school), housing (access to water, sewage, and

electricity), and income. (CONAPO 2002) Data are available on-line at CONAPO's web site.[12]

Additional information regarding number of schools and average test outcomes at those schools were obtained from the National Institute of Education Evaluation.

As previously mentioned, one additional feature of this estimation is to explicitly control for household wealth that may be related to better income. In addition, to include a control variable that will reflect the fact that wages may be different for individuals depending on where they are able to offer their time, that is, the specific market where the labour is offered, I included a categorical variable for socioeconomic status that will capture variability in wages related to family/network capital. This variable was constructed using socio-demographic and housing characteristics, including assets, to generate an imputated variable from a national income and expenditures survey. Additional details on the procedure are reported elsewhere. (Gutierrez 2008)

The descriptive statistics of the analytical sample are presented in Table 2. With an average age of approximately 50 years, the heads of households included in the analysis have a mean of completed years of education below 6 years (i.e., on average, they have not completed primary school). As expected, the average socioeconomic level is around the 5th decile of income distribution (i.e., if the sample is representative, it should have an income distribution similar to that for the country), with approximately 20% of them self-described as indigenous.

The average body mass index (BMI) is in the overweight range and is close to obese. Average height has increased in recent years, but it is still below the USA or Europe. Average monthly income for men is 31% higher than for women, at approximately US$353 & US$270, respectively.

[12] www.conapo.gob.mx, in the section related to the marginalization index, accessed January 18th, 2012 .

Table 2. Means (standard errors) of relevant variables, by sex

VARIABLES	Male.	Women.
Height	164.84	151.28
	(164.59 - 165.09)	(150.95 - 151.60)
Weight	75.15	66.56
	(74.67 - 75.63)	(65.86 - 67.27)
Age	47.89	53.17
	(47.37 - 48.42)	(52.32 - 54.03)
Completed years of education	5.80	4.52
	(5.63 - 5.97)	(4.31 - 4.73)
BMI	27.59	29.04
	(27.44 - 27.74)	(28.75 - 29.34)
Indigenous	0.20	0.19
	(0.19 - 0.22)	(0.17 - 0.21)
SE level	4.27	4.60
	(4.17 - 4.37)	(4.48 - 4.72)
Works	0.81	0.42
	(0.80 - 0.83)	(0.39 - 0.45)
Has a child	0.83	0.78
	(0.81 - 0.84)	(0.76 - 0.80)
Has a partner	0.93	0.24
	(0.92 - 0.94)	(0.21 - 0.26)
Observations	9,310	4,723

In Table 3, the means of body mass index (BMI), height, and completed years of education are reported by SE level and sex. In all variables, there is a trend by SE level, with height and years of education reflecting a positive trend for both females and males, with a slight larger increase for males. In terms of height, although the difference for males between the highest and the lowest SE level is approximately 4%, this difference for females is approximately 3%. With regard to BMI, the trend by SE level seems to form an "M" shape, with the lowest values at the extremes of the SE distribution.

Table 3. Means (95% CI) of relevant variables, by SE level and sex

	Females			Males		
	BMI	**Height**	**School years**	**BMI**	**Height**	**School years**
SE Level 1-2	28.68	150.43	4.52	27.24	163.37	4.99
	(28.29 - 29.08)	(150.01 - 150.85)	(4.31 - 4.72)	(26.99 - 27.48)	(163.01 - 163.72)	(4.86 - 5.13)
SE Level 3-4	28.35	149.39	2.37	27.17	163.94	4.73
	(27.86 - 28.84)	(148.73 - 150.05)	(1.92 - 2.81)	(26.87 - 27.47)	(163.41 - 164.47)	(4.31 - 5.16)
SE Level 5	30.11	151.76	5.15	28.15	165.70	7.20
	(29.27 - 30.96)	(151.04 - 152.48)	(4.69 - 5.62)	(27.82 - 28.48)	(165.19 - 166.22)	(6.82 - 7.59)
SE Level 6	29.31	152.04	5.58	28.50	166.35	7.20
	(28.60 - 30.01)	(151.18 - 152.89)	(4.92 - 6.24)	(28.06 - 28.93)	(165.63 - 167.07)	(6.66 - 7.73)
SE Level 7	28.93	153.38	5.89	27.93	165.92	6.59
	(28.19 - 29.67)	(152.42 - 154.34)	(5.28 - 6.50)	(27.51 - 28.35)	(165.24 - 166.60)	(6.04 - 7.14)
SE Level 8	29.40	153.80	6.70	28.16	167.73	7.22
	(28.44 - 30.36)	(152.53 - 155.07)	(6.07 - 7.32)	(27.61 - 28.71)	(167.02 - 168.45)	(6.51 - 7.92)
SE Level 9	29.77	154.76	5.36	28.19	168.85	5.98
	(28.55 - 30.98)	(153.56 - 155.96)	(4.53 - 6.19)	(27.46 - 28.92)	(167.89 - 169.81)	(4.94 - 7.01)
SE Level 10	29.13	154.67	6.31	27.43	170.23	7.80
	(25.45 - 32.81)	(152.56 - 156.79)	(4.63 - 7.99)	(26.42 - 28.45)	(168.87 - 171.60)	(5.87 - 9.73)
Observations	5,009	5,009	5,009	10,609	10,609	10,609

Figure 2 shows the mean of height in centimetres by SE level and sex. As previously mentioned, although there is a positive relation between height and SE level for both females and males, the slope is slightly higher for males. In terms of the completed years of education, Figure 3 indicates that the situation is somewhat unclear; although there is a clear difference between the mean at the lowest and at the highest SE level, the means indicate that education alone has little explanatory capacity for SE level. Finally, the BMI means presented in Figure 4 emphasise that obesity is a major concern for Mexico; for all SE levels as well as for females and males, the mean BMI is well above the value of 25 that indicates overweight.

Figure 2. Mean of height in cm, by SE level and sex

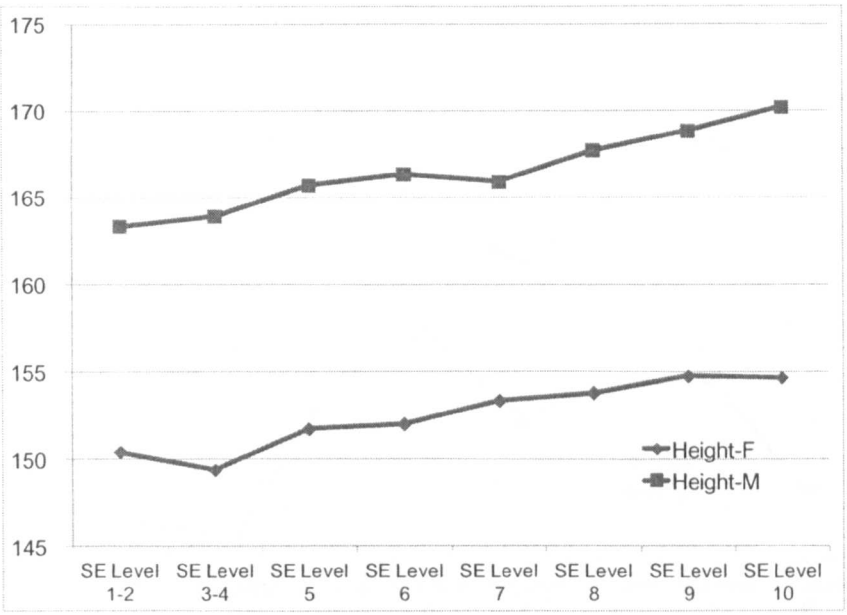


Figure 3. Mean of completed years of education, by SE level and sex

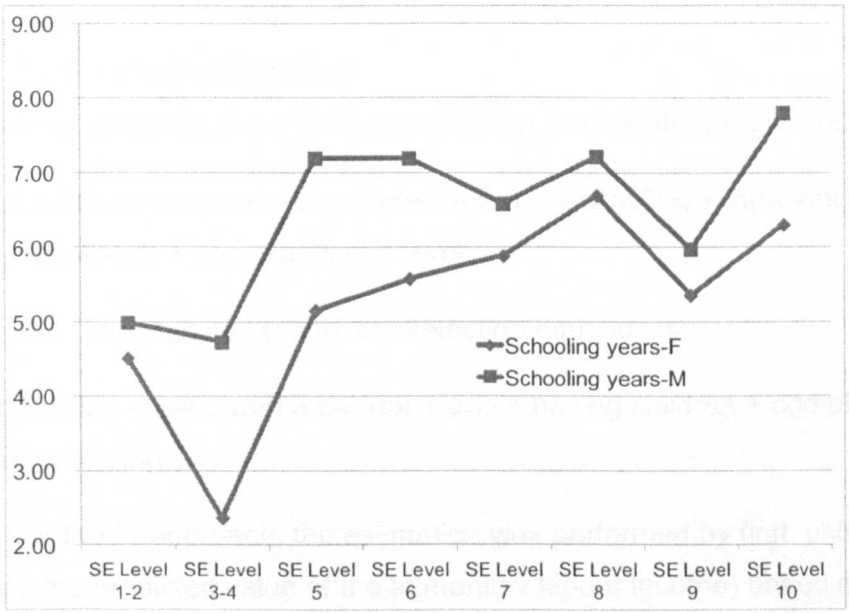
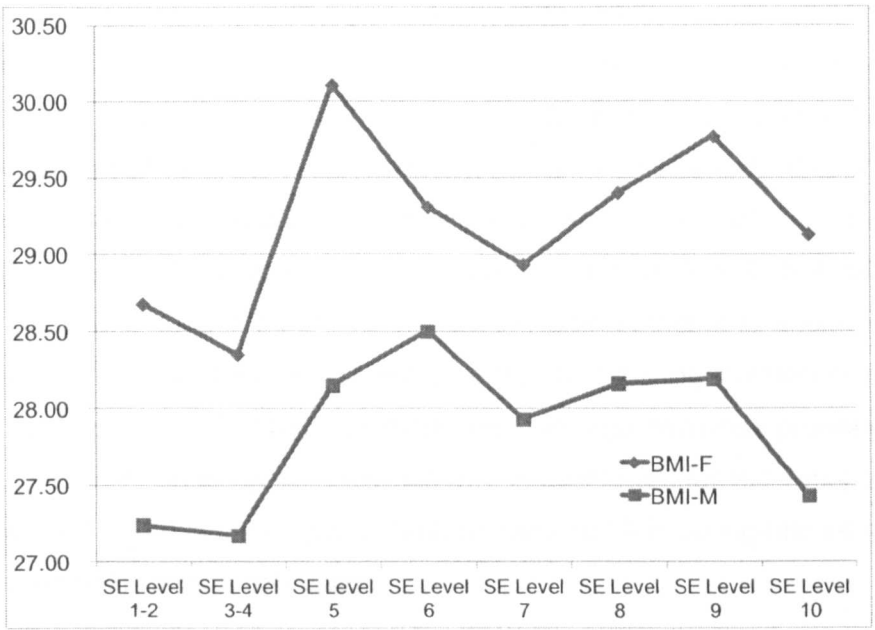


Figure 4. Mean of body mass index (BMI), by SE level and sex



2.4.1 Empirical models

Using these variables, the estimated model for the health rate of return is

ln(monthly labour income) = completed years of schooling + ln(height) + age + age^2 + indigenous + socioeconomic level

and for the Heckman correction, the selection equation is:

Working status = living with a partner + age + having children + completed years of schooling

For the IV approach, the estimation was performed by first using OLS to estimate the predicted value of the ln(monthly labour income) based on the instruments and then using this predicted value in the same Heckman model as above.

2.5 Results

The results from the Mincerian equation estimations are reported in Table 4; in columns 1, 2, 3 & 5, the dependent variable is the log wage, whereas in columns 4 & 6, the dependent variable is a binary indicator of whether the

individual was working at the time of the survey. The estimations from the OLS models are reported in columns 1 & 2 for women and men, respectively. Columns 3 to 6 report the estimations from the Heckman selection models, both the selection equation (columns 4 & 6) and the Mincerian equation (columns 3 & 5). As indicated by the *rho* values, OLS seems to provide biased estimates for both woman and men, thus the selection model provides better estimates. In the selection model, for women having a partner decrease probability of working (it is important to keep in mind that the sample was restricted to adults & head of households), while for men, having a partner and having children increase labour participation.. . For both, women and men, age decrease probability of working while schooling years increase it. The coefficient for the variable of interest (log height) is consistent in both models, but it is no significant for women in the Heckman estimation.

The IV approach is reported in table 5, in columns 1 & 2 for women and in columns 3 & 4 for men; to test for potential bias related to the SE status variable, this estimation was also implemented excluding this variable, reported in table 6. It would be expected that if SE status is capturing, as proposed, part of the heterogeneity on wages, the coefficient for height may be larger after excluding SE status from the estimation. The F for the first-stage regression for height was 14.58 for women and 36,37 for men, which is higher than the suggested threshold for weak instruments (below 10), and was thus considered adequate. For the schooling years first-stage regression, the F for women was 22.13 and 65.78, also way higher than 10, so also seems to be adequate instrumented. (Staiger and Stock 1997) The first-stage results for the IV approach are reported in annex 1(see table 9).

In all estimations, for both men and women, height is significantly and positively correlated with wage; the rate of return on health capital (height) in the standard Heckman approach is similar for both women and men, while no significant for womenFor men, a 1% per cent increase in height translates to a 1.09% higher wage. Nevertheless, using the IV approach (table 5 & 6), these values are approximately 5 times higher, and significant at 1% for for both women and men. For women, a 1% increase in height is associated with a 5.59% increase in wage, whereas for men, it is associated with a 6.27%

increase in wage. Excluding the SE status variable for these estimations lead to higher estimates of the rate of return: 7.85% for women and 8.03% for men (for a 1% increase in height), that is, about 40% higher, but still within the confidence interval, that is, the 95% CI for both estimated (with and without IV) are overlapped, so are not significant different.

According to the estimations, health capital has a much larger return than education capital. This strongly suggests that human capital is an important determinant of wages, and in that sense, socioeconomic mobility. As expected, education is also significantly and positively correlated with income level, but the amount of increase with each additional school year is small: 1% increase in schooling years is associated with a 0.4% to 0.7% increase in the labour wage when health capital (height) is included in the model.

Age presents the expected inverse U pattern, as suggested by the positive and significant coefficient for the linear value and the negative and significant value for the quadratic one. Indigenous individuals received lower wages.

As expected, wage is positively correlated with SES; wage expectations increase with household SES, and the relative differences among SES levels reflect the high level of inequality in income distribution in Mexico, a country with a large differential in income among SES (see tables 4,5 & 6).

The model excluding health indicators (presented in the annex) reports similar coefficients for the remaining variables. In particular, the completed years of education remained at the same significant and positive levels. This result reinforces the idea that health matters not only because of its role in improving educational attainment but also because of its intrinsic value.

The models for intergenerational education mobility are reported in Table 7. In all estimations (generation and gender), there is a positive and significant coefficient for the effect of the head-of-household completed years of school on the individuals' completed years of school, even after controlling for SE level. Columns 1 to 3 present the results for males and females together, 4 to 6 for males, and 7 for females. The estimated coefficients for mobility are higher than

those reported in other contexts.(Aydemir, Chen et al. 2008) The values are large enough to suggest incomplete mobility, that is, a context in which parental education plays a role the achievements of offspring. Other studies have found that low levels of mobility are related to inequality. (Nimubona and Vencatachellum 2007)

Although there is a difference in education attainment by sex (the coefficient is positive for males and represents 0.5 year, see Table 7), it seems that sex differences related to the head of household are only significant for the older group (34 years and older). It is also clear that SES plays a significant role in education; for the highest SE level, there is a difference of approximately 4 years of schooling compared to the lowest. Interestingly, this difference is even larger for females, for whom it represents between 5.5 and 7.2 additional years. This difference may be related to women's larger social role, as suggested by the fact that this differential is larger for older women in a changing society in which women are increasingly empowered.

In general, these results suggest that socioeconomic mobility is constrained by parental education. Parental education, which may reflect family capital, is strongly related to individual education perspectives.

Table 4. Returns on health & education capital measured by monthly wage

VARIABLES	[1] **Women OLS** lwage	[2] **Men OLS** lwage	[3] **Women Heckman** Lwage	[4] work	[5] **Men Heckman** lwage	[6] work
lheight	1.85***	1.26***	1.03		1.09***	
	(0.58 - 3.13)	(0.63 - 1.89)	(-0.21 - 2.26)		(0.49 - 1.68)	
weight	0.00	0.00***	-0.00		0.00***	
	(-0.00 - 0.01)	(0.00 - 0.00)	(-0.00 - 0.00)		(0.00 - 0.00)	
age	0.04***	0.02***	0.06***	-0.03***	0.02***	-0.03***
	(0.01 - 0.07)	(0.01 - 0.04)	(0.03 - 0.08)	(-0.04 - -0.03)	(0.01 - 0.04)	(-0.03 - -0.03)
age^2	-0.00***	-0.00***	-0.00***		-0.00**	
	(-0.00 - -0.00)	(-0.00 - -0.00)	(-0.00 - -0.00)		(-0.00 - -0.00)	
Log Completed years of education	0.30***	0.26***	-0.03		0.17***	
	(0.18 - 0.42)	(0.21 - 0.31)	(-0.17 - 0.11)		(0.11 - 0.24)	
indigenous	-0.10	-0.20***	-0.07		-0.18***	
	(-0.29 - 0.09)	(-0.27 - -0.13)	(-0.23 - 0.10)		(-0.25 - -0.12)	
SE level 4	0.16	0.24***	0.17		0.24***	
	(-0.10 - 0.42)	(0.16 - 0.31)	(-0.06 - 0.40)		(0.16 - 0.31)	
SE level 5	0.23**	0.27***	0.20**		0.27***	
	(0.04 - 0.42)	(0.19 - 0.34)	(0.02 - 0.39)		(0.21 - 0.34)	
SE level 6	0.45***	0.36***	0.38***		0.38***	
	(0.26 - 0.64)	(0.28 - 0.45)	(0.20 - 0.56)		(0.29 - 0.47)	
SE level 7	0.28	0.39***	0.30**		0.42***	
	(-0.07 - 0.63)	(0.28 - 0.51)	(0.06 - 0.55)		(0.30 - 0.54)	
SE level 8	0.42***	0.48***	0.41***		0.50***	
	(0.18 - 0.67)	(0.39 - 0.57)	(0.19 - 0.63)		(0.40 - 0.59)	
SE level 9	0.45***	0.62***	0.42***		0.72***	
	(0.12 - 0.78)	(0.37 - 0.87)	(0.16 - 0.68)		(0.46 - 0.99)	
SE level 10	1.17***	1.00***	1.12***		1.08***	
	(0.82 - 1.51)	(0.82 - 1.19)	(0.75 - 1.49)		(0.88 - 1.28)	
Have children	-3.20	0.40		0.09		0.22***
	(-9.60 - 3.21)	(-2.69 - 3.50)		(-0.03 - 0.21)		(0.12 - 0.31)

Have partner	1.85***	1.26***		-0.33***		0.30***
	(0.58 - 3.13)	(0.63 - 1.89)		(-0.51 - -0.16)		(0.16 - 0.44)
Schooling years				0.07***		0.04***
				(0.06 - 0.09)		(0.03 - 0.05)
Constant	0.00	0.00***	1.67	0.70***	2.29	0.97***
	(-0.00 - 0.01)	(0.00 - 0.00)	(-4.57 - 7.90)	(0.41 - 0.99)	(-0.61 - 5.19)	(0.69 - 1.25)
athrho			-1.51***		-1.08***	
			(-1.83 - -1.19)		(-1.30 - -0.86)	
lnsigma			0.16**		-0.25***	
			(0.03 - 0.29)		(-0.36 - -0.15)	
Observations	1,792	6,371	5,283	5,283	10,142	10,142
Robust ci in parentheses						
***** p<0.01, ** p<0.05, * p<0.1**						

Table 5. Returns on health & education capital measured by monthly wage: IV estimation

VARIABLES	[1] Women Heckman &IV lwage	[2] Work	[3] Men Heckman & IV lwage	[4] work
Predicted lheight	5.59***		6.27***	
	(1.70 - 9.48)		(4.66 - 7.88)	
Weight	0.00		0.00***	
	(-0.00 - 0.01)		(0.00 - 0.01)	
Age	0.06***	-0.03***	0.03***	-0.04***
	(0.03 - 0.08)	(-0.04 - -0.03)	(0.01 - 0.04)	(-0.04 - -0.03)
age^2	-0.00***		-0.00***	
	(-0.00 - -0.00)		(-0.00 - -0.00)	
Predicted log Completed years of education	0.37		0.71***	
	(-0.07 - 0.81)		(0.59 - 0.83)	
Indigenous	-0.15*		-0.12***	
	(-0.31 - 0.01)		(-0.19 - -0.05)	
SE level 4	-0.04		0.11***	
	(-0.24 - 0.17)		(0.03 - 0.18)	
SE level 5	0.25**		0.22***	
	(0.06 - 0.43)		(0.15 - 0.29)	
SE level 6	0.41***		0.33***	
	(0.20 - 0.61)		(0.24 - 0.41)	
SE level 7	0.27*		0.42***	
	(-0.04 - 0.58)		(0.29 - 0.55)	
SE level 8	0.49***		0.44***	
	(0.28 - 0.70)		(0.34 - 0.55)	
SE level 9	0.49***		0.48***	
	(0.23 - 0.76)		(0.32 - 0.64)	
SE level 10	1.04***		0.72***	
	(0.73 - 1.35)		(0.56 - 0.89)	
Have children		0.08		0.06
		(-0.03 - 0.18)		(-0.05 - 0.18)

Have partner		-0.38***		0.18**
		(-0.55 - -0.21)		(0.02 - 0.34)
Completed years of education		0.03***		-0.02***
		(0.02 - 0.04)		(-0.03 - -0.01)
Constant	-21.62**	0.89***	-25.96***	1.80***
	(-40.85 - -2.39)	(0.61 - 1.18)	(-34.11 - -17.81)	(1.45 - 2.14)
Athrho	-1.53***		0.10	
	(-1.85 - -1.22)		(-0.04 - 0.24)	
Lnsigma	0.32***		-0.44***	
	(0.19 - 0.46)		(-0.49 - -0.39)	
Observations	5,121	5121	9,981	9,981
Robust ci in parentheses				

Table 6. Returns on health & education capital measured by monthly wage: IV estimation excluding SE variable

VARIABLES	[1] Women Heckman &IV lwage	[2] Work	[3] Men Heckman & IV lwage	[4] work
Predicted lheight	7.85***		8.03***	
	(3.61 - 12.09)		(6.29 - 9.77)	
Weight	0.00		0.00***	
	(-0.00 - 0.01)		(0.00 - 0.01)	
Age	0.06***	-0.03***	0.02***	-0.04***
	(0.03 - 0.09)	(-0.04 - -0.03)	(0.01 - 0.04)	(-0.04 - -0.03)
age^2	-0.00***		-0.00***	
	(-0.00 - -0.00)		(-0.00 - -0.00)	
Predicted log Completed years of education	0.65***		0.96***	
	(0.19 - 1.12)		(0.84 - 1.08)	
Indigenous	-0.17**		-0.13***	
	(-0.34 - -0.01)		(-0.20 - -0.06)	
Have children		0.02		0.06
		(-0.08 - 0.13)		(-0.04 - 0.17)
Have partner		-0.40***		0.18**
		(-0.58 - -0.23)		(0.02 - 0.34)
Completed years of education		0.03***		-0.02***
		(0.02 - 0.04)		(-0.03 - -0.01)
Constant	-33.42***	0.96***	-35.33***	1.80***
	(-54.33 - -12.51)	(0.68 - 1.24)	(-44.10 - -26.55)	(1.48 - 2.12)
Athrho	-1.47***		0.15**	
	(-1.78 - -1.15)		(0.03 - 0.27)	
Lnsigma	0.33***		-0.41***	
	(0.20 - 0.47)		(-0.45 - -0.36)	
Observations	5,121	5,121	9,981	9,981
Robust ci in parentheses				

Table 7. Intergenerational education mobility as schooling elasticity, by sex and age range (>17 years, >24 years & >34 years, All, Males and Females)

VARIABLES	(1) > 17 A	(2) >24 A	(3) >34 A	(4) >17 M	(5) >24 M	(6) >34 M	(7) >17 F	(8) >24 F	(9) >34 F
Completed years of school by the head of HH	0.22***	0.29***	0.37***	0.22***	0.30***	0.48***	0.23***	0.29***	0.30***
	(0.19 - 0.26)	(0.25 - 0.34)	(0.29 - 0.45)	(0.17 - 0.27)	(0.22 - 0.37)	(0.37 - 0.59)	(0.19 - 0.27)	(0.24 - 0.35)	(0.20 - 0.41)
Sex (Male = 1)	0.51***	0.58***	0.57**	0.00	0.00	0.00	0.00	0.00	0.00
	(0.32 - 0.70)	(0.31 - 0.85)	(0.10 - 1.04)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)
Age	-0.00	-0.06***	-0.06***	0.01	-0.05**	-0.03	-0.02	-0.08***	-0.09***
	(-0.02 - 0.01)	(-0.08 - -0.04)	(-0.10 - -0.03)	(-0.02 - 0.03)	(-0.09 - -0.01)	(-0.10 - 0.03)	(-0.04 - 0.00)	(-0.10 - -0.05)	(-0.14 - -0.04)
Age of head of HH	0.02***	0.02**	0.02	0.01	0.01	0.01	0.03***	0.03**	0.02
	(0.01 - 0.03)	(0.00 - 0.04)	(-0.01 - 0.04)	(-0.00 - 0.03)	(-0.02 - 0.03)	(-0.03 - 0.05)	(0.01 - 0.05)	(0.01 - 0.05)	(-0.02 - 0.06)
Head of household is indigenous	-0.26**	-0.62***	-0.70**	-0.18	-0.52**	-0.82**	-0.36*	-0.72***	-0.54
	(-0.51 - -0.01)	(-1.00 - -0.25)	(-1.36 - -0.03)	(-0.47 - 0.12)	(-0.95 - -0.09)	(-1.62 - -0.01)	(-0.73 - 0.02)	(-1.25 - -0.18)	(-1.48 - 0.39)
SE level 4	0.41***	0.56***	0.25	0.34**	0.53**	0.09	0.47***	0.57***	0.44
	(0.19 - 0.63)	(0.23 - 0.88)	(-0.21 - 0.72)	(0.04 - 0.65)	(0.09 - 0.98)	(-0.55 - 0.72)	(0.18 - 0.77)	(0.19 - 0.95)	(-0.22 - 1.11)
SE level 5	0.67***	0.97***	0.75*	0.56***	0.90***	0.58	0.77***	1.02***	0.97
	(0.36 - 0.98)	(0.54 - 1.40)	(-0.04 - 1.54)	(0.15 - 0.98)	(0.32 - 1.48)	(-0.46 - 1.61)	(0.32 - 1.23)	(0.40 - 1.64)	(-0.21 - 2.16)
SE level 6	1.04***	1.67***	1.81***	0.71**	1.32***	0.93	1.39***	2.01***	2.46***
	(0.53 - 1.55)	(0.99 - 2.34)	(0.86 - 2.76)	(0.06 - 1.36)	(0.42 - 2.21)	(-0.40 - 2.27)	(0.69 - 2.10)	(1.10 - 2.93)	(1.20 - 3.73)
SE level 7	1.53***	2.09***	2.02***	1.27***	1.77***	1.13	1.80***	2.38***	2.79***
	(0.98 - 2.08)	(1.41 - 2.76)	(0.99 - 3.04)	(0.56 - 1.98)	(0.81 - 2.74)	(-0.33 - 2.60)	(0.91 - 2.69)	(1.39 - 3.38)	(1.35 - 4.23)
SE level 8	1.60***	2.56***	3.08***	1.00**	2.27***	2.94***	2.28***	2.82***	3.25***
	(1.00 - 2.19)	(1.79 - 3.33)	(2.01 - 4.14)	(0.16 - 1.84)	(1.12 - 3.41)	(1.35 - 4.54)	(1.38 - 3.18)	(1.79 - 3.86)	(1.74 - 4.76)
SE level 9	2.74***	3.77***	2.78***	2.23***	3.30***	2.03**	3.35***	4.26***	3.22***
	(1.72 - 3.76)	(2.82 - 4.71)	(1.16 - 4.40)	(1.02 - 3.43)	(2.15 - 4.45)	(0.11 - 3.95)	(2.06 - 4.64)	(2.96 - 5.55)	(0.91 - 5.53)
SE level 10	4.16***	4.45***	5.84***	2.81***	2.99***	2.34	6.11***	6.58***	9.47***
	(2.21 - 6.11)	(2.35 - 6.56)	(2.47 - 9.22)	(1.22 - 4.39)	(1.26 - 4.72)	(-2.31 - 7.00)	(2.98 - 9.23)	(2.85 - 10.31)	(7.12 - 11.82)
Constant	3.94***	5.62***	5.80***	4.72***	6.53***	5.39***	4.68***	6.47***	7.74***
	(3.20 - 4.68)	(4.53 - 6.72)	(4.00 - 7.61)	(3.82 - 5.62)	(4.94 - 8.11)	(2.75 - 8.04)	(3.81 - 5.54)	(5.27 - 7.66)	(5.51 - 9.96)

Observations	24,609	12,912	4,342	12,547	6,255	2,025	12,062	6,657	2,317
R-squared	0.06	0.12	0.17	0.05	0.11	0.19	0.07	0.13	0.16
ci in parentheses									
***** p<0.01, ** p<0.05, * p<0.1**									

2.6 Discussion

The analysis presented here is consistent with the initial hypothesis that health capital stock is significantly and positively correlated with productivity. The rate of return on health, measured by height, is higher among men than women in the estimation using IV, methodological approach which could be considered the most consistent. For both sexes, a 1% increase in height is associated with a 6% increase in wage (or more than 9% excluding the SE status variable). This rate is obtained after controlling for schooling years and socioeconomic status, so it is expected to reflect only the health component.

These estimations imply that in Mexico and similar countries (high middle income) investing in health is an adequate social policy, as health capital will contribute to socioeconomic mobility. One featured of this analysis is that it attempts to control for other potential sources of heterogeneity on wages that may hide the health effect. In particular, after controlling for family/social networks that may increase probability of higher wages, these results highlights that even in a society with an important level of inequality, increasing health capital have a potential to increase welfare. This result is reinforced by the existence of non-complete transmission of educational level.

Together these results provide evidence that in Mexico strategies aiming to increase health capital may promote socioeconomic mobility, which is expected to contribute to development. As suggested in the literature, there is an ongoing debate on the role of health capital on development.(Bleakley 2010) This analysis contributes linking both estimations of returns of health and mobility for Mexico.

The estimation approach was designed to take into account the potential bias that has been discussed in the literature regarding the determination of health to income causality, so the results are expected to represent an accurate estimation of the returns on health in Mexico.

Given that investments in health capital are related to available resources, these results indicate that individuals from the poorest households are facing conditions that will prevent them from socioeconomic mobility,

perpetuating poverty. However, it also indicates the important potential role of a social development intervention aiming to incentivise/facilitate investments in human capital in general, and health capital in particular.

Conditional cash transfer programmes may play an important role in modifying this pattern if they are able to increase investment in health capital, provided that health-related services are of sufficient quality to transform such investment into health capital.

The relatively small rate of return on education compared to other variables could result from schooling year being included as a continuous variable rather than a categorical one, as in previous studies. Other estimations have found a larger effect for completed levels (i.e., the effect of school years is not linear). However, this analysis is consistent in finding a significant and positive rate of return on education: on average, more educated individuals (both women and men) receive higher wages in the labour market.

The estimated coefficient of correlation for parent/children schooling is larger than in other studies for Latin-American countries, but it is consistent in the sense that reflects decreasing immobility by age cohort. (Nuñez and Miranda 2011) While using earning instead of schooling years, previous studies have reported consistent results for developed countries. (Solon 1999)Although it seems that there is more room for mobility among younger cohorts, parental education still significantly affects individual schooling in a portion of the sample.

Although the absolute value of the coefficient of head of household education may seem relatively small, it is positive and significant after controlling for other factors that could affect schooling and that are also related to the contextual conditions of individuals. There are additional variables related to household wealth that are also related to educational attainment. In particular, it is clear that the lower the socioeconomic status, the lower the educational attainment of the individual. In addition, having a household self-identified as indigenous is related to lower educational attainment. Both SE level and indigenous ethnicity are barriers to mobility.

These results support the argument that for Mexico, as for other developing countries, there are strong reasons to increase investments in health during childhood and adolescence among those individuals living in poverty. Health capital promotes positive socioeconomic mobility, as it contributes to higher incomes both on its own and through increasing school performance.

There are, however, some limitations to this analysis. The most important limitation is that data on height were not gathered for all adults, but only a subset of the sample. This omission could affect the representativeness of the sample. Nevertheless, at least for observable factors, there are no major differences in the characteristics of included adults. Unreported findings from selection models defined by the probability of selection display similar results. In terms of the econometrics, the approach to the rate of return is based on the ability of the Heckman approach to address omitted variables; the included variables at the first stage of the estimation incorporate the relevant variables to predict an individual's decision to work. The estimation performed in this chapter follows the approach typically found in the literature and may therefore reflect the best feasible approach.

Human capital in general and health capital in particular play an important role in economic development. A society is as strong as the most vulnerable in its population, so investing in human capital is a necessary condition for progress.

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2.8 Annex

Table 8: Models without health capital variable

VARIABLES	[1] Women Heckman & IV lwage	[2] Work	[3] Men Heckman & IV lwage	[4] work
Predicted lheight				
weight				
age	0.06*** (0.04 - 0.08)	-0.03*** (-0.04 - -0.03)	0.03*** (0.02 - 0.04)	-0.04*** (-0.04 - -0.03)
age^2	-0.00*** (-0.00 - -0.00)		-0.00*** (-0.00 - -0.00)	
Predicted log Completed years of education	0.70*** (0.40 - 0.99)		0.84*** (0.74 - 0.94)	
indigenous	-0.25*** (-0.38 - -0.11)		-0.17*** (-0.22 - -0.12)	
SE level 4	0.11 (-0.03 - 0.25)		0.10*** (0.06 - 0.14)	
SE level 5	0.33*** (0.20 - 0.46)		0.33*** (0.28 - 0.39)	
SE level 6	0.56*** (0.40 - 0.72)		0.36*** (0.30 - 0.41)	
SE level 7	0.42*** (0.20 - 0.65)		0.42*** (0.35 - 0.48)	
SE level 8	0.55*** (0.35 - 0.74)		0.63*** (0.56 - 0.70)	
SE level 9	0.74*** (0.56 - 0.93)		0.63*** (0.54 - 0.71)	
SE level 10	0.06*** (0.04 - 0.08)		0.95*** (0.83 - 1.08)	

Have children		0.04		0.04
		(-0.05 - 0.12)		(-0.04 - 0.12)
Have partner		-0.29***		0.19***
		(-0.40 - -0.18)		(0.09 - 0.30)
Completed years of education		0.03***		-0.01**
		(0.02 - 0.04)		(-0.02 - -0.00)
Constant	5.82***	1.12***	5.95***	2.10***
	(5.13 - 6.51)	(0.90 - 1.35)	(5.72 - 6.18)	(1.88 - 2.32)
athrho	-1.48***		0.06	
	(-1.67 - -1.29)		(-0.06 - 0.18)	
lnsigma	0.30***		-0.37***	
	(0.20 - 0.40)		(-0.40 - -0.34)	
Observations	8,521	8,521	29,431	29,431
Robust ci in parentheses				

Table 9a-First-state regression for the IV approach (height)

VARIABLES	(1) Lheight Women	(2) Lheight Men
Marginalisation index	-0.01***	-0.01***
	(-0.02 - -0.01)	(-0.01 - -0.01)
Locality size = urban	-0.01*	-0.01***
	(-0.01 - 0.00)	(-0.01 - -0.00)
Locality size = metropoli	-0.01*	-0.01***
	(-0.01 - 0.00)	(-0.01 - -0.00)
State = 2	0.01	0.00
	(-0.01 - 0.03)	(-0.01 - 0.01)
State = 3	0.03***	0.01*
	(0.01 - 0.05)	(-0.00 - 0.02)
State = 4	-0.03***	-0.04***
	(-0.05 - -0.02)	(-0.05 - -0.03)
State =5	-0.00	0.00
	(-0.02 - 0.01)	(-0.01 - 0.01)
State=6	0.00	-0.00
	(-0.01 - 0.02)	(-0.01 - 0.01)
State=7	-0.01	-0.02***
	(-0.03 - 0.01)	(-0.03 - -0.01)
State=8	0.01	0.01
	(-0.01 - 0.03)	(-0.00 - 0.01)
State=9	-0.01	-0.01**
	(-0.03 - 0.01)	(-0.02 - -0.00)
State=10	0.00	0.01*
	(-0.01 - 0.02)	(-0.00 - 0.02)
State=11	-0.00	-0.01
	(-0.01 - 0.01)	(-0.01 - 0.00)
State=12	-0.01	-0.02***
	(-0.03 - 0.01)	(-0.03 - -0.01)
State=13	-0.01	-0.02***
	(-0.03 - 0.00)	(-0.03 - -0.01)
State=14	0.00	-0.00
	(-0.01 - 0.02)	(-0.01 - 0.01)
State=15	-0.01*	-0.01***
	(-0.03 - 0.00)	(-0.02 - -0.00)
State=16	-0.01	-0.00
	(-0.02 - 0.01)	(-0.01 - 0.00)
State=17	-0.02**	-0.02***
	(-0.03 - -0.00)	(-0.03 - -0.01)
State=18	0.01	-0.00
	(-0.01 - 0.02)	(-0.01 - 0.01)
State=19	0.00	0.00
	(-0.01 - 0.02)	(-0.01 - 0.01)
State=20	-0.02**	-0.03***
	(-0.03 - -0.00)	(-0.04 - -0.02)
State=21	-0.02**	-0.02***

	(-0.04 - -0.00)	(-0.03 - -0.01)
State=22	-0.01	-0.01**
	(-0.02 - 0.01)	(-0.02 - -0.00)
State=23	-0.02*	-0.03***
	(-0.04 - 0.00)	(-0.04 - -0.02)
State=24	-0.01	-0.01**
	(-0.03 - 0.01)	(-0.02 - -0.00)
State=25	0.01	0.01**
	(-0.01 - 0.02)	(0.00 - 0.02)
State=26	0.01	0.01***
	(-0.00 - 0.03)	(0.00 - 0.02)
State=27	-0.02**	-0.02***
	(-0.04 - -0.00)	(-0.03 - -0.01)
State=28	0.00	-0.00
	(-0.02 - 0.02)	(-0.01 - 0.01)
State=29	-0.02**	-0.02***
	(-0.03 - -0.00)	(-0.03 - -0.01)
State=30	-0.01	-0.02***
	(-0.02 - 0.01)	(-0.03 - -0.01)
State=31	-0.05***	-0.05***
	(-0.07 - -0.03)	(-0.06 - -0.04)
State=32	-0.00	-0.00
	(-0.02 - 0.01)	(-0.01 - 0.01)
Constant	5.01***	5.10***
	(5.00 - 5.02)	(5.10 - 5.11)
Observations	5,009	10,603
R-squared	0.11	0.13
ci in parentheses		
***** p<0.01, ** p<0.05, * p<0.1**		

Table 10b-First-state regression for the IV approach (schooling years)

VARIABLES	(1) Lheight Women	(2) Lheight Men
Locality size = urban	0.10*	0.23***
	(-0.00 - 0.21)	(0.16 - 0.30)
Locality size = metropoli	0.38***	0.45***
	(0.25 - 0.50)	(0.37 - 0.52)
Ln number of schools	0.01	0.01
	(-0.01 - 0.04)	(-0.01 - 0.02)
Ln average score	0.41	0.54***
	(-0.16 - 0.97)	(0.17 - 0.90)
Multigrade	-0.01	0.02
	(-0.08 - 0.05)	(-0.02 - 0.06)
Constant	-1.14	-1.94*
	(-4.60 - 2.32)	(-4.20 - 0.32)
Observations	3,675	9,409
R-squared	0.08	0.11
ci in parentheses		
***** p<0.01, ** p<0.05, * p<0.1**		

Chapter 3. Youth risk behaviours as barriers for human (health) capital accumulation

Juan Pablo Gutiérrez

3.1. Abstract

One key element for development is the accumulation of appropriate levels of human capital, of which health capital is an essential component. Social programmes seeking to increase human capital, such as CCT programmes, aim to incentivise investments in health, nutrition and education, assuming that such investments will translate into a larger stock of human capital that will then promote social mobility. Although there has been some discussion on the barriers and constraints that hinder the effective translation of human capital into higher income (and social mobility), less attention has been paid to factors that may counterbalance investments in human capital. Risk behaviours (i.e., behaviours that place current and future health at risk) may reduce the flow and accumulation of human capital. As engagement in these behaviours is assumed to be related to access to goods and services, it may be the case that CCT programmes could promote risk behaviours, as they relax the budgetary constraints on households and individuals. Analysing data from the Mexican CCT programme Oportunidades, I found that this programme may decrease participation in risk behaviours, although they are highly prevalent among its target population (poor households). Therefore, it is important to address them directly in order to preserve investment in human capital.

