Essays on Healthcare Decisions

Patricia Triunfo

Departamento de Teoría e Historia Económica

Tesis Doctoral

Para optar al grado de doctor por la Universidad de Granada

Dirigida por el Prof. Dr. Pablo Brañas Garza

Granada, Junio de 2008

A Agustina y Rafael, sin ellos tal vez esta etapa la hubiese

culminado antes, pero no tendría ningún sentido...

Agradecimientos

Escribo este capítulo con tanta dedicación como los artículos que componen esta tesis, porque lo que en ellos se recoge no capta la esencia de lo que he vivido al hacerlos. El objetivo de contar lo que sucedió en esta etapa de mi vida puede resultar pretencioso, me ayudaré de un discurso que me marcó, el de Steve Jobs en Stanford, diré que aprendí a tener confianza en que los "puntos se conectarían en el futuro", esta tesis es el testimonio de ello.

El trabajar durante dieciséis años en el Departamento de Economía de la Facultad de Ciencias Sociales de la Universidad de la República de Uruguay, me ha permitido conocer personas que han marcado mi vida, en lo afectivo y en lo académico. Liberándome de la presión del orden en que los cito, Máximo Rossi fue la persona que me llevó al mundo de la Economía de la Salud, su avidez por la lectura lo convierte en la gran fuente de inspiración de trabajos, generoso y altruista al extremo, continuo promotor de intercambios con otras universidades, amigo... Me ha enseñado que en esta profesión el secreto está en trabajar duro, y quizás, mucho después, en algo de inspiración y suerte. Este empuje lo llevó a presentarme a Todd Jewell, de la Universidad de North Texas, quien me expuso de forma decidida al mundo de las revistas,

7

de los referatos, y quien me enseñó a "largar los trabajos", a aprender de las críticas constructivas, y de quien jamás olvidaré su humildad y generosidad en compartir todos sus conocimientos y dudas, éxitos y frustraciones, y su alta dedicación al trabajo. Gracias a su apoyo me incorporé al Doctorado del Departamento, aunque luego por distintos motivos renuncié a él. Lo anterior me permitió estar abierta a la propuesta de Pablo Brañas de participar en el Doctorado de la Universidad de Granada. Agradezco especialmente a la Universidad de Granada por darme esta oportunidad, al tribunal que aceptó esta tarea con dedicación y cuyos aportes me permitirán mejorar los productos, y a Pablo Brañas.

Pablo, fue un ventarrón que entró por la ventana y lo cambió todo. Lector atento y minucioso, con dedicación extrema al trabajo, para el cual los días, seguro por ser él, se los hicieron de cuarenta horas, y quien me enseñó que a tener confianza y a creer que los puntos se unirían en el futuro, y lo hicieron.

Así llego a esta tesis, la cual jamás hubiese logrado sin el talento y el apoyo de mis coautores (Todd Jewell, Máximo Rossi y Juan Pablo Pagano), y de Zuleika Ferre, Mariana Gerstenbluth y Graciela Sanromán.

Aunque hay cuestiones que no se agradecen, Héctor, Rosario y Zuleika deben saber que su amistad y consejos son inestimables, el verlos cada día es

una de las razones que me hacen volver.

El resto de los compañeros del Departamento deben saber que han enriquecido de manera considerable mi formación, y que me han marcado las alegrías y penas que hemos vivido juntos.

Mis amigos, deben saber que el privilegio de compartir largas charlas me han permitido crecer y ver la vida desde otros enfoques, y me ayudaron a que no perdiera la perspectiva de las cosas. Con las disculpas de no ser exhaustiva, debo nombrar a Silvia y hacer honor a los más de treinta años que nos unen, y durante los cuales la adversidad siempre nos ha unido, una vez más estuvo junto a mí en Granada, brindándome su apoyo, jamás olvidaré esos días.

A mi familia (los Triunfo y los Aguirre) debo agradecer el apoyo logístico diario que me ha permitido la alta dedicación que este desafío ha implicado, y deben saber que pusieron en mí valores que no me abandonan, no olvido de respetarme día a día, de amar lo que hago, de no conformarme, por eso al mirar atrás todo valió la pena. . .

Esta tesis la dedico a mi hija y mi esposo, las dos anclas de mi vida, simplemente mis razones de ser. . . no encuentro palabras que describan este compromiso...

Introducción

Los economistas modelizamos el comportamiento de los sujetos basándonos en la *selfish assumption.* Este supuesto tiene un dobe significado, por un lado los sujetos maximizan y, en segundo lugar, su utilidad se deriva de sus propios pagos, esto es, es *self-centered.* Lo primero implica que los sujetos para llevar a cabo una decisión evalúan costes y beneficios y, maximizan la diferencia. Lo segundo que los individuos solo consideran sus pagos y no tienen en cuenta los beneficios (costes) de los demás.

La Decisiones sobre Salud, objeto de esta tesis, suelen violar ambos supuestos: los sujetos no buscan lo mejor para ellos, sino que además como se verá a lo largo de los artículos, pueden dañar su salud por no tener hábitos saludables, no realizar conductas preventivas, etc.; o pueden tener efectos sobre otros, no solo por el coste familiar indirecto, sino porque terceras personas están involucradas, como por ejemplo durante el embarazo.

A pesar que ya Adam Smith en su "Teoría de los sentimientos morales" indicó que la naturaleza de los individuos lo llevan a interesarse por la suerte de los demás, recién en años recientes se desarrollan modelos que intentan ex-

plicar el comportamiento pro social de los mismos, como ser comportamientos altruistas, preferencias inter-dependientes, etc. (Camerer *et al.*, 2004[5]).