Keywords: health capital, risk behaviours, adolescence, youth, Mexico

JEL Classification: I15, I25, I38

3.2. Introduction

In a sense, development implies the positive socioeconomic mobility of individuals, especially those from severely resource-constrained households. Strategies for social development target individuals who are at risk of reaching adulthood with an inadequate stock of human (health) capital, which limits their ability to choose a livelihood that is assumed to represent positive mobility.

Programmes such as the Mexican Oportunidades provide an opportunity to study the effects of development on both human (health) capital accumulation and socioeconomic mobility. Using cash transfers is conditional on utilising health and education services that are assumed to increase human capital, Oportunidades aims to interrupt the

intergenerational transmission of poverty. However, additional resources also increase access to goods that are related to unhealthy behaviours. An increase in these types of behaviours, referred to hereafter as risk behaviours, could represent a barrier to health capital accumulation, as participating in risk behaviours represents a negative accumulation of this capital.

Risk behaviours occur throughout life, but they are particularly prevalent during adolescence and early youth[xiii]. The risk behaviours of youth and adolescents reduce the potential benefits of interventions aimed to increase their skills and capabilities, and, in this sense, they counterbalance the incentives of CCT programmes such as *Oportunidades*.

Analysing the net effect of Oportunidades on the risk behaviours of adolescents and youths could provide insight into the potential of the programme to increase human (health) capital and promote socioeconomic mobility. As this could affect further development (human capital accumulation), it is essential to understand how to prevent such behaviours if socioeconomic mobility is desired.

To accumulate an adequate level of human (health) capital, risk behaviours should be avoided or limited. This chapter first discusses the literature on risk behaviours and their links with development. It highlights the importance of preventing adolescents and youth risk behaviours from the perspective of development, as risk behaviours may decrease health capital, compromise development, and result in the perpetuation of poverty. From this perspective, using the data from a CCT programme, a discussion on the potential impact of risk behaviour on structural interventions is presented. If structural interventions have the potential to prevent risk behaviours, they may actually promote human development.

The approach used in this chapter benefits from data collected from evaluations of the Mexican Oportunidades, a CCT programme. Within the Oportunidades evaluations, data on risk behaviours were collected in two different years, 2003 and 2007. To identify a counterfactual, two different approaches are used. Using the 2003 data, results from a matching approach based on propensity score matching, a quasi-experimental design, are reported. Using the 2007 data, a dose-response approach is implemented in which the differences in risk behaviours between individuals with different exposures to the program (the dose) are estimated as proxy measures of the program's capacity to modify behaviours.

[xiii] Without entering into the debates on how to define specific life periods, following standard definitions, in this document, adolescence represents individuals from 10 to 19 years of age, whereas youth is used for individuals from 15 to 24 years of age. These definitions are used by the United Nations system; see, for example, http://go.worldbank.org/2ESS9SO270 & http://www.who.int/topics/adolescent_health/en/

The main limitation of this approach is that while it could generate a comparison group that is close to the intervention group in terms of observable characteristics, because of the non-random assignment, it is not possible to assume that there is also a balance in non-observable characteristics.

The dose response analysis assumes that for individuals in Oportunidades, the time of exposure approximates the additive effect of the programme, recognising that in the absence of a counterfactual, the differences in outcomes by dose cannot be clearly attributed to the programme, although they suggest that the program has an effect.

For this analyses, I will use as risk behaviours a set of variables in 3 categories: sexual risk behaviours, substances abuse, and others. The first category, sexual behaviours, is relevant as consequences from those are seem to directly affect future wellbeing: early pregnancy is one of the most important factor for school drop-off. Indicators include also sexually transmitted infections.

Substances abuse includes tobacco, alcohol, and drugs. Alcohol and drugs are related to both immediate consequences (accidendents and violence) as well as medium term consequences in the form of mental and physical disability. Tobacco is one of the most important factors for medium and long term disability, related to the main cause of death in the adulthood.

3.3. Background

The largest 10-year age group of individuals in the world is composed of youth between 15 and 24 years of age (WB 2005). Considering their role in generational replacement, the health of adolescents is a key factor in development. During adolescence, important behaviour patterns are established, and these patterns can have serious and long-term consequences on lifetime health and welfare. Although this is an age group that is relatively healthy, having already passed the critical stage of infant mortality and morbidity and having yet to confront the health problems that afflict adults, they contribute a disproportionate percentage of health conditions that are a consequence of behaviours that compromise both their present and future wellbeing (i.e., risk behaviours) (World-Bank 2007). Among those behaviours are unsafe sexual relationships, violent behaviour, drug and alcohol abuse[xiv], consumption of fatty foods, smoking cigarettes, and limited physical activity. The core of health-related problems in adolescents lies in the consequences of these unhealthy behaviours.

[xiv] And the consequences of it, such as motor vehicle accidents.

The study of adolescent health requires investigating factors that generate incentives for participation in risk behaviours, particularly those where a public intervention is feasible. The World Development Report 2007: Development and the Next Generation (WDR 2007) was devoted to adolescents and youths in the developing world and concluded that the world has an unprecedented opportunity to accelerate development and reduce poverty through investing in the human capital of youth and adolescent populations. (World_Bank 2007)

Development depends on increasing the stock of human capital in general and health capital in particular. As mentioned above, the accumulation of human capital during childhood and adolescence could be jeopardised by risk behaviours. The consequences of risk behaviours include dropping out of school, early pregnancy, life-threatening situations such as accidents (related to substance abuse) or group violence, and mental illness (also related to substance abuse).

Previous analyses have shown that decisions made during adolescence are a determining factor in the future behaviour of an individual; it is at this stage in the transition from childhood to adulthood where life-long patterns of behaviour are established (Nurmi 1991; CGCED 2003). Once the risk behaviour has been adopted at this stage, it is more likely to continue throughout adult life. For example, when alcohol and tobacco consumption begins in adolescence, they affect adult consumption of these products (Gruber 2001). The correlation between condom use at the first sexual encounter and subsequent use throughout sexual life has also been documented.(Shafii, Stovel et al. 2007)

As countries develop and poverty rates fall, either because of economic growth or explicit poverty alleviation programs, adolescents and youths living in poor households may obtain more opportunities to engage in these risky behaviours, or they may learn to avoid risks through improved and expanded education and supportive social norms. Although existing research has demonstrated a strong correlation between poverty and risk behaviour, few studies have been able to identify the causal relationship between economic or social disadvantage and increased risk behaviour, nor have they been able to show the impact of a large-scale human capital accumulation program on adolescent behaviours. To develop appropriate policy responses, it is essential to understand what happens to the risk behaviour of adolescents as countries develop. (Cawley and Ruhm 2011)

In line with the World Bank's argument, an investment in the human capital of adolescents and youth is justified by evidence showing that interventions in these age groups generate social returns through better health, higher productivity, a reduction in poverty, and benefits to society in general (Knowles and Behrman 2003; Knowles and Behrman 2005).

The factors that contribute to the appearance of risk behaviours in youth operate at three levels: individuals, micro-environments, and macro-environments. At the individual level, negative predispositions exist, including low self-esteem, anger, ambivalence, and uncertainty; all of these increase the likelihood that adolescents and youths will participate in risk behaviour. These emotions can be learned or have biological roots, and they are influenced by the environment. The micro-environment represents the context closest to the individual, and its potential effects have a direct relation to the structures and dynamics of the family, the values and influences to which the individual is exposed, the community in which the individual interacts, and the individual's physical environment. The macro-environment is the youth's broader context. It is affected by the mass media, the national economy, levels of poverty and inequality, public institutions, history and culture, and social norms. Micro-environmental factors differ from macro-environmental factors in that the influences of the former are specific to each individual, emerging at an intimate and personal level, whereas the latter are shared by all youths in a community (CGCED 2003).

In Latin American countries, as in most developing countries, young people are the most inclined to experiment with risk behaviours, and they also have a higher probability of being poor. Synergistically, poverty functions as one of the factors that increase the probability of a young individual engaging in risk behaviours (Resnick, Harris et al. 1993; Gutierrez, Bertozzi et al. 2006), and it does so in both direct and indirect manners. Directly, poverty diminishes (or affects) expectations for the future and, in this sense, makes the immediate pleasure or benefit associated with risk behaviours more valuable than the future benefits of avoiding such behaviour (including the future costs of the current behaviours). Indirectly, the association between the consumption of certain goods (including, for example, addictive substances) and higher SE status makes their consumption more desirable for adolescents with limited resources. That is, relative poverty (i.e., how poor an individual perceives her/himself compared to others) may promote the consumption of goods that are associated with higher socioeconomic status. Ineffective laws, weak or non-existent institutions or the inadequate operation of assistance programs for vulnerable groups tend to aggravate the link between poverty to risk behaviours (Joseph 1979; Resnick, Harris et al. 1993; Martens 2004).

Socioeconomic inequality can create environments in which participation in risky practices or behaviours provides individuals in socially excluded groups with immediate and accessible satisfaction. Such satisfaction is even more valued if the behaviours are perceived as belonging to a higher socioeconomic status (i.e., that allow the feeling of access to a different socioeconomic environment).

The socioeconomic context in which the children are raised thus places limits on their access to goods linked to risk behaviours (e.g., addictive substances), as they are constrained by the resources available, but it also impacts the status or desirability of these behaviours, and the consumption of these substances may be perceived as a prerequisite to participation in a specific social environment.

3.4. How do risk behaviours affect development?

There are three primary links between risk behaviours and human development. First, neurodevelopment may be affected by smoking, alcohol drinking and drug use. As adolescence is a period of high vulnerability to addiction, the consumption of addictive substances involves a higher risk of developing addiction, and these products are also related to neurological damage that limits development. (Chambers, Taylor et al. 2003) Second, risk behaviours increase the likelihood of both early pregnancy and sexually transmitted infections. For simplification, if completed years of education is a good proxy measure of human capital accumulation in general[xv], early pregnancy is a leading cause of dropping out of school (for both women and men), which translates into a permanently lower expected income (World_Bank 2007). Finally, there are long-term consequences of smoking, as smoking-related diseases are among the leading causes of death in the world.

Although primary school attendance is almost universal in Mexico, as in several developing countries, there is limited progression to the secondary level. According to the WDR 2007, the high rates of participation in primary school in developing countries are not sustained through secondary education, and the rate of enrolment in school declines with age. In addition, those who attend school are not learning at the desired level, as many of those who complete primary or secondary school have neither the ability to read fluently nor the necessary skills to face the challenges of daily life (World_Bank 2007).

3.4.1. Sexual risk behaviours

Although school quality certainly plays an important role in these educational issues, engagement in risk behaviours also decreases school enrolment and progression. According to the World Health Organization (WHO 2002), 13 million adolescent mothers give birth each year (that is, 1 in 10 of all births), and 90% live in developing countries. It is also estimated that 70,000 women between 15 and 19 years of age die due to pregnancy and childbirth

[xv] This does not include other elements of human capital that may not be related to education and may be better measured with a health capital indicator, such as general skills and physical capacity. Although these elements are also relevant to development, it could be argued that they are also somewhat related to human capital, so a factor affecting one measure it may be expected to also affect other forms of human capital

complications each year and that more than 1 million children of adolescent mothers die before their first birthday (Children 2004).

Adolescent pregnancy is a social phenomenon that facilitates the perpetuation of poverty, creating immediate challenges and compromising future opportunities. Adolescent pregnancy is related to several factors, including low levels of education in the mother and her parents, the mother coming from a dysfunctional family, and reduced income opportunities (Hoffman, Foster et al. 1993; Guijarro, Naranjo et al. 1999). Some studies have shown that adolescent pregnancy leads to issues such as reduced education and income for the mother and her children, malnutrition in children, larger families, the break-up of families, and a higher probability of receiving government assistance (Dillard and Pol 1982; Geronimus and Korenman 1993; Grogger and Bronars 1993; Hoffman, Foster et al. 1993; Buvinic 1998; Assuncao and Carvalho 2005). Assunçao and Carvalho (2005) estimated that the future income of an adolescent mother in Brazil is 38% lower than the permanent income of an adult woman who gave birth to a child born alive. Similarly, the children of single mothers had salaries 6% lower than the control group (controlled for race, age, and gender). Buvinic (1998) indicated that 26% of adolescent mothers in Mexico live in poverty compared to only 4% of adult mothers. This author also found that adolescent mothers had a higher probability of having daughters who become pregnant in their adolescence.

Early sexual initiation and unprotected sex are the risk behaviours directly related to adolescent pregnancy. However, these two risk behaviours also increase the likelihood of sexually transmitted infections (STIs), including HIV. Data from studies among adolescents and youths have shown a high prevalence of STIs, indicating that those who are sexually active are not using condoms consistently. Evidence from Mexico shows that the prevalence of herpes simplex 2 among adolescents is up to 60%. (Gutierrez, Conde-Gonzalez et al. 2007) Data from adolescents and youth in poor households in Mexico also showed a high prevalence of STIs, which were related to other risk behaviours. (Gutierrez, Bertozzi et al. 2006)

3.4.2. Alcohol and drug consumption

The simultaneous engagement in several risk behaviours has been widely discussed. The consumption of alcohol and drugs that cause disinhibition has been related to sexual risk behaviours. (Kingree, Braithwaite et al. 2000; Kingree and Betz 2003) In addition, this relationship is particularly prevalent in low-income populations. (Singh, Schensul et al. 2010)

Alcohol consumption during adolescence strongly influences the levels of alcohol consumed as an adult and the long-term consequences that result from alcohol abuse. (York

1999) Other studies have shown evidence that alcohol consumption among adolescents has negative effects on health and leads to poorer performance in school. Furthermore, it places the individual's participation in the labour market and their labour productivity at risk (Jones, Casswell et al. 1995; Aseltine and Gore 2000; Rehm, Monga et al. 2005). In Mexico, the consumption of alcohol contributes to the presence of behavioural problems, antisocial conduct, and the break-up of families (Rojas-Guiot, Fleiz-Bautista et al. 1999).

Evidence suggests that exposure to drugs such as marijuana may affect brain development. (Gruber, Sagar et al. 2011) In this sense, these drugs affect both the probability of school success and the development of key skills, as adolescence is an important phase in brain development when characteristics such as talents, reasoning and complex behaviours are established. (Crews, He et al. 2007)

3.4.3. Smoking

Although there are short-term consequences of smoking, such as tooth discoloration and reduced lung capacity, the more worrying consequences are long term, where smoking could lead to several health problems. In fact, smoking-related diseases are among the leading causes of death in the world, causing approximately 6 million deaths each year worldwide.[xvi]

3.4.4. Overeating

Likewise, the observed increase in the number of persons who were overweight or obese could be explained by potential modifications in the individual and family diet as a result of additional resources, together with changes in patterns of physical activity that could be related to longer stays in school (by definition, there is no physical activity during classroom hours). Overweight and obesity have been related to lower school performance, and they also predispose individuals to the development of problems linked to metabolic syndrome in adulthood.

3.5. Analysing development and risk behaviours

To study the role of development in risk behaviours and the consequences of these behaviours, I take advantage of surveys on Oportunidades, a conditional cash transfer programme in Mexico that aims to interrupt the intergenerational transmission of poverty. In this chapter, I analyse both the effect of a human capital accumulation programme on risk behaviours and how these behaviours could affect educational attainment and labour force incorporation.

[xvi] WHO, report on the global tobacco epidemic, 2011: Warning about the dangers of tobacco. http://www.who.int/tobacco/global_report/2011/en/ Accessed on March 23, 2012

The analysis in the present study aims to estimate the net effect of Oportunidades on adolescent risk behaviour; that is, the sum of income, health knowledge and time discount rate effects. This approach was used because there is no variation in how the programme is delivered that could be used to estimate the differential effects of its components. As previously mentioned, this analysis is implemented using two different approaches: a quasi-experimental design with propensity score matching and a dose-response analysis with the years in the programme as a measure of dosage. The analysis was designed to determine how the programme affects risk behaviours. Theoretically, the effects of the programme could be positive or negative: on the one hand, increasing household resources increases purchasing power, making goods related to risk behaviours more accessible; on the other hand, increasing knowledge and modifying future outlook could reduce participation in risk behaviours.

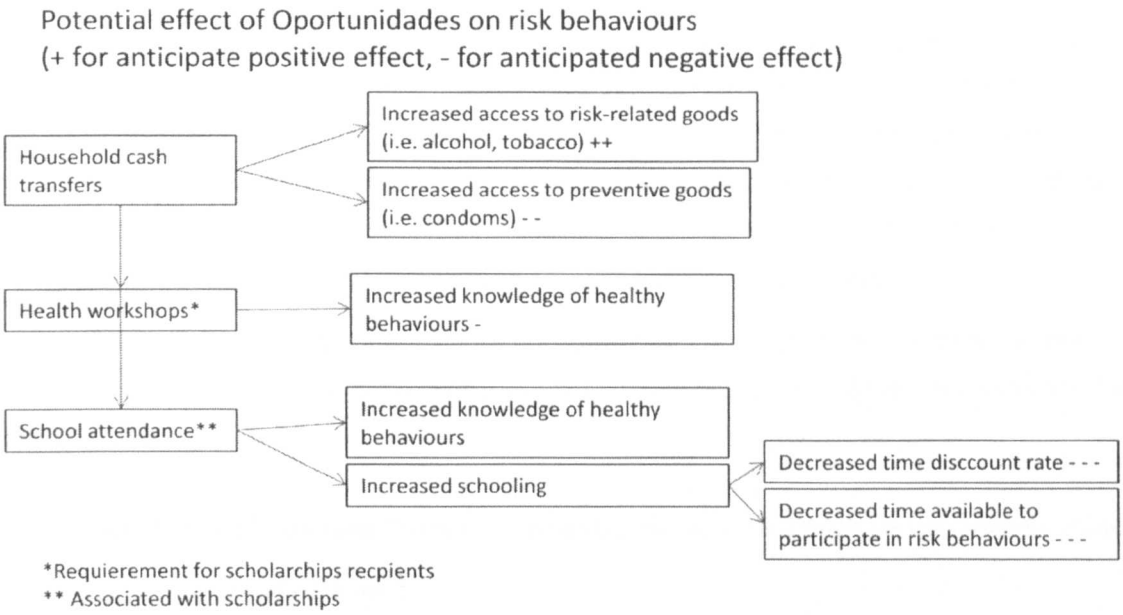
The data used for the analysis, gathered for programme evaluation purposes, highlight the fact that risk behaviours are highly prevalent among adolescents and youths in rural Mexico. The analysis of the effect of Oportunidades on risk behaviours presents evidence that the programme reduces several risk behaviours among adolescents and youths between 10-21 years of age. Based on the quasi-experimental analysis, the evidence is stronger for the consumption of tobacco and alcohol and slightly weaker for sexual risk behaviours (e.g., age at sexual initiation, sexual relations without protection); in contrast, based on the dose-response analysis, the correlations are stronger for sexual risk behaviours.

In the next section, I will discuss how Oportunidades could affect risk behaviour and propose a theoretical framework for this analysis. In the third section, I describe the data and methods. I report the results in section 4, and I discuss the implications of the results in section 5.

3.6. How Oportunidades could affect risk behaviours

Oportunidades could affect risk behaviours in two different ways, one *direct* and the other *indirect*. These potential effects, described below, are summarized in the Figure 5.

Figure 5. Potencial paths to the effect of Oportunidades on risk behaviuor



Directly, the programme encourages retention in school and require adolescents and youths to participate in health education workshops related to the risks of unprotected sex and the consumption of addictive substances. These workshops aim to promote healthy behaviours and are targeted at beneficiaries attending high school (Coordinación-Nacional-del-Programa-de-Desarrollo-Humano-Oportunidades 2008). These workshops are targeted to those receiving scholarships, so are only for in-school adolescents and youths. The 8 compulsory topics for the workshops are adolescence and sexuality, family planning, addictions, accidents, sexually transmitted infections, HIV, gender and health, and intra-family violence. These workshops are delivered at the schools, and are complementary to the standard content on health education in the schools, and are programmed during each school year.

Because there is little evidence of the ability of this type of workshop to change behaviours, it is not clear whether this strategy has any real impact on risk behaviours. However, school attendance can have a positive effect on behaviour modification, even if it is only by limiting the time available to participate in harmful behaviours. Nevertheless, it is also possible that the influence of peers could be higher within the school environment, although peers who are more likely to participate in risk behaviours are less likely to continue in school, which would limit the possibility of exposure.

Indirectly, a potential effect of the programme may be a change in the individuals' inter-temporal discount rate. The literature has reported that in conditions of social exclusion

and in which the future is highly uncertain, individuals have a marked preference for the present, which reduces their ability to attribute value to the future costs of their present behaviour. In other words, the future costs of their behaviours have a very low value when compared to the immediate benefits gained from participating in risk behaviours (Pennings and Garcia 2005; Das 2007; Cardenas and Carpenter 2008). Through education and investment in the communities covered, the programme could modify the perception of the future and reduce the inter-temporal discount rate, such that future negative impacts are assigned a higher value than the immediate benefits of the risk behaviour.

The balance among these factors will determine the programme net effect on risk behaviours. It is expected that the negative effect (decreasing risk behaviours) dominate the positive effect.

3.6.1. Previous analyses on Oportunidades and risk behaviours: what this analysis add

While in the original evaluation questions regarding Oportunidades its potential effect on risk behaviours was not explicitly stated, because of the potential to affect accumulation of human capital the issue was introduced in the evaluation agenda. In the report produced for the Program by a team I coordinated, results suggested a preventive effect of the program among adolescents in rural (mid-term) and urban (short-term) settings. Those results reported a significative effect regarding alcohol & tobacco consumption but less evidence regarding sexual behaviours. A key result from those analyses was the relative high prevalence of risk behaviours among this population. In that document, the reliance of analyzing this population was stated. (Gutierrez, Gertler et al. 2005)

In terms of the 2007 data, a report I produced for Oportunidades focused on the potential consequences of risk behaviours on the wellbeing of adolescents concluded that a the programme seemed to have a effect on preventing some risk behaviours using a similar approach to the reported in this document. Also, results from that analysis suggested that risk behaviours reported in 2003 affected some outcomes in 2007, but evidence was still limited.(Gutierrez 2008)

Other analysis focused on risk behaviours related to Oportunidades supported the hypothesis that increasing income by the transfers could lead to higher risk behaviours, in particular tobacco consumption. (Reddy-Jacobs, Tellez-Rojo et al. 2006)

The analysis implemented in this document use a new approach to the mid-term analysis (Encel 2003 data), looking at the effect using as intervention group a single set of localities that included those incorporated in 1998 and those incorporated in 2000 (previous analysis was implemented with the 2 intervention groups separated) and refining the matching using update information on households participation in the program. In addition, other alternatives for the matching are implemented, in particular looking at the potential effect in 2007 of the different doses (comparing adolescents in households incorporated between 1998 and 2000 with those in households that were incorporated from 2003), and using as a comparison group adolescents in households that were not in the programme by 2007. In this document, also the 2007 data is used, with an alternative specification for the models reported in the previous report for the programme that is, including fixed and random effect models, including a peer-effect indicator, and refining the data using updated datasets, in particular using the data from a follow-up implemented in 2008 to interview migrant youths, that is, individuals that were not found in their households in the Encel 2007, and were tracked down to other states in Mexico, and even some to the USA to collect their information. An additional feature of the analysis in this document is combining both analyses (2003 & 2007) to discuss them using a framework on how a structural intervention such as Oportunidades could affect risk behaviours. .

3.6.2. Human (health) capital and risk behaviours

From an individual perspective, human capital accumulation could be viewed as a continuous process from birth to early youth; that is, starting with early development and continuing until the end of school age. It could be argued that to generate socioeconomic mobility, an individual has an education threshold he/she needs to achieve such that his/her expected permanent income is higher than his/her parental household.

The first phase in human (health) capital accumulation is primarily affected by parental behaviour and household resources, as child development is linked to nutrition and health during the first 2 or 5 years of life and to early childhood stimulation. Although these years are all highly relevant, the primary influences during this time are exogenous. Although they are still highly influenced by family

context, during adolescence, individuals begin a decision-making process that will influence their current and future wellbeing.

There is a growing literature on adolescent risk behaviours that focuses on two issues: the greater response to external influences (peers, mass media, etc) and a high discount rate, a phenomenon called temporal myopia that refers to the low value that adolescents assign to future years of life.(Furby, Ochs et al. 1997) There is also discussion on the existence of a risk behaviour participation threshold. If such a threshold exists, once it is crossed, the probability of additional risk behaviours increases. In other words, some risks, such as exposure to sexually transmitted infection, could be viewed as less costly after an initial exposure (as it decreases the probability of non-infection), which increases the probability of an additional exposure. There is also an addictive component to these behaviours; that is, the short-term utility gains are not sufficiently counterbalanced by the medium- or long-term consequences. As proposed by Becker, the current consumption levels of addictive goods are related to the effect of past consumption, in the sense that previous utility is influencing current consumption.(Becker and Murphy 1988; Gruber 2000)

The presence of non-monetary costs and benefits also influences the adolescent decision process. In addition, lack of information could make the costs and benefits of a given behaviour less evident, so decisions that are based on available information seem to maximise welfare because the health risks are not apparent.

The basic assumption in the analysis is that an adequate or minimum level of human (health) capital is a necessary condition for socioeconomic mobility. There are other constraints or factors that could affect reaching this given level of capital (for instance, quality of health services, which is analysed in another chapter), but for this analysis, we will focus on risk behaviours.

In this sense, the basic assumption for this analysis is that risk behaviours decrease both health capital accumulation and health capital stock. That is, engagement in risk behaviours decreases accumulation, and from certain threshold it consume health capital.

3.6.3. Basic framework on how risk behaviours affects health capital and how structural interventions such as Oportunidades could prevent this

As mentioned above, engagement in risk behaviours is assume to have a negative effect on health capital, both decreasing the accumulation and consuming it. From Grossman's model where health is a determinant of the inter-temporal utility:

$U = U(\phi_t H_t, Z_t), t = 0, 1, ..., n$ .....(1)

where H_t is the stock of health at age t, ϕ_t is the service flow per unit stock, and Z_t is the consumption of other commodities. Engagment on risk behaviours represents a de-investment in health, by affecting current and future health.

Following from Grossman, if the net investment (I) in the stock of health (H) is

$H_{(t+1)}-H_t = I_t - \delta H_t$ .....(2)

where δ is the depreciation rate. The proposition is that risk behaviours increase depreciation rate by consuming health, so increasing the magnitude of the negative value on the right hand side of equation 2, and also reduce investments (decreasing the magnitude of the positive value on the right hand side of equation 2) as proposed:

$I_t=I_t(H_t,r_t, \phi Ht, \phi r_t);E),$ .....(3)

where r represent risk behaviours; if investments are a function of stocks and flows, then r_t and ϕr_t are de-investments. This effect of risk behaviours in health capital implies that they also affect inter-temporal utility.

The assumption is that risk behaviours would have negative marginal returns, which would also affect the utility gains from all other goods (that is, a high accumulation of units of risk behaviours decreases the utility of a unit of other goods). This implies that the consequences of risk behaviours generate disutility; for example, while until certain level drug use could generate utility (the pleasure associate with the chemical components), an overdose would generate a highly unpleasant reaction, and even death. In this case, we assume that the consumption of r is a function of its price, past consumption of r, health knowledge, time preferences, and income:

$r_t=f(p_r,r_{t-1},k_t, \rho,Y),$ .....(4)

where p_r is the price (that includes time devoted to the behaviour), r_{t-1} is past consumption, k is health knowledge, ρ is time preference (measured as time discount rate), and Y is income.

The general framework for the analysis of how a structural intervention[xvii] such as Oportunidades is expected to affect risk behaviours is based on the following assumptions. Oportunidades is assumed to directly affect k and Y and indirectly affect ρ. Oportunidades relaxes the budgetary constraint by increasing available household income, so it should be correlated with an increase in the consumption of all goods. However, Oportunidades also increases the adolescents' probability of attending school (through scholarships), which leads to an increase in health knowledge and a may decrease time discount rate. School attendance also reduces leisure time, so reducing availability of time for risk behaviours, so increasing its relative price.(Black, Devereux et al. 2008) Health knowledge is also positively affected by health talks, which are mandatory for adolescents receiving scholarships. As Oportunidades is offered as a package, that is, all or nothing, it is not possible to disentangle the specific effect.For the estimation, these three factors cannot be separated, so we are estimating:

$r_i=f(\text{Oportunidades}=g(k + \rho + p_r + Y))+\text{Individual factors})$ .....(5)

Ceteris paribus, for Oportunidades to actually promote the accumulation of health capital, the net effect must be negative; that is, the combined effect of k, ρ and p_r must be higher than the income effect.

It is also the case that engagement in risk behaviours has a family / genetic component, either in the form of imitation or predisposition. Individuals in families with higher levels of risk behaviours are more likely to participate in these types of behaviours, so the estimation should include household and parental variables as controls. Most likely continuously receiving benefits from Oportunidades would impact behaviour.

3.7. Methods

3.7.1. Data

To empirically approximate the proposed framework, I analysed data from the Oportunidades evaluation. In particular, the data came from the two most recent rounds of the Rural Households Evaluation Surveys (ENCELs), those conducted in 2003 and 2007. For these two rounds, specific modules on risk behaviours were developed and implemented[xviii] within

[xvii] Structural interventions are defined as those that aim to change the broader context where problems or conditions are present. That is, for health interventions, a structural intervention will look at socioeconomic and community factors that promote or prevent a specific behaviour. Blankenship, K. M., S. R. Friedman, et al. (2006). "Structural Interventions: Concepts, Challenges and Opportunities for Research." J Urban Health **83**(1): 59-72.

[xviii] I have detailed knowledge of this module, as I coordinated this topic in the 2003 survey and led it in 2007.

multi-thematic surveys that included detailed information on the socioeconomic conditions and demographics of all household members, as well as data on health status and health services utilisation, food consumption, anthropometrics, education, and labour participation.

The ENCEL surveys were implemented as a follow-up to the early impact evaluation of Oportunidades (when it was named Progresa) that occurred between 1998 and 2000. Additional details on the original design of the evaluation are published elsewhere. (Behrman and Todd 1999) For the purpose of this document, the basic information needed is that in 1997, as the programme was to begin, a random sample of localities in 7 of the 32 states in Mexico were selected for the impact evaluation. This sample of 505 localities was randomly assigned to an intervention group (320 localities) or a control group (185 localities). Within each locality, all households were surveyed. The short-term impact evaluation included rounds every six months. By the year 2000, the original control group was incorporated into Oportunidades.

In the year 2002, with the aim of evaluating the mid-term effects of the programme, a quasi-experimental design was implemented that added to the original 506 localities a sample of additional localities where the program had been not implemented. Thus, from a group of approximately 14 thousand rural localities without Oportunidades, for each intervention community (the original 505), a comparison community was matched using a propensity score constructed using data from the 2000 National Census. As some intervention localities from the original sample had a score of 1 (which is not possible for the comparison communities because 1 defines being treated), matching was performed using its nearest neighbour. To avoid having one comparison community as the match for a large number of treatments, the number of those matched was restricted to 4. Using this procedure, the new comparison group was selected, resulting in a sample of 152 localities that were all in the 7 original states. Further details of the selection process are published elsewhere. (INSP-CNO 2005)

The ENCEL 2003 was implemented in this set of localities (i.e., the original 505 and the additional 152 matched in 2002). After the field-work, the new set of 152 comparison localities were also incorporated to the programme for the purpose of scaling up Oportunidades. By 2003, 3 exposure groups were thus defined: i) households in localities from the original intervention group, where the programme started in 1998; ii) households from the original control group, where the programme was offered in 2000; and iii) households from the additional comparison group, where the programme was offered by the end of 2003.

Several reports were produced for the programme using these data.

To evaluate the long-term effects of Oportunidades, a new round of surveys was carried out in 2007; all localities included in the ENCEL 2003 were already incorporated into Oportunidades, and there were no remaining rural localities where the programme was not implemented. In addition to these localities, a new set of localities was selected from 2 additional states that represented an important proportion of all households in the programme, Chiapas & Oaxaca.[xix] In total, approximately 60% of the Oportunidades beneficiaries lived in the 9 states were included in the ENCEL 2007.

3.7.2. Risk behaviour module

A module was developed for the ENCEL 2003 with the specific purpose of measuring risk behaviours among adolescents and youths. This module included sections on sexual behaviour, smoking, drinking, and several questions related to time preferences. Because the module was aimed at individuals living in the already surveyed households, along with this specific information, detailed information on education and labour was also obtained, as well was socioeconomic and demographic data.

Risk variables measure the proportion of adolescents and youths who report having smoked, consumed alcoholic beverages (and problems associated with their consumption), had sexual relations, used condoms in their first sexual relationship and in their most recent one, and consumed high-calorie junk foods and beverages. Likewise, data on the weight and height of the participants were used to estimate the body mass index (BMI) to determine the proportion of participants who were overweight or obese. Blood samples were taken, and tests for herpes simplex virus type 2 (which is sexually transmitted) were performed on participants who stated they were sexually active.

To compare the age at the initiation of sexual activity, a variable was created that controlled truncation in the proportions by age group and estimated the proportion of those who were sexually active at the year immediately before the youngest year in the age group (that is, for the group of 14-18 years of age, the proportion of those who were sexually active at 13 years of age, for the 19 to 21, sexual activity was measured at age 18, and finally, for the 22 to 24, sexual activity was measured at ate 21).

This module was integrated within the biological component of the ENCEL 2003, which was designed to survey a sub-set of localities. In this sub-set of localities, the module was applied to all individuals between the ages of 15-21 years.

[xix] The original seven states were Puebla, Hidalgo, San Luis Potosí, Guerrero, Querétaro, Veracruz, & Michoacán. By 2007, 41% of total Oportunidades beneficiaries lived in these 7 states. Approximately 19% of the total beneficiaries lived In Chiapas & Oaxaca.

For the ENCEL 2007, the module was implemented within the general survey, so it was applied in all localities visited (and not a sub-set) and extended the age range to 14 to 24 years of age.

Although the basic structure and content of the module were similar, one relevant difference in 2007 was the interviewing method. Whereas face-to-face interviews were used in 2003, for the ENCEL 2007, an Audio-Computer Assisted Self-Interview (ACASI) application was developed to improve the reliability of the answers obtained. Based on literature showing the limitations of data obtained by interviewers, as well as the complexity of the questionnaire and the population's profile, a self-administered questionnaire was chosen that was assisted by audio and computer equipment (Young 1996; Leigh, Gillmore et al. 1998; Turner, Ku et al. 1998; Des-Jarlais, Paone et al. 1999; Hewett, Mensch et al. 2004; Ghanem, Hutton et al. 2005).

Previous studies using similar populations have shown that the use of these types of technologies improve reporting on sensitive behaviour data and are relatively acceptable for the population, for whom the use of computers is generally feasible (Gutierrez 2008). The limitation of this method is that it may affect the ability to compare the reports in 2003 and 2007 both in terms of individual reporting, and locality characteristics. Nevertheless, this limitation was not significant enough to require discarding the 2007 data, which evidence suggested being more reliable.

3.7.3. Estimation of the Net effect of Oportunidades in risk behaviours by matching

Estimating the impact of a programme requires the identification of a suitable control group. The selection of the control or reference group is based on a number of factors, that are related to the level of evidence that could be offered. According to the literature, there are 3 types of inferences related to quantitative evaluations: probability, plausibility and appropriateness. Probability refers to randomised studies whose design requires a significant level of commitment to its implementation and in which it is necessary to identify causal relations. These studies are the preferred option in instances where there is little evidence regarding intervention effectiveness. Plausibility studies, which include quasi-experimental designs, require a control group, although it is not assigned randomly. These designs allow for the identification of some degree of causality (under restrictive assumptions) and can constitute a viable option in many contexts. Finally, appropriateness studies involve reporting

trends in process and/or impact indicators, thus suggesting that the interventions have produced an effect. (Victora, Habicht et al. 2004)

As previously discussed, the original, randomly assigned control groups were already in the programme in 2003, so a comparison group was formed by selecting a matched set of new localities. Because this assignment was not random, this represents a quasi-experimental approach. Thus, the first approach to measure the effect of Oportunidades on adolescent risk behaviour, was a model that estimates differences in the probability of engaging in risk behaviours between individuals from beneficiary households and individuals from non-beneficiary households that are otherwise similar, that is, individuals in the localities where the programme was implemented before 2003 and individuals in the localities that just started incorporation in 2003:

$$\Pr(r \mid O) - \Pr(r \mid O)$$

These differences were estimated using the ENCEL 2003 data, a survey implemented for the evaluation of Oportunidades, that collected socioeconomic, demographic, and health data in a sample of households both in localities with the programme and localities that at the time of the ENCEL 2003 were not yet in the programme. The quasi-experimental approach is based on first matching at the aggregated level (localities) and then matching individuals within these localities using a propensity score matching technique. Further details on matching at the locality level are reported elsewhere.(INSP-CNO 2005)

Thus, the matching was implemented as 2 sequential matching in practice. First localities were matched based on their pre-intervention characteristics from Census data, so comparison localities were selected The second matching was done at individual level, using household pre-intervention characteristics as well as individual demographic characteristics, as collected for the original evaluation in 1997 for the intervention group and retrospectively in 2003 for the comparison group. This quasi-experimental approach aims to guarantee that before the intervention both groups (intervention and comparison) were similar in observable characteristics.

Propensity score matching (PSM) is a matching technique that matches using an index of the characteristics of the analytical units; that is, instead of matching based on individual characteristics, as in standard matching, it generates an index that could be interpreted as the conditional probability of participating in the programme or intervention and matches based on this value. The index must be estimated using pre-intervention characteristics so that it is not affected by the intervention. The basic idea is that the closer in

this index two observations are, the more likely that they are similar enough to be compared post-intervention. (Ravallion 2001)

The two basic assumptions that are required for the PSM to generate adequate estimations is that the variables used to generate the matching index are the ones relevant in terms of understanding participation in the programme, that is, that there are no other non-observable variables that determine participation. This assumption is called conditional independence, and although it is impossible to test, because the matching of these estimations included a score for participation in the programme, it is very likely that this assumption is met. The other assumption is that there is a large enough sample to estimate the effects (i.e., sufficient observations can be matched). As reported in table 10, the sample was large, so even only using the common support, enough observations were available for the estimation. (Rosenbaum and Rubin 1983) (Heckman, Ichimura et al. 1997; Heckman, Ichimura et al. 1998)

The main limitation of the PSM is that while a balance of pre-intervention observable characteristics can be ensured, it is impossible to test for balance in non-observable characteristics; thus, while the estimated effects are correct under the assumption, it cannot be determined whether a balance in non-observable variables also exists.

Therefore, I estimate propensity scores using a probit model of the probability that an adolescent is enrolled in Oportunidades, as a function of the pre-intervention individual, family and locality characteristics, to generates the propensity (probability) that an adolescent is enrolled in the program in treatment areas and would be enrolled in comparison areas if the program were offered there. These characteristics included the variables that are used in the score used for the programme to identify eligibility to the programme, so the propensity score include the relevant variables for eligibility. This is feasible because the programme was offered at different moments in different localities; this implies that the comparison group were not part of the programme because at the time of the 2003 survey, the set of localities they were living were not served by the programme.

The first approach is to estimate the average treatment effect (ATE) of the programme using individuals that by 2003 were living in the two type of localities and were eligible for the programme; this approach is useful in this context because the high take-up rate of the programme in rural areas (all localities in the sample are rural by Mexican definition, that is, less than 2,500 inhabitants). The characteristics used for the propensity score included dwelling access, assets, access to services, size of household, education and ethnicity of head of household, as well as general demographics of household.

The effect of Oportunidades on risk behaviours is obtained by comparing the differences between intervention and comparison groups of adolescents using a kernel weighting procedure to obtain the matching estimator. (Leuven and Sianesi 2003)

The, other 3 alternative approaches are implemented, in particular to estimate exposure effects in risk behaviours; that is, differences that could last because a longer exposure among individuals in the localities that were already in the programme in 2003. The first estimation replicates the approach described above but also estimate the ATE for 2007 outcomes, to see if being in the programme longer has additional effect. That is, by 2007 all localities were receiving the programme since 2003, so these additional effects would be the result of a larger dose.

Second, an alternative on how intervention is defined is used. If in the previous approach participation in the programme (the treatments) was defined as being eligible and living in the localities that were in the evaluation sample since 1998 (that is, localities where the programme started between 1998 & 2000) and non-treatment for those in the localities incorporated in 2003, for an additional analysis, treatment group was limited to those in households actually incorporated between 1998 and 2000, that is, not including households in localities where the programme started between 1998 & 2000 that were actually incorporated after 2000.

Finally, to take advantage of the additional sample of households in 2007 because the addition of new states (and so localities) in the sample, the estimation was implemented matching individuals based on the previous definition of treatment, but not limiting to those that were surveyed in 2003. The main limitation of this is that not baseline data was available for new households, so matching is performed assuming that current characteristics used in the matching are not affected by the intervention. Matching variables in this case were limited to sex, age, indigenous status, locality marginalization and some socioeconomic characteristics of the households, including assets and per-.capita income.

3.7.3.1. Descriptive statistics from the ENCEL 2003

Table 10 shows the unmatched means (and standard errors) of outcome variables (but among matched localities) and also indicates whether the unmatched means were significantly different from intervention and comparison groups. Ever smoked, ever drank alcohol and ever had sex are all statistically lower for the intervention group both for boys and girls. Nevertheless, no difference was found among the other sexual behaviours.

The mean age of participants was approximately 17 (similar in boys and girls), and while there was a significant difference in age among girls in intervention and comparison

groups, the magnitude was very low (approximately 0.2 year or 3 months), so it should not affect other results.

It is important to note that a high proportion of individuals reported participation in risk behaviours, with important differences by sex. For example, more than twice as many boys smoke and drink compared to girls. This high proportion of adolescents who reported smoking and consuming alcohol (almost 6 out of 10 adolescents smoke among comparison boys) was reported despite the fact that the legal age for purchasing tobacco and alcohol in Mexico is 18.

In the case of sexual activity, the higher proportion of girls who reported having had sex is likely to be related to marital status (they were more likely to be married). Condom use was low among girls, and while this can be partially explained by their marital status, this cannot be the only reason when one considers the higher rate of condom use among boys.

Even more impressively, the high prevalence of HSV 2 is consistent with low condom use and highlights the negative consequences of unsafe sex in this population.

Table 11. Unmatched Means (standard errors) and sample size for outcome variables

	Comparison		Treatment	
	Boys	Girls	Boys	Girls
Age	16.9894	17.1850	16.881	16.9935
	(0.0904)	(0.0727)	(0.0479)	(0.0453)**
	754	1000	1689	2002
Smoke	0.5930	0.2840	0.4398	0.1636
	(0.0444)	(0.0273)	(0.0194)**	(0.0122)***
	747	993	1662	1980
Drink	0.4043	0.1984	0.2786	0.0970
	(0.034)	(0.0202)	(0.0176)**	(0.0094)***
	747	993	1662	1980
Sexually active	0.2361	0.2800	0.1676	0.1978
	(0.0266)	(0.0203)	(0.0114)**	(0.0128)**
	754	1000	1689	2002
Condom last	0.4663	0.1571	0.5018	0.1591
	(0.0529)	(0.0362)	(0.0397)	(0.0252)
	178	280	283	396

Pregnancy		0.0499		0.0375
		(0.0086)		(0.0063)
		762		1627
HSV 2	0.1460	0.1961	0.1349	0.1738
	(0.0363)	(0.0349)	(0.0288)	(0.0255)
	137	204	215	305
Chlamydia	0.0331	0.0374	0.0181	0.0328
	(0.0162)	(0.0176)	(0.0089)	(0.0117)
	151	187	221	274
Any STI	0.1572	0.2044	0.1387	0.1810
	(0.038)	(0.0364)	(0.0274)	(0.0255)
	159	225	238	326

Differences between comparison and intervention groups: *** $p < 0.01$, ** $p < 0.05$

3.7.4. Dose effect of Oportunidades

Because by 2007 no comparison set of localities was available, for the Encel 2007 the estimation on the ability of Oportunidades to modify behaviours was implemented using a dose-response approach, that is, by estimating the probability of engaging in risk behaviours for several sets of individuals who were grouped in terms of their households time participating in the programme. Because take-up rates for the programme are high in the rural areas, from where these data were collected, the household approach was considered preferable over an estimation of dose at the locality level. For the rural evaluation, take-up rate was estimated at 97%.(Angelucci and Attanasio 2009) As an alternative, models were also estimated using as a dose measure the time the programme had been available at the locality, defined as the time of incorporation of the oldest incorporated household in the locality. The basic assumption is that there is an accumulative effect of Oportunidades on the outcomes of interest. Following this proposition, the conceptual model is:

$$R_{ij} = f(EO_{ij}, X_{ij}, L_j)$$

where R_{ij} refers to risk behaviours of the individual (i) living in community (j) and EO_{ij} is the time during the year that the household where the individual (i) lives was registered in Oportunidades; X_{ij} is a set of characteristics of the same individual and her household, and L_j are community variables.

Because inclusion in Oportunidades is highly affected by the community in which one lives (the incorporation process was implemented by community) and also determines one's socioeconomic context and access to goods and services, it is assumed that community must be controlled for in the model. In addition, there is an expected peer effect; that is, individual risk behaviours may be affected by the level of such behaviour in one's community. While this is not the primary outcome for the analysis, controlling for peer effect

would allow for a cleaner estimation of Oportunidades effect. The discussion regarding peer-effect identifies three different reasons that explain similar behaviour within a group: the influence of the group on individual behaviour (endogenous effect), a common background of the group is related to individual behaviour (exogenous effect), and similar behaviours because it is affected by the context (correlated effect). (Mansky 1993)

To try to capture some of the heterogeneity related to the community, the community level variables also included an estimated prevalence of risk behaviours, based on the frequency of those behaviours among those who responded to the survey. This approach has been used extensively, but also presents some challenges because potential selection bias to a given group. As the average used for this analysis is the locality where adolescents live and all households in the locality were surveyed, it could be assumed that selection bias is not a concern. (Hoxby 2000; Ali, Amialchuk et al. 2011)

Some other potentially relevant variables, such as those related to participation in risk behaviours in the general population (that is, not only among youths), are not available for these communities. For example, other analyses have found that markers of sexual behaviour are related to the extent of sexual work in the community or that substance abuse is related to crime rates. (Gutierrez, Conde-Gonzalez et al. 2007) Although the SE characteristics of the communities could capture a significant portion of community influence, it may not be enough to disentangle unobservable community effects from the Oportunidades exposure effect.

To test for community effects, models were estimated using both fixed and random community effects. Although the use of random effects is more efficient for the estimation (more degrees of freedom), they also require more restrictive assumptions; in particular, they assume that errors are not correlated with the independent variables. If this assumption is not met, then random effect estimators will be inconsistent, so the estimators from the fixed effect models would be preferred.

To test for the appropriateness of the random effects model, the Hausman test was implemented, which tests for consistency between fixed and random effect estimators. If the null hypothesis of non-consistency cannot be rejected, then random effect estimators may not be appropriate. (Hausman 1978)

Time of exposure information was gathered from administrative records on the date that the family was incorporated into *Oportunidades*. Categories were generated for those in the programme for three years or less, four to six years, seven to nine years, and more than nine years. Additionally, data were registered for households recently incorporated or those

that were not registered, defining them as 0 years. An alternative measure of exposure was generated as the maximum incorporation time for a household in a given locality, that is, how long the programme had been available in that locality.

As the programme increased coverage over time with different procedures that included incorporation of new formed households, immigrant households, and a revision on the score used for incorporation, household level data seems more appropriate over locality level, also because of the high take-up rate of the programme mentioned before.

In addition, data from a sample of migrants that were followed in 2008 was incorporated to the dataset, to correct the potential bias that migrants could introduce in the estimation. As the migration effect is not clear (that is, whether migrants present less or more risk behaviours than no migrants), it is important to reduce its bias.

The 0 years group includes households with no time in the programme and households that were not eligible. In all cases, these households were located in the communities visited, and they were more or less similar to the other households. Nevertheless, as there was incomplete information available on the status of incorporation and eligibility *before* the programme, caution is required when making comparisons using these households, so the comparisons reported here are among the groups with at least 1 year in the programme.

To estimate the effect of exposure time, multivariate probit regression models were used, where the outcome variable was the risk behaviour and the exposure variable was the length of participation in the programme, controlling for other factors. These models were based on the grouping of observations at the community level.

The degree of marginalisation of the communities, as defined by the National Council on Population (CONAPO)[xx], and the socioeconomic region of the state, according to the classification of the National Institute of Statistics, Geography and Informatics (INEGI)[xxi], were included as control variables. In both cases, the codification was performed from the lowest to the highest, that is, from less favourable situations to more favourable ones.

3.7.4.1. Descriptive statistics from the ENCEL 2007

In this section, descriptive statistics from the ENCEL 2007 for the main outcome variables are discussed through the comparison of the means by exposure group. Although analysis

[xx] http://www.conapo.gob.mx/publicaciones/indice2005xloc.htm

[xxi] Regiones Socioeconómicas de México (Socioeconomics Regions of Mexico) in http://jweb.inegi.org.mx/niveles/jsp/index.jsp?c=11724

on how exposure may be related to engagement in risk behaviours is later presented using the regression models discussed above, means comparison provides a better understanding of the population of interest.

Tables 11 to 13 (in the annex 1) report the descriptive statistics of adolescents included in the ENCEL 2007 by sex, age group, and time of exposure to the programme from the 2007 data. Differences between groups are noted in the tables.

In general, the proportion of women in this sample increases with age and is higher in groups with less exposure to the programme.[xxii] The difference in time of exposure could be related to different patterns of work activity or migration, which may imply a difference between the groups. The proportion of indigenous households and those with agricultural labour are different for the exposure groups. Individuals with longer exposure to Oportunidades are from households with a higher probability of being indigenous, and a higher proportion of them work in agricultural activities compared to those with less exposure.

At the same time, the proportion of participants who are married or in a cohabiting relationship is higher among those who come from homes with less exposure to the programme. However, this result could not be linked to the programme because there is no real comparison group, but it is nevertheless interesting, as it seems to suggest that the programme is associated with adolescents and youths postponing a formal partnership. In the following pages, the results by analytical variables and age group are presented.

3.7.4.2. General characteristics

Age group: 14-18 years

Table 11 shows the demographic, education and labour variables for this group, as well as the risk behaviours. Although the great majority of participants in all exposure groups attended school at some point, the proportion of those who currently attend the school increases with the time of participation in the programme. This finding is consistent with both a higher average number of years in school and the percentage of those who have the appropriate schooling for their age.

Age group: 19-21 years

[xxii] However, this could be explained by the fact there is a smaller probability of finding men at home in general (they often work in places other than at home, as opposed to women, who, in addition to housework, carry on activities close to the home), and the fact that they have a higher probability of having migrated (for school or for work).

Table 12 reports characteristics and participation in risk behaviours among individuals between 19-21 years of age, as well as their general characteristics. The proportion of individuals in this age group who are in a cohabiting relationship is clearly associated with time of exposure to the programme, reaching 39.4% among women in the group with less exposure compared to 8.9% of the women in the group with greater exposure. In all cases, the percentage is higher among women than men, which suggests that the women's spouses are older, on average.

There is a slight difference among those who attended school at some point, with proportions being greater for those who have had more exposure to the Program. This result is consistent with a higher number of years in school (for women, 8.69 in the group with greater exposure and 8.3 in the group with less exposure), which is equally reinforced by the proportion of those who have appropriate schooling for their age (70.7% vs. 67.2% in the same groups, respectively). Nevertheless, these differences are reversed when considering those still in school, being 12.2% and 15.1%, respectively, for the same groups (women in the highest exposure group vs. women in the group with the lowest exposure). It is possible that individuals in the group with greater exposure have already reached the level of education sought, whereas this occurred in a lower proportion in the group with less exposure.

Labour participation is higher in the group with less exposure compared to the group with greater exposure (40.1% and 30.7%, respectively, among men). As in the case of the youngest age group, those working within the highest exposure group are engaged in agricultural activities.

Age group: 22-24 years

Table 13 shows the characteristics for the 22 to 24 age group. While individuals in this age group can be considered adults, their relevance to this analysis is even higher, as their behaviours may have been established during their adolescence.

As in the previous age group, the percentage of those who report being married or living with a partner is significantly higher for the group with less exposure, reaching 47.7% among women compared to 9.9% among women in the group with greater exposure.

The proportion of individuals enrolled in school is similar in all groups, at approximately 95%. The number of years in school is also similar between all exposure groups (slightly higher in the group with less exposure, 8 years for women compared to 7.6 in the group with greater exposure). However, the percentage of those who have achieved an age-appropriate level of education is higher for men in the group with greater exposure

(77.3% vs. 73%), whereas the result is the opposite for women (73.8% vs. 75.3%, respectively). In contrast, current school attendance is higher in the group with less exposure than the group with greater exposure.

The proportion of those who work is higher for the group with less exposure. Among those who work, the percentage of people engaged in agricultural activities is higher in the group with greater exposure.

3.7.4.3. Consumption of high-calorie foods and overweight

Age group: 14-18 years

Regarding the consumption of high-calorie foods, there are no important differences between groups by exposure group or sex. Over half of the participants reported having consumed some food of this type the day before the interview. As to the level of consumption, the figures are similar for all exposure groups, but there is a minor difference by gender related to exposure time.

Data regarding the consumption of sodas (beverages with a high calorie content and no other nutritional value) display a memory bias, as the differences between daily and weekly consumption are not consistent (a weekly consumption about seven times higher would be expected). Both unit consumption (the measure used was mid-size sodas) and money expenditure are similar between all exposure groups, but they are consistently higher in men than in women.

The proportion of those who were overweight or obese was higher for women in all groups. There was, also a trend for exposure to the programme, with a greater proportion of those in the groups with less exposure being overweight or obese. For instance, 20% of women in the group with less exposure were overweight compared to 15.5% in the group with more exposure.

Age group: 19-21 years

Fewer individuals report the consumption of food with empty calories in this group compared to the youngest age group (50% vs. 40%, respectively), but it is similar between groups with different exposure times. As in the younger aged group, there is a smaller difference by gender for the group with longer exposure. The amount of junk food consumed on the day prior to the interview is similar among all groups.

There is a slight difference in the number of sodas consumed among the groups, both in units as in money spent, with the lower exposure groups reporting greater consumption for both men and women.

More individuals in the group with less exposure to the programme were overweight compared to the group with greater exposure (18.5% and 10.8%, respectively, among females). The level is also higher among women for all exposure groups, except the group with the longest exposure time.

Age group: 22-24 years

The consumption of junk food tends to be lower with age, and the percentage decreased in this age group relative to the previous one. Nevertheless, the group with greater exposure tends to consume more junk food, and as with the other age groups, there is a smaller difference between the sexes. The amounts consumed tend to be higher among women in the group with greater exposure to the programme, whereas there are no differences among the men.

The consumption of sodas, whether in units or in expenditure, is the same between the exposure groups and higher for men than women.

Finally, the percentage of women who are overweight (higher among women than men) is greater for the group with lower exposure than the group with greater exposure (20.2% vs. 13.8%, respectively), but there are no differences by exposure for the men.

3.7.4.4. Smoking

Age group: 14-18 years

The proportion of participants who report smoking is smaller in groups with higher exposure to the programme and is equal for men and women. Among the participants in the group with less exposure, 8.6% of men and 1.9% of women report smoking, whereas those with more than nine years in the programme report 8.0% and 1.7%, respectively.

The proportion of smokers that smoke at home (which would show permissiveness in the household context) varies between the groups; it was not possible to observe a clear trend. The most striking result here is the higher proportion of women who smoke at home compared to men.

Age group: 19-21 years

There are clear and important differences by gender. In all cases, more males report smoking, with levels ten times greater in males than in females.

Age group: 22-24 years

There is an association with time of exposure and smoking, with the greater percentage of smokers among the group with less exposure (for men, 21.2% vs. 17.5% in the group with greater exposure). As in the previous age group, there is a large difference between men and women.

3.7.4.5. Alcohol and drug consumption

Age group: 14-18 years

The proportion of individuals reporting alcoholic beverage consumption is smaller in the groups with exposure to the programme, although this proportion is not entirely consistent. In the group with less exposure, 15.7% of men and 9.4% of women report drinking, compared to 14.1% and 7.1%, respectively, for the group with longer time in the programme. The amount of alcoholic beverages consumed among those who consume is similar in all groups and is higher for men than women.

As for those who report having trouble with alcohol consumption (defined as having violence problems due to the consumption of alcohol), the proportion appears to be greater in the groups with more exposure to the programme. However, it is not clear whether this variable points to a larger problem or to a greater awareness of the problem.

Fifteen per cent of women also reported problems due to parental abuse of alcohol. There is no clear trend among the groups, as fewer men reported this problem.

Drug consumption at some point in the subject's life was reported more frequently in the group with higher exposure to the programme, although the percentages were small for all groups (the highest rate was reported at 1.7% for men in the group with more exposure).

Age group: 19-21 years

Differences in alcohol consumption between men and women for this age group are also significant, but there is no trend for time of exposure to the program. Males report alcohol consumption up to four times more than females. Furthermore, among all of those who drank alcohol, men consume two to three times the amount of alcohol that women do. Problems associated with alcohol consumption are greater for men and for the group with greater exposure to the programme. In addition, 15% of women also report having parents with alcohol abuse problems.

There are differences by gender and exposure level for ever having used drugs. More individuals in the group with less exposure report drug use.

Age group: 22-24 years

Those with less exposure to the programme are more likely to report consuming alcohol (for men, 44.5% vs. 35.3% for higher exposure). Similarly, the lower exposure group also reported consuming a greater number of drinks than those with greater exposure (4.17% vs. 3.73%, respectively, among men). In all cases, men consumed more alcohol than women by up to nearly nine times the amount. However, problems with alcohol were higher among the group with greater exposure to the programme.

Drug use was almost nonexistent for women, but it was reported more by men in the group with greater exposure than in the group with less exposure.

3.7.4.6. Sexual behaviours

Age group: 14-18 years

The percentage of females – controlled for truncation– in the group with higher exposure to the programme who report having had sexual relations is 2.4% compared with 8.0% in the lowest exposure group. Men show a small difference (2.8% vs. 3.3%, respectively). Differences by gender do not suggest a clear pattern by level of exposure to the program.

Condom use is higher among the groups with greater exposure for both the first and last sexual encounter, but the difference is greater for the most recent sexual encounter. This difference is also likely to be influenced by the percentage of those who are in a cohabiting relationship (union), which changes the pattern of utilisation of contraceptive methods. For all exposure groups, more men use protection in sexual relationships than women, which suggests a higher risk for women.

In addition, more women test positive for herpes simplex virus type 2 (HSV2), which is consistent with less condom use and a higher probability of having sexual activity with an infected partner. Likewise, the report observes an inverse relationship between the time of exposure to the programme and testing positive for HSV 2.

As reported in table 11, women have a greater knowledge of sexual health matters than men, but a trend was not identified in relation to time of exposure.

Age group: 19-21 years

Time spent in the programme also seemed to influence the proportion of individuals in this age group who have had sexual relations, as the group with less time in the programme clearly has a higher frequency of sexual relations. With the exception of the group with the greatest amount of exposure, more women than men reported being sexually active. As noted for the youngest group, this could be related to the fact that a greater proportion report being in a union, although the order of these decisions is not clear.

In addition, the group with less exposure to the programme reported a higher level of condom use for their first sexual relation as well as their most recent one. Men consistently report using condoms two to three times more frequently than women. It is possible that there is a reporting bias in relation to sex, as the data could be reinforcing the notion that women's relations are with older men.

There is a higher rate of testing positive for HSV 2 among women, although for some exposure groups, the difference between the genders is smaller. Sero-positivity was lower in the group with a greater time of exposure to the programme.

Finally, women are again more knowledgeable on the subject of sexual health. Individuals in the group with less exposure to the programme appear to have more correct answers to health-related questions.

Age group: 22-24 years

Approximately 50% of this age group reported already having had sexual relations. Approximately 50% of this group reported having had sex; when compared by gender (adjusted for truncation), women reported greater sexual activity. Additionally, the proportion was higher among the group with less exposure to the programme.

More men than women reported condom use, and men in the group with greater exposure to the programme were more likely to use a condom than those with less exposure (35.3% vs. 21.3%, respectively) for the most recent sexual relation. There was also an inverse relationship with age, as this group reported lower condom use than the younger participants. Again, more women tested positive for HSV 2, but there is no clear trend relative to time of exposure to the programme.

Knowledge on sexual health topics showed a tendency towards more knowledge among individuals with less exposure to the programme. Women again have a greater level of sexual health knowledge.

3.7.4.7. Future expectations

To measure future expectations, the questionnaire included a set of questions on how the individual perceived him/herself at the present and in the future. This approach allowed potential changes in perception to be identified, which are assumed to partially related to future expectations. Risk behaviours are expected to be related to lower future expectations, as those would be related to a lower perception of future cost for current behaviours.

Age group: 14-18 years

As reported in table 11, future expectations are higher when the comparison is performed with peers than when it is performed with a larger, less specific group (i.e., Mexican families in general). There is no clear trend between the exposure groups.

Age group: 19-21 years

Future expectations are higher when considering the larger social environment, but there are no differences between the exposure groups.

Age group: 22-24 years

Much like the other age groups, future expectations are higher when the reference point is the immediate context as opposed to the larger one. There are no trends related to the time of exposure to the programme.

3.7.4.8. Violence

Age group: 14-18 years

Indicators of violence reached high levels, especially among men. More than half of men interviewed reported having engaged in physical fights; more than 20% had participated in the destruction of property, and approximately 10% reported participating in robberies. It is important to note that these figures referred only to those who reported being sexually active and are therefore not representative of the entire group. For this set of variables, there was no clear trend between the exposure groups.

Age group: 19-21 years

A high proportion of this age group reports violent behaviour, but there is no relation to the time exposed to the programme (these results should be considered with caution because of the previously mentioned limitations of this indicator).

Age group: 22-24 years

Participation in antisocial activities (a proxy for violence) is lower for this age group than for the youngest group, but again, there is no relation to the time exposed to the programme.

However, there is a strong difference by gender, as males participate more in these activities more often.

3.8. Results

3.8.1. Quasi-experimental estimation of the effect of Oportunidades on risk behaviours

Using the ENCEL 2003 data and the PSM approach previously discussed, I estimated the effect of Oportunidades on risk behaviours. These results are based on differences in the probability of engaging on risk behaviours between the matched intervention and comparison localities. As shown in figure 6, for the locality matching estimation of ever smoked and condom use in the last sexual intercourse, the sample was imbalanced, so additional matching at individual level was required to accurately estimate the effects. These two variables are show because the first (smoking) is estimate for the complete sample, while as sexual behaviours like condom use are measured only for sexual active participants, for the second (condom use) only a sub-set of participants are included, so it is useful to review balance for the complete sample and for the sub-sample of sexual active participants.

Table 14 presents the results of the individual matching estimation using kernel distributions and also reports the corrected confidence interval bias estimated using 1000 bootstraps. Oportunidades has a significant and negative impact on smoking and drinking among both girls and boys: 18% fewer boys and 12% fewer girls smoke, and 8% fewer boys and 15% fewer girls reported drinking when comparing the intervention and comparison groups, an effect that can be attributed to the programme.

Additionally, approximately 5% fewer girls are sexually active, and among sexually active boys, 17% fewer presented HSV 2, which is again attributable to Oportunidades.

Nevertheless, Oportunidades has no effect on pregnancy or reported condom use. Although the effect on HSV 2 among boys seems counterintuitive given the lack of effect on condom use, because it is an objective measure, it could be a more reliable indicator of actual behaviour than the self-reported condom use.

It is important to highlight that as matching is implemented on observable variables[23], it is possible that non-observable differences existed at baseline. This is a general limitation of this quasi-experimental approach. Nevertheless, as the sample was matched from a similar set of

[23] By observable characteristics, I am referring to measurable characteristics, or more specifically, measured characteristics.

localities with similar characteristics both at locality and household level, it is likely that intervention and comparison groups were similar also on non-observable characteristics.

Table 12. Treatment effect on the intervention group (bias-corrected confidence intervals estimated by bootstrapping with 1000 replications)†

Variable	Boys	Girls
Ever smoke	-0.18**	-0.12**
	(-0.27 -- -0.08)	(-0.19 -- -0.05)
Drink	-0.08*	-0.15**
	(-0.18 -- -0.00)	(-0.22 -- -0.09)
Sexually active	-0.05	-0.05*
	(-0.13 – 0.01)	(-0.12 -- 0.02)
Condom use last	-0.01	-0.05
	(-0.24 – 0.19)	(-0.20 – 0.09)
Pregnancy		0.02
		(-0.09 – 0.16)
Any STI	-0.18*	0.03
	(-0.45 -- -0.00)	(-0.11 – 0.12)
HSV 2 seroprevalence	-0.17**	-0.01
	(-0.44 -- -0.00)	(-0.17 – 0.11)

** Significant at 95%; *Significant at 90%. †confidence intervals using bias correction are the pth quantiles of the bootstrap distribution

As presented in table 15, once all localities were incorporated, there are no lasting differences among original treated and original control groups (by 2007 all localities were in the programme), but it is important to notice that as robustness check, using this sample of individuals that were both in 2003 and in 2007 the effect measure for the differences in 2003 are consistent with those in the previous estimation, that is, a preventive effect on smoking and drinking, but not in the sexual related outcomes. The magnitude of the effects is similar, and the main difference is the non-significant result for smoking among males.

Table 13. Average treatment effect (ATE) on selected risk behaviours among youths eligible for Oportunidades

	Boys		Girls	
	ATE	p	ATE	p
Smoke 07	-0.033	0.105	0.009	0.206
Drink 07	-0.013	0.618	-0.004	0.802
Sexually active 07	-0.028	0.233	0.016	0.510
BMI 07	-0.447	0.302	-0.283	0.237
Smoke 03	-0.064	0.14	**-0.087**	**0.000**
Drink 03	**-0.078**	**0.045**	**-0.076**	**0.000**
# drinks 03	0.001	0.993	-0.006	0.797
Sexually active 03	-0.002	0.933	-0.016	0.541
Condom 07	-0.083	0.474	0.011	0.880
HSV 03	0.005	0.675	0.015	0.521

In the specification refining the definition of treatment (those in households that were incorporated between 1998 and 2000) reported in table 16, results are highly similar to the previous, with estimated effects on smoking and drinking in 2003 and once all localities are incorporated, these effects vanish by 2007. That does not mean that the preventive effect disappears, but that there is not additional effect of 4 years of additional exposure, that could be interpreted as the programme affecting these behaviours in a short time span. The magnitudes of the effect are quite similar to those in the previous estimation.

Table 14. Average treatment effect (ATE) on selected risk behaviours among youths eligible for Oportunidades compared to those not incorporated by 2003, estimated by matching

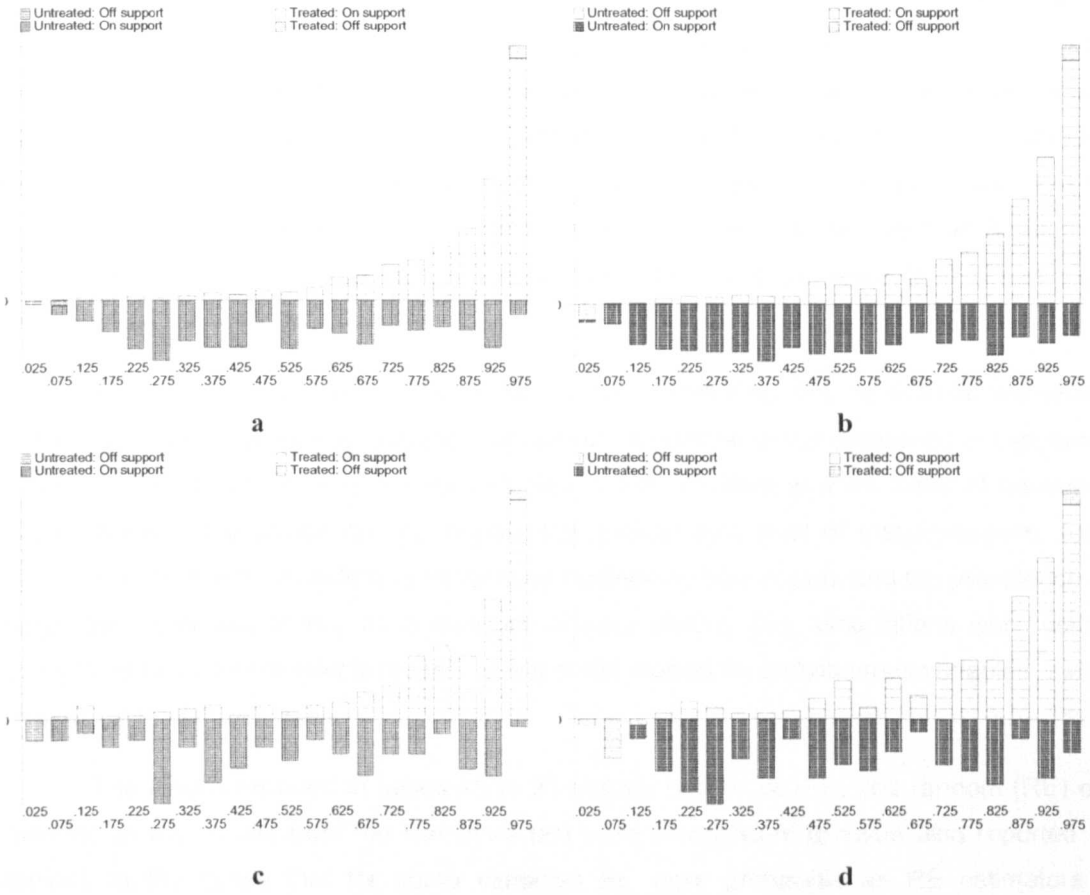
	Boys		Girls	
	ATE	p	ATE	p
Smoke 07	-0.033	0.187	0.009	0.146
Drink 07	-0.013	0.605	-0.004	0.796
Sexually active 07	-0.028	0.336	0.016	0.521
BMI 07	-0.447	0.330	-0.283	0.262
Smoke 03	*-0.064*	*0.072*	**-0.087**	**0.002**
Drink 03	**-0.078**	**0.010**	**-0.076**	**0.000**
# drinks 03	0.001	0.993	-0.006	0.753
Sexually active 03	-0.002	0.940	-0.016	0.560
Condom 07	-0.083	0.422	0.011	0.878
HSV 03	0.005	0.586	0.015	0.536

Finally, when expanding the analytical sample to those individuals in the new localities in 2007, results are interesting (table 17). While it is important to remember that this specification is based only in data collected in 2007 for the matching (as oppose of the previous where baseline data was used for the matching), this comparison is an attempt to estimate differences between individuals incorporated in the programme and individuals not yet in the programme by 2007. As oppose to the previous estimation, some effects are estimate in 2007, specifically, the proportion of those that are sexually active is less for females, and body mass index is lower for females. The effect on this outcomes, sexually active adolescents, is particularly relevant for at least two reasons: this outcome has a positive trend in Mexico (so this effect is against a national trend), and it is directly related with the probability of pregnancy and childbearing, that is associated with lower accumulation of human capital.

Table 15. Average treatment effect (ATE) on selected risk behaviours among youths incorporated to Oportunidades compared with those not incorporated by 2007 estimated by matching

	Boys		Girls	
	ATE	p	ATE	p
Smoke 07	0.000	0.984	-0.003	0.629
Drink 07	-0.006	0.768	-0.010	0.341
Sexually active 07	-0.006	0.715	**-0.045**	**0.001**
BMI 07	0.084	0.145	0.021	0.421
Smoke 03	0.141	0.532	*-0.301*	*0.080*
Drink 03	-0.033	0.305	0.015	0.443
# drinks 03	-0.025	0.440	-0.005	0.716
Sexually active 03	0.136	0.245	0.012	0.504
Condom 07	-0.027	0.260	**-0.077**	**0.000**
HSV 03	0.007	0.924	0.028	0.428

Figure 6. Common support for a) smoke boys, b) smoke girls, c) condom use boys, & d) condom use girls



Observation in the common support area for the matching. For PSM, the idea is to match observations with similar score, so to have similar characteristics in average

3.8.2. Exposure to Oportunidades and risk behaviours

As previously discussed, an additional approach to investigate how Oportunidades may affect risk behaviours was based on time of exposure to the programme. Time of exposure was defined as the number of years that a household had received Oportunidades transfers by 2007. The idea behind this approach is that longer exposure to the programme would be reflected in better outcomes relative to the programme's goals. Given that take-up rate for the programme is high, household data seems preferable over locality year of incorporation, because within locality differences in incorporation would be related to household formation or immigration into the locality where they were surveyed.

Youth risk behaviours as barriers for human (health) capital accumulation

For this analysis, I used the ENCEL 2007 data, which includes information from adolescents in households that have exposure to the programme ranging from non-exposure (non-beneficiaries) to more than 9 years. The main limitation in this analysis in terms of discussing causality is that no baseline data for the non-exposed households and for some of the exposed households are available; therefore, it is impossible to establish how similar the households were prior to incorporation. To avoid comparing households that maybe not elegible or decided to stay out of the programme, the comparison was done using as references group the one with the less exposure but still in the programme, that is the less than 3 years in the programme group, compared to the 3 to 6, the 6 to 9 and the more than 9 years in the programme.

Table 18 shows the results of the models estimating the association between risk behaviour and time of exposure to the programme. In addition to the categories of exposure, the models included the following control variables: if the individual was the head of household or his/her partner; the socioeconomic region; the community's level of marginalisation; the age group; whether the household was indigenous (defined by household); and the prevalence of the behaviour in the community as a measure of peer effects. The associations were estimated using fixed and random effects models, using probit models for dichotomous variables and linear models for continuous ones.

The results reported in tables 18 to 21 include both fixed (FE) and random (RE) effects models, as the results from the Hausman test were inconsistent (p-value also reported in the tables), in the sense that for some variables FE were preferable as RE estimators were systematically different from FE estimators, while for other variables RE estimators were not systematically different from FE estimators and are more efficient. Even in some cases, the test was inconclusive. For some estimations, the null hypothesis is rejected, so random effects models are preferable, but for other estimations, the random effects model seems inconsistent. Nevertheless, presenting both estimations allow to discuss the influence of the peer effects on risk behaviours in these rural Mexican areas

As reported in Tables 18 to 21, exposure to the programme seems to be inversely related to the probability of being sexually active, being pregnant and being positive to HSV 2, and it is marginally positively related to condom use at first sexual intercourse. That is, these results suggest a preventive effect of the programme on risk behaviours, as did the analysis using the quasi-experimental design, but not as strong as those results. The associations measured with

this approach identified a strong association of programme exposure with sexual risk behaviours, but not so much with the non-sexual behaviours. .

There is also a clear peer association for all risk behaviours measured for this analysis; in all cases, higher community prevalence is significantly related to a higher probability of participation in risk behaviours (or even for health outcomes), even controlling for community socioeconomic conditions. This suggests that both general socioeconomic characteristics and peers may be influencing individual behaviours. This finding suggests that interventions need to take into account both individuals and communities. Interventions only focused at the individual or household level may have an effect in the locality accumulated behaviour, but it may be a better approach to design specific strategies targeting adolescents and youths in their interaction settings such as schools, recreational spaces, and even work spaces. Promoting healthy behaviours in the broader community may influence cultural and social norms, that in turn are determinants of behaviours in the longer term.

It seems that there is no effect of programme exposure for smoking. Coefficients for other variables are consistent with other empirical results, indicating that women have a lower prevalence of smoking and that the probability of smoking increases with age.

The probability of drinking is not correlated with the level of exposure to the programme; however. The coefficients for age and gender had significant results (higher by age, but less consumption among women). There is also no association between exposure and the number of alcoholic drinks.

There was a clear and inverse relationship between the time exposed to the programme and the probability of having had sexual relations. Women were also slightly more likely to have had sexual relations than men, and clearly probability of being sexually active increase with age.

The association of exposure to the programme and condom use at the first sexual intercourse is significant for only one of the three groups of exposure, but these estimations are affected by the limited sample size, as they can be estimated only for those who are sexually active. Nonetheless, women were less likely to use condoms, and the older group was also less likely to had used condoms in their first sexual intercourse compared to the younger group. There is also a clear peer effect.

The probability of being pregnant was lower among those with 6 to 9 years of exposure compared with the less that 3 years of exposure group, but not significant for the other exposure

groups. This outcome is particularly relevant because early pregnancy has been related to school dropout. As can be expected, the probability of pregnancy increases with age. There is also a clear peer effect on this outcome.

The probability of testing positive for HSV 2 was clearly higher among women, and there was negative association with exposure to the programme; this association was stronger (more significant) for the 3 to 6 years of exposure group compared to the less than 3 years, but the coefficient was similar for the other two groups of exposure (6 to 9 years and more that 9 years). The probability of testing positive was higher for the older groups.

In table 22 results from the models using locality level exposure are reported, showing no relation between availability of *Oportunidades* in the locality and selected risk behaviours (models were estimated for all the same outcomes with similar results). Associations for the co-variables were all similar to the models above using exposure at the household level.