Tradicionalmente la psicología ha establecido que los individuos están sujetos a limitaciones cognitivas y de autocontrol que los hacen cometer errores de forma sistemática. Sin embargo, desde el ámbito de la economía, es la economía del comportamiento la que al incorporar estas características como propias del sujeto, además de otras tales como diferencias en la aversión al riesgo y en las tasas de descuento, ha generado evidencia útil para el diseño de políticas públicas. Este trabajo aporta evidencia empírica que intenta determinar las características que llevan a los individuos a no utilizar métodos anticonceptivos en la primer relación sexual (artículo 1), a no realizar visitas prenatales durante el embarazo (artículo 2), o al final de la vida el no realizar conductas preventivas que mejorarían su salud (artículo 3).

Nótese que en el primer caso se está frente a un problema de negociación entre dos individuos (con un resultado incierto); en el segundo sólo hay un decisor (con preferencias altruistas o no) pero dos individuos son afectados; mientras que en el tercero, las consecuencias de las acciones son tan cercanas que la tasa de descuento es cero.

El trabajo hará un especial hincapié en dos cuestiones. Por un lado,

diferenciar qué situaciones (o patologías) pueden ser mejoradas y/o afectadas por las decisiones de los sujetos, y qué otras no son más que cuestiones genéticas que ni son objeto de política ni pueden ser aligeradas por ellos mismos. Por otro, identificar parámetros de las preferencias de los individuos, tales como la tasa de descuento, aversión al riesgo, altruismo y preferencias interdependientes (Glaeser y Cutler, 2005).

Al analizar decisiones de salud, es importante retomar los trabajos de Grossman (1972a[7], 1972b[8], 1999[9], 2003[10]), quien a partir de la teoría de capital humano (Becker, 1964[1]; Becker, 1975[2]; Ben Portah, 1967[3]; Mincer, 1974[13]), desarrolla el concepto de capital salud, profundizando en dos aspectos relacionados con la asignación y la eficiencia en el uso del tiempo. Por un lado, el tiempo de enfermedad genera ingresos perdidos, y por otro las inversiones que debe realizar el individuo para mantener un buen estado de salud también insumen tiempo. De acuerdo a dicho modelo, los individuos demandan cuidados médicos con el objetivo de generar un buen estado de salud, por lo que la demanda de cuidados médicos es una demanda derivada de la demanda de salud. Según dicho modelo los individuos maximizan una función de utilidad intertemporal, la cual depende del consumo de diferentes bienes, del stock de salud inicial y del consumo de servicios de salud, sujeto

a la dotación de capital humano (considerado como exógeno) excluido lo que
refiere a la salud, la inversión bruta que se quiera realizar en capital salud,
la depreciación del mismo y el presupuesto.

$$U = U(\phi_t H_t, Z_t) \qquad t = 0, ..., n \tag{1}$$

donde ϕ_t es el flujo de tiempo saludable por unidad de H_t; H_t es el stock
de salud al momento t; $\phi_t H_t$ es el consumo total de servicios de salud; Z_t es
el consumo de otros bienes. El stock de salud en el momento t viene dado
por el stock de salud en el momento $t-1$, más las inversiones en salud
realizadas en el período, menos la depreciación. Se tiene entonces, que en el
momento inicial el stock de salud está dado, pero es endógeno en cualquier
otro momento del tiempo:

$$H_t = H_{t-1} + I_{t-1} - \delta_{t-1} H_{t-1} \qquad t = 1, ..., n \tag{2}$$

donde I_{t-1} es la inversión en salud y δ_{t-1} la tasa de depreciación del período
$t-1$.

Se admite que el consumo de ciertos bienes afecta el stock de salud (por
ejemplo drogas, tabaco, alcohol, etc.), así como determinados comportamien-

tos (por ejemplo, sedentarismo, dietas no balanceadas, práctica de activi-
dades recreativas riesgosas, etc.).

$$I_t = I_t(M_t, TH_t, E) \tag{3}$$

$$Z_t = Z_t(X_t, T_t, E) \tag{4}$$

donde M_t es un vector de bienes adquiridos en el mercado que contribuyen a
la inversión en salud; X_t es un vector de bienes similar que contribuyen a la
producción de Z_t; T_t y TH_t son insumos de tiempo; E es el stock de capital
humano del individuo, excluido el capital salud.

La restricción presupuestal está dada por los precios de los bienes inclu-
idos en M_t y X_t, y por el salario; y una restricción de tiempo, dada por el
tiempo insumido en la inversión en salud (TH_t), el tiempo insumido en la
producción de otros bienes (T_t), el tiempo de trabajo (TW_t) y el tiempo
perdido, debido a la enfermedad (TL_t). Este último será igual al tiempo
total disponible menos el consumo total de servicios de salud $(\phi_t H_t)$.

$$\sum \left[\frac{P_t^m M_t + P_t^x X_t}{(1+r)^t} \right] = \sum \left[\frac{W_t TW_t}{(1+r)^t} \right] + A_0 \tag{5}$$

donde P_t^m y P_t^x son los precios de M_t y X_t respectivamente; W_t es el salario; y A_t es el stock inicial de activos.

El tiempo total disponible, T, en cualquier periodo es:

$$T = TH_t + T_t + TW_t + TL_t \tag{6}$$

Maximizando la función de utilidad intertemporal dada en la ecuación (1), sujeto a las restricciones dadas por las ecuaciones (2), (3), (5) y (6), se puede obtener la demanda estructural por salud, la demanda derivada por cuidados médicos y el stock óptimo de salud en cada momento del tiempo.

$$H^d = H^d(P^m, P^x, P^t, \mu, t, \phi, F) \tag{7}$$

donde H^d es la demanda de salud; P^t es el costo del tiempo; μ es el precio sombra de los activos iniciales; t representa el paso del tiempo y puede asimilarse a la edad del individuo; y F son factores ambientales.

$$M^d = M^d(H, P^m, P^x, P^t, t, \phi, F) \tag{8}$$

donde M^d es la demanda por cuidados médicos.

Por lo tanto, el stock de salud en cualquier período $j > 1$ será igual al valor depreciado del stock inicial de salud más la suma de los valores depreciados de las inversiones realizadas hasta dicho período.

$$H_j = H_j(H_0, I, \delta) \tag{9}$$

donde: I y δ son vectores de $j-1$ inversiones en salud y tasas de depreciación respectivamente.