Table 16: Association between exposure to Oportunidades and substance consumption (drugs, alcohol and tobacco) (FE & RE models)

	1 Smoking	2 Smoking	3 Drinking	4 Drinking	5 Drugs	6 Drugs	7 #drinks	8 #drinks
3 to 6 years in Oportunidades	0.03	-0.35	0.01	0.07	-0.39	-0.64	-0.08	0.19
	(-0.27 - 0.34)	(-0.87 - 0.18)	(-0.20 - 0.21)	(-0.31 - 0.44)	(-1.09 - 0.30)	(-1.71 - 0.42)	(-0.50 - 0.35)	(-0.80 - 1.18)
6 to 9 years in Oportunidades	-0.01	-0.13	0.10	0.11	-0.49	-0.49	-0.06	-0.11
	(-0.30 - 0.28)	(-0.65 - 0.40)	(-0.09 - 0.30)	(-0.26 - 0.48)	(-1.13 - 0.15)	(-1.61 - 0.63)	(-0.46 - 0.34)	(-1.13 - 0.91)
More than 9 years in Oportunidades	-0.03	-0.27	0.05	0.19	-0.06	0.20	0.05	0.09
	(-0.32 - 0.27)	(-0.79 - 0.25)	(-0.15 - 0.26)	(-0.18 - 0.57)	(-0.69 - 0.57)	(-0.90 - 1.30)	(-0.34 - 0.44)	(-0.94 - 1.12)
Sex (women=1)	-2.00***	-1.98***	-1.37***	-1.37***	-1.64***	-1.48***	-1.20***	-1.47***
	(-2.19 - -1.81)	(-2.17 - -1.79)	(-1.48 - -1.25)	(-1.49 - -1.26)	(-2.06 - -1.22)	(-1.89 - -1.07)	(-1.43 - -0.97)	(-1.74 - -1.20)
Head of Household = 1	-0.93	-1.22	1.11**	1.07*	-29.65	-13.98	2.02*	2.40*
	(-2.99 - 1.14)	(-3.30 - 0.85)	(0.00 - 2.22)	(-0.08 - 2.22)	(-5470854.83 - 5,470,795.53)	(-2,636.75 - 2,608.79)	(-0.37 - 4.42)	(-0.31 - 5.12)
Head of Household's Spouse = 1	-0.95	-0.97	-0.72*	-0.69*	-0.44	-0.16	-0.75	-1.11
	(-2.40 - 0.50)	(-2.43 - 0.49)	(-1.54 - 0.10)	(-1.51 - 0.13)	(-2.69 - 1.80)	(-2.28 - 1.97)	(-2.87 - 1.36)	(-3.63 - 1.40)
Region SE = 2	0.19*		0.07		-0.20		0.09	
	(-0.01 - 0.39)		(-0.07 - 0.21)		(-0.66 - 0.25)		(-0.26 - 0.44)	
Region SE = 3	0.12		0.02		-0.05		0.26	
	(-0.16 - 0.41)		(-0.17 - 0.21)		(-0.69 - 0.60)		(-0.16 - 0.68)	
Region SE = 4	-0.12		0.14		-0.69		0.02	
	(-0.58 - 0.35)		(-0.15 - 0.43)		(-1.85 - 0.46)		(-0.67 - 0.70)	
Region SE = 6	0.66		0.25		-0.35		0.10	
	(-0.17 - 1.49)		(-0.32 - 0.81)		(-1.97 - 1.26)		(-1.33 - 1.54)	
High marginalisation	-0.07		0.02		0.06		-0.04	
	(-0.27 - 0.12)		(-0.12 - 0.16)		(-0.40 - 0.51)		(-0.32 - 0.23)	
Medium marginalisation	-0.37		-0.07		-0.14		-0.29	
	(-0.88 - 0.13)		(-0.39 - 0.24)		(-1.38 - 1.09)		(-1.14 - 0.56)	
Low marginalisation	0.20		-0.13		-25.13		-0.37	
	(-0.95 - 1.34)		(-0.97 - 0.72)		(-1516762.25 - 1,516,711.99)		(-3.02 - 2.29)	
18 to 21 years	0.82***	0.84***	0.84***	0.87***	0.74***	0.66***	-0.07	-0.09

	(0.63 - 1.00)	(0.65 - 1.03)	(0.71 - 0.97)	(0.74 - 1.00)	(0.32 - 1.16)	(0.24 - 1.09)	(-0.34 - 0.20)	(-0.41 - 0.22)
22 to 25 years	0.80***	0.81***	0.79***	0.80***	0.58**	0.46*	-0.15	-0.15
	(0.60 - 1.00)	(0.59 - 1.02)	(0.64 - 0.93)	(0.65 - 0.94)	(0.09 - 1.07)	(-0.03 - 0.95)	(-0.43 - 0.13)	(-0.48 - 0.18)
Indigenous household	-0.14	-0.19	-0.14*	-0.17	-0.03	-0.07	0.05	0.01
	(-0.34 - 0.06)	(-0.52 - 0.15)	(-0.28 - 0.00)	(-0.40 - 0.06)	(-0.48 - 0.41)	(-0.80 - 0.65)	(-0.23 - 0.33)	(-0.50 - 0.53)
Prevalence	11.60***		7.49***		31.52***		0.93***	
	(10.54 - 12.66)		(6.97 - 8.02)		(28.01 - 35.04)		(0.86 - 1.00)	
	-3.33***		-2.88***		-4.65***		0.65**	2.32***
Constant	(-3.69 - -2.97)		(-3.14 - -2.63)		(-5.42 - -3.88)		(0.08 - 1.22)	(1.44 - 3.19)
	13,535	10,345	13,531	11,889	13,523	3,546	3,174	3,174
Observations	678	371	678	495	678	105	501	501
Hausman (p-value)	**inconclusive**		0.6474	RE preferrred	**inconclusive**		0.0377	FE preferrred
Number of localities	682	366	682	511	682	105	506	506

ci in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ci in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 17: Association between exposure to Oportunidades and sexual behaviours (FE & RE models)

	1 Sexually active	2 Sexually active	3 Sexually active corrected	4 Sexually active corrected	5 Condon at last sexual intercourse	6 Condon at last sexual intercourse	7 Condom at first sexual intercourse	8 Condom at first sexual intercourse
3 to 6 years in Oportunidades	-0.16*	-0.55***	-0.19*	-0.54***	-0.07	-0.46	0.20	0.02
	(-0.34 - 0.01)	(-0.88 - -0.21)	(-0.40 - 0.01)	(-0.93 - -0.16)	(-0.52 - 0.39)	(-1.30 - 0.39)	(-0.10 - 0.51)	(-0.57 - 0.61)
6 to 9 years in Oportunidades	-0.38***	-0.70***	-0.47***	-0.80***	0.06	-0.28	0.23	0.30
	(-0.54 - -0.21)	(-1.03 - -0.37)	(-0.67 - -0.28)	(-1.18 - -0.42)	(-0.37 - 0.49)	(-1.14 - 0.59)	(-0.06 - 0.52)	(-0.31 - 0.90)
More than 9 years in Oportunidades	-0.14*	-0.27	-0.33***	-0.58***	-0.08	-0.29	0.16	0.30
	(-0.31 - 0.03)	(-0.60 - 0.07)	(-0.53 - -0.13)	(-0.97 - -0.19)	(-0.51 - 0.35)	(-1.13 - 0.55)	(-0.13 - 0.46)	(-0.31 - 0.91)
Sex (women=1)	0.16***	0.15***	0.25***	0.23***	-1.33***	-1.45***	-1.28***	-1.31***
	(0.06 - 0.26)	(0.05 - 0.25)	(0.13 - 0.37)	(0.11 - 0.36)	(-1.59 - -1.06)	(-1.73 - -1.16)	(-1.46 - -1.11)	(-1.50 - -1.13)
Head of Household = 1	0.42	0.63	-0.12	0.01	-0.96	-0.53	-0.71	-0.49
	(-0.85 - 1.69)	(-0.75 - 2.02)	(-1.28 - 1.03)	(-1.19 - 1.22)	(-3.56 - 1.65)	(-2.93 - 1.88)	(-2.68 - 1.26)	(-2.45 - 1.47)
Head of Household's Spouse = 1	1.51***	1.68***	0.79***	0.87***	-0.76	-0.45	-1.09**	-1.18**
	(0.86 - 2.16)	(0.95 - 2.41)	(0.33 - 1.26)	(0.36 - 1.38)	(-2.03 - 0.52)	(-1.73 - 0.83)	(-1.98 - -0.20)	(-2.23 - -0.12)
Region SE = 2	0.04		0.06		-0.21		-0.01	
	(-0.08 - 0.16)		(-0.09 - 0.20)		(-0.55 - 0.14)		(-0.22 - 0.21)	
Region SE = 3	0.14		-0.01		-0.21		-0.22	
	(-0.04 - 0.31)		(-0.22 - 0.21)		(-0.64 - 0.22)		(-0.52 - 0.09)	
Region SE = 4	0.21		0.15		-0.28		-0.21	
	(-0.07 - 0.49)		(-0.20 - 0.50)		(-1.01 - 0.44)		(-0.75 - 0.33)	
Region SE = 6	0.40		0.47		-0.30		-0.36	
	(-0.18 - 0.98)		(-0.22 - 1.15)		(-2.49 - 1.89)		(-1.53 - 0.80)	
High marginalisation	-0.01		0.06		0.08		0.07	
	(-0.13 - 0.11)		(-0.09 - 0.21)		(-0.26 - 0.41)		(-0.14 - 0.29)	
Medium marginalisation	-0.05		-0.01		-0.18		0.14	
	(-0.34 - 0.23)		(-0.34 - 0.33)		(-1.08 - 0.71)		(-0.40 - 0.68)	

	1 Sexually active	2 Sexually active	3 Sexually active corrected	4 Sexually active corrected	5 Condon at last sexual intercourse	6 Condon at last sexual intercourse	7 Condom at first sexual intercourse	8 Condom at first sexual intercourse
Low marginalisation	0.58		0.77		0.15		-0.24	
	(-0.22 - 1.39)		(-0.17 - 1.71)		(-1.77 - 2.07)		(-2.06 - 1.58)	
18 to 21 years	1.96***	1.97***	2.41***	2.42***	-0.20	-0.15	-0.31***	-0.33***
	(1.84 - 2.07)	(1.85 - 2.08)	(2.27 - 2.56)	(2.27 - 2.57)	(-0.53 - 0.13)	(-0.50 - 0.20)	(-0.53 - -0.10)	(-0.55 - -0.11)
22 to 25 years	2.73***	2.76***	3.13***	3.09***	-0.60***	-0.55***	-0.69***	-0.68***
	(2.60 - 2.85)	(2.63 - 2.90)	(2.97 - 3.28)	(2.94 - 3.25)	(-0.93 - -0.26)	(-0.91 - -0.18)	(-0.91 - -0.48)	(-0.91 - -0.45)
Indigenous household	-0.01	-0.11	-0.01	-0.11	-0.16	0.05	-0.21**	-0.10
	(-0.13 - 0.10)	(-0.30 - 0.09)	(-0.16 - 0.13)	(-0.34 - 0.13)	(-0.48 - 0.17)	(-0.51 - 0.61)	(-0.43 - -0.00)	(-0.43 - 0.24)
prevalence	5.56***		6.53***		6.17***		5.25***	
	(5.27 - 5.85)		(6.09 - 6.97)		(5.39 - 6.94)		(4.68 - 5.83)	
Constant	-3.81***		-4.55***		-1.58***		-1.42***	
	(-4.05 - -3.57)		(-4.84 - -4.26)		(-2.20 - -0.97)		(-1.81 - -1.03)	
Observations	13,563 678	12,618 544	13,041 678	11,234 481	1,774 443	1,300 190	3,365 553	2,904 317
Hausman (p-value)	**0.0346**	FE prefered	**0.2731**	RE prefered	**inconclusive**		**0.9847**	RE prefered
Number of claveofi	682	577	682	501	462	188	575	305

ci in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 20: Association between exposure to Oportunidades and sexual outcomes (FE & RE models)

	1 pregnant	2 pregnant	3 HSV 2	4 HSV 2
3 to 6 years in Oportunidades	0.09	0.10	-0.88***	-1.25**
	(-0.59 - 0.77)	(-1.04 - 1.24)	(-1.52 - -0.23)	(-2.41 - -0.10)
6 to 9 years in Oportunidades	-0.77**	-1.05*	-0.41	-1.07*
	(-1.38 - -0.15)	(-2.18 - 0.08)	(-0.97 - 0.14)	(-2.16 - 0.02)
More than 9 years in Oportunidades	-0.54	-0.91	-0.45	-1.07*
	(-1.21 - 0.13)	(-2.11 - 0.29)	(-1.06 - 0.15)	(-2.19 - 0.05)
Sex (women=1)	-0.54	-0.37	0.61***	0.63***
	(-2.83 - 1.75)	(-2.92 - 2.18)	(0.18 - 1.04)	(0.18 - 1.08)
Head of Household = 1	30.25 (-16798883.05 - 16798943.55)	10.10 (-1,049.05 - 1,069.24)	0.98 (-0.93 - 2.90)	0.39 (-1.81 - 2.60)
Head of Household's Spouse = 1	1.33*	1.05	-0.33	-0.38
	(-0.22 - 2.88)	(-0.48 - 2.58)	(-1.44 - 0.78)	(-1.78 - 1.02)
Region SE = 2	0.04		-0.31	
	(-0.37 - 0.46)		(-0.73 - 0.11)	
Region SE = 3	0.30		-0.26	
	(-0.31 - 0.92)		(-0.91 - 0.39)	
Region SE = 4	0.57		-0.47	
	(-0.34 - 1.47)		(-1.53 - 0.59)	
Region SE = 6	1.72*		-27.65 (-2822922.66 - 2,822,867.37)	
	(-0.17 - 3.61)			
High marginalisation	-0.01		-0.15	
	(-0.46 - 0.44)		(-0.59 - 0.29)	
Medium marginalisation	-0.57		0.03	
	(-1.44 - 0.29)		(-0.94 - 1.00)	
Low marginalisation	0.89		-1.44	
	(-1.95 - 3.73)		(-16.47 - 13.59)	
18 to 21 years	0.80***	0.89***	0.88***	0.95***
	(0.39 - 1.20)	(0.43 - 1.34)	(0.38 - 1.37)	(0.43 - 1.46)

22 to 25 years	1.81***	1.69***	1.33***	1.32***
	(1.31 - 2.31)	(1.15 - 2.24)	(0.85 - 1.81)	(0.80 - 1.83)
Indigenous household	0.09	-0.38	0.08	0.35
	(-0.35 - 0.54)	(-1.13 - 0.36)	(-0.37 - 0.54)	(-0.40 - 1.10)
prevalence	8.00***		10.89***	
	(6.81 - 9.18)		(9.27 - 12.52)	
Constant	-4.71***		-4.38***	
	(-7.30 - -2.12)		(-5.20 - -3.55)	
Observations	1,343	708	3,193	1,148
Clusters	446	129	520	99
Hausman (p-value)	**Inconclusive**		**Inconclusive**	

ci in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 21: Association between exposure to Oportunidades and risk behaviours and outcomes (FE & RE models)

	1 Overweight	2 Overweight	3 #junk food	4 #junk food	5 # sodas per week	6 # sodas per week
3 to 6 years in Oportunidades	0.24*	0.15	0.01	0.03	-0.02	0.04
	(-0.03 - 0.52)	(-0.30 - 0.60)	(-0.11 - 0.13)	(-0.20 - 0.26)	(-0.16 - 0.12)	(-0.23 - 0.31)
6 to 9 years in Oportunidades	0.10	0.00	-0.04	-0.05	-0.01	0.03
	(-0.17 - 0.37)	(-0.44 - 0.44)	(-0.15 - 0.07)	(-0.27 - 0.18)	(-0.14 - 0.12)	(-0.23 - 0.30)
More than 9 years in Oportunidades	-0.01	-0.16	-0.01	0.04	0.00	0.03
	(-0.29 - 0.28)	(-0.61 - 0.29)	(-0.13 - 0.10)	(-0.18 - 0.27)	(-0.13 - 0.14)	(-0.24 - 0.29)
Sex (women=1)	0.36***	0.36***	-0.22***	-0.25***	-0.76***	-0.81***
	(0.22 - 0.51)	(0.21 - 0.52)	(-0.28 - -0.16)	(-0.31 - -0.18)	(-0.83 - -0.69)	(-0.89 - -0.73)
Head of Household = 1	0.77	0.78	0.24	0.17	0.73	0.83
	(-0.46 - 2.01)	(-0.47 - 2.04)	(-0.70 - 1.18)	(-0.81 - 1.14)	(-0.34 - 1.80)	(-0.28 - 1.95)
Head of Household's Spouse = 1	0.43	0.48*	-0.47***	-0.50***	0.01	0.01
	(-0.08 - 0.95)	(-0.05 - 1.02)	(-0.82 - -0.13)	(-0.87 - -0.14)	(-0.40 - 0.42)	(-0.43 - 0.44)
Region SE = 2	-0.10		0.02		-0.03	
	(-0.27 - 0.08)		(-0.05 - 0.10)		(-0.12 - 0.06)	
Region SE = 3	-0.12		0.04		0.01	
	(-0.37 - 0.13)		(-0.07 - 0.16)		(-0.13 - 0.14)	
Region SE = 4	-0.01		-0.06		-0.01	
	(-0.39 - 0.37)		(-0.24 - 0.11)		(-0.21 - 0.20)	
Region SE = 6	0.07		-0.05		-0.07	
	(-0.60 - 0.74)		(-0.42 - 0.33)		(-0.51 - 0.37)	
High marginalisation	-0.01		0.00		-0.02	
	(-0.20 - 0.18)		(-0.07 - 0.08)		(-0.11 - 0.07)	
Medium marginalisation	-0.16		-0.04		-0.04	
	(-0.54 - 0.22)		(-0.21 - 0.12)		(-0.23 - 0.15)	
Low marginalisation	-0.40		-0.20		-0.14	
	(-1.58 - 0.79)		(-0.75 - 0.35)		(-0.78 - 0.49)	
18 to 21 years	0.03	0.05	-0.37***	-0.40***	0.07	0.07
	(-0.15 - 0.21)	(-0.13 - 0.23)	(-0.45 - -0.29)	(-0.49 - -0.32)	(-0.02 - 0.16)	(-0.03 - 0.17)
22 to 25 years	0.17	0.19*	-0.38***	-0.42***	-0.03	-0.04

Youth risk behaviours as barriers for human (health) capital accumulation

	1	2	3	4	5	6
	Overweight	Overweight	#junk food	#junk food	# sodas per week	# sodas per week
	(-0.03 - 0.37)	(-0.02 - 0.40)	(-0.48 - -0.29)	(-0.52 - -0.33)	(-0.13 - 0.08)	(-0.15 - 0.07)
Indigenous household	0.01	-0.02	-0.00	0.03	0.02	0.03
	(-0.18 - 0.19)	(-0.32 - 0.28)	(-0.08 - 0.07)	(-0.10 - 0.16)	(-0.07 - 0.11)	(-0.13 - 0.18)
prevalence	7.56***		0.98***		0.95***	
	(6.91 - 8.20)		(0.93 - 1.03)		(0.90 - 1.00)	
	-3.42***		0.31***	1.46***	0.56***	2.12***
Constant	(-3.77 - -3.07)		(0.16 - 0.46)	(1.26 - 1.66)	(0.38 - 0.73)	(1.88 - 2.36)
Observations	7,138	5,862	13,563	13,563	13,055	13,055
Number of clusters	638	374	678	678	678	678
Hausman (p-value)	**0.8327**	RE preferred	**0.0366**	FE preferred	**0.0692**	RE preferred

Table 22: Association between exposure to Oportunidades at locality level and selected risk behaviours

	1 Smoking	2 Drinking	3 Drugs	4 Sexually active corrected	5 Condon at last sexual intercourse	6 Condom at first sexual intercourse
3 to 6 years in Oportunidades	0.19	-0.06	-0.46	-0.05	-0.00	0.26
	(-0.21 - 0.59)	(-0.33 - 0.22)	(-1.60 - 0.67)	(-0.37 - 0.26)	(-0.76 - 0.76)	(-0.29 - 0.80)
6 to 9 years in Oportunidades	0.00	-0.01	-0.21	0.00	0.11	0.21
	(-0.35 - 0.36)	(-0.24 - 0.23)	(-1.03 - 0.61)	(-0.25 - 0.25)	(-0.50 - 0.72)	(-0.23 - 0.65)
More than 9 years in Oportunidades	-0.00	-0.09	-0.14	0.01	-0.17	0.04
	(-0.35 - 0.35)	(-0.32 - 0.15)	(-0.96 - 0.68)	(-0.24 - 0.27)	(-0.78 - 0.44)	(-0.40 - 0.48)
Sex (women=1)	-1.99***	-1.25***	-1.64***	0.45***	-1.50***	-1.62***
	(-2.17 - -1.81)	(-1.36 - -1.15)	(-2.05 - -1.23)	(0.33 - 0.56)	(-1.78 - -1.21)	(-1.81 - -1.43)
Head of Household = 1	0.29	0.75	-25.83	0.81*	-0.77	-0.88
	(-0.84 - 1.43)	(-0.16 - 1.65)	(-1695723.21 - 1,695,671.54)	(-0.08 - 1.70)	(-2.70 - 1.16)	(-2.39 - 0.62)
Head of Household's Spouse = 1	-0.59	-0.89**	-0.05	1.18***	-0.38	-0.57
	(-1.63 - 0.46)	(-1.57 - -0.21)	(-2.22 - 2.13)	(0.79 - 1.57)	(-1.39 - 0.62)	(-1.31 - 0.18)
Region SE = 2	0.06	0.03	-0.52**	-0.04	-0.01	-0.07
	(-0.12 - 0.24)	(-0.10 - 0.15)	(-0.94 - -0.09)	(-0.16 - 0.08)	(-0.34 - 0.31)	(-0.28 - 0.14)
Region SE = 3	-0.02	-0.07	-0.33	-0.29***	-0.14	-0.31*
	(-0.29 - 0.24)	(-0.25 - 0.10)	(-0.96 - 0.29)	(-0.50 - -0.08)	(-0.60 - 0.31)	(-0.63 - 0.02)
Region SE = 4	-0.28	0.08	-0.46	-0.01	-0.14	-0.35
	(-0.73 - 0.17)	(-0.18 - 0.35)	(-1.49 - 0.56)	(-0.33 - 0.32)	(-0.94 - 0.65)	(-0.91 - 0.21)
Region SE = 6	0.20	-0.08	0.35	0.42	-0.50	-0.40
	(-0.61 - 1.02)	(-0.62 - 0.46)	(-1.05 - 1.74)	(-0.23 - 1.06)	(-2.68 - 1.69)	(-1.50 - 0.71)
High marginalisation	0.02	0.09	0.51**	0.11	-0.01	0.02
	(-0.18 - 0.21)	(-0.05 - 0.23)	(0.01 - 1.02)	(-0.03 - 0.26)	(-0.41 - 0.39)	(-0.24 - 0.29)
Medium marginalisation	-0.19	0.06	-0.35	-0.03	0.19	0.14
	(-0.62 - 0.23)	(-0.21 - 0.33)	(-1.58 - 0.88)	(-0.31 - 0.26)	(-0.57 - 0.96)	(-0.33 - 0.61)
Low marginalisation	-0.01	0.11	-24.73	0.58	0.11	-0.24
	(-1.15 - 1.13)	(-0.63 - 0.85)	(-1118205.58 - 1,118,156.13)	(-0.34 - 1.50)	(-1.89 - 2.10)	(-2.18 - 1.70)
18 to 21 years	0.84***	0.86***	0.59***	2.41***	-0.19	-0.24**
	(0.66 - 1.01)	(0.74 - 0.98)	(0.17 - 1.01)	(2.27 - 2.55)	(-0.54 - 0.16)	(-0.47 - -0.02)

	1	2	3	4	5	6
	Smoking	Drinking	Drugs	Sexually active corrected	Condon at last sexual intercourse	Condom at first sexual intercourse
22 to 25 years	0.86***	0.88***	0.81***	3.17***	-0.56***	-0.69***
	(0.66 - 1.05)	(0.74 - 1.01)	(0.35 - 1.26)	(3.02 - 3.31)	(-0.92 - -0.20)	(-0.92 - -0.45)
Indigenous household	-0.02	-0.05	0.12	-0.04	-0.18	-0.37***
	(-0.21 - 0.17)	(-0.19 - 0.09)	(-0.31 - 0.55)	(-0.18 - 0.10)	(-0.55 - 0.20)	(-0.62 - -0.12)
prevalence	11.94***	7.93***	28.57***	8.06***	6.72***	6.37***
	(10.94 - 12.93)	(7.42 - 8.43)	(25.34 - 31.80)	(7.52 - 8.60)	(5.90 - 7.53)	(5.77 - 6.97)
	-3.38***	-2.91***	-4.98***	-5.10***	-1.85***	-1.60***
Constant	(-3.78 - -2.98)	(-3.19 - -2.63)	(-5.91 - -4.04)	(-5.43 - -4.77)	(-2.59 - -1.12)	(-2.11 - -1.08)
Observations	15,959	15,955	15,952	15,966	1,776	3,566
Number of clusters	675	675	675	675	458	571

3.9. Discussion

Economic development could lead to an increase in risk behaviours among adolescents due to increased access to risk-related goods and services. In the absence of other effects, the additional available income should be reflected in an increase in the overall consumption of all normal goods, which could include tobacco, alcohol and unsafe sex. Poverty alleviation programs thus can induce an income effect and increase risk behaviour, but conditional cash transfers could impose counterbalancing interventions. In particular, if lack of information and temporal myopia are factors influencing risk behaviours, conditional cash transfer programs act through incentives to increase the level of education and future aspirations, which, in turn, decreases the incidence of risk behaviours.

Although it is impossible to disentangle the specific effect of staying at school and receiving additional education and health information, I estimated the combined effect of these factors and found that they decrease risk behaviours. An increase in education level and information regarding healthy behaviour can neutralise the income effect.

In many middle-income countries such as Mexico, risk behaviours among young adults are widespread. A large proportion of adolescents not only smoke and drink alcohol but also engage in unsafe sex, which leads to early pregnancy and sexually transmitted infections. Increasing income levels can worsen these habits, but if preventive strategies are implemented, synergies could emerge: additional resources could be used to buy healthy products rather than unhealthy ones.

These results encourage the continuation of programs oriented to increase human and health capital using economic incentives, as the overall effect on health and human capital seems to be positive. Nevertheless, also highlights the need to include strategies toward preventing behaviours that may decrease health (and human) capital, as risk behaviours are highly prevalent, and the preventive effect of Oportunidades still could be larger.

The analysis of the association between time spent in the programme and risk behaviours in 2007 suggests that *Oportunidades* has played an important role in delaying long-term committed relationships (or unions) among the adolescent and youth populations, which appears to reflect an increase in educational successes and ultimately complements the programme's long-term objectives. These results are also supported by the matching estimation using the 2007 data, where a preventive effect on sexual initiation was found for females. With a

longer time of exposure to the programme, adolescents and young people equally delayed sexual initiation (which may be directly related to their unions), which also contributes to better educational results by diminishing the probability of adolescent pregnancy.

Likewise, although the mechanism is not completely clear due to a lack of evidence regarding differences in the consumption of high-calorie foods, there was a negative association between time spent in the programme and the probability of being overweight, that seems to be also supported by a negative effect on BMI estimated by matching with the 2007 data. Therefore, individuals in the programme are more likely to be healthy adults. From a medium-term perspective, being overweight is a negative factor for educational and labour market success. This result serves to highlight the programme's achievement in diminishing the likelihood of being overweight.

A significant percentage of adolescents and young people from households that are beneficiaries of *Oportunidades* (and who are programme beneficiaries themselves) report participating in behaviours that put their future wellbeing at risk, such as participation in unprotected sex and the consumption of alcohol, drugs and tobacco. Although patterns were observed that suggest individuals in households with greater time spent in the programme are less likely to engage in these behaviours, this was not true in all cases. These behaviours could compromise the programme's ability to increase human capital for this age group.

Likewise, important gender asymmetries were present for risk behaviours. Not only were women more likely to have had sexual relations than men, they were also less likely to have used condoms in their first and most recent sexual encounters. This finding emphasises the need for prevention strategies that target adolescent pregnancy and STIzs, as STIs such as HSV2 were more frequently found in the women of this study.

Although alcohol and tobacco consumption continues to increase with age, the reported levels of consumption were lower than those observed for tobacco, alcohol, and drugs in the National Survey on Addictions 2002, suggesting a downward trend in this population. However, it is important to promote gender-differentiated prevention strategies that specifically target women, even though a low prevalence of these behaviours was observed. In other studies, women displayed the largest increase in the consumption of addictive substances.

The results suggest that an inverse correlation exists between risk behaviours and time spent in the programme, which was one of the hypothesis of this study. This finding indicated

that the programme partially prevents the appearance of these behaviours and that this effect contributes to the achievement goals of *Oportunidades*, safeguarding the investment made in human capital. Nevertheless, these results are not as strong as expected, suggesting that these type of structural interventions that have almost all focus at the individual and household level may not be enough to promote healthy behaviours that could reinforce the health capital accumulation process. One important finding from the dose-response analysis was the strong association of locality level prevalence of risk behaviour in individual behaviour; that is, communities where a given risk behaviour is prevalent may reinforce this particular behaviour. Although commonsensical, using this knowledge to improve intervention should lead to the development of more comprehensive strategies, that address cultural and social norms by promoting healthy behaviours at the adolescents and youth spaces: school, recreational areas, work, etc.

The promotion of healthy behaviours should be addressed as a investment in human capital, as it could result in higher returns by both increasing accumulation and decreasing the depreciation rate.

In terms of the human (health) accumulation process, these results suggest that risk behaviours could interfere with this process and thereby limit socioeconomic mobility; however, they also suggest that it is possible to develop strategies that increase certainty about the future, that overcome the positive effect of income rises on overcoming risk behaviours .

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3.11. Annex 1: Risk Behaviours in 2007

Table 18: Averages and standard errors for variables selected for the 14-18 age group in 2007, broken down by years exposed to Oportunidades and by gender.

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time *Oportunidades*	9.61	9.61	7.82	7.81	4.00	4.04	1.47	1.49	0.00	0.00
	0.01	0.01	0.04	0.04	0.06	0.06	0.08	0.09	0.00	0.00
Age [в, ѓ, б, ж, ѕ, з, Ц, ь, Ф, П, Л, г]	15.94	15.97	15.94	15.96	15.87	15.90	15.83	15.91	15.94	16.05
	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.05	0.02	0.02
Sex (Women)	49.5%		50.6%		49.8%		48.6%		52.2%	
Indigenous [ѓ, ѓ, Ч, ѕ, з, Г, Т, П, Л, г]	42.8%	44.5%	37.4%	35.9%	29.6%	32.8%	30.8%	28.7%	28.3%	27.7%
	2.4%	2.5%	3.0%	2.7%	3.1%	2.8%	4.6%	5.1%	2.1%	2.1%
Living in union [ш, †, ‡, ѓ, в, ѓ, б, Ч, ѕ, ь, Ц, Ф, Т, Л, Д, г]	1.9%	5.0%	1.8%	4.7%	2.7%	5.9%	2.4%	9.5%	3.4%	14.9%
	0.2%	0.4%	0.2%	0.4%	0.3%	0.4%	0.5%	1.3%	0.3%	0.7%
Enrolled in school [ѓ, Ч, Т, Л, г]	98.9%	99.3%	98.5%	99.0%	98.3%	99.0%	98.1%	98.3%	97.5%	98.1%
	0.3%	0.2%	0.2%	0.2%	0.3%	0.3%	0.6%	0.5%	0.4%	0.3%
Years of school [ш, †, ‡, в, ѓ, Ч, ѕ, Ц, ь, Ц, Т, Л, Д, г]	7.82	8.07	7.95	8.19	7.68	8.04	7.37	7.44	7.55	7.78
	0.07	0.07	0.06	0.06	0.08	0.08	0.18	0.21	0.09	0.08
Education success	70.6%	77.8%	53.8%	47.4%	57.1%	84.6%	20.0%	66.7%	55.0%	75.0%
	12.6%	13.9%	9.0%	11.4%	14.0%	10.1%	18.0%	15.8%	10.6%	8.6%
Presently in school [ѓ, б, ж, ѕ, Г, Ф, П, г]	53.5%	54.6%	57.0%	59.3%	55.0%	58.6%	60.0%	59.1%	51.1%	50.5%
	1.7%	1.8%	1.7%	1.7%	1.8%	1.8%	2.9%	3.6%	1.8%	2.0%
Granted an *Oportunidades* scholarship [‡, в, ѓ, б, Ч, ж, Ф, Л, г]	45.6%	47.1%	48.3%	49.4%	44.8%	49.7%	46.7%	47.2%	19.7%	17.1%
	1.6%	1.8%	1.7%	1.6%	1.7%	1.6%	3.0%	3.4%	1.6%	1.3%
Continuing education [†, Л]	80.0%	79.3%	78.4%	80.9%	80.5%	81.9%	82.3%	81.0%	81.1%	83.5%
	1.4%	1.4%	1.3%	1.3%	1.5%	1.6%	2.9%	2.5%	1.4%	1.7%
Working [ш, †, ‡, ѓ, в, Б, ѓ, ѓ, ж, ѕ, Г, ь, Ц, Ф, Т]	37.7%	13.3%	34.1%	11.0%	38.2%	13.9%	33.1%	8.9%	35.4%	12.3%

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
	1.3%	1.0%	1.0%	0.8%	1.3%	1.0%	2.0%	1.5%	1.2%	0.8%
Agricultural work Ш, т, ‡, ₣, ₪, Б, Ч, ≠, Г, П, Л, Г	68.1%	35.8%	59.9%	25.8%	55.4%	24.2%	61.4%	30.3%	53.8%	19.9%
	1.9%	3.8%	2.1%	2.9%	4.0%	2.9%	5.2%	8.8%	2.3%	2.5%
Daily wage	$82.72	$ 67.25	$ 81.13	$ 67.94	$86.01	$71.04	$69.94	$ 62.61	$83.70	$68.82
	$3.15	$ 3.69	$ 2.29	$ 3.56	$ 2.86	$3.28	$ 3.60	$ 11.49	$ 2.54	$ 5.04
Junk food ₪, Л, Г	53.7%	53.5%	54.5%	53.3%	56.9%	55.7%	51.4%	54.2%	53.0%	48.7%
	1.9%	1.9%	1.8%	1.8%	1.9%	2.1%	4.1%	3.8%	1.9%	1.5%
Amount of *junk food* Ш, т, ‡, ₪, Г, Л	1.47	1.34	1.43	1.14	1.49	1.26	1.46	1.24	1.39	1.06
	0.08	0.07	0.09	0.06	0.10	0.07	0.17	0.14	0.08	0.05
Number of sodas yesterday Ш, т, ‡, ₪, ₤, Ж, Ь	1.15	0.88	1.11	0.80	1.24	0.91	1.06	0.95	1.07	0.86
	0.06	0.05	0.04	0.04	0.07	0.05	0.09	0.09	0.05	0.04
Number of sodas a week Ш, т, ‡, ₣, ₪, ₤, Ё, Ж, ≠,	1.95	1.34	2.02	1.37	2.34	1.47	1.83	1.34	2.02	1.44
	0.08	0.07	0.07	0.05	0.17	0.10	0.14	0.11	0.10	0.07
Spending on sodas Ш, т, ‡, ₣, ₪, Б, Ч, Д, Г	$20.30	$15.29	$ 20.23	$14.69	$ 21.72	$14.67	$20.16	$16.96	$ 23.46	$ 16.49
	$ 0.75	$ 0.62	$ 0.61	$ 0.47	$ 0.96	$ 0.97	$ 1.71	$ 1.20	$ 0.84	$ 0.57
Smoking Ш, т, ‡, ₣, ₪, Б, ₤, Ц, Ф, Д	8.0%	1.7%	6.1%	1.9%	8.5%	2.0%	6.8%	0.8%	8.6%	1.9%
	0.9%	0.3%	0.7%	0.3%	1.0%	0.5%	1.4%	0.4%	1.0%	0.4%
Smoke at home	19.8%	26.1%	14.4%	28.6%	19.2%	10.5%	25.0%	33.3%	20.9%	24.0%
	4.2%	9.3%	4.2%	8.1%	4.1%	7.1%	8.2%	27.3%	4.5%	8.4%
Drink Ш, т, ‡, ₣, ₪, ₤, Б, Ц, Ф, Л, Г	14.1%	7.1%	14.1%	7.0%	17.1%	8.6%	11.1%	5.5%	15.7%	9.4%
	1.3%	0.9%	1.1%	0.7%	1.4%	1.1%	2.2%	1.2%	1.5%	0.9%
Number of alcoholic Drinks Ш, ‡, ₣, ₪	3.63	2.14	2.68	1.84	2.90	1.36	3.34	1.40	3.18	1.48
	0.49	0.44	0.36	0.35	0.43	0.35	1.00	0.56	0.47	0.30
Drugs Ш, Б, ≈, ≠	1.7%	0.3%	0.8%	0.4%	0.6%	0.3%	0.3%	0.5%	0.9%	0.6%
	0.5%	0.2%	0.2%	0.1%	0.3%	0.2%	0.3%	0.4%	0.3%	0.2%
Problems with alcohol т, Ё, Б, ≈	9.7%	6.9%	12.6%	6.4%	9.0%	9.9%	20.5%	19.0%	5.1%	4.2%
	2.3%	2.4%	2.2%	2.2%	2.3%	3.2%	5.5%	8.8%	1.8%	2.2%

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
Father alcoholic [Ш]	12.9%	15.6%	14.3%	16.1%	13.2%	14.6%	11.6%	15.2%	12.2%	13.7%
	1.1%	1.2%	1.1%	1.1%	1.5%	1.6%	1.7%	2.6%	1.3%	1.3%
Mother alcoholic [Ғ, Ғ, Б, =, Ц]	0.9%	1.2%	1.2%	1.7%	1.2%	1.4%	0.0%	2.6%	1.0%	1.7%
	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.0%	0.9%	0.4%	0.4%
Sexually active [Ш, Щ, Б, Ф, Л, Г]	10.4%	6.8%	7.3%	7.7%	9.4%	8.1%	7.4%	8.2%	10.2%	19.7%
	1.1%	0.8%	0.7%	0.9%	1.2%	1.0%	1.8%	1.5%	1.1%	1.3%
Sexually active at 13 years of age [Щ, Ф, Л, Г]	2.8%	2.4%	2.2%	2.6%	2.9%	2.5%	3.1%	3.4%	3.3%	8.0%
	0.5%	0.4%	0.4%	0.5%	0.6%	0.5%	0.8%	0.9%	0.6%	0.9%
Age of first sexual Encounter	14.77	15.19	14.76	15.27	14.88	14.97	14.41	15.17	14.90	15.26
	0.34	0.19	0.23	0.20	0.26	0.20	0.36	0.25	0.24	0.12
First condom use [Ш, Т, Ѣ, Ғ, Щ, П]	57.1%	14.9%	60.2%	21.3%	65.7%	29.2%	60.0%	24.1%	52.6%	16.5%
	4.9%	3.9%	4.9%	3.9%	6.7%	5.0%	8.8%	7.5%	4.9%	2.8%
Used condom at last encounter [Ш, Т, Ѣ, Ғ, Щ, Г]	57.4%	15.0%	59.2%	20.8%	50.0%	16.7%	63.6%	17.6%	52.8%	7.2%
	7.1%	5.7%	7.0%	5.9%	8.1%	6.7%	13.1%	9.6%	7.0%	2.5%
IMC [Ш, Т, Ѣ, Щ, Ғ, Ғ, Ж, ≠, Ь, Ц, Ф, Г, П, Л, Д, Г]	21.27	21.73	21.19	21.69	21.74	22.40	21.12	21.33	21.25	22.39
	0.15	0.13	0.13	0.12	0.20	0.18	0.28	0.19	0.14	0.14
Overweight [Ш, Т, Ѣ, Щ, Ғ, Ғ, Ч, ≠, Ь, Ц, Ф, П, Л, Г]	8.6%	15.6%	10.8%	14.2%	15.8%	21.6%	10.2%	12.7%	12.6%	20.0%
	1.1%	1.4%	1.2%	1.2%	1.8%	2.0%	2.5%	2.5%	1.4%	1.4%
Expectation of future (difference)	0.31	0.31	0.01	0.38	-0.17	0.30	0.00	0.04	0.36	0.19
	0.36	0.35	0.34	0.26	0.40	0.35	0.71	0.65	0.32	0.19
Expectation of social future (difference) [≠]	-0.20	-0.01	0.13	0.13	0.52	0.49	0.32	0.14	0.23	-0.12
	0.23	0.19	0.22	0.16	0.30	0.26	0.55	0.22	0.19	0.14
Have stolen [Ш, Ѣ, Щ, Ғ, Ж, ≠]	13.9%	4.3%	12.9%	7.1%	25.0%	4.3%	21.1%	10.0%	13.3%	4.7%
	3.7%	2.2%	4.2%	2.4%	5.1%	2.4%	7.8%	5.1%	3.6%	1.4%
Destroyed property of others [Ш, Т, Ѣ, Щ, Ц, Ф, Т, Д]	26.9%	8.7%	31.3%	12.7%	30.1%	16.4%	15.0%	0.0%	20.9%	9.4%
	4.2%	2.9%	4.8%	2.8%	5.1%	4.2%	10.6%	0.0%	4.2%	1.8%

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
Engage in fighting [Ш, †, ‡, ₣, ₪, ≠, Ц, Ф, Д]	51.8%	19.6%	53.9%	25.2%	63.5%	23.6%	52.2%	10.0%	59.2%	20.3%
	4.9%	4.2%	5.3%	4.7%	5.0%	5.4%	10.7%	5.7%	5.2%	2.6%
Report knowledge on the effects of alcohol [Ж]	82.8%	82.7%	83.4%	83.1%	79.5%	80.7%	82.1%	84.0%	83.5%	84.0%
	1.1%	1.2%	1.4%	1.2%	2.0%	1.7%	2.8%	2.5%	1.2%	1.1%
Report knowledge on the effects of pregnancy [Ш, †, ‡, ₪, Ч, =, Г, Ь, Л]	58.0%	63.4%	61.7%	70.6%	60.9%	64.9%	66.2%	65.1%	62.4%	67.7%
	1.8%	1.8%	1.7%	1.6%	2.0%	2.1%	4.6%	3.3%	1.9%	1.5%
Report knowledge on the effects of PAP [Ш, †, ‡, ₣, ₪, Б, Ч, Ж]	47.2%	65.9%	53.8%	67.6%	49.6%	68.6%	53.1%	63.1%	54.5%	68.3%
	1.9%	1.6%	1.8%	1.9%	2.2%	2.2%	4.0%	3.5%	1.9%	1.5%
Tested positive for HSV 2 [Ш, ‡, ₪, Г]	0.3%	3.2%	2.1%	3.3%	0.7%	3.9%	4.3%	5.7%	1.1%	6.7%
	0.3%	1.1%	1.2%	1.0%	0.7%	1.5%	2.6%	2.8%	0.8%	1.3%

[a] Includes marriages and civil unions

[Ш] Value p < 0.05 of 1 *vs.* 2; [Ш] Value p < 0.1 of 1 *vs.* 2, [†] Value p < 0.05 of 3 *vs.* 4; [†] Value p < 0.1 of 3 *vs.* 4, [‡] Value p < 0.05 of 5 *vs.* 6; [‡] Value p < 0.1 of 5 *vs.* 6, [₣] Value p < 0.05 of 7 *vs.* 8; [₣] Value p < 0.1 of 7 *vs.* 8, [₪] Value p < 0.05 of 9 *vs.* 10; [₪] Value p < 0.1 of 9 *vs.* 10, [Б] Value p < 0.05 of 1 *vs.* 3; [Б] Value p < 0.1 of 1 *vs.* 3, [Ь] Value p < 0.05 of 3 *vs.* 5; [Ь] Value p < 0.1 of 3 *vs.* 5, [Ъ] Value p < 0.05 of 5 *vs.* 7; [Ъ] Value p < 0.1 of 5 *vs.* 7, [Ъ] Value p < 0.05 of 7 *vs.* 9; [Ъ] Value p < 0.1 of 7 *vs.* 9, [Ч] Value p < 0.05 of 1 *vs.* 9; [Ч] Value p < 0.1 of 1 *vs.* 9, [Ж] Value p < 0.05 of 5 *vs.* 9; [Ж] Value p < 0.1 of 5 *vs.* 9, [=] Value p < 0.05 of 1 *vs.* 7; [=] Value p < 0.1 of 1 *vs.* 7, [Г] Value p < 0.05 of 1 *vs.* 5; [Г] Value p < 0.1 of 1 *vs.* 5, [Ц] Value p < 0.05 of 3 *vs.* 7; [Ц] Value p < 0.1 of 3 *vs.* 7, [Г] Value p < 0.05 of 2 *vs.* 4; [Г] Value p < 0.1 of 2 *vs.* 4, [Ь] Value p < 0.05 of 4 *vs.* 6; [Ь] Value p < 0.1 of 4 *vs.* 6, [Ц] Value p < 0.05 of 6 *vs.* 8; [Ц] Value p < 0.1 of 6 *vs.* 8, [Ф] Value p < 0.05 of 8 *vs.* 10; [Ф] Value p < 0.1 of 8 *vs.* 10, [Т] Value p < 0.05 of 2 *vs.* 8; [Т] Value p < 0.1 of 2 *vs.* 8, [Л] Value p < 0.05 of 2 *vs.* 6; [Л] Value p < 0.1 of 2 *vs.* 6, [Л] Value p < 0.05 of 2 *vs.* 10; [Л] Value p < 0.1 of 2 *vs.* 10, [Д] Value p < 0.05 of 4 *vs.* 8; [Д] Value p < 0.1 of 4 *vs.* 8, [Г] Value p < 0.05 of 4 *vs.* 10; [Г] Value p < 0.1 of 4 *vs.* 10

Table 19: Averages and standard errors of selected variables for the 19-21 age group in 2007, broken down by years exposed to Oportunidades and by gender

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
Time in *Oportunidades*	9.62	9.62	7.80	7.82	4.02	3.99	1.43	1.46	0.00	0.00
	0.01	0.01	0.04	0.04	0.06	0.05	0.08	0.07	0.00	0.00
Age [д, е, б, ж, з, и, ц, ь, ф, п, л, г]	19.95	20.01	19.99	20.00	19.95	20.01	19.97	20.03	20.03	20.08
	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.04	0.02	0.02
Sex (women)	51.6%		52.9%		54.9%		56.4%		55.4%	
Indigenous [т, е, ч, ъ, ы, г, т, п, л, г]	37.7%	38.1%	32.7%	30.1%	23.7%	29.9%	28.1%	24.8%	25.9%	24.6%
	3.2%	3.2%	3.3%	2.8%	3.3%	3.2%	6.2%	5.7%	2.8%	2.5%
Living in *union* [ш, т, э, р, щ, е, б, ч, ы, ь, ц, ф, т, л, д, г]	6.7%	8.9%	6.5%	10.3%	9.7%	19.5%	13.0%	30.1%	21.7%	39.4%
	0.7%	0.6%	0.7%	0.9%	0.9%	1.2%	2.0%	2.8%	1.2%	1.4%
Enrolled in school [т, ч, т, л, г]	97.6%	98.5%	97.9%	97.9%	97.9%	97.9%	97.4%	97.5%	95.6%	97.0%
	0.9%	0.5%	0.5%	0.5%	0.8%	0.8%	1.5%	1.0%	0.9%	0.7%
Years educated [ш, т, э, щ, е, ч, ы, ц, ь, ц, т, л, д, г]	8.57	8.69	8.76	8.77	8.44	8.32	8.10	7.71	8.15	8.30
	0.18	0.13	0.14	0.13	0.21	0.20	0.33	0.28	0.18	0.17
Education success	74.5%	70.7%	72.6%	76.0%	72.2%	67.2%	76.1%	73.0%	68.5%	67.2%
	2.3%	2.5%	2.5%	1.8%	3.4%	2.6%	3.4%	3.9%	2.8%	2.7%
Presently in school [т, б, ж, ы, г, ф, п, г]	9.4%	12.2%	12.5%	14.8%	13.9%	12.8%	15.3%	11.5%	12.6%	15.1%
	1.3%	1.4%	1.4%	1.6%	2.0%	1.8%	4.1%	2.4%	1.4%	1.8%
Granted *Oportunidades* scholarship [т, щ, е, б, ч, ж, ф, л, г]	4.4%	3.5%	3.4%	4.2%	2.0%	2.2%	4.7%	3.0%	0.8%	1.2%
	0.8%	0.8%	0.7%	0.7%	0.7%	0.6%	2.0%	1.2%	0.3%	0.3%
Continuing education [т, л]	83.0%	87.7%	92.3%	79.5%	92.2%	84.5%	76.5%	88.9%	84.9%	84.0%
	5.0%	3.9%	2.6%	3.6%	3.8%	4.6%	6.7%	7.0%	4.7%	3.7%
Working [ш, т, э, р, щ, б, е, ё, ж, ы, г, ь, ц, ф, т]	30.7%	12.2%	34.0%	12.5%	38.1%	17.0%	35.1%	11.8%	40.1%	11.4%

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
	1.4%	0.9%	1.6%	1.0%	2.2%	1.5%	3.1%	1.7%	1.5%	1.1%
Agricultural work Ш, †, ‡, ₣, ₡, б, ч, ≠, Г, П, Л, Г	57.6%	22.5%	54.8%	13.0%	41.0%	18.6%	43.2%	14.7%	48.9%	10.3%
	2.9%	3.7%	2.9%	2.6%	4.3%	3.4%	5.5%	7.4%	3.7%	2.3%
Daily wage	$100.31	$78.33	$96.35	$74.74	$97.11	$77.14	$91.08	$77.10	$96.36	$79.53
	$6.34	$5.12	$4.33	$3.72	$3.96	$3.16	$7.45	$9.45	$3.03	$5.17
Junk food ₡, Л, Г	43.7%	41.3%	44.6%	42.7%	43.8%	40.2%	48.3%	28.6%	44.2%	36.7%
	3.2%	2.7%	2.9%	2.4%	4.0%	2.8%	10.4%	3.6%	2.8%	2.0%
Amount of *junk food* Ш, †, ‡, ₡, Г, Л	1.02	0.85	1.08	0.85	1.01	0.89	1.38	0.62	1.17	0.75
	0.12	0.09	0.11	0.08	0.15	0.11	0.40	0.13	0.12	0.06
Number of sodas yesterday Ш, †, ‡, ₡, €, Ж, Ь	1.11	0.77	1.29	0.81	1.10	0.92	1.26	0.79	1.13	0.77
	0.10	0.08	0.10	0.06	0.09	0.07	0.20	0.10	0.07	0.05
Number of sodas per week Ш, †, ‡, ₣, ₡, €, ₾, Ж, ≠,	2.16	1.41	2.19	1.16	2.82	1.57	2.19	1.25	2.35	1.28
	0.15	0.14	0.15	0.08	0.24	0.16	0.25	0.18	0.19	0.08
Spending in sodas Ш, †, ‡, ₣, ₡, б, ч, Д, Г	$23.49	$15.61	$24.79	$16.69	$26.70	$19.36	$20.84	$14.55	$27.75	$17.58
	$1.37	$1.05	$1.26	$0.93	$1.84	$1.13	$2.75	$1.64	$1.54	$0.79
Smoking Ш, †, ‡, ₣, ₡, б, €, Ц, Ф, Д	20.6%	2.1%	15.4%	2.7%	20.2%	2.5%	19.0%	0.7%	19.6%	1.8%
	2.5%	0.8%	2.2%	0.8%	2.9%	0.8%	6.5%	0.6%	2.1%	0.5%
Smoke at home	23.1%	14.3%	18.9%	28.6%	41.2%	28.6%	27.3%	100.0%	25.0%	16.7%
	6.0%	13.3%	5.7%	10.2%	8.7%	17.1%	13.5%	0.0%	5.4%	10.8%
Drink Ш, †, ‡, ₣, ₡, €, б, Ц, Ф, Л, Г	40.9%	10.4%	33.0%	11.7%	33.7%	12.7%	24.1%	7.9%	39.7%	10.1%
	3.6%	1.7%	2.9%	1.5%	3.6%	2.0%	4.8%	2.3%	2.7%	1.1%
Number of alcoholic drinks Ш, ‡, ₣, ₡	3.27	1.21	3.18	1.26	3.49	1.42	3.92	2.27	4.24	1.32
	0.52	0.43	0.50	0.32	0.67	0.36	0.86	1.74	0.49	0.31
Drugs Ш, б, =, ≠	1.6%	0.9%	3.4%	0.2%	3.0%	0.3%	3.4%	0.0%	4.0%	0.1%
	0.8%	0.5%	1.0%	0.2%	1.3%	0.3%	2.0%	0.0%	1.1%	0.1%
Problems with alcohol †,	19.4%	0.0%	11.2%	1.8%	10.7%	2.4%	7.1%	0.0%	10.8%	4.4%

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
[е, б, ≈]	4.0%	0.0%	2.8%	1.7%	3.9%	2.4%	7.0%	0.0%	2.5%	2.5%
Father alcoholic [Ш]	12.2%	16.9%	11.9%	14.3%	12.2%	15.6%	13.5%	15.8%	10.2%	15.8%
	2.4%	2.4%	1.9%	1.9%	2.8%	2.3%	4.5%	3.4%	1.8%	1.4%
Mother alcoholic [ғ, ғ, б, ≈, Ц]	1.4%	1.5%	0.7%	0.7%	0.7%	2.9%	7.4%	2.4%	1.4%	1.6%
	0.8%	0.7%	0.5%	0.4%	0.7%	1.1%	3.1%	1.2%	0.7%	0.5%
Sexually active [Ш, щ, Б, Ф, Л, г]	29.4%	34.3%	29.4%	35.0%	29.0%	45.2%	27.6%	50.7%	41.2%	61.9%
	2.9%	2.8%	3.2%	2.3%	3.3%	3.0%	6.2%	6.0%	3.6%	2.2%
Sexually active at 13 years of age [щ, Ф, Л, г]	19.1%	15.7%	19.7%	21.7%	16.8%	32.5%	19.0%	35.7%	25.3%	45.1%
	2.5%	2.1%	2.6%	1.9%	3.1%	2.8%	5.1%	5.1%	3.0%	2.2%
Age of first relation	16.27	17.52	16.28	17.11	17.00	16.71	15.93	15.97	16.73	16.62
	0.36	0.22	0.25	0.15	0.40	0.19	0.41	0.24	0.17	0.11
First condom use [Ш, ғ, ғ, ғ, щ, п]	48.6%	21.3%	61.1%	19.6%	51.1%	19.0%	50.0%	13.2%	50.8%	15.0%
	5.5%	3.9%	5.5%	2.9%	8.3%	3.4%	11.7%	4.3%	4.5%	2.0%
Used condom at last encounter [Ш, ғ, ғ, ғ, щ, г]	36.4%	21.3%	42.0%	19.0%	46.2%	16.7%	71.4%	11.1%	43.8%	16.3%
	6.2%	5.9%	8.1%	4.5%	11.4%	4.5%	15.6%	5.5%	5.3%	2.4%
IMC [Ш, ғ, ғ, щ, ғ, ғ, Ж, ≈, Ь, Ц, Ф, ғ, п, л, д, г]	23.25	22.60	23.03	23.69	23.46	24.19	24.91	23.33	23.82	23.66
	0.22	0.19	0.26	0.26	0.35	0.31	1.58	0.32	0.36	0.18
Overweight [Ш, ғ, ғ, щ, ғ, ғ, Ч, ≈, Ь, Ц, Ф, п, л, г]	11.6%	10.8%	11.6%	17.5%	18.2%	20.5%	3.0%	12.6%	16.7%	18.5%
	1.1%	1.4%	1.2%	1.2%	1.8%	2.0%	2.5%	2.5%	1.4%	1.4%
Expectation of future (difference)	0.75	0.29	0.42	0.23	0.62	0.79	0.43	-0.45	0.84	0.66
	0.27	0.24	0.33	0.22	0.32	0.23	1.06	0.38	0.19	0.13
Expectation of social future (difference) [≈]	0.49	-0.03	0.00	-0.05	-0.16	0.26	0.07	-0.22	0.50	0.18
	0.24	0.18	0.32	0.17	0.25	0.19	0.33	0.25	0.16	0.11
Have stolen [Ш, ғ, щ, ғ, Ж, ≈]	13.0%	2.8%	7.6%	3.7%	6.7%	2.2%	6.3%	6.0%	7.3%	4.1%
	4.1%	1.6%	2.6%	1.5%	3.6%	1.3%	5.8%	2.9%	2.1%	1.0%

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
Destroyed property of others' [†,‡,Ш,Ц,Ф,Т,Д]	13.2% 4.4%	10.2% 2.8%	17.4% 4.2%	8.5% 2.1%	8.9% 4.2%	8.2% 2.5%	18.8% 10.2%	7.6% 2.8%	16.1% 3.2%	4.8% 1.0%
Engage in fighting [Ш,†,‡,Б,Щ,≠,Ц,Ф,Д]	43.5% 6.0%	15.7% 3.7%	45.7% 5.3%	17.6% 3.2%	46.8% 7.0%	14.7% 3.1%	37.5% 15.0%	12.3% 3.8%	37.5% 4.2%	13.2% 1.7%
Report knowledge on the effects of alcohol [Ж]	86.5% 2.1%	84.7% 2.1%	83.5% 2.2%	86.9% 1.7%	84.6% 3.0%	81.1% 2.5%	93.2% 3.6%	82.9% 4.5%	83.9% 2.2%	83.4% 1.5%
Report knowledge on the effects of pregnancy [Ш,†,‡,Щ,Ч,=,Г,Ь,Л]	65.6% 3.5%	69.4% 2.7%	61.0% 2.9%	70.4% 2.2%	64.2% 4.4%	66.7% 3.3%	64.2% 6.2%	69.2% 5.8%	63.3% 2.7%	70.3% 2.0%
Report knowledge on the effects of PAP [Ш,†,‡,Б,Щ,Б,Ч,Ж]	58.3% 3.2%	70.9% 2.7%	57.0% 2.5%	79.1% 2.1%	55.0% 4.9%	72.4% 2.7%	62.7% 6.1%	77.1% 3.6%	60.5% 3.1%	81.8% 1.6%
Tested positive for HSV 2 [Ш,‡,Щ,Г]	2.3% 1.6%	4.1% 1.6%	8.0% 2.3%	9.0% 2.1%	2.9% 2.1%	4.8% 1.7%	5.0% 5.0%	6.8% 3.0%	6.7% 2.6%	6.3% 1.2%

[a] Includes marriages and civil unions

[Ш] Value p < 0.05 of 1 *vs.* 2; [Ш] Value p < 0.1 of 1 *vs.* 2, [†] Value p < 0.05 of 3 *vs.* 4; [†] Value p < 0.1 of 3 *vs.* 4, [‡] Value p < 0.05 of 5 *vs.* 6; [‡] Value p < 0.1 of 5 *vs.* 6, [Ф] Value p < 0.05 of 7 *vs.* 8; [Ф] Value p < 0.1 of 7 *vs.* 8, [Щ] Value p < 0.05 of 9 *vs.* 10; [Щ] Value p < 0.1 of 9 *vs.* 10, [Б] Value p < 0.05 of 1 *vs.* 3; [Б] Value p < 0.1 of 1 *vs.* 3, [Б] Value p < 0.05 of 3 *vs.* 5; [Б] Value p < 0.1 of 3 *vs.* 5, [Б] Value p < 0.05 of 5 *vs.* 7; [Б] Value p < 0.1 of 5 *vs.* 7, [Б] Value p < 0.05 of 7 *vs.* 9; [Б] Value p < 0.1 of 7 *vs.* 9, [Ч] Value p < 0.05 of 1 *vs.* 9; [Ч] Value p < 0.1 of 1 *vs.* 9, [Ж] Value p < 0.05 of 5 *vs.* 9; [Ж] Value p < 0.1 of 5 *vs.* 9, [=] Value p < 0.05 of 1 *vs.* 7; [=] Value p < 0.1 of 1 *vs.* 7, [Ц] Value p < 0.05 of 1 *vs.* 5; [Ц] Value p < 0.1 of 1 *vs.* 5, [Ц] Value p < 0.05 of 3 *vs.* 7; [Ц] Value p < 0.1 of 3 *vs.* 7, [Г] Value p < 0.05 of 2 *vs.* 4; [Г] Value p < 0.1 of 2 *vs.* 4, [Ь] Value p < 0.05 of 4 *vs.* 6; [Ь] Value p < 0.1 of 4 *vs.* 6, [Ч] Value p < 0.05 of 6 *vs.* 8; [Ч] Value p < 0.1 of 6 *vs.* 8, [Ф] Value p < 0.05 of 8 *vs.* 10; [Ф] Value p < 0.1 of 8 *vs.* 10, [Т] Value p < 0.05 of 2 *vs.* 8; [Т] Value p < 0.1 of 2 *vs.* 8, [Л] Value p < 0.05 of 2 *vs.* 6; [Л] Value p < 0.1 of 2 *vs.* 6, [Л] Value p < 0.05 of 2 *vs.* 10; [Л] Value p < 0.1 of 2 *vs.* 10, [Д] Value p < 0.05 of 4 *vs.* 8; [Д] Value p < 0.1 of 4 *vs.* 8, [Г] Value p < 0.05 of 4 *vs.* 10; [Г] Value p < 0.1 of 4 *vs.* 10

Table 20: Averages and standard errors of selected variables for the 22 to 24 age group in 2007, broken down by years of exposure to Oportunidades and by gender

	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
Variable	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time in *Oportunidades*	9.62	9.62	7.78	7.77	4.02	3.96	1.51	1.48	0.00	0.00
	0.01	0.01	0.03	0.04	0.06	0.05	0.08	0.07	0.00	0.00
Age [ш, ѣ, б, ж, ≈, з, ц, ь, ф, п, л, г]	22.96	22.94	22.95	23.00	22.97	23.06	23.02	23.01	23.01	23.01
	0.02	0.02	0.02	0.02	0.03	0.02	0.04	0.03	0.02	0.02
Sex (women)	50.8%		52.1%		57.4%		56.8%		55.8%	
Indigenous [ѣ, ѣ, ч, ≈, ≠, г, т, п, л, г]	40.8%	29.8%	28.6%	34.0%	28.1%	32.5%	25.0%	31.0%	26.3%	23.5%
	3.6%	3.3%	3.2%	3.6%	3.9%	4.6%	7.5%	6.2%	2.9%	2.5%
Live in *union* [ш, т, ѣ, ѣ, ш, ѣ, б, ч, ≠, ь, ц, ф, т, л, д, г]	7.6%	9.9%	9.9%	13.9%	17.9%	35.1%	29.5%	44.2%	35.7%	47.7%
	0.7%	0.8%	0.8%	1.1%	1.5%	1.8%	2.8%	3.2%	1.3%	1.2%
Enrolled in school [ѣ, ч, т, л, г]	95.6%	95.2%	94.8%	95.9%	97.6%	95.0%	96.4%	94.3%	94.5%	95.5%
	1.2%	1.3%	1.1%	1.1%	1.0%	1.5%	2.1%	2.6%	1.2%	1.0%
Years educated [ш, т, ѣ, ш, ѣ, ч, ≈, ц, ь, ц, т, л, д, г]	7.6	7.6	7.2	7.9	8.1	7.6	7.1	7.7	8.0	8.0
	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.2	0.2
Education success	77.3%	73.8%	75.7%	75.9%	75.5%	79.5%	81.9%	81.8%	73.0%	75.3%
	2.6%	2.8%	2.3%	2.3%	3.2%	2.5%	4.8%	3.0%	2.5%	2.2%
Presently in school [ѣ, б, ж, ≈, г, ф, п, г]	4.0%	5.7%	4.5%	6.7%	7.8%	3.1%	4.9%	6.1%	9.4%	7.6%
	1.2%	1.6%	1.1%	1.4%	1.9%	1.1%	2.6%	3.4%	1.4%	1.2%
Granted *Oportunidades* scholarship [ѣ, ш, ѣ, б, ч, ж, ф, л, г]	0.3%	0.0%	0.9%	0.4%	0.7%	0.0%	0.9%	1.0%	0.1%	0.2%
	0.3%	0.0%	0.4%	0.3%	0.5%	0.0%	0.9%	0.7%	0.1%	0.1%
Continuing education [т, л]	75.0%	88.2%	77.8%	83.3%	81.3%	85.7%	75.0%	60.0%	80.0%	82.1%
	12.9%	8.1%	10.3%	6.2%	9.9%	13.3%	23.5%	15.0%	7.0%	6.1%
Working [ш, т, ѣ, ѣ, ш, б, ѣ, ѣ, ж,	22.7%	8.0%	27.0%	8.8%	30.0%	11.4%	39.1%	8.4%	37.9%	12.2%

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
≈, Г, Ь, Ц, Ф, ₸	1.2%	0.8%	1.6%	0.8%	1.8%	1.3%	3.4%	1.3%	1.3%	0.8%
Agricultural work Ш, ₸, ‡, ₣, ₪, Б, Ч, ≠, Г, П, Л, Г	53.4%	21.0%	59.4%	17.7%	48.0%	13.8%	43.7%	18.5%	42.0%	12.2%
	3.1%	4.4%	3.3%	3.8%	6.0%	3.4%	7.1%	6.7%	3.4%	2.7%
Daily wage	$94.55	$75.43	$92.73	$98.60	$96.07	$83.25	$92.12	$61.95	$108.67	$88.11
	$3.25	$5.84	$4.11	$16.30	$4.47	$5.40	$6.07	$7.27	$3.96	$7.41
Junk food ₪, Л, Г	40.9%	40.9%	37.3%	33.5%	40.2%	33.3%	40.5%	34.6%	36.0%	32.8%
	4.5%	3.5%	4.0%	2.8%	4.8%	2.7%	8.6%	4.0%	2.8%	1.8%
Amount of *junk food* Ш, ₸, ‡, ₪, Г, Л	1.09	1.02	1.15	0.68	1.00	0.72	0.86	0.70	0.86	0.61
	0.18	0.15	0.18	0.08	0.21	0.09	0.23	0.14	0.10	0.05
Number of sodas yesterday Ш, ₸, ‡, ₪, ₤, Ж, Ь	1.11	0.80	1.13	0.69	1.29	0.86	0.86	0.77	1.10	0.61
	0.15	0.13	0.13	0.07	0.17	0.09	0.11	0.17	0.10	0.04
Number of sodas per week Ш, ₸, ‡, ₣, ₪, ₤, ₾, Ж, ≠,	2.17	1.14	2.02	1.08	2.39	1.49	1.70	0.90	2.34	1.24
	0.21	0.16	0.18	0.10	0.36	0.15	0.37	0.12	0.20	0.10
Spending in sodas Ш, ₸, ‡, ₣, ₪, Б, Ч, Д, Г	$25.33	$18.42	$26.49	$14.39	$27.19	$18.10	$25.15	$17.66	$26.14	$17.99
	$2.25	$1.68	$2.60	$1.13	$3.66	$1.44	$3.57	$3.14	$1.51	$0.93
Smoking Ш, ₸, ‡, ₣, ₪, Б, ₤, Ц, Ф, Д	17.5%	1.0%	18.4%	2.3%	20.5%	2.3%	23.8%	1.5%	21.2%	1.1%
	3.6%	0.7%	2.9%	0.8%	4.0%	0.8%	7.5%	1.1%	2.4%	0.4%
Smoke in house	37.5%	100.0%	23.5%	12.5%	26.1%	14.3%	40.0%	50.0%	28.6%	12.5%
	10.0%	0.0%	7.0%	11.7%	8.1%	13.3%	15.6%	35.5%	5.5%	11.7%
Drink Ш, ₸, ‡, ₣, ₪, ₤, Б, Ц, Ф, Л, Г	35.3%	4.7%	36.2%	7.0%	42.0%	10.2%	40.5%	10.8%	44.5%	9.6%
	4.1%	1.6%	3.4%	1.4%	4.6%	1.8%	8.8%	3.1%	3.3%	1.1%
Number of alcoholic drinks Ш, ‡, ₣, ₪	3.73	2.67	3.10	2.00	3.84	0.74	2.75	0.85	4.17	0.46
	0.63	1.21	0.56	0.61	0.98	0.22	1.00	0.37	0.51	0.13
Drugs Ш, Б, ≈, ≠	6.0%	0.0%	1.1%	0.6%	3.6%	0.0%	2.4%	0.0%	4.3%	0.1%
	1.9%	0.0%	0.8%	0.4%	1.8%	0.0%	2.4%	0.0%	1.0%	0.1%

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
Problems with alcohol [т, ё, б, ж]	16.7%	11.1%	4.5%	0.0%	12.8%	3.2%	5.9%	0.0%	7.6%	1.4%
	5.5%	10.6%	3.2%	0.0%	5.1%	3.1%	5.8%	0.0%	2.1%	1.4%
Father alcoholic [ш]	14.5%	18.9%	12.8%	16.0%	9.5%	18.7%	7.9%	16.2%	9.5%	14.5%
	2.9%	2.9%	2.4%	2.1%	3.3%	2.4%	4.6%	3.5%	1.6%	1.5%
Mother alcoholic [ғ, ё, б, ж, ч]	0.0%	1.8%	1.3%	2.1%	1.1%	3.6%	0.0%	3.6%	0.4%	1.9%
	0.0%	1.0%	0.9%	0.8%	1.1%	1.1%	0.0%	1.8%	0.4%	0.6%
Sexually active [ш, щ, б, ф, л, г]	43.1%	50.3%	43.8%	51.2%	52.7%	70.3%	52.4%	72.3%	55.5%	72.3%
	4.3%	3.8%	3.8%	2.8%	6.9%	2.8%	9.9%	6.7%	3.5%	2.0%
Sexually active at 13 years of age [щ, ф, л, г]	21.2%	31.8%	32.6%	39.4%	43.8%	57.1%	47.6%	60.0%	43.3%	55.0%
	3.6%	3.7%	3.4%	2.7%	6.9%	3.2%	9.7%	5.9%	3.2%	2.3%
Age of first relation	16.91	18.11	17.57	17.32	16.84	16.47	17.25	16.96	17.48	17.33
	0.51	0.29	0.32	0.22	0.33	0.18	0.33	0.22	0.17	0.11
First Condom Use [ш, т, ‡, ғ, щ, п]	36.4%	13.8%	40.0%	15.7%	31.5%	9.6%	20.0%	8.6%	34.9%	12.0%
	6.9%	3.6%	5.8%	2.9%	6.0%	2.1%	10.8%	3.0%	3.7%	1.5%
Used condom at last encounter [т, ‡, ғ, щ, г]	35.3%	15.6%	34.1%	11.1%	36.1%	6.3%	36.4%	9.8%	21.3%	11.9%
	9.2%	5.4%	7.4%	3.7%	7.7%	2.3%	14.5%	4.5%	3.9%	1.9%
IMC [ш, т, ‡, щ, ё, ё, ж, ж, ъ, ц, ф, т, п, л, д, г]	23.80	23.63	24.93	24.18	24.47	24.62	25.79	24.00	24.47	24.32
	0.29	0.24	0.59	0.27	0.40	0.33	0.78	0.42	0.21	0.20
Overweight [ш, т, ‡, щ, ё, ё, ч, ж, ъ, ц, ф, п, л, г]	15.4%	13.8%	16.8%	18.6%	17.5%	21.8%	14.8%	23.6%	14.0%	20.2%
	3.6%	2.6%	3.5%	2.3%	3.9%	2.6%	6.6%	4.4%	2.3%	1.7%
Expectation of future (difference)	0.52	0.94	0.70	0.33	0.51	0.01	0.00	-0.21	0.46	0.21
	0.47	0.35	0.28	0.21	0.45	0.21	0.90	0.37	0.18	0.13
Expectation of social future (difference) [ж]	-0.02	0.14	0.18	0.27	0.00	0.06	-0.11	0.04	0.23	0.00
	0.30	0.21	0.19	0.15	0.35	0.20	0.34	0.28	0.14	0.08

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
Have stolen [ш, ‡, ₪, ₴, Ж, ≠]	7.4% 3.6%	1.1% 1.1%	18.1% 4.4%	1.2% 0.9%	5.8% 3.3%	2.5% 1.0%	5.3% 5.2%	2.3% 1.6%	6.7% 2.0%	3.0% 0.8%
Destroyed property of others' [†, ‡, ₪, Ц, Ф, Т, Д]	3.7% 2.6%	6.8% 2.7%	13.7% 3.8%	3.0% 1.3%	7.5% 3.7%	3.5% 1.2%	11.8% 7.9%	2.3% 1.5%	9.2% 2.1%	5.0% 1.1%
Engage in fighting [ш, †, ‡, ₴, ₪, ≠, Ц, Ф, Д]	33.9% 6.5%	8.0% 3.1%	37.8% 5.6%	3.6% 1.4%	26.4% 5.9%	9.8% 2.5%	22.2% 9.4%	6.8% 2.7%	28.3% 3.4%	7.2% 1.2%
Report knowledge on the effects of alcohol [Ж]	77.7% 3.6%	76.7% 3.2%	81.1% 3.0%	82.9% 2.0%	83.9% 4.1%	78.5% 2.7%	85.7% 5.9%	80.0% 4.0%	81.6% 2.3%	81.8% 1.6%
Report knowledge on the effects of pregnancy [ш, †, ‡, ₪, Ч, ≈, Г, Ь, Л]	51.5% 5.6%	70.3% 3.7%	70.9% 3.5%	69.7% 2.6%	66.7% 4.3%	66.9% 2.8%	45.7% 9.5%	64.4% 4.8%	60.7% 3.2%	68.7% 2.1%
Report knowledge on the effects of PAP [ш, †, ‡, ₴, ₪, Б, Ч, Ж]	46.0% 4.4%	69.9% 3.5%	50.8% 4.0%	79.2% 2.2%	66.1% 5.1%	79.9% 2.8%	47.6% 8.1%	77.7% 3.8%	60.4% 3.0%	79.7% 1.5%
Tested positive for HSV 2 [ш, ‡, ₪, Г]	5.7% 2.8%	10.6% 2.6%	5.9% 2.5%	11.7% 2.1%	7.4% 3.6%	5.9% 1.8%	4.3% 4.3%	12.8% 3.7%	4.3% 1.5%	6.4% 1.3%

[a] Includes marriages and civil unions

[ш] Value p < 0.05 of 1 *vs.* 2; [Ш] Value p < 0.1 of 1 *vs.* 2, [†] Value p < 0.05 of 3 *vs.* 4; [‡] Value p < 0.1 of 3 *vs.* 4, [‡] Value p < 0.05 of 5 *vs.* 6; [‡] Value p < 0.1 of 5 *vs.* 6, [₴] Value p < 0.05 of 7 *vs.* 8; [₴] Value p < 0.1 of 7 *vs.* 8, [₪] Value p < 0.05 of 9 *vs.* 10; [₪] Value p < 0.1 of 9 *vs.* 10, [Б] Value p < 0.05 of 1 *vs.* 3; [Б] Value p < 0.1 of 1 *vs.* 3, [Ь] Value p < 0.05 of 3 *vs.* 5; [Ь] Value p < 0.1 of 3 *vs.* 5, [Ь] Value p < 0.05 of 5 *vs.* 7; [Ь] Value p < 0.1 of 5 *vs.* 7, [б] Value p < 0.05 of 7 *vs.* 9; [б] Value p < 0.1 of 7 *vs.* 9, [Ч] Value p < 0.05 of 1 *vs.* 9; [Ч] Value p < 0.1 of 1 *vs.* 9, [Ж] Value p < 0.05 of 5 *vs.* 9; [Ж] Value p < 0.1 of 5 *vs.* 9, [≈] Value p < 0.05 of 1 *vs.* 7; [≈] Value p < 0.1 of 1 *vs.* 7, [≠] Value p < 0.05 of 1 *vs.* 5; [≠] Value p < 0.1 of 1 *vs.* 5, [Ц] Value p < 0.05 of 3 *vs.* 7; [Ц] Value p < 0.1 of 3 *vs.* 7, [Г] Value p < 0.05 of 2 *vs.* 4; [Г] Value p < 0.1 of 2 *vs.* 4, [Ь] Value p < 0.05 of 4 *vs.* 6; [Ь] Value p < 0.1 of 4 *vs.* 6, [Ц] Value p < 0.05 of 6 *vs.* 8; [Ц] Value p < 0.1 of 6 *vs.* 8, [Ф] Value p < 0.05 of 8 *vs.* 10; [Ф] Value p < 0.1 of 8 *vs.* 10, [Т] Value p < 0.05 of 2 *vs.* 8; [Т] Value p < 0.1 of 2 *vs.* 8, [П] Value p < 0.05 of 2 *vs.* 6; [П] Value p < 0.1 of 2 *vs.* 6, [Л] Value p < 0.05 of 2 *vs.* 10; [Л] Value p < 0.1 of 2 *vs.* 10, [Д] Value p < 0.05 of 4 *vs.* 8; [Д] Value p < 0.1 of 4 *vs.* 8, [Г] Value p < 0.05 of 4 *vs.* 10; [Г] Value p < 0.1 of 4 *vs.* 10

3.12. Annex 2: Risk Behaviours in 2003 by exposure group in 2007

Table 21: Averages and standard errors of selected variables for the group 15 to 18 years of age in 2003, broken down by years exposed to Oportunidades and by gender

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
Age [Ш, Т, Л, Д, Г]	16.4	16.4	16.4	16.4	16.4	16.4	15.3	16.5	16.4	16.3
	0.03	0.04	0.03	0.03	0.04	0.04	0.07	0.07	0.04	0.03
Sex (Women)	49.7%		51.2%		55.1%		55.3%		51.6%	
Indigenous [Ч, Л, Г]	38.8%	38.5%	40.2%	39.6%	32.9%	30.6%	35.4%	32.8%	25.5%	23.0%
	0.04%	0.05%	0.05%	0.04%	0.06%	0.05%	0.09%	0.09%	0.05%	0.04%
Union [Ш, Т, Ѣ, Ғ, Ѳ, Б, Б, Ч, Ѣ, Ѵ, Ь, Ц, Ф, Т, П, Л, Д, Г]	1.3%	5.4%	3.1%	6.0%	3.6%	12.7%	7.0%	21.3%	3.0%	15.3%
	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.03%	0.01%	0.02%
Junk food [Ѳ, Ь, Ц, Ф, Т, Л, Г]	26.5%	29.4%	24.6%	26.2%	28.3%	30.2%	22.9%	23.5%	26.9%	34.7%
	0.02%	0.02%	0.02%	0.01%	0.02%	0.02%	0.03%	0.03%	0.02%	0.02%
Amount of *junk food* [Ь]	0.50	0.51	0.48	0.46	0.51	0.57	0.40	0.49	0.50	0.53
	0.04	0.04	0.04	0.03	0.05	0.05	0.08	0.10	0.04	0.04
Number of sodas yesterday [Ш, Т, Ѣ, Ғ, Ѳ, Ѧ, Ѥ, Б, Ч, Ѵ]	0.83	0.57	0.81	0.57	0.97	0.59	0.77	0.53	1.05	0.57
	0.05	0.04	0.04	0.03	0.06	0.05	0.09	0.06	0.05	0.04
Number of sodas per week [Ш, Т, Ѣ, Ғ, Ѳ, Ѧ, Ѥ, Б, Ч, Ѵ]	2.39	1.61	2.42	1.61	2.88	1.74	2.18	1.65	3.21	1.89
	0.12	0.10	0.12	0.08	0.21	0.13	0.23	0.17	0.16	0.12
Money spent on sodas [Ш, Т, Ѣ, Ғ, Ѳ, Ѧ, Ѥ, Б, Ч, Ѵ]	$16.3	$10.4	$15.5	$10.0	$18.9	$11.5	$13.8	$10.6	$19.9	$10.6
	$0.9	$0.6	$0.8	$0.5	$1.2	$0.9	$1.6	$1.0	$1.2	$0.6
Smokes [Ш, Т, Ѣ, Ғ, Ѳ, Ѧ, Ч, Ц, Ф, П, Л, Г]	42.8%	16.1%	41.6%	15%	50%	26%	46.3%	19.4%	56.1%	26.5%
	0.02%	0.02%	0.02%	0.01%	0.04%	0.02%	0.05%	0.02%	0.03%	0.02%

Drinks [Ш, ₸, ‡, ₣, ₪, ₤, Ч, ≈, Ь, П, Л, Г]	24.8% 0.02%	10.6% 0.01%	24.9% 0.02%	8.8% 0.01%	33% 0.03%	16.7% 0.02%	28.1% 0.05%	14.1% 0.03%	36.4% 0.03%	18.4% 0.02%
Number of alcoholic drinks [Ш, ₸, ‡, ₣, ₪, Ч, Ь, Ц, Ф, Л, Г]	0.30 0.06	0.04 0.01	0.49 0.10	0.01 0.01	0.40 0.08	0.10 0.02	0.37 0.17	0.01 0.01	0.58 0.10	0.08 0.02
Sexually active [‡, ₣, ₪, Б, Ч, ≈, Ь, Ц, Т, П, Л, Д, Г]	9.5% 0.02%	11.4% 0.02%	13.6% 0.01%	11.3% 0.01%	12.0% 0.02%	16.9% 0.02%	16.9% 0.04%	25.7% 0.03%	14.3% 0.02%	20.2% 0.02
Sexually active (adjusted by age) [Ш, ₸, ‡, ₣, ₪, ₤, Ч, Ж, ≈, Ц, Г]	5.6% 0.01%	4.7% 0.01%	5.7% 0.01%	4.1% 0.01%	6.2% 0.02%	7.9% 0.01%	8.9% 0.03%	9.4% 0.02%	8.7% 0.01%	8.5% 0.01%
IMC [Ш, ₸, ‡, ₣, ₪, Б, б, Ч, Ж, ≠]	22.1 0.12	22.6 0.20	21.4 0.12	22.8 0.16	21.6 0.17	22.9 0.17	21.1 0.34	22.7 0.27	22.2 0.16	22.9 0.13
Overweight [Ш, ₸, ‡, ₣, ₪, Б, б, Ч, Ж, ≠, Г, Ь]	6.6% 0.01%	19.2% 0.02%	10.4% 0.01%	23.8% 0.02%	11.0% 0.02%	19.7% 0.02%	10.1% 0.03%	18.2% 0.03%	17.0% 0.02%	20.5% 0.01%