El monto real de depreciación e inversión es habitualmente desconocido, por lo que se suele aproximar a través de la edad, sexo, capital social, ocupación, educación, comportamientos, etc.; mientras que para aproximar el stock inicial de salud del individuo se suelen utilizar variables parentales o condiciones en las etapas iniciales de la vida.

Por lo tanto, Grossman especifica un modelo dinámico para el bien "buena salud", donde los individuos demandan cuidados médicos no en sí mismos sino para obtenerla, afectando el monto y la productividad de la oferta de trabajo en la economía.

Este modelo permite explicar conductas relacionadas con el hábito de fumar, alimenticios, consumo de drogas, sedenatrismo, así como con la uti-

lización del sistema sanitario.

En particular, esta tesis se centrará en dos conductas específicas que son la iniciación sexual de las mujeres y la conducta asociada de utilizar o no métodos antioconceptivos en la primer relación sexual (primer artículo); y el tener malos hábitos alimenticios en la adultez, que afecten una enfermedad crónica específica como es la hipertensión (tercer artículo).

Sin embargo, este modelo a pesar de incluir el concepto de preferencia temporal, no permite estimar su impacto en la demanda de salud. Claramente, en ambos ejemplos la elección temporal entre premios inmediatos e inversiones en salud futura es muy distinta, porque de hecho la percepción de los riesgos en salud y de la efectividad del comportamiento en salud es diferente.

En la discusión final se hará énfasis en estas características, a pesar de las limitaciones en los datos disponibles que no permiten su inclusión en las estimaciones, se pretende hipotetizar acerca de las diferentes tasas de descuento en los comportamientos mencionados, ya que altas tasas de descuento pueden ser una explicación del fracaso de conductas preventivas, y por tanto una política que permitiría reducirlas es enmarcar las decisiones de salud en las pérdidas más que en las ganancias (Meier, 2006[12]).

Otra cuestión relevante es que el modelo de Grossman al estar basado en el individuo como productor de salud, solo puede ser usado para analizar la salud de los adultos y no la de los niños. De hecho, este tipo de modelo no puede explicar los fenómenos a lo largo del ciclo de vida en una familia, donde los stocks de salud y de conocimiento son simultáneamente determinados.

En este sentido, en el modelo familiar de Jacobson (2000[11]), los padres son productores de su propia salud y de la de sus hijos -éstos se asume que son pasivos-, y de sus propios ingresos y el de los otros. Utilizando un enfoque de ciclo de vida, donde la familia pasa a ser la unidad económica que produce salud, asume preferencias comunes y certidumbre completa.

Mientras que en el modelo de Grossman, la productividad esta determinada por la educación del individuo, en el enfoque familiar la productividad puede estar determinada por la educación de otros miembros del hogar, del mismo modo con el ingreso. La familia consume un monto de bienes en cada periodo para maximizar la utilidad a lo largo de la vida, dada una riqueza familiar inicial, un monto de capital de salud inicial de cada miembro y una función de producción y precios. La secuencia del tiempo en la riqueza y de la salud de cada miembro están dados por el monto óptimo de los bienes de mercado elegidos.

La utilidad de una familia (esposos con un hijo) pasa a ser:

$$U = U(H_m, H_f, H_c, Z) \tag{10}$$

donde H_m y H_f corresponden a la salud del esposo (male) y la esposa (female) respectivamente, y H_c es la salud del niño.

A su vez, en la restricción temporal se incorpora el tiempo gastado en cuidar al niño en la enfermedad. Al maximizar, se obtiene que el costo efectivo neto marginal de la salud del niño es igual al costo de construir el capital de salud del niño menos el beneficio marginal de la inversión en la salud del niño. La familia invierte en salud hasta que la tasa marginal de utilidad en salud con respecto al precio efectivo en salud es igual para todos los miembros y es igual a la utilidad marginal de la riqueza.

Para las familias pobres, donde es elevada la restricción de riqueza, el valor del cambio marginal en la salud del niño es mayor que en las familias ricas. A su vez, las familias que no tienen restricción de riqueza tiene una utilidad marginal cero en la salud del niño. Esto implica que un niño con padres no saludables, puede esperar tener una menor salud comparado con un hijo de padres saludables.

Para aproximar la salud del niño el indicador más utilizado ha sido el

peso al nacer, dado que es una buena medida de resumen de un problema multifacético que incluye malnutrición materna de largo plazo, morbilidad y pobres cuidados durante el embarazo. A su vez, individualmente permite predecir resultados en la niñez y la adolescencia, no sólo en materia de salud sino también en términos de desarrollo cognitivo y psicosocial.

Aproximadamente el 17% de todos los nacimientos del mundo en desarrollo son de bajo peso (menos de 2.500 g), tasa que duplica la de los países industrializados. En este sentido, a efecto de alcanzar las Metas del Milenio, y en particular reducir la mortalidad infantil, se ha establecido como principal objetivo reducir la incidencia del bajo peso al nacer en un tercio entre el año 2000 y 2010.

Este producto del nacimiento es parcialmente una consecuencia de elecciones realizadas por la madre antes y durante el embarazo, básicamente a través de cuatro canales: realización de cuidados prenatales, estado marital, hábito de fumar y fecundidad. En la literatura económica este es un tópico controversial, difiriendo las conclusiones en función de los datos, definición de variables o metodologías utilizadas.

En el segundo artículo, se analiza específicamente el impacto de la realización de cuidados prenatales en el peso al nacer del neonato. En este

tipo de comportamiento, se espera que no se cumpla la hipótesis de interés personal, apareciendo como relevante las preferencias pro sociales. En este sentido, el bienestar del niño puede influenciar directamente en la utilidad de la madre (altruismo puro), parcialmente dado que puede producir en esta un *warm glow* (altruismo impuro); o puede depender de la diferencia entre el bienestar de uno y el bienestar del otro (*inequality aversion*) (Meier, 2006[12]).