[a] Includes marriages and civil unions

[Ш] Value p < 0.05 of 1 *vs.* 2; [Ш] Value p < 0.1 of 1 *vs.* 2, [₸] Value p < 0.05 of 3 *vs.* 4; [₸] Value p < 0.1 of 3 *vs.* 4, [‡] Value p < 0.05 of 5 *vs.* 6; [‡] Value p < 0.1 of 5 *vs.* 6, [₣] Value p < 0.05 of 7 *vs.* 8; [₣] Value p < 0.1 of 7 *vs.* 8, [₪] Value p < 0.05 of 9 *vs.* 10; [₪] Value p < 0.1 of 9 *vs.* 10, [Б] Value p < 0.05 of 1 *vs.* 3; [Б] Value p < 0.1 of 1 *vs.* 3, [₤] Value p < 0.05 of 3 *vs.* 5; [₤] Value p < 0.1 of 3 *vs.* 5, [₾] Value p < 0.05 of 5 *vs.* 7; [₾] Value p < 0.1 of 5 *vs.* 7, [б] Value p < 0.05 of 7 *vs.* 9; [б] Value p < 0.1 of 7 *vs.* 9, [Ч] Value p < 0.05 of 1 *vs.* 9; [Ч] Value p < 0.1 of 1 *vs.* 9, [Ж] Value p < 0.05 of 5 *vs.* 9; [Ж] Value p < 0.1 of 5 *vs.* 9, [≈] Value p < 0.05 of 1 *vs.* 7; [≈] Value p < 0.1 of 1 *vs.* 7, [≠] Value p < 0.05 of 1 *vs.* 5; [≠] Value p < 0.1 of 1 *vs.* 5, [Ц] Value p < 0.05 of 3 *vs.* 7; [Ц] Value p < 0.1 of 3 *vs.* 7, [Г] Value p < 0.05 of 2 *vs.* 4; [Г] Value p < 0.1 of 2 *vs.* 4, [Ь] Value p < 0.05 of 4 *vs.* 6; [Ь] Value p < 0.1 of 4 *vs.* 6, [Ц] Value p < 0.05 of 6 *vs.* 8; [Ц] Value p < 0.1 of 6 *vs.* 8, [Ф] Value p < 0.05 of 8 *vs.* 10; [Ф] Value p < 0.1 of 8 *vs.* 10, [Т] Value p < 0.05 of 2 *vs.* 8; [Т] Value p < 0.1 of 2 *vs.* 8, [П] Value p < 0.05 of 2 *vs.* 6; [П] Value p < 0.1 of 2 *vs.* 6, [Л] Value p < 0.05 of 2 *vs.* 10; [Л] Value p < 0.1 of 2 *vs.* 10, [Д] Value p < 0.05 of 4 *vs.* 8; [Д] Value p < 0.1 of 4 *vs.* 8, [Г] Value p < 0.05 of 4 *vs.* 10; [Г] Value p < 0.1 of 4 *vs.* 10

Table 22: Averages and standard errors of selected variables for the group 19 to 21 years of age, broken down by years exposed to Oportunidades and by sex

Variable	More than 9 years of exposure		Between 6-9 years of exposure		Between 3-6 years of exposure		Less than 3 years of exposure		No exposure recorded	
	Men (1)	Women (2)	Men (3)	Women (4)	Men (5)	Women (6)	Men (7)	Women (8)	Men (9)	Women (10)
Age	19.5	19.4	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.6
	0.04	0.04	0.04	0.03	0.04	0.04	0.06	0.07	0.04	0.03
Sex (Women)	45.8%		51.8%		62.3%		54.3%		57.9%	
Indigenous	52.6%	27.5%	36.7%	42.1%	40%	30.6%	41.1%	44.4%	27.1%	24.7%
	0.08%	0.06%	0.06%	0.07%	0.08%	0.07%	0.19%	0.12%	0.06%	0.05%
Unión	12.6%	15.1%	13.1%	22.6%	20.1%	48%	24%	43.2%	24.6%	42.6%
	0.02%	0.03%	0.02%	0.03%	0.03%	0.04%	0.05%	0.07%	0.03%	0.03%
Junk food	9.5%	18.8%	13.1%	14.3%	14.8%	21.8%	17.3%	13.5%	12.3%	22.1%
	0.02%	0.03%	0.02%	0.02%	0.02%	0.03%	0.04%	0.03%	0.02%	0.02%
Amount of *junk food*	0.22	0.29	0.34	0.28	0.33	0.35	0.24	0.26	0.19	0.43
	0.05	0.06	0.07	0.05	0.08	0.05	0.07	0.07	0.05	0.06
Number of sodas yesterday	0.95	0.46	1.03	0.53	1.09	0.55	0.93	0.55	0.90	0.59
	0.09	0.04	0.09	0.04	0.13	0.05	0.15	0.09	0.12	0.05
Number of sodas per week	2.66	1.33	2.80	1.48	3.16	1.63	3.21	1.58	3.19	1.87
	0.30	0.15	0.23	0.14	0.39	0.20	0.56	0.30	0.49	0.19
Money spent on sodas	$18.8	$9.3	$19.2	$11.8	$17.5	$11.7	$22.4	$12.0	$19.4	$11.1
	$2.2	$1.3	$1.8	$1.3	$1.7	$1.3	$3.4	$2.6	$1.8	0.9$
Smokes	59.5%	22.5%	62.2%	21.5%	69.6%	21.3%	869.0%	31.9%	74.6%	26.5%
	0.05%	0.03%	0.04%	0.03%	0.04%	0.04%	0.05%	0.06%	0.03%	0.03%
Drinks	44%	16.1%	42.9%	14.8%	46%	18.3%	62.8%	19.1%	58.7%	23.4%
	0.05%	0.03%	0.04%	0.02%	0.05%	0.03%	0.07%	0.05%	0.04%	0.03%
Number of alcoholic drinks	0.67	0.01	0.62	0.12	0.84	0.07	1.77	0.10	1.06	0.06

	0.16	0.01	0.13	0.06	0.33	0.02	0.50	0.07	0.26	0.02
Sexually active	31.0%	21.3%	38.7%	33.5%	35.9%	46.7%	72.1%	40.4%	52.8%	43.6%
	0.05%	0.03%	0.04%	0.04%	0.05%	0.04%	0.06%	0.08%	0.05%	0.03%
Sexually active (adjusted by age)	31%	21.3%	38.7%	33.5%	35.9%	46.7%	72.1%	40.4%	52.8%	43.6%
	0.05%	0.04%	0.05%	0.04%	0.05%	0.04%	0.06%	0.08%	0.05%	0.03%
IMC	22.8	23.2	22.6	23.5	22.8	22.9	23.6	23.3	23.7	24
	0.29	0.27	0.23	0.27	0.37	0.30	0.56	0.42	0.30	0.28
Overweight	13%	12.3%	9.9%	16.3%	17.2%	18.4%	20.9%	15.6%	16.9%	20.8%
	0.03%	0.03%	0.03%	0.03%	0.04%	0.03%	0.06%	0.05%	0.03%	0.03%

[a] Includes marriages and civil unions

Value p < 0.05 of 1 *vs.* 2; Value p < 0.1 of 1 *vs.* 2, Value p < 0.05 of 3 *vs.* 4; Value p < 0.1 of 3 *vs.* 4, Value p < 0.05 of 5 *vs.* 6; Value p < 0.1 of 5 *vs.* 6, Value p < 0.05 of 7 *vs.* 8; Value p < 0.1 of 7 *vs.* 8, Value p < 0.05 of 9 *vs.* 10; Value p < 0.1 of 9 *vs.* 10, Value p < 0.05 of 1 *vs.* 3; Value p < 0.1 of 1 *vs.* 3, Value p < 0.05 of 3 *vs.* 5; Value p < 0.1 of 3 *vs.* 5, Value p < 0.05 of 5 *vs.* 7; Value p < 0.1 of 5 *vs.* 7, Value p < 0.05 of 7 *vs.* 9; Value p < 0.1 of 7 *vs.* 9, Value p < 0.05 of 1 *vs.* 9; Value p < 0.1 of 1 *vs.* 9, Value p < 0.05 of 5 *vs.* 9; Value p < 0.1 of 5 *vs.* 9, Value p < 0.05 of 1 *vs.* 7; Value p < 0.1 of 1 *vs.* 7, Value p < 0.05 of 1 *vs.* 5; Value p < 0.1 of 1 *vs.* 5, Value p < 0.05 of 3 *vs.* 7; Value p < 0.1 of 3 *vs.* 7, Value p < 0.05 of 2 *vs.* 4; Value p < 0.1 of 2 *vs.* 4, Value p < 0.05 of 4 *vs.* 6; Value p < 0.1 of 4 *vs.* 6, Value p < 0.05 of 6 *vs.* 8; Value p < 0.1 of 6 *vs.* 8, Value p < 0.05 of 8 *vs.* 10; Value p < 0.1 of 8 *vs.* 10, Value p < 0.05 of 2 *vs.* 8; Value p < 0.1 of 2 *vs.* 8, Value p < 0.05 of 2 *vs.* 6; Value p < 0.1 of 2 *vs.* 6, Value p < 0.05 of 2 *vs.* 10; Value p < 0.1 of 2 *vs.* 10, Value p < 0.05 of 4 *vs.* 8; Value p < 0.1 of 4 *vs.* 8, Value p < 0.05 of 4 *vs.* 10; Value p < 0.1 of 4 *vs.* 10

Chapter 4. The structural quality of health services as a potential constraint for human capital accumulation

Juan Pablo Gutierrez

6.1 Abstract

One key assumption underlying interventions and policies aiming to promote development by increasing the accumulation of human capital, particularly health capital, is that increasing access to and utilisation of health services will translate into health capital. This assumption, from Grossman's health capital model, assumes that both preventive and curative health services improve health status and thus increase its level. The ability of health services to generate health is related to their quality. In terms of analysing the quality of health services, structural quality could be viewed as a necessary but not sufficient component of quality; having areas, equipment, supplies and medicine to offer health services is a requirement to offer care, and thus, analysing structural quality provides a basic measure of the ability of health services to effectively generate health. While there is an important amount of literature regarding quality of health services, empirical analysis of structural quality are limited as are those related this dimension of quality and outcome indicators. In this chapter, I present the first published analysis on structural quality of primary health services in Mexico and show large heterogeneity in structural quality that is negatively correlated with general living conditions, meaning that the poorest are served by the lowest level of structural quality facilities, and some indication that poor quality is related to higher infant mortality rate. Improving structural quality is required if development is sought.

Key words: structural quality, primary health care, Mexico, Oportunidades

JEL I10, I38, L15

6.2 Background

The quality of health services is a necessary condition for the production of health, assuming that health services are available. To promote positive social mobility and development, most of the focus on social development policies and programs has been on increasing the use of services by those most in need, that is, individuals with significant resource constraints; nevertheless, utilising health services is clearly only part of the equation to improve health status. (Powell-Jackson and Hanson)

Although improving health status is also related to individual background and non-health sector factors, such as access to public services (sanitation, for example) and living conditions, utilisation and quality are the key health service-related factors. Once individuals are in the health facilities, the services provided (preventive or curative) must be the best option for the specific health condition in order for the utilisation of health services to effectively translate into improved health status. In this sense, focusing on quality is essential in improving health outcomes. (Chassin, Galvin et al. 1998)

Among the potential dimensions of service quality, structural quality, that is, the means by which providers are able to deliver a service, is the basic setting needed for services to work. Analysing structural quality is a way of analysing the foundations of quality. (Gilson, Magomi et al. 1995; Ehiri, Oyo-Ita et al. 2005)

Understanding the structural quality of health services in the context of a programme that seeks to increase the demand for these services as an intervention to improve health should provide a measure of the programme's effectiveness. It could be argued that merely changing attitudes towards health care may produce positive results, as it increases the awareness of self-care and some health conditions; nevertheless, in terms of these outcomes the perception of how good these services are will affect trust in health providers, and one key element of this perception is how good these services are in providing health care.

Within the general approach of using health capital to promote socioeconomic mobility, the quality of health services plays an important role, as low quality could constitute a barrier to health capital accumulation. Investing in health services should lead to improvements in both quality and capacity. In countries where access to health services has improved, such as Mexico, reaching better outcomes is now related to better services, that is, to improved quality.

4.2.1. Health services quality

By quality, I refer to the characteristics of a good or a service that make it effective and that meet the needs or expectations of users. (Organización-Panamericana-de-la-Salud 1999) In the context of health services, quality has been discussed as a concept with complex and multidimensional elements, as it is associated with aspects of effectiveness, efficiency, scientific-technical know-how, management, perception, expectations, communication, conformity, coordination, accessibility, availability, distribution, satisfaction, privacy, credibility, professionalism, competitiveness, accreditation, structural support, and security (World-Health-Organization 2000; March and Prieto 2001).

Quality has been defined at the clinical level in terms of technical know-how and the ability to offer safe and effective treatment to ensure the well-being of the patient (Creel, Sass et al. 2002). The quality of medical care can also be defined as providing the treatment expected to maximise the well-being of a patient, after taking into consideration the expected consequences (cost and benefits) (Torres-Arreola and Constantino-Casas 2003). According to the American Medical Association (AMA), quality in healthcare is a level of care that consistently increases or maintains the quality and duration of life (Frenk 1993). The Institute of Medicine in the USA defined quality of care as

> *"the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (IOM 1990)*

4.2.2. Dimensions for the analysis of quality in healthcare: structure, process and outcomes

For practical purposes, all actions undertaken in health institutions are related to service quality, that is, the process through which a user receives care is embedded in a quality framework. However, due to heterogeneity in individuals and their health conditions, the evaluation of quality is a difficult task (IMSS 2006).

The analysis of quality of care may be framed from the perspective of providers, users, health organisations, and health financers (Torres-Arreola and Constantino-Casas 2003). It could be analysed through three interconnected components: medical care (medical know-how and technology used to maximise benefits in patient care while minimising implicit risks); interpersonal attention (psychosocial aspects of care, including the patient-provider relationship); and organisation (which determines accessibility, efficiency, etc.) (World-Health-Organization 2000).

Following Donabedian's framework for quality of care, three dimensions for the measurement of quality were identified based on a continuum of service provision: structure, processes, and results (Donabedian 1966; Donabedian 1984; Petiti and Amster 1998).

Structural quality refers to the characteristics of existing resources to provide health services. For staff, it includes characteristics such as specialty, certification, age, and gender. Regarding facilities, size and type are relevant, as well as physical attributes (equipment, supplies) and other factors or organisational indicators, such as the patient/physician ratio, organisational structure, budget distribution, and payment source (Donabedian 1966; Donabedian 1984; Quality and Medicine 1999).

Process quality refers to the specific care provided to the patient. It is divided into two aspects: technical excellence and interpersonal quality. From the perspective of health service providers, technical quality includes actions that guarantee the security, effectiveness, and utility of health treatment, as well as the

ability of providers to serve users in an effective and appropriate manner. Quality is defined in terms of the attributes and results of the care, which highlight the technical excellence and characteristics of the interaction between doctors and patients (Ross, Zeballos et al. 2000; World-Health-Organization 2004). Thus, technical quality is defined as the challenge of applying medical science and technology to provide health benefits (Ross, Zeballos et al. 2000; Torres-Arreola and Constantino-Casas 2003; World-Health-Organization 2004).

Finally, health outcomes are measured by the quality of life of the patients, their functional status, and their satisfaction after they have received care. Material, psychological, administrative, and ethical elements are taken into consideration to evaluate this area and to determine how health-related actions or interventions develop. The perspective of the patient is also taken into consideration, including his own preferences, values, and opinions about the medical care received. Therefore, quality is represented as the user's satisfaction with the care provided, regardless of the health outcomes of the treatment (morbidity, mortality, and functional status) (Ross, Zeballos et al. 2000; Torres-Arreola and Constantino-Casas 2003; World-Health-Organization 2004). Health outcomes are a product of the health and well-being of the community; in other words, they are a measurement of the effectiveness of the healthcare system.

Although attention to health has been considered a priority because it will improve the quality of life of marginal socio-economic populations, emphasis on the quality of services has only recently developed. Quality programs and policies have primarily been developed in hospitals, and only recently has emphasis also been placed on primary care (Organización-Panamericana-de-la-Salud 2001). Although the three dimensions of quality are all relevant, structural quality could be viewed as the foundation of quality in general, as the provision of health services requires a structure.

Several studies have shown that health services in developing countries do not offer appropriate solutions in the necessary proportions. According to a study in seven countries, among 75% of the cases reviewed, diagnostic or treatment

mistakes and erroneous monitoring of health problems frequently occurred. In more than half of the cases, incorrect use of antibiotics, as well as incorrect administration of fluids, oxygen, or food treatments, was recorded. Low service quality is not only related to access to resources, and more money does not ensure more efficiency or quality. Organisational changes are necessary to improve quality and to optimise the use of available resources (Massoud, Askov et al. 2001).

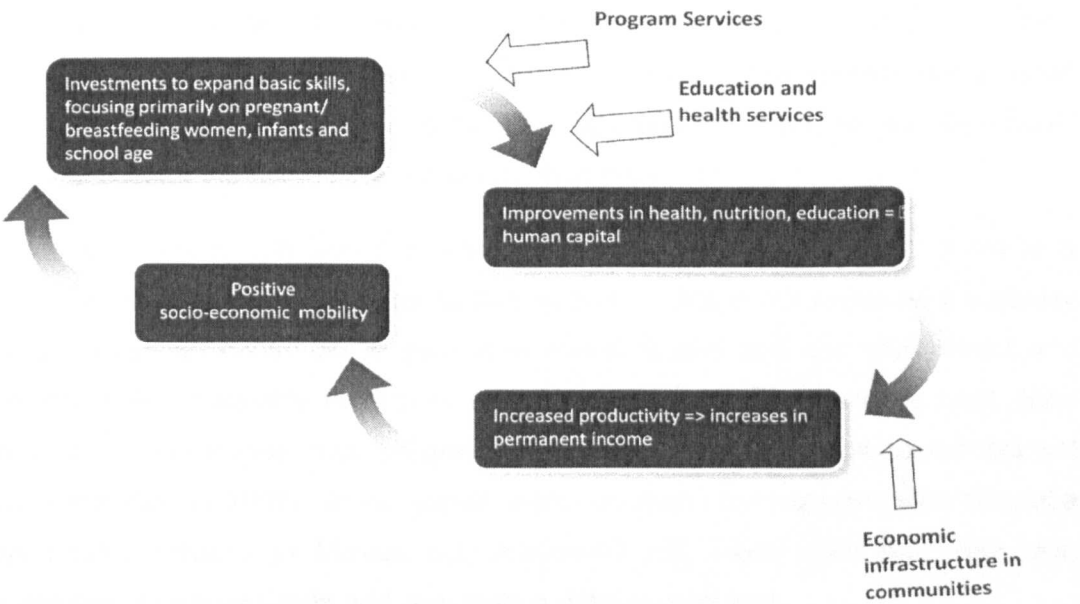
Research performed for The Bellagio Conference on Child Survival showed that approximately two-thirds of the 10 million child deaths that occur each year in low-income countries could be prevented by medical interventions that are feasible and available in today's medical world (Jones, Steketee et al. 2003). Other similar research articles note that the mechanisms used to implement medical interventions are deficient and that their use is inadequate, especially for the treatment of the low-income population (Bryce, el Arifeen et al. 2003; Victora, Wagstaff et al. 2003). The structure of health services presents an important challenge in ensuring the provision of adequate services.

Because of its multidimensionality and the lack of appropriate data, quality is difficult to measure. (McClellan and Staiger 1999) As different elements play a role in the final outcome (health status) and each individual health condition may require a specific approach, there is no single measure of quality in general. One advantage of analysing structural quality is that it refers to structures that are universally required, regardless of the specific patient.

For the analysis presented in this document, I used data from a survey evaluating Oportunidades, a Mexican CCT programme that seeks to contribute to the reduction of the intergenerational transmission of poverty and thereby promote positive social mobility and development. The overall approach to measure structural quality reported in this paper was developed first for a report to the programme on the quality of health services that are use by beneficiaries in rural areas. (Gutiérrez, Leroy et al. 2008) The program design seeks to incentivise the demand for health and education services among under-resourced households, which is expected to increase the accumulation of human capital (education and

health). As mentioned above, in order for these incentives to effectively generate more health and education capital, the services provided must be adequate, timely and relevant to the health condition (i.e., they must be quality services). As presented in figure 1, key assumptions in the theory behind Oportunidades, and in general CCT programmes, is that services are there and have an adequate level of quality.

Figure 1. How Oportunidades is supposed to contribute to interrupt the inter-generational transmission of poverty



The key finding from previous evaluations of the impacts of Oportunidades in health status is that positive effects are not as large as expected given the magnitude in the increases in health services utilization; the main hypothesis to explain this is related to the quality of health services: Oportunidades has been very effective in increasing utilization, but because services low-quality, this extra-utilization is producing less than potential health capital. (Angeles, Gutierrez et al. 2011) This conclusion regarding Oportunidades has been also described more in general for CCT programmes, reporting their unquestionable potential to increase utilization, but less clear effects on health outcomes. (Gaarder, Glassman et al. 2010)

The increase in health services utilization has been also documented using administrative data from the facilities; Bautista showed how an increase in the percentage of Oportunidades houholds in a locality is directly related to an important increase in the total number of consultation at the health facilities. (Bautista 2004)

Health services provided to the *Oportunidades* population are offered through different providers: the states' Ministries of Health, facilities operated by the IMSS-*Oportunidades*, and a programme funded by Federal resources and managed by the Mexican Institute of Social Security (IMSS). The programme's procedures establish the contents of the health package. Households incorporated into the programme and utilising facilities operated by these institutions should have access to the same package of health services.

Because health services are operated by different providers, there is a potential for heterogeneity. Even assuming that access is not an issue, the quality of services can contribute to increased health quality and can also reflect and reinforce the inequality in access to health services. The available staff, their training, and their resources are areas in which equity considerations are important (Das and Gertler 2007). In this sense, state variations are expected also, because as health services in Mexico are des-centralized, each state has their own institutional arrangements and constitute a different provider.

The aim of this analysis is to measure the structural quality of primary health services that serve rural localities in Mexico and to analyse factors related to structural quality and how structural quality may affect health outcomes. For this analysis, I take advantage of the largest survey of primary health services in Mexico, which was collected within an evaluation of Oportunidades. The relevance of focus on structural quality is related to the fact that this is a necessary condition to provided adequate services.That is, as having a proper structure to function is a condition to provide adequate care, describing facilities in terms of structure allows to discuss if conditions exits to effectively translate utilization into health.

6.3 Methodology

6.2.1 Measurement of structure

To measure the structural dimension of quality, I lead a team that developed an instrument to gather data on how well the health facilities were equipped, supplied, and staffed. This instrument, similar to a verification list, was elaborated by considering the minimal requirements of a unit to provide primary care, based on previously used instruments and according to Mexican regulations for public health services. This instrument follows Donabedian definition of structural quality as well as the standard approach to it, in terms of percentage of adequacy. (Donabedian 1984; Berendes, Heywood et al. 2011)

The basis for this instrument was a version developed for a 2001 survey among similar facilities. The survey asks for the current stock of the areas/supplies/drugs and the number of units for each one. This list is filled out during a face-to-face interview with MDs or nurses in each facility. The information registered is that reported by the informant and was not verified, although the respondent usually provided the information after checking their stocks.

In terms of drugs, the list used included all medicines in the basic catalogue, a document that includes all drugs that are provided by the public health institutions in Mexico. This catalogue was complemented with vaccines.

In addition to this instrument, MDs, nurses and patients were interviewed. Although the information collected in those instruments was not focused on structural quality and was thus not part of this analysis in general, some variables were used, particularly staff characteristics and the variables required to generate the SE level of staff and households of users (patients).

The instrument also included information on whether the facilities were accredited by the federal MoH and whether the reported services were provided by the Seguro Popular programme, a large-scale insurance-type programme in Mexico that channels resources for health facilities equipment.

6.2.2 Data

The data analysed in this document were collected during the fall of 2007 as part of a survey evaluating Oportunidades, the Household Evaluation Survey 2007 (ENCEL 2007, for its initials in Spanish). To measure the quality of health services, a specific component was incorporated into the ENCEL 2007, to be administered at the health facilities assigned to the households in the sample. At the time of incorporation in Oportunidades, every household is assigned to a specific health facility; for the rural localities that were surveyed, localities either have only one health facility or none, in which case households are assigned to the nearest one, which is in a nearby locality within walking distance.

The component evaluating health services was conceptualised to include the information of all health units providing service to the population of the 767 communities included in the household sample. For several reasons, not every community in the sample was visited (mainly because of weather conditions), and the effective sample of localities was 733 (96% of the original sample).

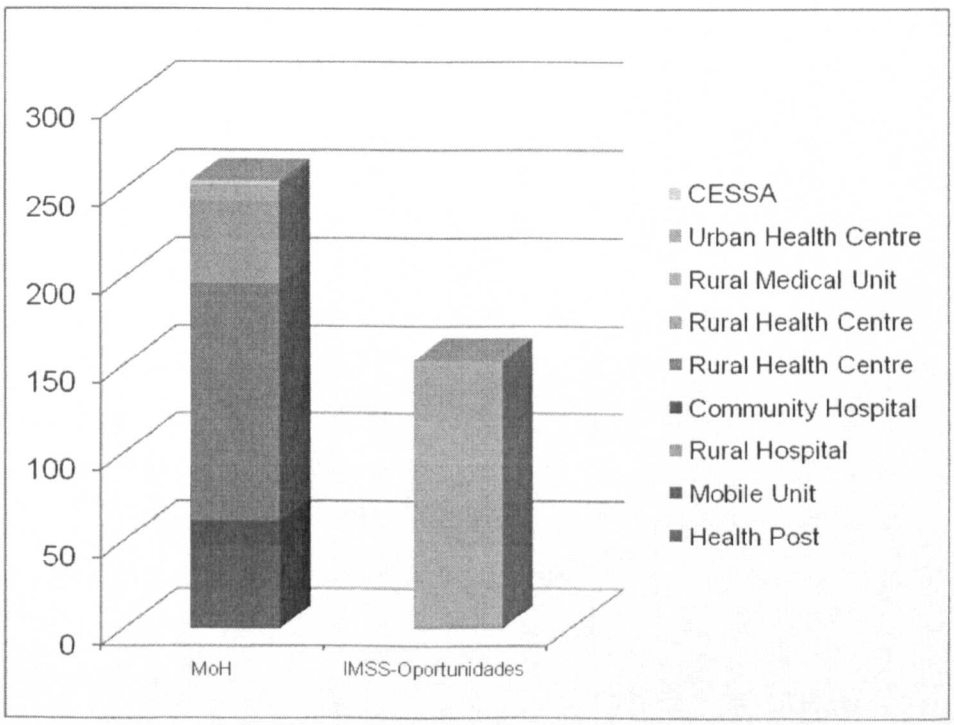
Data were obtained from 495 health facilities that served 591 localities (80% of those visited). It was not possible to obtain health service information from every community visited, as gaining access was difficult because providers refused to allow the survey team access. In other localities, there were logistical issues: the clinic was not in operation in the community during the days the team visited (a very frequent occurrence with mobile health units and also a problem with regular clinics). For the analysis reported here, data were available from 408 clinics (82% of the total visited) where complete structural data were obtained. The visited units are located in the 13 states included in the evaluation sample.

Although it is important to recognise the potential bias caused by a response rate of approximately 66% (80% of localities and 82% of facilities with structural data), it is important to note that this sample is the most complete measurement of health service quality at the primary care level in Mexico.

As shown in figure 7, most of the healthcare facilities in the sample were operated by the states' Ministries of Health (MoHs) (64%), and 36% are part of the IMSS-Oportunidades (Rural Hospitals and Rural Medical Units). One very relevant aspect to consider is that states' Ministries of Health are independent of each

other, and coordination from the Federal Ministry of Health is far from perfect; decentralization of these services had result is having in fact 32 different providers plus IMSS-Oportunidades, each with specific organization and capacity to delivery care. As the type of provider may be an important determinant of quality, for the analysis, facilities were stratified in these two subsystems (states´ MoH and IMSS-Oportunidades facilities), even though it is important to keep in mind that the former are heterogeneous.

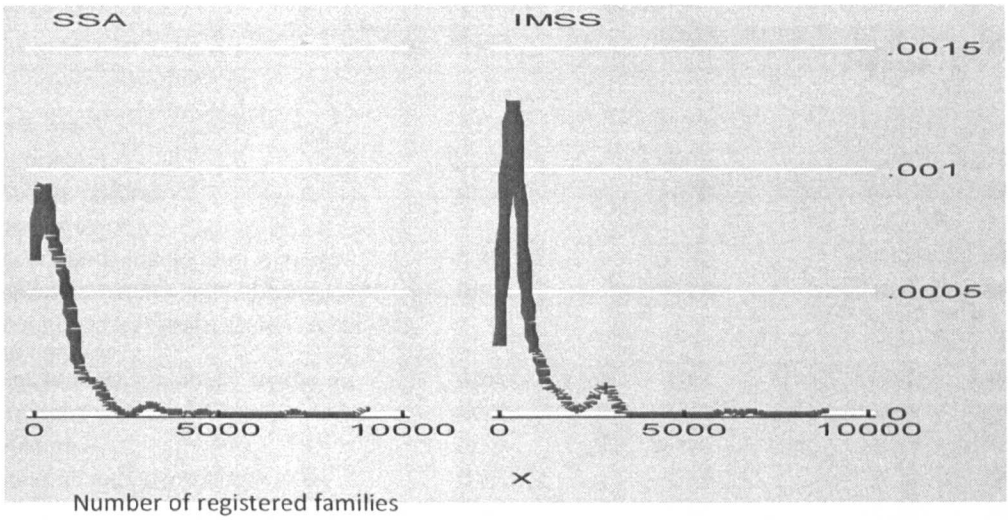
Figure 7: Distribution (n) of health facilities by type and provider



As a measure of size, the number of households that are registered at the facility was used. SSA units have a median of 500 families, with an interquartile

range from 206 to 986, while IMSS-Oportunidades units have a median of 450 families with an interquartile range of 316 to 838. Both, SSA & IMSS-Oportunides, comprise a heterogeneous set of facilities in terms of size, as it can be seen in the wide distribution shown in Figure 8. According to informants, 65% of the facilities reported providing service to the population affiliated with the *Seguro Popular* (even though only 60% could be identified in the listing of units providing service for *Seguro Popular*), but only 40% are accredited by the Federal MoH, which, in theory, is a requirement to provide services for the *Seguro Popular* (SP).

Figure 8: Distribution by number of registered families



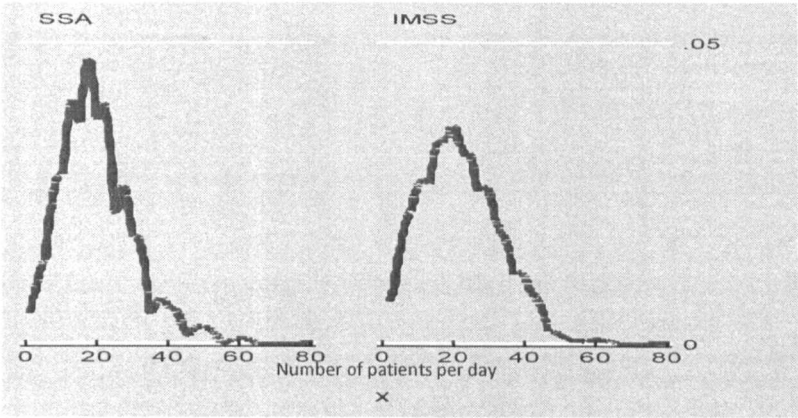
In terms of staffing, 42% of the facility's staff are medical doctors (most of them just graduated), and 36% are nurses (See Table 23). Of the 359 doctors interviewed, 46% were women, and 18% identified themselves as indigenous. The average age was 32 years old. Most of the physicians reported having attended a training course in the last year and were general practitioners (80%) who recently finished school (average of 4 years) and graduated recently (average of 3 years). Although MDs with long tenures at the facilities were interviewed, the average stay was less than a year (which is consistent with the fact that, for most of them, attending this facility is part of the social service requirement of the medical school). Approximately 15% of doctors reported having another job. According to the socioeconomic indicator developed (see below), 70% of the doctors were located in the 9th and 10th deciles (in contrast to the patients, who were located in the first two deciles). The nurses tended to have longer tenure at the facilities (average of 9 years), and the percentage of indigenous nurses was also higher (34%). The socioeconomic level of the nurses, located between deciles 7 and 10, was lower than that of MDs.

Table 23: Characteristics of unit personnel

	Doctors		Nurses			
	Mean	**SD**	**Mean**	**SD**	**P Value**	***n***
Sex (% men)	0.54		0.09		<0.001	*548*
Age (months)	32.05		35.91		<0.001	*542*
Number of children	0.89	1.28	1.78	1.38	<0.001	*540*
Ethnic condition						
Understands indigenous language (%)	0.10		0.33		<0.001	*548*
Considers him/herself indigenous (%)	0.18		0.34		0.25	*548*
Training courses: years since last course about care for ...						
... patients with metabolic syndrome	0.88	1.38	1.27	1.70	0.02	*402*
... pregnant women	0.58	1.14	0.83	1.41	0.05	*443*
... children	0.79	1.32	0.80	1.36	0.98	*439*
Training about *Oportunidades* (%)	0.66		0.73		0.12	*540*
Training to teach self-care workshops (%)	0.60		0.82		<0.001	*366*
Work activity						
In the last 4 weeks...						
... number of days worked for the unit	19.77	5.32	18.34	5.58	<0.001	*530*
... number of days of training	1.07	2.3	0.76	1.93	0.13	*503*
... number of days of rest	5.75	4.77	5.94	4.88	0.68	*512*

The average work week is 5 days, with an average of 10 hours of service per day, during which services are provided to approximately 20 patients (see Figure 9).

Figure 9: Distribution of number of daily patients served by clinic



In terms of access to public services at the health facilities, some constraints were detected. Health facilities have electricity, but they occasionally have interruptions in the supply. Approximately 30% of the units do not have running water, and about half do not have a sewage connection, so they use septic tanks.

Regarding their referral system, that is, the capacity of units to refer patients that they cannot treat (either due to a lack of qualified staff or a shortage of equipment and/or supplies) to units with higher technical capacity, the long transfer distances may reduce their effectiveness. Referral facilities for women with obstetric emergencies or very sick children are located an average of 32 kilometres away, with an average commute time of 1.5 hours. In general, transportation to referral facilities is the patients' responsibility (more than 70% of cases), that is, no transportation is provided by the health facilities.

As presented in Figures 10 and 11, referral facilities for obstetric emergencies and severely sick children are located even as many as 200 kilometres away; examining the distribution of the distance showed that for a significant portion of the units, the distance to the referral units is more than 100 kilometres away, which results in a transfer time delay of 40 hours.

Figure 10: Distribution of the distance to referral health units for obstetric emergencies (in Km)

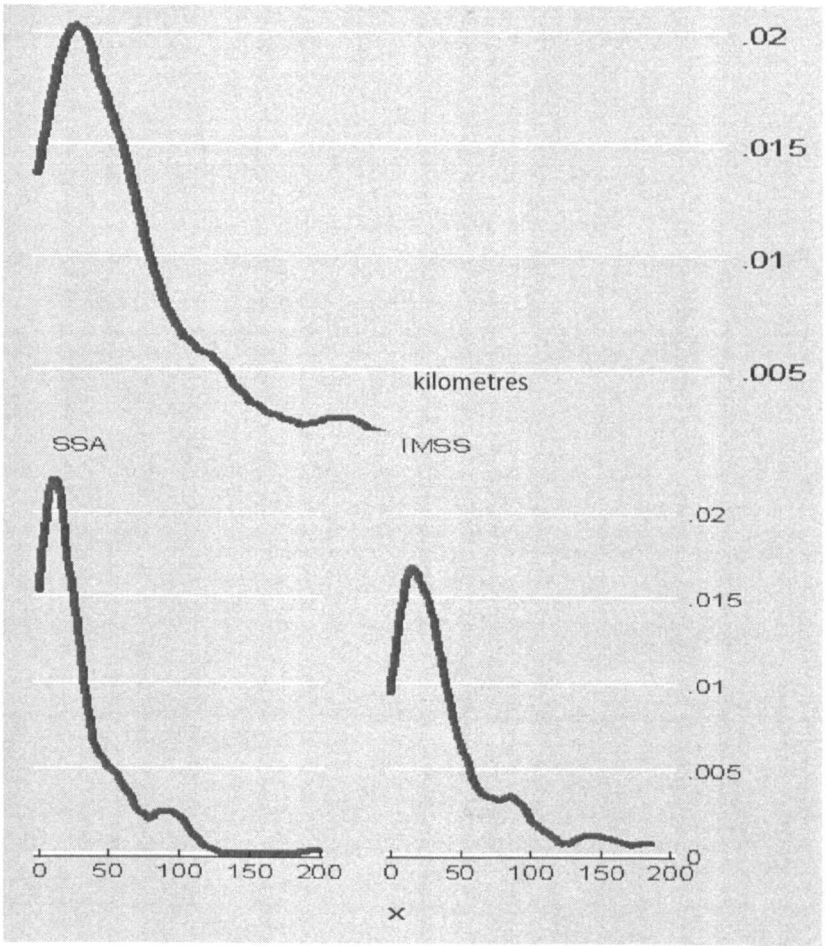
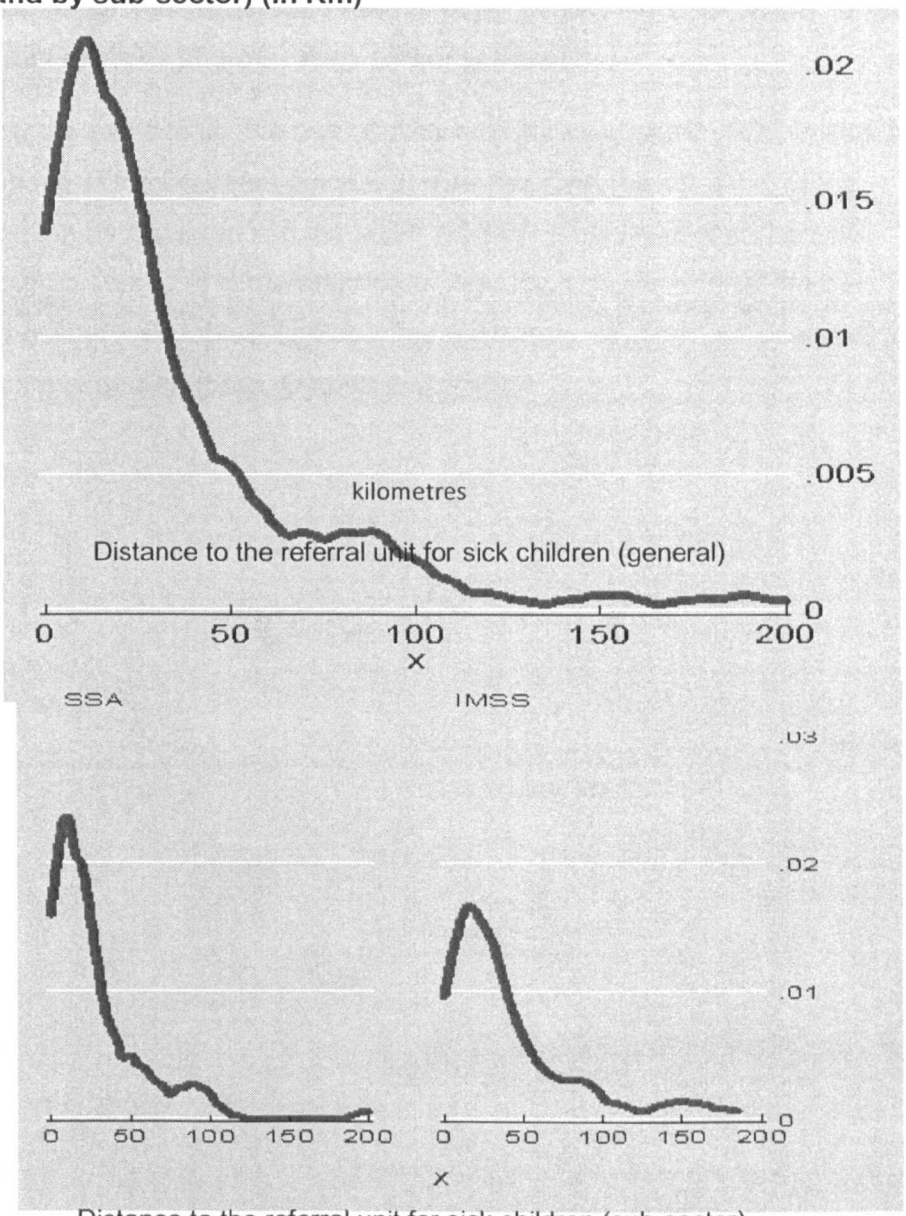


Figure 11: Distribution of the distance to referral units for very sick children (general and by sub-sector) (in Km)



Distance to the referral unit for sick children (sub-sector)

In terms of the use of documents or guidelines for patient care and for prescription, although current and accessible information could be considered a mandatory requisite for service operation, among the facilities in the sample, 10% reported not having basic drug listings, and 16% reported not having copies of the basic manual of *Oportunidades.* This is a document that contains and lists all of the

procedures and activities related to the Program that should be applied by the health units. Only half of them have a copy of any pharmacopeia or some document that explains pharmacology and drug dosage.