Finalmente, en la sección final se realiza una discusión general, mostrando que los factores genéticos, que están más allá del alcance de las políticas públicas, influyen fuertemente en las comportamientos de salud de los individuos.

References

[1] Becker G. **Human capital**. *The University of Chicago Press* 1964.

[2] Becker G. Human capital and the personal distribution of income: an analytical approach. University of Michigan, Woytinsky Lecture, republished in Becker G. Human Capital. NBER, 2nd edition 1975; 94-117.

[3] Ben-Porath Y. The production of human capital and the life cycle of earnings. *J Polit Econ* 1967; **75**: 352-365.

[4] Chapman GB. Time discounting of health outcomes. In Loewenstein G. Read D. Baumeister R. Eds.**Time and decision: economic amd psychological perspectives on intertemporal choice.** Russell Sage Foundation 2003; 395-417.

[5] Camerer C., Loewenstein G., Rabin M., Matthew G Loewenstein.**Advances in behavioral economics**. *Princeton University Pr.* 2004.

[6] Glaeser E., Cutler D. What explains differences in smoking, drinking and other health-related behaviors?. *Am Ec Rev Papers and Proceedings* 2005; **95(2):** 238-242.

[7] Grossman M. On the concept of health capital and the demand for health. *J Polit Econ* 1972; **80**:223-255.

[8] Grossman M. The demand for health: a theoretical and empirical investigation. *Columbia University Press for the NBER, New York* 1972.

[9] Grossman M. The human capital model of the demand for health. *NBER* 1999*;* WP **7078**.

[10] Grossman M. Household Production and Health. *Rev Econ Household* 2003; **1(4):** 331-342.

[11] Jacobson L. The family as producer of health: an extended grossman model. *J Health Econ* 2000; **19**: 611-637.

[12] Meier S. A survey of economic theories and field evidence on pro-social behavior. *Federal Reserve Bank of Boston* 2006; WP **06-6**.

[13] Mincer J. Schooling, experience and earnings. *NBER* 1974.

Sexual initiation decisions among adolescent women: the uruguayan case

Introduction

In recent years public discussion about the importance of risky sexual behavior has grown, particularly due to the HIV/AIDS epidemic and the high incidence of other sexually transmitted diseases (STDs, such as chlamydia and gonorrhea), and the high rate of non-planned pregnancies.

This question becomes especially important in the case of young people and teenagers, for whom the risk of contracting diseases and unwanted pregnancies is higher than among the rest of the population. This can generate clandestine abortions – where abortion is illegal-, higher morbidity and mortality of the mother and her child. Moreover, this can cause future effects, such as the loss of educational opportunities and lower levels of family income (Gupta, 2000 [9]).

By 2006, almost half the 5 million people infected with HIV/AIDS were teenagers between 15 and 19 years old (UNAIDS, 2006 [25]). For Uruguay,

the figures available show that 30% of the HIV+'s are aged between 15 and 24. It is also important to note that the main means of transmission (70%) is sexual, followed by blood transfusions (20%) and prenatal (2%) (MSP, 2004 [17]).

In addition, teenage motherhood is of concern from various points of view, such as demographic, economic and health. This is associated with poverty, given the fact that poorer and less educated families start the reproductive cycle earlier in their lives and have higher fertility rates (Hobcraft and Kiernan, 2001 [11]). At the same time, the younger the mother when she has her first child, the greater family growth there is in the short term (a greater number of children at the same age of the mother), the higher the fertility rate (more children) and an earlier emancipation, compared with those who postpone motherhood until the age of 21 (Katzman, 1999 [13]).

In the world as a whole, in one fifth of total births the mother is under 20, but there are differences between regions. In the United States –the developed country with the highest teenage pregnancy rates- early motherhood rose to its maximum in the fifties, and then went down in the eighties. This is associated with abortion legalization, and the rate is now near 10% (Singh and Darroch, 2000 [24]). There is a correlation between teenage pregnancy

and poverty, given the fact that 83% of the children of teenage mothers and 61% of abortions are in poor or low income families (Guttmacher Institute, 2006 [10]). Estimates show that, at the age of 20, 40% of white American women and 64% of black American women have been pregnant at least once.The same downward trend can be found in the pregnancy rates in Europe, expect for England, were over the last 30 years the rate has not fallen and is the highest in the entire European Union (Kaplan et al, 2004 [12]; Creatsas, 1995 [2]).

In Latin America, the proportion of births to teenage mothers under 20 years of age is between 15 and 18%, and the same European trend is observed, except in Chile, were it has increased 50% in the last 50 years.

In the case of Uruguay, were abortion is illegal, between 1963 and 1996 teenage fertility grew (33% among those aged 15-19 and 66% among those aged 10-14) and there has been a big decline in fertility among women between 20 and 29 years old. Both these factors mean that teenagers are making a greater contribution to the global fertility rate. The increase in teenage fertility rates in the last 50 years is considered by demographers as the most important change in women's sexual behavior, and the main factor responsible for maintaining the country's reproductive level, particularly until the

mid nineties (Varela, 1998 [26]; Varela, 1999 [27]; Varela 2004 [28]; Paredes and Varela,2005 [18]; Varela, 2007 [29]).

In sum, we find a great change in teenage sexual behavior. Different analytical frames -including epidemiological, psychological and sociological- have been used to try to understand the determinants of this behavior. This paper analyzes sexual behavior related to first intercourse among females under 20 years old, using Biological and Social Reproduction of the Uruguayan Population Survey: an approximation from the perspective of gender and generations 2004 (United Nations Population Fund), collected between September and December, 2004.

Background

The literature on sexual behaviour has focused in three mayor topics: sex and drugs, adolescent pregnancy, and sexual initiation and the use of contraception. This study makes a contribution to this last line of research.

In the first place, the literature is often concerned with determining a causal link between alcohol and drugs consumption and sexual initiation with or without the use of any contraception, because finding such causality

would support the idea that it is important to design policies to control the use of substances.

Grossman and Markowitz (2002 [7]), using data from the 1991, 1993, 1995, 1997 and 1999 waves of the National School-Based Youth Behaviour Surveys in the United States [1], and through the use of an instrumental variables approach[2], produce evidence against the theory that alcohol consumption increases the probability of young people having sexual intercourse or multiple partners. They also found evidence that alcohol consumption drives a reduced use of contraceptives and condoms among sexually active adolescents.

In a later study, Grossman et al (2004 [6]) use complementary approaches (bivariate probit and fixed-effects regression models) to examine in depth the causal relationship between substance use and adolescent sexual behaviour. Through the use of the National Longitudinal Survey of Youth (NLSY) for the United States, the authors construct a panel of about 8500 adolescents aged 12-16 in 1996, who were re-interviewed in 1997, 1998 and 1999. They conclude that the positive association between substance use and risky sexual

---

[1] Nationally representative samples of High School students in grades 9-12.

[2] They use the Two Stage Least Squares method (TSLS), where at the first stage alcohol and drugs use is predicted, using as instruments prices, and in a second stage these predictions are used as regressors in the risky sexual behavior equation.

behaviours is more a result of omitted variables than of causality.

Sen (2002 [23]), based on the same data, also considers the endogeneity of the phenomena being studied through an Instrumental Variables estimating strategy. His instruments at the state level are taxes on beer and cigarettes, the year that 21 becomes the legal drinking age, per capita expenditure on police security, rates of young drunk driving arrests, and per capita adult alcohol consumption. The main conclusion of his work is that alcohol use has a positive effect on the probability of sexual intercourse among adolescents.

In another work, Rees et al. (2001 [21]) with data from the National Longitudinal Study of Adolescent Health for the United States, consider as instruments education on drug and alcohol use in high schools, per capita expenditure on protection policies, number of arrests because of violent crimes, and the total number of arrested people by type of crime. Two-stage least squares and bivariate probit estimations show that the link between substance use and sexual behaviour is much weaker than that suggested in the literature. Specifically, they found that after adjusting for omitted variables, the majority of the correlations that render an account of the effects of alcohol and marihuana on sexual behaviour are no longer statistically significant.

To sum up, differences found between the conclusions that emerge from

similar research, even using similar data sets, could be explained by the selection of instruments, the scant correlation between them and the endogenous variables, and by the different strategies to test the validity of the exclusion restrictions. (Rashad and Kaestner, 2004 [17]).

In the second place, the literature on adolescent motherhood is vast but only few studies have an economic point of view. In fact, the majority of the studies of premarital motherhood are based on models of psychological and sociological behaviour, focusing on personal and family variables more than variables related to costs or policies.

Examples of this are the studies by Plotnick (1992 [19]) and Lundberg and Plotnick (1995 [15]), in which, using NLSY data, they estimate nested logit models to model adolescent premarital pregnancy and its resolution. The results show that white adolescents behave in accordance with the predictions of economic behaviour models, where the costs of different alternatives have an influence on the decision, and therefore where a rational choice perspective contributes to the understanding of premarital birth. With respect to education, they find that the expectation to enhance educational level reduces the probability of premarital pregnancy and raises the probability of abortion and marriage. As to religiosity, it seems that attending church on a regular

basis is more important than being affiliated to a particular denomination.

Zavodny (2000 [30]) with data from the National Survey of Family Growth of 1995 for the United States, examines whether adolescents' and their partners' personal characteristics affect the probability of an adolescent pregnancy from the first sexual relation and how that pregnancy is resolved. First, through the use of logit models, the author estimates the probability of a pregnancy in the first sexual relation before marriage. Second, through the use of multinomial logit models the author estimates the resolution of the pregnancy (abortion, birth within marriage or outside marriage). The results show that the probability of a pregnancy is lower for adolescents with more educated mothers and among those who lived with both parents at least until the age of 14. Also, he finds that partners' characteristics have no independent influence on premarital adolescent pregnancy and its resolution. This last result is important because it validates previous research that only controls for women's personal characteristics.[3]

A third marginal line of research is that of the study contraception, usually focusing on the methods which are used in the first sexual relation (or

---

[3]However, as the author himself warns, in the survey used information about the partner is provided by the women. This gives as a result a high number of non-responses and a bias due to the fact that they could remeber more the characteristics of those with whom they had a child, much more if the relationship culminated in marriage.

in the last one, or regularly) as well as the determinants of their use.

Gupta (2000 [9]), with data from the Demographic and Health Surveys between 1986 and 1996 for the northeast of Brazil, estimates a multivariate logistic hazard model and finds that higher levels of education postpones sexual initiation at adolescence. However the finding of diminishing returns of education helps to explain the increase in the absolute levels of adolescent sexual experience through different surveys. In fact, a young woman in the mid 1990s with a higher schooling level has a probability of initiating that is one and a half times higher than that of a women with the same characteristics but ten years before. On the other hand, a higher rate of attendance at religious services, regardless of the denomination, and exposure to television, are associated with lower rates of sexual initiation and the greater use of contraception.[4]

Manning et al. (2000 [16]), through the estimation of logit and multinomial logit models using data from the National Survey of Family Growth from 1995 for the United States, analyse the impact of sexual partner characteristics and of type of relationship in the choice of contraceptive method in first intercourse. The condom is the most common one among adolescents,

---

[4]In this case, findings are not concluding when the analysis is limited by premarital sexual activities.

but it requires cooperation and agreement of the partner.[5]

Finally, recent studies analyse the decline in adolescent pregnancy rates observed in developed countries in recent years, and find that the main cause for this decline is the greater use of contraception, and in the second place a delay in the age of initiation, mostly among adolescents aged 15-17 (Singh and Darroch, 2000 [24]; Santelli et al., 2007 [22]).

In this study we model the decision about the use of contraceptive methods among young people. In our approach, we avoid selection biases (a common error found in the literature) by proceeding by estimations conditional on the individual having sexually initiated.