Using the same logic, the use of official norms and guidelines is limited, and only in the case of the Diabetes guide did more than half (barely 53%) of the doctors mention having used it in the last 6 months. Nearly a third of the staff reported using a source of information other than the Mexican Official Norms (NOM) and guides (see table 24). Following guidelines has been proposed as a factor to improve quality. (Ehiri, Oyo-Ita et al. 2005)

Table 24: Characteristics of the use of information for clinical practices

	Doctors		Nurse			
	Mean	SD	Mean	SD	Value p	*n*
Clinical Guides used in the last 6 months						
None (%)	0.08		0.14		0.04	*548*
Diagnostic and management of DM (%)	0.53		0.35		0.00	*548*
Management of high blood pressure (%)	0.5		0.28		0.00	*548*
Prenatal Care (%)	0.39		0.24		0.00	*548*
Monitoring of nutrition, growth, and development of children under 5 years of age (%)	0.31		0.3		0.94	*548*
NOM-174-SSA1-1998 for Integral Management of Obesity (%)	0.16		0.08		0.01	*548*
Official Mexican Standard (%)	0.25		0.21		0.27	*548*
NOM-037-SSA2-2002 for prevention, treatment and control of dislipidemy (%)	0.12		0.06		0.02	*548*
Other (%)	0.35		0.34		0.73	*548*
Source for information on medicines						
Basic table (%)	0.22		0.32		0.01	*545*
SSA Compendium (%)	0.03		0.05		0.17	*545*
PLM (%)	0.52		0.22		0.00	*545*
Vademecum (%)	0.14		0.08		0.04	*545*
Internet (%)	0.02		0.02		0.66	*545*
Other (%)	0.05		0.05		0.7	*545*
None (%)	0.02		0.25		0.00	*545*

6.2.3 Analysis of Adequacy (descriptive)

The analysis of adequacy is a simple comparison of characteristics of the health units (infrastructure, equipment, supply of prescription drugs, services provided) against a normative reference, that is, the structural conditions expected according to Mexican regulations or similar documents. From this, the percentage of items that are available at each facility is calculated. (Gilson, Magomi et al. 1995; Berendes, Heywood et al. 2011)

For the normative approach, the existing documents about the characteristics of the units correspond to the Medical Units Model published by the Under Secretariat of Innovation and Quality and the Guides for Equipment for Health Centres and Community Hospitals of the Health Technologies Evaluation Centre. Five types of units described in the Integrating Model of Health Care (IMHA) were included in the first level of care: Health Post, Rural Health Centres,

Health Centre for Urbanized and Settled Rural Population, Health Centres with Extended Services (HCES), and Community Hospitals. The differences between these types of facilities are related to their size, both in terms of the infrastructure and staff; in this sample, health posts are the more basic facility, and community hospitals are more complex. Although the focus of this analysis is primary care, these hospitals were included because they provide primary care for some localities.

For each type of facility, the above-mentioned documents described the expected organisation, functioning, and design characteristics, among other elements, including the staff, defined as clusters of personnel (CENETEC ; Secretaría-de-Salud 2006; Secretaría-de-Salud 2006). There were some localities served by mobile teams within the sample that are not described in these documents; thus, the same requirements that these documents described for the health post were used for these mobile teams. The IMHA established that: "Health Posts are Auxiliary Units where Mobile Brigades operate". Even if the documents contain substantial aspects of Organization, Functioning, Architectural Design, and Basic Equipment, for consistency, all information related to Drugs and Supplies was analysed using the guidelines of the Multiple Content Manuals dating from 1988 (according to the authors, there are no recent publications on these guidelines), which is the most complete document on this matter. These documents were established alongside the Health Care Model for the General Population, and its main goals are to unify the planning, programming, instrumentation, and control criteria of healthcare units; to strengthen the national health system by providing general guidelines on management actions for primary care; and to optimise the quality and quantity of the population's health services (Secretaría-de-Salud 1988; Secretaría-de-Salud 1988; Secretaría-de-Salud 1988; Secretaría-de-Salud 1988; Secretaría-de-Salud 1988).

Because they are operated by a different provider (IMSS-Oportunitidades), information on the characteristics of Rural Medical Unit(s) and Rural Hospital(s) is not included in the general list by the MoH; the reference for these types of

facilities were those developed by IMSS-Oportunidades (IMSS 2005), which were complemented by the Programme's Rules of Operation (IMSS 2007).

Because the minimum supplies that a facility requires according to the documentation are related to the type of facility, it is important to establish a reference lists for each type of facility. The normative structure of the units, as defined for the documents, is listed in Table 37, in the annex.

It is important to note that this analysis is the most basic approach to structure, as it merely requires each unit to have at least one of the listed areas/supplies/drugs/staff and does not take quantity into account. In addition, only the possession of the equipment by the facilities was considered, and whether the equipment was functional was not taken into account. In this sense, this analysis of adequacy could be viewed as the lower bound of structural quality.

6.2.4 Structural quality index

The previously detailed descriptive analysis generates an overall picture of the health facilities' structural quality and also allows for comparisons by sub-sectors, providing information on the heterogeneity of services that are normally expected to be homogeneous. This issue, heterogeneity, is particularly relevant, as homogeneity is required for the standardisation of services and is thus an important measure of quality.

To generate a measure that allows comparison among units in a single measure and makes comparison and ranking a straightforward process, a quality index was produced. In essence, the proposed single measure would incorporate the observed information to provide a meaningful value indicating the quality of the health facilities included.

Generating such an index assumes that this value exists but is a non-observed or latent variable. Methods developed for this type of analysis include the general approach of factor analysis (FA).(van Belle, Fisher et al. 2004) FA assumes that by using observed variables, it is possible to obtain a value that represents the unobservable factors (the latent variables). The primary limitation of

this approach is that the outcome variable is not explicit (because is a latent variable), so it is necessary to have observed variables that are conceptually related to the desired outcome. The advantage of this method is that it allows a single value to be generated from several indicators.

For this quality index, the observed variables included were the percentages of adequacy in the above-described categories: infrastructure or areas, equipment, supplies, drugs, and services provided, as reported by the health units. As all values were included as the percentage of adequacy (which, as mentioned above, is specific for the type of facility), these values are comparable across facilities.

To test for the appropriateness of the data used for the FA, the Kaiser–Meyer–Olkin measure of sampling adequacy was estimated; we also tested whether the selection of one factor was adequate for this analysis.

The index was categorised into four groups of relative quality based on a visual exploration of the score to identify clustering that shown low and high performers, as well as a wide range of middle performers. Score data were plotted on a quantile chart with uniform size distribution. Groups were labelled as low, medium-low, medium-high, and high quality. Although the labelling and the cut-off points are somewhat arbitrary, they are useful to paint a picture of quality in the primary care facilities serving the poor population of Mexico.

It is important to note that these categories are based on the relative heterogeneity in the sample and are thus not necessarily reflective of the general health clinic situation in the country. However, it should also be noted that this is the largest study to date on the quality of primary care facilities in Mexico.

6.2.5 Multivariable analysis of factors associated with structural quality

Using the quality index as a dependent variable, a multi-variable regression was estimated to measure its association with locality factors and other general characteristics. As data from the localities were obtained from other sources, coding issues with the localities prevent the merging of all health facilities in the

sample. Only 327 health facilities serving 484 localities were correctly merged with Census and other data sources, which is approximately 80% of the effective sample. Nevertheless, this sub-set included localities in the 13 states.

I explored the relation between quality and different measures of the socioeconomic status at the locality level; the measures used were marginalisation index and the average SE level of households (estimated using an imputation method detailed elsewhere and described in chapter 2). I also analysed the role of provider type on quality based on the sub-sector and the state of the facility.

The marginalisation index is a measure constructed by the National Population Council (CONAPO for its Spanish acronym). This index is developed using Census data, and it is an aggregate measure of living conditions, including schooling (literacy and primary school), housing (access to water, sewage, and electricity), and income. (CONAPO 2002) Data are available on-line at CONAPO's website.[x]

The average SE level of the households was estimated using data from the households of the health facility users, so it represents the SE level of users and not necessarily the SE level of all local HHs. For each household, data collected from the users were used to determine the SE level using an approach I developed based on a procedure proposed for the SE classification of HH. This variable was constructed using socio-demographic and housing characteristics, including assets, to impute a value from a national income and expenditures survey. More detail on the procedure is reported elsewhere. (Gutierrez 2008)

The type of provider was defined as IMSS-Oportunidades facilities or MoH facilities; it is important to remember that MoH facilities are operated by the state MoH, so controlling for state is also relevant for the type of provider variable.

[x] www.conapo.gob.mx, in the section related to the marginalization index.

6.2.6 Quality and aggregate outcomes

An additional analysis was implemented to measure how much the quality index was correlated with health outcomes. The main challenge of this analysis is to gather an outcome indicator that may be related to quality within the desired timeframe and available at the same observation level, that is, the health facility. Both challenges are major constraints, and the solution allows only for an approximation of the desired analyses. For example, I explored the use of the infant mortality rate, which is usually regarded as a measure related to current health situation in the sense that measures health conditions in a given year, as an indicator of quality. The primary limitation of this approach is that mortality rate data are not available at the locality level, but only at the larger, municipality level and that it could be significant underreporting, and more over, this underreporting may be higher in the localities with the worse health services, so results could be totally biased.

In order to sort underreporting, the use of primary data from the same survey seems as preferable alternative, but not mortality data is feasible from it. As an alternative measure, the proportion of individuals that were reported to being sick in the 4 weeks before the survey was used. This measure was estimated for the complete population and by age-groups.

Correlations between the quality index and categories of the index and these provalences of morbidity were estimated by age-group and for the complete population.

6.4 Results

The description of conditions in health care units allows us to determine whether they have the required resources to offer quality care, in particular, to evaluate whether the staff, supplies, and medications available at the health centre allow required interventions to be offered to users. Structural analysis is a practical method to evaluate quality of care in the visited units. Moreover, the heterogeneity

of these units is examined by identifying differences between subsectors and types of units, as well as the variation among them.

3.4.1 Adequacy of the structure at the health facilities

Areas at the health facilities

The percentage of each area at the facilities by type is reported in Table 25. For hygienic reasons and privacy, it is expected that units will have different areas for different activities. Units with appropriate spaces are more capable of offering quality services. All units observed have an office and a waiting room. Less than half of the units have a training area (a significant portion of these units were IMSS-*Oportunidades'* units) or a labour and delivery room for childbirth. In general, they do not have a laboratory area, and the refrigeration area is small, even though a larger area is designated for vaccine storage.

Table 25. Infrastructure of Patient Attention

Variables	All	Subsector SSA**	IMSS-OPORTUNIDADES	Value p*
Exam room[1,3]	97%	95%	99%	**0.03**
Nurse's room[3]	67%	64%	67%	**0.56**
Waiting Room	91%	87%	96%	**0.00**
Training room	48%	29%	79%	**0.00**
Storage Area[1]	70%	63%	78%	**0.00**
Cold Box med[1,2]	32%	25%	39%	**0.00**
Cold Box vaccines[1,2]	80%	71%	93%	**0.00**
Labour Room[1]	43%	37%	48%	**0.03**
Personnel bathroom	83%	78%	89%	**0.00**
Patient bathroom[1]	72%	70%	72%	**0.74**
General Bathroom	29%	24%	37%	**0.00**
Pharmacy[3]	60%	53%	66%	**0.01**
Treatment Room	52%	47%	55%	**0.15**
Delivery Room[1]	51%	46%	53%	**0.19**
Admission area[1,3]	69%	53%	91%	**0.00**
Dormitory	75%	62%	95%	**0.00**
DB storage room[1]	29%	22%	31%	**0.04**
Emergency Room[1]	20%	11%	26%	**0.00**
Operating Room	8%	4%	10%	**0.01**
AC Laboratory [1,3]	6%	3%	1%	**0.09**
Vaccination room	29%	32%	17%	**0.00**
Cleaning Room	28%	27%	22%	**0.28**

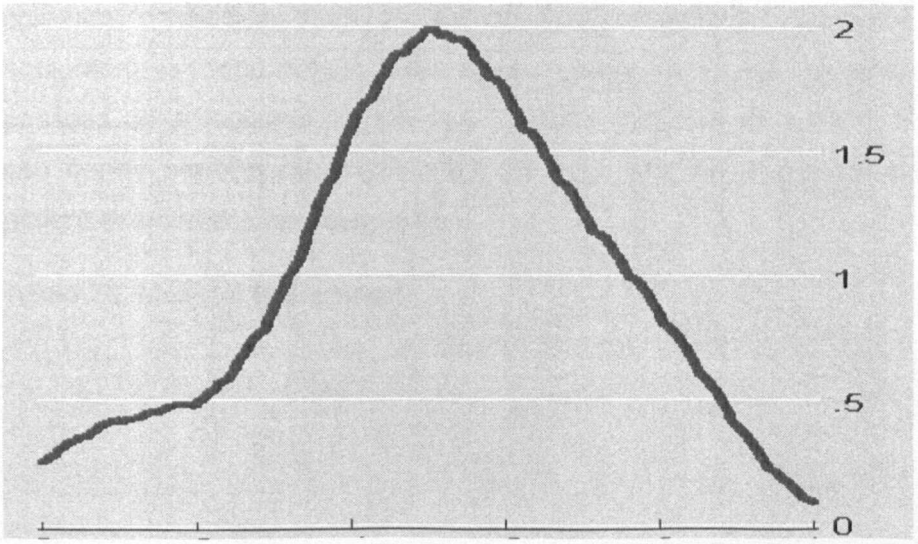
*** Probability value of t test for mean difference**
**** SSA: Health Centres, health houses, mobile units, mobile brigades**

[1] **Supplies necessary for child birth attention**
[2] **Supplies necessary for child care**
[3] **Supplies necessary for metabolic syndrome attention**

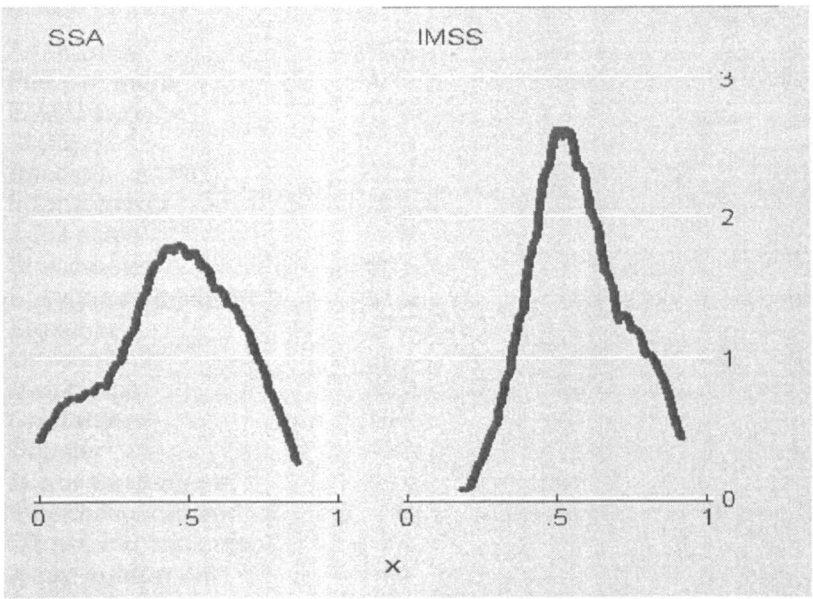
A visual representation of adequacy in terms of areas reflects significant heterogeneity, as shown in Figure 12; some facilities are far to the left of the chart, meaning that they lack many essential areas.

Figure 1: Areas distribution

Percentage of areas designated for patient care (All)



Percentage of areas designated for patient attention (SSA-IMSS-*Oportunidades*)



Equipment

As mentioned above, in terms of equipment, the analysis was based on the presence of each item and not whether the item was fully operational. The revised equipment list was based on the normative list, and it focused on basic equipment that should be available in primary healthcare units. As shown in Table 26, basic equipment absences are common. The equipment required to perform physical examinations of patients – such as scales, Baumanometers, otoscopes, and thermometers – do not exist in a large number of units, even though they would normally be used daily.

Likewise, other relatively sophisticated equipment essential for users with common conditions, such as an electrocardiograph, microscope, or Doppler equipment, is found only in a few units. Furthermore, only one-tenth of all clinics possess an ambulance for transfers. Clinics that operate without this equipment can barely perform basic activities, as they lack the minimum instruments for patient examination and diagnosis.

Table 26. Medical Equipment

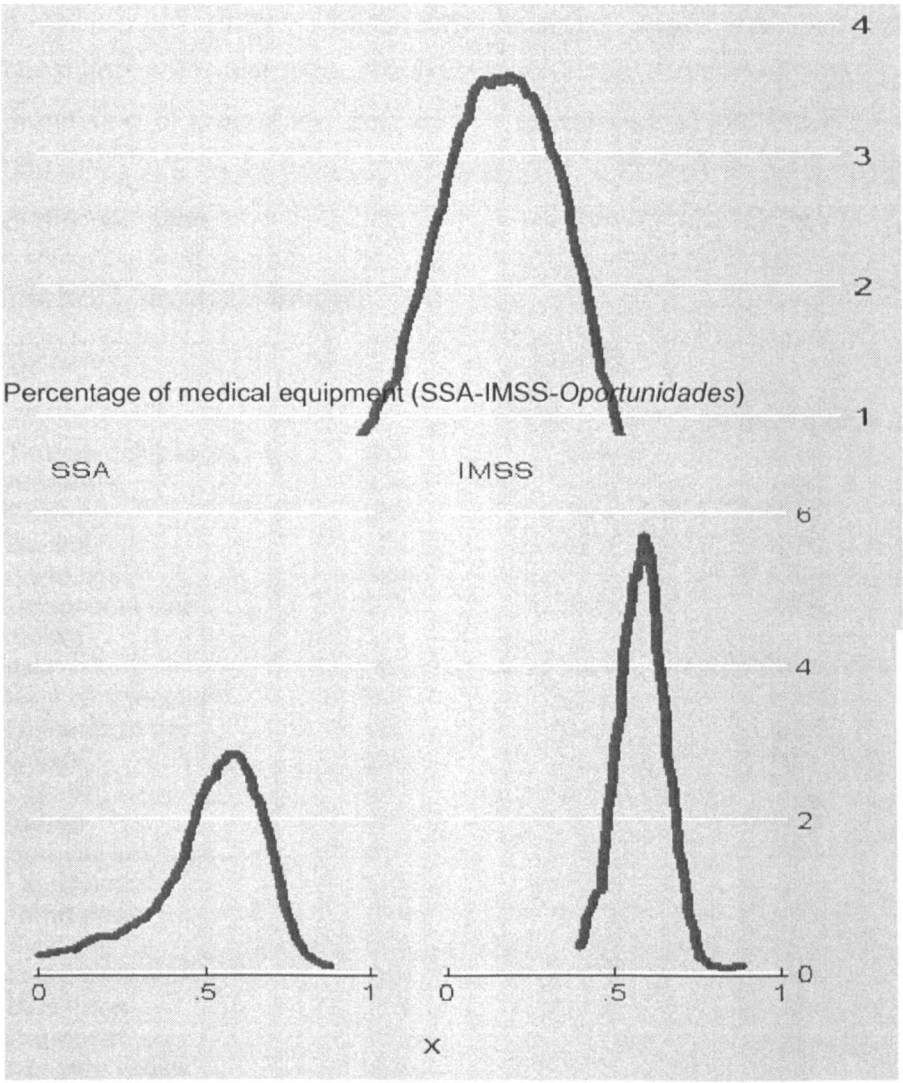
Variables	General	Subsector SSA**	IMSS-OPORTUNIDADES	Value p
Ambulance[1]	10%	10%	3%	**0.01**
File Cabinets	43%	54%	23%	**0.00**
EMAU Syringe[1]	12%	2%	22%	**0.00**
Steriliser[1,2]	58%	65%	42%	**0.00**
Paediatric scale[1,2]	92%	89%	97%	**0.00**
Infantometer	75%	64%	93%	**0.00**
Adult scale[1,2,3]	96%	95%	98%	**0.08**
Stadiometer[1,3]	85%	78%	96%	**0.00**
Sphygmomanometer[3]	91%	88%	97%	**0.00**
Stretcher[1,3]	17%	17%	8%	**0.01**
Oxygen tank[1]	26%	26%	19%	**0.14**
Metric tape[1]	96%	95%	99%	**0.03**
Containers	75%	67%	85%	**0.00**
Doppler[1]	13%	15%	4%	**0.00**
Minor Surgery set	54%	48%	68%	**0.01**
Electrocardiogram[3]	3%	0%	1%	**0.06**
Ultrasound equipment[1]	5%	2%	1%	**0.62**
X-ray equipment	6%	2%	2%	**0.61**
Stethoscope[1,3]	93%	90%	97%	**0.00**
Foetal stethoscope[1]	93%	90%	97%	**0.00**
Washbasin[1]	88%	82%	97%	**0.00**
Tray stand	84%	76%	95%	**0.00**
Microscope	8%	5%	4%	**0.67**
Ophthalmoscope[3]	48%	43%	53%	**0.05**
Otoscope	45%	44%	42%	**0.69**
Refrigerator[1,2]	82%	75%	90%	**0.00**
Eye Chart[3]	68%	53%	85%	**0.00**
Thermometer[1]	92%	88%	97%	**0.00**
Tococardiogram[1]	6%	4%	5%	**0.53**
Clock[1,2]	34%	30%	36%	**0.29**
Oral Electrolytes[2]	90%	87%	93%	**0.05**
Reg book med[2]	74%	62%	90%	**0.00**
Reg book vaccines[2]	83%	75%	94%	**0.00**

*** Probability value of t test for mean difference**
**** SSA: Health Centres, health houses, mobile units, mobile brigades**
[1] Supplies necessary for childbirth attention
[2] Supplies necessary for child care
[3] Supplies necessary for metabolic syndrome attention

Regarding the heterogeneity in how well equipped the facilities are, as shown in Figure 13, the distribution clearly shows a generalised lack of equipment

and a scenario in which, at best, only 70% of the equipment required to operate is available.

Figure 2: Distribution of minimum equipment by health centre (total percentage)



Supplies

In terms of the existence of supplies for primary medical care, the list of supplies includes those needed to provide basic care and is focused on common conditions found in the Mexican population. Once again, it is a matter of having the necessary supplies in all units to conduct proper care on a regular basis.

Table 27 reports the percentage of supplies in the health facilities on the day of the visit. In some clinics, even basic supplies (such as gauze or tongue depressors) were missing. The high percentage of clinics without the supplies necessary to monitor basic and everyday conditions (e.g., pre-natal care consultations) is alarming. The limited existence of urine test strips complicates the monitoring of pregnancy, and the low percentage of health facilities with glucose test strips in a country with a high prevalence of diabetes prevents timely detection of this condition.

Table 27. Medical Material

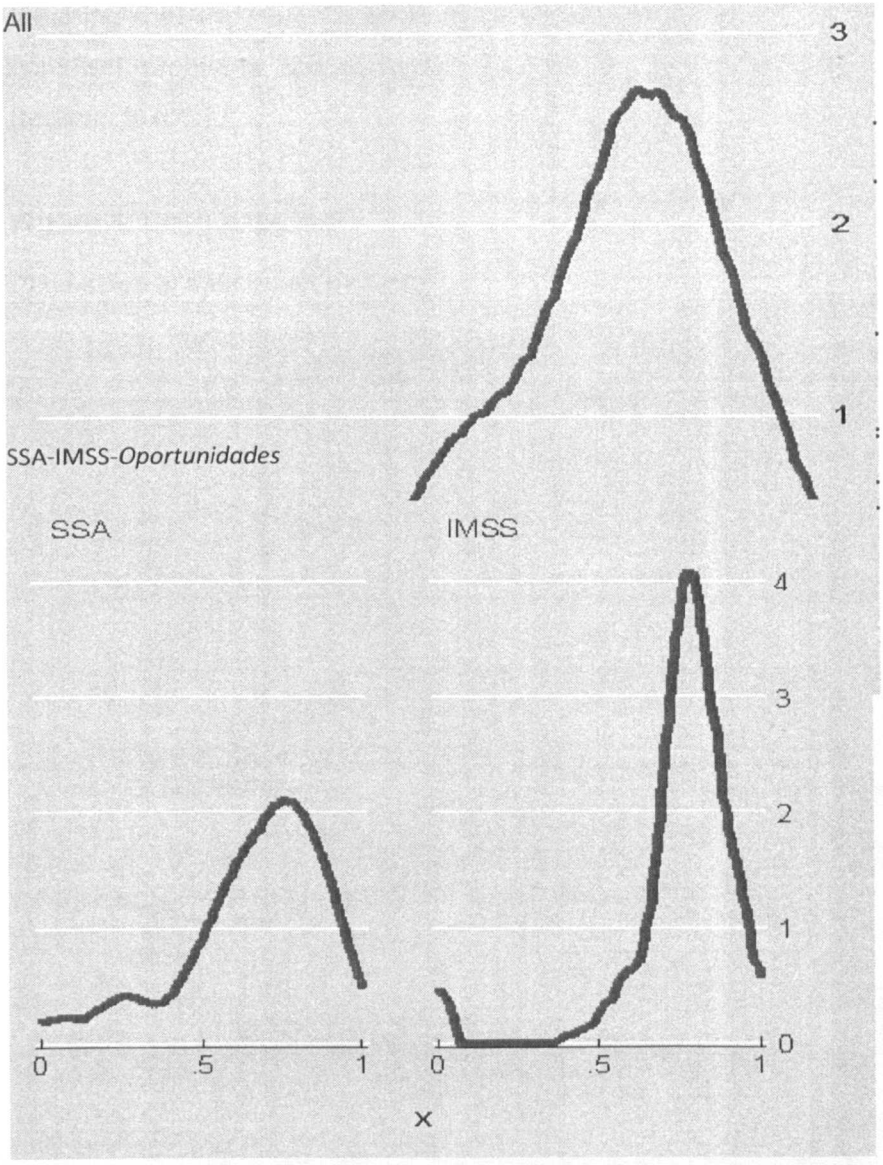
Variables	All	Subsector SSA**	IMSS-*Oportunidades*	Value p*
Tongue depressors[2]	94%	92%	98%	**0.00**
Alcohol	90%	88%	94%	**0.06**
Cotton	94%	95%	95%	**0.98**
Benzal	58%	56%	61%	**0.28**
Condoms[1]	92%	93%	94%	**0.60**
Disposable face masks[1]	87%	87%	86%	**0.76**
IUD[1]	86%	80%	96%	**0.00**
Vaginal Speculum[1]	89%	83%	98%	**0.00**
Dissection set	59%	54%	66%	**0.01**
Gauze[1]	89%	86%	93%	**0.03**
Gloves	92%	90%	95%	**0.13**
Iodine	90%	88%	93%	**0.07**
Surgical lubricant	83%	76%	96%	**0.00**
Liquid soap[1]	60%	67%	47%	**0.00**
Hand soap	74%	67%	85%	**0.00**
Syringes[2]	93%	90%	97%	**0.01**
Instrument set[1]	69%	57%	88%	**0.00**
Bed linen	77%	69%	91%	**0.00**
Punzocat	79%	72%	88%	**0.00**
Surgery robes	62%	47%	85%	**0.00**
Catheter	36%	31%	40%	**0.08**
Foley catheter	52%	40%	68%	**0.00**
Sutures	80%	73%	92%	**0.00**
Adhesive gauze	91%	90%	93%	**0.23**
Towels	47%	44%	50%	**0.29**
Glucose strips[1,3]	78%	73%	89%	**0.00**
Urine strips[1,3]	46%	35%	63%	**0.00**
Thermos	66%	60%	74%	**0.00**
Disposable towels	36%	29%	47%	**0.00**
Vacutainer	19%	20%	15%	**0.19**
Elastic bandages	81%	79%	84%	**0.19**

Variables	All	Subsector SSA**	IMSS-*Oportunidades*	Value p*
Venoset	45%	42%	47%	**0.44**
Sample collection cups	67%	65%	71%	**0.22**

*** Probability value of t test for mean difference**
**** SSA: Health Centres, health houses, mobile units, mobile brigades**
[1] Supplies necessary for childbirth attention
[2] Supplies necessary for child care
[3] Supplies necessary for metabolic syndrome attention

Regarding the distribution of existing supplies, a group of clinics with significant needs and an average group, which tends to have the most supplies, are observed (Figure 14).

Figure 3: Percentage of medical supplies (general and by sub-sector)



Medicines

As for the supply of basic drugs, as in the previous items, significant heterogeneity is observed in Table 28 and Figure 15, with some units lacking most drugs. The supply difference is clear among subsectors in which the IMSS-Oportunidades units show higher percentages of supplies compared to those of the MoHs.

The list of medicines presented is included in the basic set for these clinics, meaning that they are theoretically available in every unit. It includes drugs for common problems (paracetamol) as well as those required for emergencies (tetanus toxoid).

Figure 4: Drug supplies

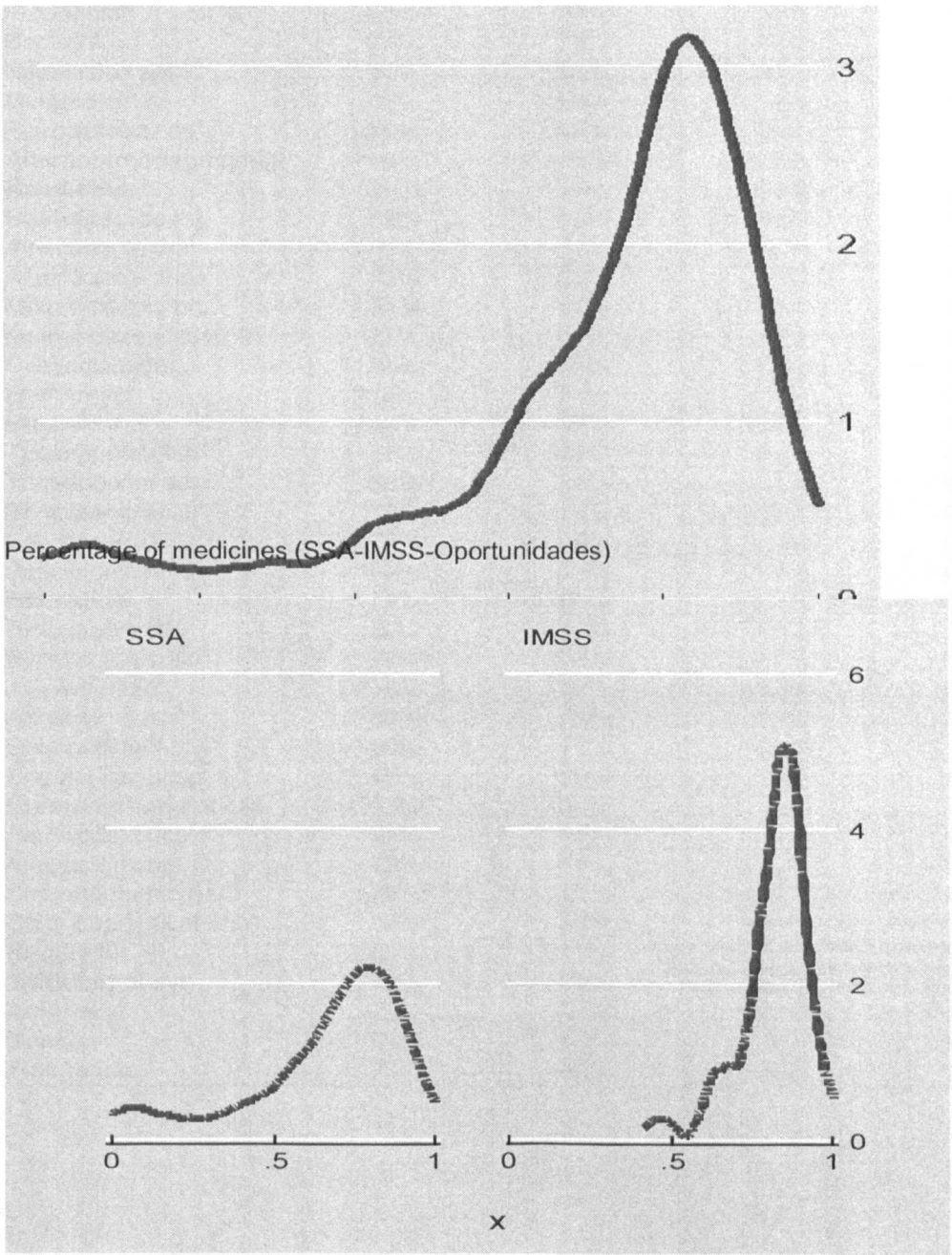


Table 28: Adequacy of medicines by type of facility

Variables	General	Subsector SSA**	IMSS-*Oportunidades*	Value p*
Acetylsalicylic acid[3]	80%	83%	75%	**0.04**
Paracetamol tab[1,2]	79%	76%	84%	**0.07**
Paracetamol sol[1,2]	77%	70%	89%	**0.00**
Sodium Metamizol	82%	75%	93%	**0.00**
Lidocaine sol inj[1]	82%	79%	87%	**0.04**
Clorfenamine tab	82%	76%	91%	**0.00**
Clorfenamine syr	80%	74%	88%	**0.00**
Propanolol[3]	58%	51%	65%	**0.00**
Captotril[3]	76%	70%	88%	**0.00**
Nifedipine caps[1,3]	74%	68%	85%	**0.00**
Metoprolol[3]	63%	66%	54%	**0.01**
Hidroclorotiazide[3]	40%	44%	30%	**0.00**
Aluminium/magnesium	84%	78%	93%	**0.00**
Ranitidine	85%	81%	91%	**0.00**
Butilnioscine inj	85%	78%	94%	**0.00**
Albendazole tab[2]	82%	77%	90%	**0.00**
Albendazole susp[2]	85%	83%	89%	**0.06**
Metronidazole tab[2]	87%	80%	98%	**0.00**
Metronidazole susp[2]	87%	81%	97%	**0.00**
Gilbenclamide[3]	85%	78%	95%	**0.00**
Metformine[3]	76%	74%	81%	**0.13**
Insulin[3]	40%	39%	38%	**0.75**
Trimethoprim tab[1,2]	87%	82%	95%	**0.00**
Trimethoprim susp[1,2]	88%	84%	95%	**0.00**
Bencilpenicillin 1[1,2]	79%	73%	86%	**0.00**
Bencilpenicillin 2[1,2]	74%	68%	83%	**0.00**
Bencilpenicillin 3[1,2]	69%	69%	68%	**0.88**
Benzidine	74%	66%	85%	**0.00**
Dicloxacillin cap[2]	80%	72%	93%	**0.00**
Dicloxacillin susp[2]	75%	63%	92%	**0.00**
Ampicillin tab[2]	78%	67%	93%	**0.00**
Ampicillin susp[2]	80%	70%	95%	**0.00**
Eritromicine tab[2]	80%	71%	94%	**0.00**
Eritromicine susp[2]	77%	65%	94%	**0.00**
Chloramphenicol cap	53%	40%	72%	**0.00**
Amoxicillin susp[2]	74%	74%	72%	**0.61**
Amoxicillin cap[2]	73%	71%	73%	**0.65**
Chloramphenicol sol[2]	70%	61%	83%	**0.00**
Chloramphenicol ung[2]	45%	33%	63%	**0.00**
Neomycin	61%	43%	90%	**0.00**
Salbutamol syr	75%	64%	92%	**0.00**
Ambroxol	75%	65%	91%	**0.00**
Bencilo	72%	64%	85%	**0.00**
Zinc oxide	**83%**	**80%**	**89%**	**0.02**

Variables	General	Subsector SSA**	IMSS-*Oportunidades*	Value p*
Lindane	28%	38%	12%	**0.00**
Clioquinol	78%	69%	92%	**0.00**
Miconazole	83%	80%	89%	**0.01**
Folic acid 1[1]	75%	68%	85%	**0.00**
Folic acid 2[1]	72%	78%	62%	**0.00**
Fumarate tab[1]	76%	68%	89%	**0.00**
Fumarate susp[1]	77%	68%	91%	**0.00**
Levonorgestrel[1]	84%	79%	94%	**0.00**
Desogestrel[1]	74%	61%	95%	**0.00**
Medroxyprogesterone	82%	77%	90%	**0.00**
Enanthate	69%	60%	85%	**0.00**
Condoms (masculine)	91%	90%	94%	**0.11**
Glucose @ 5%	75%	62%	93%	**0.00**
NaCl 0.9%[3]	74%	64%	88%	**0.00**
Sol Hartman[2,3]	75%	65%	90%	**0.00**
Electrolytes[2]	90%	88%	93%	**0.15**
Streptomycin	14%	12%	14%	**0.54**
Isoniazide	23%	20%	26%	**0.16**
Sabin	56%	46%	72%	**0.00**
BCG[2]	69%	56%	87%	**0.00**
DPT[2]	75%	72%	79%	**0.10**
Tetravalent[2]	28%	26%	30%	**0.47**
Triple viral	80%	73%	93%	**0.00**
Measles[2]	59%	52%	71%	**0.00**
Tetanic toxoid[1, 2]	81%	74%	91%	**0.00**
Children complement[2]	90%	86%	96%	**0.00**
Women complement	88%	84%	95%	**0.00**

*** Probability value of t test for mean difference**
**** SSA: Health Centres, health houses, mobile units, mobile brigades**
[1] Supplies necessary for childbirth attention
[2] Supplies necessary for child care
[3] Supplies necessary for metabolic syndrome attention

Services provided

Finally, and as a validation of the previous items, the adequacy of services provided in the facilities was analyzed. Services were defined as having proper facilities, equipment, supplies, and drugs. Table 29 summarises the services offered in the visited clinics and repeats the previously observed scenario; in addition to consultations, there are few additional services offered by the clinics. As in previous cases, the list of services includes those required for basic healthcare.

Basic haemoglobin tests and urine samples are offered in a low percentage of clinics. The PAP is only offered at 72% of the clinics, and obstetric ultrasounds are practically nonexistent in these clinics (4%).

Table 29: Services provided to the outpatient population

Variables	General	Subsector SSA**	IMSS-*Oportunidades*	Value p
Biopsy	2%	2%	0%	**0.07**
Caesarean section[1]	2%	0%	1%	**0.72**
Minor surgery	39%	33%	43%	**0.05**
Dental consultation	29%	34%	14%	**0.00**
Adult consultation[3]	95%	93%	97%	**0.05**
Paediatric consultation[2]	96%	95%	97%	**0.25**
Preg consultation[1]	96%	95%	97%	**0.19**
Nutrition monitoring	94%	94%	96%	**0.27**
Newborn care[1]	64%	59%	70%	**0.01**
Childbirth[1]	50%	39%	65%	**0.00**
Punctures	20%	13%	24%	**0.00**
Ultrasound[1]	4%	1%	1%	**0.92**
Emergencies	72%	66%	79%	**0.00**
Vaginal cytology[1]	80%	77%	83%	**0.16**
Microbacterial culture	4%	2%	3%	**0.61**
Syphilis detection[1]	9%	9%	2%	**0.00**
Electrocardiogram[3]	3%	0%	0%	**0.43**
GS and Rh[1]	7%	4%	2%	**0.19**
Glucose levels[1,3]	78%	74%	83%	**0.02**
Haemoglobin levels[1,3]	8%	5%	6%	**0.70**
Hemos glucoside[1,3]	6%	5%	2%	**0.07**
Urine tests[1,3]	47%	38%	57%	**0.00**
Blood chemistry[3]	5%	2%	1%	**0.13**
Ultrasound[1]	4%	1%	1%	**0.92**
Urine examination[1,3]	5%	2%	1%	**0.33**
Sample taking	2%	2%	0%	**0.07**
Skin tests	2%	1%	2%	**0.30**
Rx	3%	1%	0%	**0.26**
Bleeding times	3%	1%	0%	**0.17**
Uroculture	2%	1%	1%	**0.92**
Papanicolaou[1]	72%	71%	73%	**0.62**
Childbirths	47%	37%	59%	**0.00**
Odontology practice	20%	22%	10%	**0.00**
Ophthalmic revision[3]	28%	22%	37%	**0.00**
Healthcare workshops[3]	87%	83%	95%	**0.00**

* Probability value of t test for mean difference, ** SSA: Health Centres, health houses, mobile units, mobile brigades
[1] Supplies necessary for childbirth attention, [2] Supplies necessary for child care, [3] Supplies necessary for metabolic syndrome attention

3.4.2 Quality index

As previously mentioned, the structural quality index was developed using information from 408 clinics using factor analysis. The observed variables were the percentage of adequacy in areas, equipment, supplies and medicines, and services provided, and the estimation method was principal factors. As reported in table 30, the first factor was able to represent the structural quality, as the percentage of explanatory power for this factor was close to 100%.