Methodology and data

The sexual behavior of teenagers can have different outcomes, such as whether or not they have intercourse, and if they do, whether or not they use contraception. When alternatives are non ordered and mutually exclusive, the correct estimation method would be multinomial logit models, and it is nec-

---

[5]Closest couples are more likely to practise contraception compared with casual ones, either by the preconception of a low probability of pregnancy in a single encounter, or because stable couples are prepared for sexual intercourse, with highest levels of communication.

essary to define whether or not regressors are different for each alternative. The conditional logit model allows regressors to be variant between different alternatives, in the multinomial logit it is assumed that they are non variant, and in the mixed logit model these two are combined, allowing the possibilities mentioned above (Cameron y Trivedi, 2005 [1]).

The prices of every contraceptive method or a price index of each one could be one of the variables that change between the alternatives. However, as we are working with individual data and because there is a national family planning policy, it is not possible to have a regressor that varies among each woman and all the alternatives.

Thus, in this paper a multinomial logit model is specified, in which the independence of the irrelevant alternatives (IIA) is satisfied, that is, relative likelihood only depends on the specified alterative and not on any other available.[6] This gives as a result that when introducing a new alternative, all the other absolute likelihoods are proportionally reduced.[7] Therefore, the dependent variable (y), *alternative*, is specified as discrete and non ordered.

---

[6] This will be tested through Hausman test.

[7] Relaxing the IIA assumption would imply to specify a nested logit model, where the alternatives have a hierarchical structure, such as, for example, in a first stage deciding to have or not sexual intercourse, and then whether or not to use contraception. This model is a generalization of the multinomial logit model, but requires the utilization of different variables for each level of decision. This should determine the use of contraception (family planning policies, prices, etc.) and not determine the decision of having or not intercourse.

35

It takes the value "1" if the woman declares that she did not have intercourse with men, "2" if declares she did not use contraception in the first intercourse, and "3" if she used contraception in the first intercourse.[8]

The likelihood for the exclusive alternatives $(j = 1, 2, 3)$ chosen by each woman $(i = 1, ..., n)$ is:

$$P(y_i = j) = P_{ij} = \frac{e^{\acute{x_i}\beta_j}}{\sum\limits_{l=1}^{m} e^{\acute{x_{il}}\beta_l}} \quad j = 1, 2, 3 \tag{1}$$

Since $\sum\limits_{l=1}^{m} P_{ij} = 1$, in order to identify the model, the normalization restriction is necessary. In this article $\beta_1 = 0$ is taken as the base category, it is that the woman did not had first intercourse. Therefore, the estimated coefficients show the relationship between any alternative and the base one.

In this paper, data from the Biological and Social Reproduction of the Uruguayan Population Survey: an approximation from the perspective of gender and generations 2004 (United Nations Population Fund) is used. Data was collected between September and December, 2004.

Given the fact that differences in the vital statistics were found between

_____

[8]The GGS only takes into account heterosexual relationships through the question: Have you ever had intercourse with a person of the other sex?

these and other databases, we paid special attention to this matter.[9]

It is necessary to analyze whether the probability of being part of the sample is related to the variables included in the model. For this reason, in a first step, the summary statistics of the database are shown, and then the dependent and independent variables included in the model.

As the objective of this paper is to analyze the sexual behavior of teenage women (15 to 19 years old), women between 20 and 24 are also considered in order to have a wider view of their behavior over a 10 year period. One problem that could arise from the survey is that the information was collected by a survey-taker instead of from a self-administered questionnaire. As a result, there could be a large number of non-responses because of social disapproval,

---

[9]The assumption of a population random sample is often unrealistic, due to the existence of selection mechanisms that can have there origin in the sample design, reposition criteria or individual's behavior (non-response, abandonment of treatment in the case of evaluating a program, etc.). In the case that there are systematic differences among individuals sampled and those finally interviewed, there might be sample selection problems. Suppose that instead of a random sample (i.e. a representative sample of the population) we have one that only has some observations that satisfy certain conditions.

Let S be an indicator that represents a random draw of the population (selection indicator), were S equals 1 if the individual belong to the sample and 0 otherwise. On a linear regression model, only those individuals for whom S equals 1 are considered. It is very important for the estimation consistency that the orthogonality assumption between the error term and the repressors holds.

However, this assumption does not hold when S is a deterministic function of the regressors of the model, or when selection is independent of the model regressors and the error (Wooldridge, 2002).

Thus, model estimation would be consistent if the selection mechanism is based on exogenous regressors. selection mechanisms based on the dependent variable or on endogenous regressors are not allowed due to tje fact that that is the case were the orthogonality assumption does not hold. Non linear models give as a result similar outcomes.

environment, etc. However, previous studies show that teenagers are generally very willing to answer, and they are consistent in their responses (Gage, 1995 [4]; Gage, 1998 [5]; Gupta, 2000 [9]). Hence the adult population is not considered in order to avoid measurement errors due to lapses of memory, and because in the survey many of the socio-economic and demographic characteristics have to do with the present, it is not possible to consider them when explaining teenage behavior. At the same time, men are also not considered because they may not have information about contraceptive methods.[10]

Finally, only women who had first intercourse under the age of 20 are considered, as theory shows that behavior patterns are different among teenagers.

The selected sample of the survey indicates that 72% of the women under 24 had their first intercourse before they were 20 years old, 14% did not use any contraception, and 94% declare that they had first intercourse in a stable relationship (boyfriend, husband, etc). As to contraceptive method, the majority declare that they used a condom in first intercourse (95%).

With regard to the independent variables, it is important to notice that most of the questions have to do with the woman's current situation, for

---

[10]At the same time, as mentioned before, previous studies that could control fot personal characteristics of the couple were not able to find an independent influence of pre marital teenage pregnancy and its resolution Zavodny (2000 [30]).

example her employment situation, education, martial status, knowledge of contraceptive methods, STDs, etc. In any case, it is well known that many of these variables are good proxies of their situation at the time of first intercourse due to time proximity or because they are structural characteristics.

Personal Variables

The *age* of the woman is considered by two continue variables, age and age squared, in order to take account of whether there are differences among generations. These differences could arise due to changes in cultural environment, technological progress that allows better access to contraceptive methods, marketing campaigns, etc., during the 10 years of difference that could exist between the women considered. In Uruguay, previous studies show that young people of both sexes start their sexual activity earlier in life (Guchin and Meré, 2004 [8]; Ferre et al., 2005 [3]).

Education is specified as a dichotomist variable that takes value "1" if the girl has completed at least two years of secondary school, and "0" otherwise. When considering young women that could still be attending school, it is understood that this is the minimum level they are supposed to have. If this is not so, they might have an educational gap.

Religion is captured by two variables: *religiosity* and *Catholic*. The first

is a discrete variable that gathers information about how often she attends religious services or activities, excluding social events such as baptisms, weddings, etc. It takes the value "0" if she never does, "1" if sometimes in a year, "2" if one or more times and "3" if once or more per week. This religious practice can be considered as a decision taken by the girl, while the binary variable Catholic is strongly influenced by her parents. It takes value "1" if she declares that she is a practicing or very devoted Catholic.

Place of residence is captured by the binary variable *Montevideo*, which takes the value "1" if the woman lives in Montevideo or the metropolitan area, and "0" otherwise.

Related Variables

The fact that the mother was an *adolescent_mother* is considered, the binary variable takes value "1" if the girl's mother was a teenage one; then the availability of information as well as the possibility to talk with someone close about intimate issues (sexual life, love, STDs risks, etc.). For this the binary variables *info_education* and i*nfo_health* were created. They both indicate if the contraceptive methods information was obtained in the educational system or the health one, respectively. The variable *network* takes value "1" if she has someone to talk.

Socio-economic Variables

As a proxy for socioeconomic status the binary variable *worker* is specified, and it takes the value "1" at the moment of the interview if the woman declares that she works (excluding working at home); *deprivation*, which is an index that captures the lack of three goods in the household: color television, car and freezer/refrigerator[11]; parents_together captures whether her *parents_together* when the woman was 20 years old or less; and the *mother's education*. For this *educ_mother_secondary* and *educ_mother_tertiary* were specified – these take the value "1" if the mother completed secondary school or university. The lowest educational level is omitted.

In Table 1.1 summary statistics for each variable are shown.

As can be seen from the table above, most of the women interviewed had first intercourse, used contraception in first intercourse, live in the provinces, never attend a religious service, are non-practicing Catholics or of another religion, their mothers were over 19 years old when the girls were born and

---

[11]In the deprivation index is the fact of having or not a certain good is weighted due to how generalized the consumption of that good is over the sample. In this sense, if there is a household where a certain good j is not present, but it is in most of the others, it would have a high weight in the aggregate deprivation index. By contrast, if there is a certain good j that is nor present in a certain household, neither in most of the others, it would have a low weight. The index is a continuous variable from 0 to 1, where 0 implies that all the goods are present in the household, and 1 means that non of them is present (total deprivation).

had a maximum educational level of completed secondary school. The average age of the women in the sample is 19 and most had completed two years of secondary school.

Finally, with regard to the randomness and representativeness of the sample, it emerges that some of the defined variables could be related to the fact that the woman might be at home, and, as a result, with the selection of the sample. That is the case of the age of the women, and employment status and occupation. However, these variables are exogenous to the model, so the estimates and statistics have the desired properties. At the same time, it could be that having first intercourse and using contraception are both independent of the fact that the woman is at home at the moment of the interviewer visit.

Table 1.1: SUMMARY STATISTICS (N=767)

Variable	Mean	Std. Dev.	Mín.	Máx.	Mode
Alternative	2.30	0.09	1	3	3
Age	19.48	2.89	15	24	23
Age²	387.67	112.83	529	225	576
Education	0.78	0.42	0	1	1
Religiosity	0.56	0.94	0	3	0
Catholic	0.21	0.41	0	1	0
Montevideo	0.43	0.50	0	1	0
Adolescent_mother	0.38	0.49	0	1	0
Info_education	0.49	0.50	0	1	0
Info_health	0.26	0.44	0	1	0
Network	0.84	0.37	0	1	1
Worker	0.22	0.41	0	1	0
Deprivation	0.41	0.35	0	1	0.05
Parents_together	0.55	0.50	0	1	1
Educ_mother_secondary	0.45	0.50	0	1	0
Educ_mother_tertiary	0.10	0.30	0	1	0

That is why we assume that selection and the endogenous variable are independent of each other, and that the dependent variable's distribution is conditional on the individual's characteristics (such as education, knowledge of contraceptive methods and STDs, etc) and does not vary with the selection.

Results

In the first place, we tested assumption A by the Hausman procedure, which means that the elimination of any choice (not having had sex with men, having initiated without the use of any contraceptive method or having initiated using one method) does not change the estimated coefficients, and supports the theoretical concept that the specified choices are all substitutes and all pertinent (Long and Freese, 2001 [14]).[12]

In the kind of models that we present it is possible to test the coefficients' equality between the different alternatives and then impose that equalities in the estimation. First, the joint test of equality of all coefficients of alternatives 2 and 3 is rejected ($\chi^2(15) = 32.25$), Estimation through a logit model seems not to be adequate. Second, it is not possible to reject the null hy-

---

[12]Results for the different alternatives were: $\chi^2 = -0.54$; $\chi^2 = -2.20$; $\chi^2 = -53.29$; negative numbers gives evidence that the IIA assumption is holding.

pothesis of zero value of the coefficients associated with *age*, *age*^{2}, *religiosity*, *Catholic*, *adolescent_mother*, *info_health*, *parents_together* in alternatives 2 and 3, so that restrictions are imposed in the estimation (see Table 1.2).