Table 30: Factor analysis for the structural quality index

	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	2.56538	2.49985	1.0577	1.0577
Factor 2	0.06553	0.13832	0.027	1.0847
Factor 3	-0.07279	0.05983	-0.03	1.0547
Factor 4	-0.13262	.	-0.0547	1

The loadings for the first factor are reported in table 31. All 4 variables are positively related to structural quality, with adequacy on equipment having the larger weight , then supplies and medicines. In terms of this analysis, the interpretation is that all 4 variables are directly related to structural quality, with equipment and supplies & drugs having a larger effect on the index. It is also important to note that the uniqueness values are low in general.

Table 31: Factor 1 loadings

	Loadings	Uniqueness
Areas	0.7108	0.4579
Equipment	0.9228	0.1463
Supplies & drugs	0.8410	0.2791
Services	0.7080	0.4857

The results from the test of sampling adequacy are presented in table 32. The KMO measure indicated a value that could be considered to represent

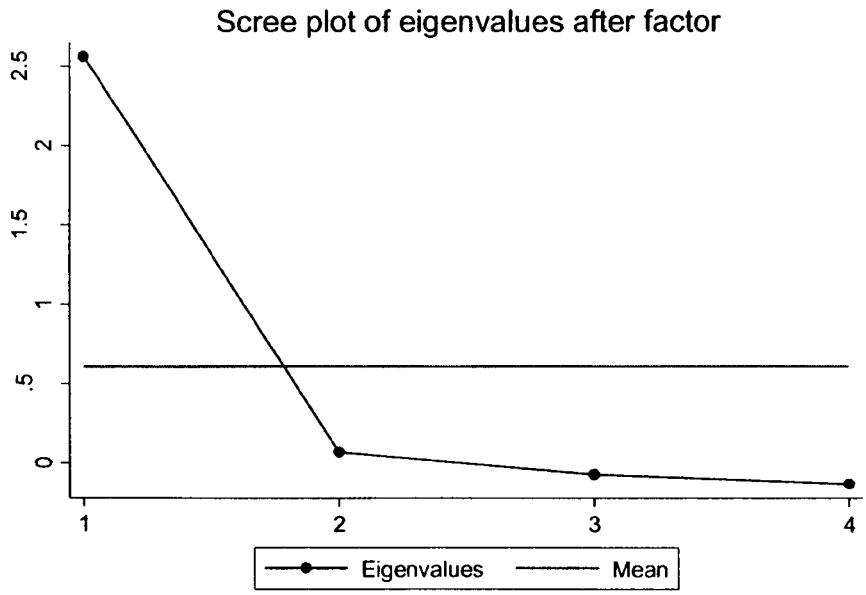
moderate adequacy; the KMO ranges from 0 to 1, and a lower value indicates that variables used for the analysis are insufficiently related to justify factor analysis.

Table 32: Sampling adequacy for the factor analysis

Value	KMO
Areas	0.7923
Equipment	0.6966
Supplies	0.7684
Medicines	0.8915
General	0.7705

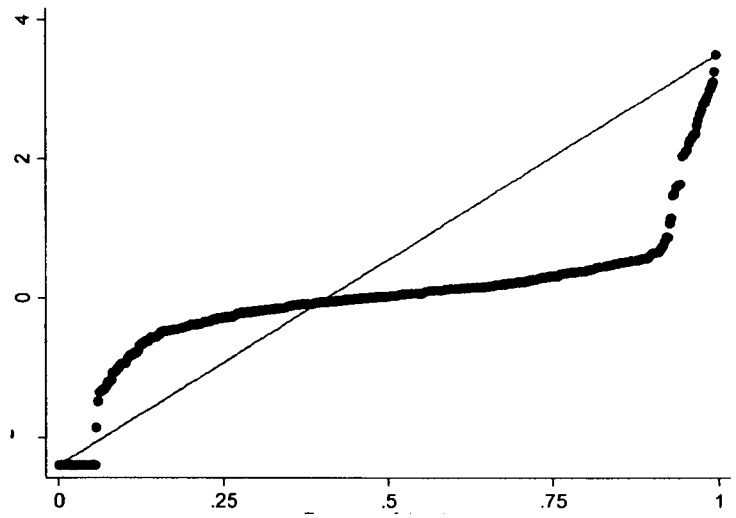
The number of retained factors was presented in a scree plot of the eigenvalues, which is a graphic representation on the fraction of total variance that is explained by each factor. As can be observed in Figure 16, the shape suggests the retention of one factor, as well as the fact that only the first factor is above the cut-off value used as a reference to select factors to be retained. As the eigenvalues of the factors 3 & 4 are negative (in general eigenvalues to be retained are expected to be greater than zero), the proportion that those factors explain of the variance are negative, so in the scree plot are below 0.

Figure 5: Scree plot for the factor analysis for the structural quality index



Based on the factor analysis obtained using the above regression methods, the index values from the first factor were between -2.4 and 3.5, with higher values for clinics with better structural conditions. In Figure 17, the index distribution is presented in a quantile distribution.

Figure 6: Distribution of the structural quality index of health units using a quantile distribution



Using the visual examination of the distribution following a quantile uniform distribution to define cut-off points, the index values were used to classify health facilities in relative quality categories as reported in Table 33. It is important to remember that this is a relative measure, in the sense that there is no external benchmark to compare the value. Nevertheless, it is important to highlight the significant heterogeneity in structural quality reflected by the fact that all four categories include a non-negligible per cent of facilities. In addition, the fact that more than 1 in 10 facilities were classified as low quality is even more striking considering that this relative measure was built from the previously discussed percentages of adequacy, which were below 100% and thus had some degree of deficiency.

Table 30: Distribution of units by structural quality category

Category	%
Low quality	**12.25**
Medium low quality	**35.54**
Medium high quality	**45.34**
High quality	**6.86**

3.4.3 Factors associated with quality

To analyse factors related to quality, a regression model was estimated using a dichotomous dependent variable, where a value of 1 represented medium-high and high quality, and 0 indicated low and middle-low quality. As detailed in the methods section, independent variables were locality level characteristics. As facilities under state Ministries of Health can be seen as belonging to different providers, state fixed-effects are included in the estimation, to control for variations that are more related to provider organization. The results of the estimated model are presented in table 34.

The average SE level of the localities was positively and significantly related to the probability of high quality. That is, localities where households have better conditions tend to also have better quality services. In terms of the providers, facilities operated by the IMSS-Oportunidades were associated with a lower probability of high quality compared to those operated by the states' MoH.

Table 31: Locality factors correlated with structural quality

VARIABLES	(1) high_quality
High marginalisation	-0.5962
	(0.5905)
Middle marginalisation	-0.1107
	(0.6251)
Low marginalisation	0.0920
	(0.7140)
Average SE level	0.9078***
	(0.3197)
Seguro Popular == 1	0.1977
	(0.2766)
IMSS-Oportunidades ==1	-1.1277***
	(0.2555)
State 7	-1.7540*
	(0.9343)
State 10	-1.2335
	(0.9500)
State 12	-1.8396*
	(0.9626)
State 13	-0.8189
	(0.8684)
State 16	-1.1811
	(0.8878)
State 18	-2.0620**
	(0.9762)
State 20	0.1912
	(0.9257)
State 21	-0.4087
	(0.9035)
State 22	-0.3108
	(1.0551)
State 24	-0.0985
	(0.8862)
State 25	-0.0730
	(0.9875)
State 30	-0.2488
	(0.8754)
Constant	0.0671
	(1.1768)
Observations	484
Standard errors in parentheses	

3.4.4 Relationship between quality and aggregate health outcomes

To test whether structural quality is related to health outcomes, an analysis using morbidity prevalence, defined as the proportion of individuals that were reported as sick in a 4-week period as a health outcome was implmented. This correlation analysis while it is not measuring causality, could provide a validation to the structural quality approach, if evidence that it is actually related to health is presented. Data from households surveyed in the same period that the data collection for quality at health facilities, and in the localities served by the facilities were used.

Individual data was aggregate at the locality level in order to estimate the correlation with structural quality. Ordinay least squares models were estimated using the quality index as a continuous variable, and order probit used to estimate the correlation using the 4 proposed categories of the index. The morbidity prevalence was generated for total population and 0 to 4, 5 to 9, 10 to 14 and 15 to 20 years-olds.

As reported in tables 35 & 36, when used as a continuous variable, there is a negative correlation between morbidity prevalence and the structural quality of services for individuals from 5 to 9 and 10 to 14, and marginal significant for the entire population. When analyzed as a categorical variable, the correlation is only shown in the 10 to 14 years.

Table 32: Correlation between morbidty prevalence and structural quality index at the locality levela

VARIABLES	All	ALL	0 to 4	0 to 4	5 to 9	5 to 9	10 to 14	10 to 14	15 t 19	15 t 19
Structural quality index	-0.00	**-0.01***	-0.00	-0.00	**-0.01***	**-0.01****	**-0.01****	**-0.01****	-0.01	-0.01
	(0.00)	**(0.00)**	(0.01)	(0.01)	**(0.01)**	**(0.01)**	**(0.00)**	**(0.00)**	(0.00)	(0.00)
Average SES		0.02***		0.04***		0.03***		-0.01		0.02***
		(0.01)		(0.01)		(0.01)		(0.01)		(0.01)
Constant	0.11***	0.07***	0.17***	0.11***	0.11***	0.06***	0.09***	0.11***	0.07***	-0.00
	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.00)	(0.03)	(0.00)	(0.02)
Observations	483	483	478	478	480	480	482	482	482	482
R-squared	0.00	0.04	0.00	0.02	0.01	0.04	0.01	0.13	0.00	0.12

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[a] includes also provider and state variables, with interactions

Table 33: Correlation between morbidty prevalence and structural quality categories at the locality levela

VARIABLES	All	ALL	0 to 4	0 to 4	5 to 9	5 to 9	10 to 14	10 to 14	15 t 19	15 t 19
Morbidity prevalence	-0.97	-1.41	-0.07	-0.13	-0.27	-0.73	**-1.21****	**-1.56****	-0.86	-1.15
	(0.74)	(0.91)	(0.35)	(0.38)	(0.46)	(0.52)	**(0.58)**	**(0.63)**	(0.68)	(0.75)
Average SES		0.46***		0.43***		0.45***		0.42***		0.46***
		(0.12)		(0.12)		(0.12)		(0.12)		(0.12)
Observations	483	483	478	478	480	480	482	482	482	482

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[a] includes also provider and state variables, with interactions

6.5 Discussion

As presented in the present chapter, there is significant heterogeneity in structural quality among primary care facilities serving rural poor localities in Mexico, which constraint the capacity of these facilities to provide effective health services. This constraint to health capital accumulation is strengthened by the fact that there is a positive correlation between quality and the average SE level of households in the locality (i.e., localities with households in better conditions also have better quality facilities). This situation is increasing the constraints on households in the poorest localities.

The analysis reported here use morbidity prevalence correlation with the estimated structural quality index as a validation on the relevance of such measure. The results suggest that structural quality matters, as quality framework propose. Lower the structural quality, lower the capacity of health services to produce health.

This study is the first large analysis of the structural quality of primary health services in Mexico, thus provide relevant empirical evidence of the quality of primary care in the country. Also, by correlating the proposed index with a measure of health outcomes provided evidence on the potential gains of investments on quality: at least for primar health units in rural Mexico, youth children are potentially the group that could be more beneficed by improvements in quality.

The structural quality of these primary health services could be viewed as a measure of the ability of these facilities to translate utilisation into health capital. This issue is relevant because development strategies, such as conditional cash transfer programmes like the Mexican Oportunidades, assume that increasing health services utilisation will increase human (health) capital accumulation, which will then result in socioeconomic mobility. If, as reported here, the quality of the facilities were not meeting the minimum structural conditions that are expected to effectively improve health, there would be a major barrier to development.

In particular, the results reported here highlight the fact that health services that serve Oportunidades households in rural Mexico lack important human and material resources, and that this deficiencies are correlated with low health

outcomes. The current structure of the visited facilities is insufficient to provide adequate treatment and care for their users according to Mexican official standards. Even if Oportunidades is successful in increasing health services utilisation among poor families with a high risk of intergenerational transmission of poverty, there is no guarantee that this will actually increase their health capital.

Half of the visited facilities have neither the necessary infrastructure nor the necessary supplies for childbearing; only 40% have a delivery room, and less than 10% possess ultrasound equipment. The use of the Papanicolaou smear, which is necessary for the appropriate detection of cervix and uterine cancer, is performed in only 70% of the clinics. About 25% of the units do not apply tests to measure glucose levels, and only 10% have glycosylated haemoglobin tests, which are needed to monitor diabetes treatments.

In general, the visited clinics had a reduced ability to offer appropriate health services for the users and face a crucial shortage of basic supplies. In a country with a high prevalence of anaemia and diabetes, the clinics are not equipped for the detection and follow-up of these conditions, which makes it impossible to prevent complications.

It is important to mention that are limitations to this analysis. As discussed in the methods section, there were some missing observations, although the sample of facilities comprises a significant proportion of the total sample. The quality index is a proxy measure for a complex concept, quality. Quality is a challenging to measure concept, and defining measures for structural quality is complex. Nevertheless, the proposed index is conceptually similar to other studies. (Gilson, Magomi et al. 1995; Peabody, Gertler et al. 1998; Meyer and Massagli 2001; Mariko 2003)

Deficiencies in structure point to important challenges in the quality of health services that could result in sub-optimal care. Failing to promote the effective accumulation of health capital would in turn affect the potential for socioeconomic mobility. Although health is one element of the human capital accumulation

process, it is a necessary but not sufficient condition. Investment in the quality of health services is actually an investment in development, as health services are a key element in socioeconomic mobility.

6.6 References

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6.7 Annex 1

Table 34. Minimum Supplies Needed by the Units.

Type of Unit	BM[b]	CS[a]	HR[d]	HC[e]	CSRD[f]	CSRC[g]		UMR[h]	UM[i]	CSU[j]			
N	4	31	2	14	132	30	16	148	11	2	2	2	2
Staff teams						2	3			2	4	5	12
Infrastructure for Patient Care													
Consulting Room	X	X	X	X	X	X	X	X	X	X	X	X	X
Nursing Room			X	X		X	X	X		X	X	X	X
Waiting Room			X	X	X	X	X	X		X	X	X	X
Workshop Rooms	X	X	X	X	X	X	X	X	X	X	X	X	X
Storage Area				X									
Cold Net Medicines													
Cold Net Vaccines	X	X	X	X	X	X	X	X	X	X	X	X	X
Birthing Room	X	X	X	X	X	X	X	X	X	X	X	X	X
Staff Bathroom			X	X				X					
Patient bathrooms			X	X				X					X
Shared Bathrooms	X	X	X	X	X	X	X	X	X	X	X	X	X
Pharmacy			X	X		X	X	X		X	X	X	X
Nurse's station	X	X	X	X	X	X	X	X	X	X	X	X	X
Expulsion room			X	X		X	X	X		X	X	X	X
Training Area			X	X	X	X	X	X		X	X	X	X
Dorms			X	X				X					
Storage Room for DB			X	X									
Emergency Room			X	X				X					
Operating Room			X	X									
Laboratory AC			X	X								X	X
Immunisation Room	X	X	X	X	X	X	X	X	X	X	X	X	X
Cleaning Room			X	X	X	X	X	X		X	X	X	X
Medical Equipment Infrastructure													
Ambulance													
Filing Cabinets			X	X		X	X	X		X	X	X	X
Vacuum AMEU			X	X		X	X	X		X	X	X	X
Steriliser													
Weight scale for children	X	X	X	X	X	X	X	X	X	X	X	X	X
Infantometer	X	X	X	X	X	X	X	X	X	X	X	X	X
Adult weight scale	X	X	X	X	X	X	X	X	X	X	X	X	X
Stadimeter	X	X	X	X	X	X	X	X	X	X	X	X	X
Baumanometer	X	X	X	X	X	X	X	X	X	X	X	X	X
Stretcher													
Oxygen cylinder			X	X				X					
Metre measurement tape	X	X	X	X	X	X	X	X	X	X	X	X	X
Containers	X	X	X	X	X	X	X	X	X	X	X	X	X
Doppler													
Minor Surgery	X	X	X	X	X	X	X	X	X	X	X	X	X
Electrocardiogram			X	X									
US Equipment			X	X		X	X	X		X	X	X	X
Radiology Equipment			X	X						X	X	X	X

Stethoscope	X	X	X	X	X	X	X	X	X	X	X	X	X
Stethoscope Pinar	X	X	X	X	X	X	X	X	X	X	X	X	X
Washer	X	X	X	X	X	X	X	X	X	X	X	X	X
Mayo Table			X	X		X	X	X		X	X	X	X
Microscope			X	X						X	X	X	X
Ophthalmoscope	X	X	X	X	X	X	X	X	X	X	X	X	X
Otoscope	X	X	X	X	X	X	X	X	X	X	X	X	X
Refrigerator	X	X	X	X	X	X	X	X	X	X	X	X	X
Visual Agud Table													
Thermometer	X	X	X	X	X	X	X	X	X	X	X	X	X
Tococardiograph			X	X		X	X	X		X	X	X	X
Clock													
Oral Serum	X	X	X	X	X	X	X	X	X	X	X	X	X
Med Reg Book													
Vaccine Reg Book	X	X	X	X	X	X	X	X	X	X	X	X	X
Medical Material													
Tongue depressor	X	X	X	X	X	X	X	X	X	X	X	X	X
Alcohol	X	X	X	X	X	X	X	X	X	X	X	X	X
Cotton	X	X	X	X	X	X	X	X	X	X	X	X	X
Benzal	X	X	X	X	X	X	X	X	X	X	X	X	X
Condoms	X	X	X	X	X	X	X	X	X	X	X	X	X
Mouthcovers			X	X		X	X	X		X	X	X	X
DIU	X	X	X	X	X	X	X	X	X	X	X	X	X
Vaginal Mirror			X	X		X	X	X		X	X	X	X
Dissecting Kit			X	X		X	X	X		X	X	X	X
Gauze	X	X	X	X	X	X	X	X	X	X	X	X	X
Gloves	X	X	X	X	X	X	X	X	X	X	X	X	X
Iodine	X	X	X	X	X	X	X	X	X	X	X	X	X
Lubricating Jelly													
Liquid Soap													
Hand soap	X	X	X	X	X	X	X	X	X	X	X	X	X
Syringe	X	X	X	X	X	X	X	X	X	X	X	X	X
Juego instrumental	X	X	X	X	X	X	X	X	X	X	X	X	X
Bed linens			X	X		X	X	X		X	X	X	X
Punzocat			X	X									
Operating robes			X	X									
Sonda			X	X		X	X	X		X	X	X	X
Sonda Foley			X	X		X	X	X		X	X	X	X
Needles and thread			X	X		X	X	X		X	X	X	X
Adhesive tape	X	X	X	X	X	X	X	X	X	X	X	X	X
Towels	X	X	X	X	X	X	X	X	X	X	X	X	X
Glucose Strips			X	X		X	X	X		X	X	X	X
Urine Strips			X	X		X	X	X		X	X	X	X
Thermo													
Disposable Towels													
Vaccine Container			X	X		X	X	X		X	X	X	X
Elastic Wraps	X	X	X	X	X	X	X	X	X	X	X	X	X

Venoset			X	X		X	X	X		X	X	X	X
Collecting Cups			X	X									
Medicines													
***Acetylsalicylic* acid**	X	X	X	X	X	X	X	X	X	X	X	X	X
Paracetamol tab													
Paracetamol sol													
Metamizole *sodium*			X	X				X					
Lidocaine sol iny			X	X	X	X	X	X		X	X	X	X
Chlorpheniramine tab	X	X	X	X	X	X	X	X	X	X	X	X	X
Chlorpheniramine jar	X	X	X	X	X	X	X	X	X	X	X	X	X
Propranolol			X	X	X	X	X	X		X	X	X	X
Captopril			X	X				X					
Nifedipine caps			X	X				X					
Metoprolol													
Hidroclorotiazide													
Al/Mg			X	X	X	X	X	X		X	X	X	X
Ranitidina			X	X				X					
Butilnioscina iny			X	X	X	X	X	X		X	X	X	X
Albendazole tab			X	X				X					
Albendazole susp			X	X				X					
Metronidazole tab			X	X	X	X	X	X		X	X	X	X
Metronidazole susp			X	X	X	X	X	X		X	X	X	X
Glibenclamide			X	X	X	X	X	X		X	X	X	X
Metformin													
Insulin			X	X	X	X	X	X		X	X	X	X
Trimetopri tab			X	X	X	X	X	X		X	X	X	X
Trimetopri susp			X	X	X	X	X	X		X	X	X	X
Bencilpenicilina 1			X	X	X	X	X	X		X	X	X	X
Bencilpenicilina 2			X	X	X	X	X	X		X	X	X	X
Bencilpenicilina 3			X	X	X	X	X	X		X	X	X	X
Benzidine													
Dicloxacillin cap			X	X				X					
Dicloxacillin susp			X	X				X					
Ampicillin tab			X	X	X	X	X	X		X	X	X	X
Ampicillin susp			X	X	X	X	X	X		X	X	X	X
Eritromicina tab			X	X	X	X	X	X		X	X	X	X
Eritromicina susp			X	X	X	X	X	X		X	X	X	X
Chloramphenicol cap			X	X	X	X	X	X		X	X	X	X
Amoxicillin susp			X	X				X					
Amoxicillin cap			X	X				X					
Chloramphenicol sol			X	X	X	X	X	X		X	X	X	X
Chloramphenicol ung			X	X	X	X	X	X		X	X	X	X
Neomycin			X	X				X					
Salbutamol jar			X	X	X	X	X	X		X	X	X	X
Ambroxol			X	X				X					
Benzyl	X	X	X	X	X	X	X	X	X	X	X	X	X

Zinc oxide	X	X	X	X	X	X	X	X	X	X	X	X	X
Lindane													
Clioquinol								X					
Miconazole			X	X	X	X	X	X		X	X	X	X
Folic acid 1			X	X				X					
Folic acid 2			X	X				X					
Bisoprolol fumarate tab			X	X	X	X	X	X		X	X	X	X
Bisoprolol umarato susp			X	X	X	X	X	X		X	X	X	X
Levonorgestrel	X	X	X	X	X	X	X	X	X	X	X	X	X
Desogestrel	X	X	X	X	X	X	X	X	X	X	X	X	X
Medroxyprogesterone	X	X	X	X	X	X	X	X	X	X	X	X	X
Enanthate	X	X	X	X	X	X	X	X	X	X	X	X	X
Male Condoms	X	X	X	X	X	X	X	X	X	X	X	X	X
Glucose @l 5%			X	X	X	X	X	X		X	X	X	X
NaCl 0.9%[3]			X	X				X					
Sol Hartman			X	X				X					
Electrolytes	X	X	X	X	X	X	X	X	X	X	X	X	X
Streptomycin			X	X	X	X	X	X		X	X	X	X
Isoniazid			X	X				X					
Sabin	X	X	X	X	X	X	X	X	X	X	X	X	X
BCG	X	X	X	X	X	X	X	X	X	X	X	X	X
DPT[2]	X	X	X	X	X	X	X	X	X	X	X	X	X
Tetravalent	X	X	X	X	X	X	X	X	X	X	X	X	X
Triple viral	X	X	X	X	X	X	X	X	X	X	X	X	X
Measles	X	X	X	X	X	X	X	X	X	X	X	X	X
Tetanus toxoid	X	X	X	X	X	X	X	X	X	X	X	X	X
Complement - child	X	X	X	X	X	X	X		X	X	X	X	X
Complement - woman	X	X	X	X	X	X	X	X	X	X	X	X	X
Services offered to the outpatient population													
Biopsy			X										
Caesarean Section			X	X		X	X	X		X	X	X	X
Minor Surgery			X	X									
Dental consultation			X	X		X	X	X		X	X	X	X
Consultation - adult	X	X	X	X	X	X	X	X	X	X	X	X	X
Consultation - child	X	X	X	X	X	X	X	X	X	X	X	X	X
Consultation – emb	X	X	X	X	X	X	X	X	X	X	X	X	X
Nutrition monitoring	X	X	X	X	X	X	X	X	X	X	X	X	X
Newborn care	X	X	X	X	X	X	X	X	X	X	X	X	X
Labour and Child birth			X	X		X	X	X	X	X	X	X	X
Punctures			X	X									
Ultrasound			X	X		X	X	X		X	X	X	X
Emergencies			X	X				X					
Vaginal cytology			X	X	X	X	X	X		X	X	X	X
Microbacterial culture			X	X								X	X
Syphilis detection			X	X								X	X
Electrocardio				X								X	X
GS and Rh			X	X								X	X

Glucose levels			X	X								X	X
Haemoglobin levels			X	X								X	X
Hemos glucoside			X	X								X	X
Urine tests			X	X								X	X
Blood chemistry			X	X								X	X
Ultrasound			X	X								X	X
Urine test			X	X								X	X
Sample taking			X	X								X	X
Skin test			X	X								X	X
X-rays			X	X								X	X
Bleeding time			X	X								X	X
Uroculture			X	X								X	X
Papanicolaou	X	X	X	X	X	X	X	X	X	X	X	X	X
Labour and childbirth			X	X		X	X	X		X	X	X	X
Dental practice			X	X									
Ophthalmological revision			X	X				X					
Healthcare workshops	X	X	X	X	X	X	X	X	X	X	X	X	X

Note: The following types of units are not considered, as they include only one observation (complete table in Appendices): "Consultorio Periférico SSA", "Urban Medical Unit", "3-nuclei Urban Health Centre", "8-nuclei Urban Health Centre" and "11-nuclei Urban Health Centre".
MB = Mobile Brigade, HH = Health House, RH = Rural Hospital, CH = Community Hospital, DRHC = Disperse Rural Health Centre, CRHC = Concentrating Rural Health Centre, MU = Mobile Unit, UMU = Urban Medical Unit, RMU = Rural Medical Unit, UHC = Urban Health Centre.
[a] For an HH, the necessary spaces are considered according to the architectural layout (consultation room, delivery room, general bathroom, lavatory, etc.). A treatment room is defined as one in which minor treatments are performed and alcohol, cotton, benzyl chloride, gauzes, iodine, soap, sutures, containers, adhesive tape, and bandages are available. For their role in vaccination campaigns, a vaccine cooling box, vaccines, and syringes are included. Consultation is available for adults, children, and pregnant women, and therefore, basic diagnostic equipment is required, as well as a scale and a stadiometer. Because of the activities required for attention to newborn babies and child growth monitoring, the following are required: a paediatric scale, infantometer, thermometer, oral electrolytes, and nutritional monitoring services and child complement. For pregnancy care, a metric tape, foetal stethoscope, and complement are required for women. Necessary instruments for mobile brigades are required, as well as condoms and IUDs for family planning. Vaginal cytology and Pap tests are necessary for cancer detection.
[b] Same results established by the Health Houses, where the mobile brigades or units arrive.
[c] CH supplies according to the equipment guide provided by CENETEC.
[d] Same requirements established as those for a Rural Medical Unit in addition to those established in the Operation Rules of the IMSS-*Oportunidades* Program. For RH, the healthcare workshops are equivalent to social work. RHs attend to labour and childbirth.
[f,a,i] In accordance with the MIDAS and CENTEC equipment guide for health centres.
[h] Equipment is established according to that set by the central office of the Evaluation Unit of the IMSS-Oportunidades Program.
[i] The same equipment is established as for HH.

Assumptions:

1. Training rooms are related to multiple service areas for the SSA and to preventive medicine for the IMSS.
2. All types of SSA units require a trash bin, bathroom, towels, and soap. Three types of bathrooms were considered (personnel, patients, and general), as well as the presence of towels and disposable towels and hand and liquid soap.
3. All types of health units (IMSS or SSA) have a consultation room and a waiting room and provide consultations to adults, children, and pregnant women.
4. In the case of SSA units requiring diagnostic equipment, an ophthalmoscope and an otoscope were considered.
5. A waste bin indicates a storage room or space for dangerous bio-infectious residues.
6. Units that require a thermometer case are assumed to have a thermometer.
7. The vaccine/treatment area requirement is related to having a treatment room and a vaccination room.
8. The minor surgery requirement is related to having minor surgery equipment, minor surgery service, emergency care, and an emergency room.

9. Requirements such as a scalpel or certain types of forceps are related to dissection.
10. The emergency childbirth requirement is related to childbirth and childbirth service.
11. The dental consultation requirement is related to dental consultation and odontology or dental practice.
12. The file registry requirement is related to the filing cabinet used for medical files.
13. All types of ENCEL instrument analyses were considered for urban health centres, as this type of unit requires laboratories for several clinical analyses.
14. X-rays performed in urban health centres are related to X-ray services and radiology equipment.
15. Cleaning is related to the cleaning room.
16. Clean clothes are related to bed linen in the case of units that require an admission area.
17. The presence of an admission area is determined by units that require oxygen, have an I.V. stand and mount or contain an observation area.
18. Units that require emergency childbirth service are related to the attention and care of newborn infants.
19. Room is related to having a dormitory.
20. Antiseptic germicide is related to alcohol, which is necessary in every unit type.
21. Lancet is related to the instrument puncture variable.
22. In the case of an IMSS-*Oportunidades* RMU, the adult bedpan requirement is related to admission area, oxygen, and bed linen.
23. Children complement and nutrition monitoring are considered equivalent to having a nutrition education centre.

Chapter 5: Discussion

5.1 Main findings

The overall scope of this thesis was to document the relevance of health capital investments for development, as well as highlighting barriers for the accumulation of health capital in the context of policies and programmes aimed to this.

Even if there is not enough information on how the different aspects of human capital contribute to its accumulation, it can be assumed that there is a minimum level for each one that allows individuals to reach an adequate level of human capital.

If this level of accumulation is represented by $\dot{H}_i$ in the function

$$HC_i = f(H_i, S_i, N_i, \mathrm{K}_i),$$

in which the level of accumulation of human capital (HC) for the individual *i* depends on her achievements on health (H), education (S), nutrition (N), and a vector of other factors affecting human capital accumulation (K). The minimum level would be reach when and only the individual achieve such levels for H, S and N, and under an adequate combination for K, that the probabilities for positive socioeconomic mobility are strictly positive.

An adequate stock in human capital, from this perspective, is then a condition for human development and development with equity. Not reaching this level of human capital is the consequence of both not investing enough and not intervening factors that may affect accumulation.

The analysis reported in this thesis makes the case for increasing investments in health capital as a mean to increase the accumulation of human capital, but at the same time devoting resources to increase the chances of these investments in translate effectively in human capital. That is, increasing quality of health services and promoting healthy behaviours.

5.1.1 Investing in health for development

As discussed in chapter 2, there is strong evidence that in the case of Mexico, as has been documented for other contexts, there is a positive rate of return for health

investments (using height to measure the stock of health capital) , which may be still below the potential, as there is also an important transmission of SE status. This rate of return indicates that individuals have incentives to devote resources for health.

While the published literature has documented using similar methodological approaches the return to health investments for developing countries like Brazil India, and Ethiopia, there is scarce studies in Mexico tackling this topic. The analysis presented used data from a large national representative survey, highlighting the role of health capital (measure with height) on wages. Assuming that wages are an adequate measure of productivity, investments in health during growth are effectively translated in higher productivity. This is true even considering the wage differentials related to socio-economic levels; that is, controlling for SE level, height still is positively related to wage.

Recognizing the role of health capital in development is a key element for social policies, as it may reinforce the need for a more comprehensive approach to development, that take into account the need to generate the foundations from the human capital, with a long-term perspective. Without investments towards ensuring capabilities, development is going to be limited and unequal.

At the same time, transmission of SE status is still high, representing a barrier for mobility. Increasing opportunities requires a broader approach, with structural interventions that also increase economic opportunities for all individuals. Transmission of SE status, measure as the degree that parents educational level is determining individual own achievements, indicates that in an important degree, there is some sort of pre-determination on the potential achievements, that is heavily related to available resources. While transmission is not strictly related to under-developments, as developed countries such as USA presents also a large degree of transmission, in developing context it represent an additional barriers.

5.1.2 Promoting healthy behaviours for development

A concerning issue is the potential negative role of risk behaviours regarding development. If health capital accumulation is affected both in terms of reducing flows and consuming the capital, the aim of social mobility is jeopardized. As discussed in chapter 3, risk behaviours may have this role and as they may be positively related to development (as increases in resources may increase the capacity to engage in risk behaviours), it is important to target them in order to effectively promote development. The evidence presented is that structural interventions such as Oportunidades may decrease engagement in risk behaviours, so this type of integral approaches is important.

Because risk behaviours are more likely to occur during adolescence or youth, they are particular relevant in terms of socioeconomic mobility, and that is why addressing them from the perspective of development is important.

Risk behaviours engagement has been also studied in the context of peer interaction, highlighting that the context is relevant for its prevention (or fail to prevent them).

An additional result from this analysis is that probably one of the most important factors to decrease participation in risk behaviours is related to having positive future perspectives. That is, while the access to additional resources alone could result in increase access to unhealthy behaviours, increasing chances to complete education and the perception that higher levels of education may be related to higher future income seems to prevent engagement in risk behaviours.

That the positive effects of the intervention seem to overcome the expected negative effects may be also related to the magnitude and allocation of the additional resources, although this is something that is not analyzed in this thesis.

While preventing or addressing unhealthy behaviours is not an specific task for interventions targeting adolescents and youths from a more broader health perspective, the specific focus in this population is related to a more specific health capital accumulation issue.

5.1.3 The pursuit for quality of health care

Policies and programmes orientated to incentivise households to invest in human capital, either explicit or implicit, are assuming that services (both health and education), will translate utilization in human capital. The analysis reported in chapter 4 made it clear that there is a case for the improvement of primary health services quality in Mexico. As has been more extensively discussed, having the means to provide an adequate care (either preventive or curative) are essential for health services to generate health.

Measuring structural quality with a lower bound approach, that is, an adequacy to norms approach, it would be expected a better outcome for the analyzed facilities. The large deviation from the norm that heterogeneity for adequacy reflects suggests that investments made to increase access have not been paralleled with efforts to ensure adequate care.

The evidence from the Mexican facilities serving the poorest population is that it is urgent to invest in the quality of these services. Structural quality is not only low in average, but highly heterogeneous in a regressive way, as the lower quality facilities are those serving the most marginalized localities.

This is particular relevant, as most marginalized localities are also those with less access to alternative providers, so the monopoly of health care is exercised by facilities staffed with temporal personnel (MDs doing social service), that have neither incentives in general nor the time to evaluate adequately health conditions of the population and plan for their needs.

Actions are needed to ensure fully equipped facilities that are operated by trained and committed staff. Under the current structure, MDs at these facilities have a short period working there, as usually are recent graduates in their social services. This has been a barrier for generating better communication with the localities that may increase their understanding of the specific health needs. It would be important to have an alternative mechanism to staff these facilities,

including a permanent MD that may be supported by those in social service, but would have more experience and knowledge of the local situation.

5.2 Limitations

In each of the chapters I have discussed the limitations of each specific methodological approach, as well as the representativeness of the analyzed samples.

In general, the two chapters on constraints for accumulation of human capital (quality of health care and risk behaviours) are analysis of samples that were collected for the evaluation of Oportunidades, and in that sense are samples that represent households that are targeted by the programme, that is, poor households. While this limit the results to this set of households, as the analysis is related to factors that may affect positive socioeconomic mobility, this seems as a minor limitation.

The analysis of the structural quality of health care were based on an empirical approach that is somehow novel, so there is not much references to compare to. Nevertheless, the existent literature discusses similar approaches, which make the used adequacy analysis a reliable approach to structural quality. As discussed in this chapter, there are some assumptions that are needed when working with factor analysis, the most relevant, that the variables used to estimate the unobserved variable are related to the latter. As structural quality has a straightforward definitions, it is clear that whatever construct is derived for it, it would be related to the physical facility and the equipments and supplies.

In terms of the analysis of risk behaviours, the impact analysis was limited by the lack of an experimental control group. It a control would be available, the conclusions on the effect of Oportunidades would be stronger. Nevertheless, the approach used has the advantage of using a large data set with several outcomes, so the internal consistency in the results provide with some level of confidence.

Regarding the analysis of returns to health investments, as discussed the main limitation has to be with the potential endogeneity between wages and height. The

analyses implemented make the possible attempts to prevent bias in the estimations, and having consistent results with similar analysis provides with some level of assurance that estimations are relatively accurate. Nevertheless, the debate in the literature remains on this issues. I would tackle this issue better if I would have access to panel data national representatively or better instruments for the IV estimation. I tested the estimations and got reasonable results to rely on these estimations. The results are also internally consistent, in the sense that analysis using different approaches lead to similar results.

5.3 Policy implications

Mexico has been facing with underdevelopment for years; while some similar countries like Brazil are now among those leading the world economy growing and expanding, Mexico has not been able to growth as it could. While there is a debate on all the factors related to this fact, one aspect of this picture is the low accumulation of human capital and the related relatively low social mobility. Investments made on social programmes have been insufficient to effectively promote a larger accumulation of human capital in general, and health capital in particular.

A tension between politics of generalizing or over-expanding transfers and the policy of investing on the poorest population has resulted in a large percent of the country households receiving a limited amount of resources that is neither enough to overcome poverty, nor to ensure adequate investments in human capital to promote positive social mobility.

Social policy need to have a structural approach, which implies effective collaboration between stakeholders to improve the living conditions of the Mexicans living in poverty. Access to quality health services should be an immediate imperative, as having low quality services is both inefficient and ineffective.

In the current context of Mexico, it is imperative to strength actions towards generation of human capital, which are expected to contribute to the country

development. The experience of other countries is that better educated and skilled population would generate the power to move the country from the lethargy it has been.

The key message from the analyses reported is that investing in health effectively will increase the living conditions of Mexicans, but that these positive effects could be even higher if attention is directed to two relevant constraints for human capital accumulation: lack of quality in the human capital formation services, and behaviours that decrease accumulation and de-accumulate human capital.

5.4 Final remarks

The analysis reported in this thesis is an approach to a policy question. Promoting development through promoting human capital has been seen as the way to tackle poverty. The evidence reported here suggests that in fact there is a positive return to health capital in particular, and human capital in general. That is, that investments made to increase health capital accumulation are effectively translated to rises in income. Nevertheless, there are two caveats at this respect.

First, labour income is also highly related to family wealth. As opposed to human capital as the main factor regarding the level of wages, for each socioeconomic level, there is a different expected wage for a given level of human capital. That is, there is still an important degree of transmission of SE level.

Second, there are other factors that could affect human capital, even decreasing its accumulation or consuming it at a high rate. Two of these factors were analyzed. The quality of health services (and this apply also for education services, or in general human capital formation related services) could affect the degree in that attendance to services is effectively translated to health (or education). Assuming that just access matters is not appropriate. As reported, at least for the Mexican case, primary health services structural quality is much below to what would be expected by norms.

Also, behaviours that decrease accumulation or more over, consume human capital, that is risk behaviours, are highly prevalent, and related to human capital as suggested by the analysis reported. A direct approach to these behaviours is needed to protect investments in human capital.

In summary, developments by increasing the accumulation of human capital is possible, but it requires a comprehensive approach that ensures quality of services that are required to generate human capital, and policies towards equality of opportunities in the labour market, as well as simply labour opportunities.