The results show that the probability that a young woman has sex (either using contraception or not) before the age of 20 is 93.35%, while the probability of initiating using any contraceptive method is 77.71%. In any non-linear model it is important to be especially careful in the interpretation of the coefficients, in particular in the multinomial logit model where there is no correspondence between the sign of the coefficient and the probability. At the same time, one can find changes in the signs of the marginal effects depending on the point at which the independent variables are evaluated (Cameron and Trivedi, 2005 [1]; Long and Freese,2001 [14]). The coefficients of the model can be interpreted as the change in the log-odds ratio, depending on the qualitative interpretation of their signs.

Now we proceed with the analysis of the different determinants. As for *personal variables*, the effect of *education* is important: we find that women with no educational lag have a higher probability of initiating sexual activity with the use of contraception. Also, *religiosity* and *Catholic* show a negative coefficient implying that practicing women and especially those catholic, have

a lower probability of initiating (with or without using any contraceptive method).

As regards the group of *related variables*, women whose mother had her first child when she was an adolescent (*adolescent_mother*) have a higher probability of initiating, while having had *parents living together* throughout adolescent lowers that probability. In addition, having obtained information about contraception through the health system (*info_health*) raises the probability of initiating, regardless of whether or not contraception was used.[13] On the other hand, information obtained through the educational system (*info_education*) shows a negative sign for the second alternative and positive for the first, which means that getting information in the educational system reduces the probability of initiating without the use of contraception and raises the probability initiating using any method. [14]

As to socio-economic status, given the age cohort under analysis, the fact that the woman is working at the time of the interview can be a indicator of a worse socio-economic situation.

---

[13]It is not possible to identify if the woman obtained information to have first intercourse. But, anyway, it is important the fact that that it does not determine the use of a contraceptive method.

[14]In this case we consider that the variable is free of biases, given the fact that information about the educational system is given by all the population, and it is independent of woman's behaviour.

At the same time, working exposes the person to different networks which can be expected to increase the probability of initiating. We find a negative coefficient associated with alternative 2 and positive for the third, showing that working women have a higher probability of initiating with the use of contraception.

To sum up, focusing on the magnitudes of the marginal effects, it is noteworthy that if the woman gets information on contraception through the educational system, the probability of initiating without the use of any method is 12 percentage points lower, which is a very important finding in terms of public policies. This is complementary to the finding that women who have an educational level that is adequate for their age, have a probability of having their first sexual relation using contraception that is 8 percentage points higher. Also, getting information through the health system increases the probability of initiating with the use of contraception by 6 percentage points, and just by 1 percentage point in the case of initiating without using any kind of contraception.

Table 1.2: Multinomial Logit

| | Alt.(initiating without contrac.) | | Alt. 3 (initiating with contrac.) | |
	Coef.	Marginal effect	Coef.	Marginal effect
Age	3.926***	0.039***	3.926***	0.197***
	-1.019	(0.013)	-1.019	(0.062)
Age2	-0.087***	-0.001***	-0.087***	-0.004***
	(0.026)	(0.000)	(0.026)	(0.001)
Education	0.379	-0.040	0.737*	0.087*
	(0.519)	(0.043)	(0.467)	(0.052)
Religiosity	-0.401**	-0.004**	-0.401**	-0.020**
	(0.186)	(0.002)	(0.186)	(0.009)
Catholic	-0.790*	-0.010	-0.790*	-0.049
	(0.432)	(0.007)	(0.432)	(0.033)
Montevideo	0.242	-0.023	0.455	0.048
	(0.429)	(0.035)	(0.363)	(0.039)
Adolescent_mother	1.136***	0.011***	1.136***	0.053***
	(0.431)	(0.004)	(0.431)	(0.019)
Info_health	1.447**	0.012***	1.447**	0.061***
	(0.645)	(0.004)	(0.645)	(0.022)
Info_education	-1.422***	-0.121***	-0.499	0.081*
	(0.499)	(0.037)	(0.420)	(0.044)
Network	-0.040	-0.067	0.457	0.091
	(0.532)	(0.053)	(0.468)	(0.060)
Worker	-0.408	-0.071**	0.208	0.078*
	(0.495)	(0.035)	(0.402)	(0.040)
Deprivation	-1.484**	-0.125**	-0.572	0.082
	(0.654)	(0.055)	(0.537)	(0.061)
Parents_together	-0.828**	-0.008**	-0.828**	-0.041**
	(0.375)	(0.004)	(0.375)	(0.019)
Educ_mother_secondary	-0.315	-0.035	-0.045	0.030
	(0.453)	(0.037)	(0.380)	(0.042)
Educ_mother_tertiary	-0.121	-0.027	0.107	0.031
	(0.809)	(0.068)	(0.620)	(0.074)
	N=458; -lnL=303.153; Pseudo R²=0.2205			
Hausman Test (IIA)	-0.54/-2.20/-53.29			
Predicted probabilities	Alternative 1=0.0665; Alternative 2=0.1564; Alternative 3=0.7771			
Wald Test	Age:$\chi^2(1)$=0.35;Prob.>χ^2=0.55			
	Age²: $\chi^2(1)$=0.39;Prob.>χ^2=0.53			
	Religiosity: $\chi^2(1)$=1.17;Prob.>χ^2=0.28			
	Catholic: $\chi^2(1)$=0.27;Prob.>χ^2=0.60			
	Adolescent_mother: $\chi^2(1)$=0.01;Prob.>χ^2=0.94			
	Info_health: $\chi^2(1)$=0.39;Prob.>χ^2=0.53			
	Parents_together:$\chi^2(1)$=0.41;Prob.>χ^2=0.52			

Note: Base cathegory is Alternative "1", no having initiated.Standard errors in parentheses.
**Significant at 5% level. ***Significant at 1% level.

Finally, because of the high quantity of missing values of the variable
parents_together (36%) we choose to estimate a second model without this
variable. The results shown in Table A.1.1 of the Appendix support the

assumption IIA ($\chi^2 = 0.56; \chi^2 = 3.05; \ \chi^2 = -215.56$), At the same time we find evidence that supports the idea of equal coefficients between alternatives 2 and 3 for the variables: *age, age^2, religiosity, adolescent_mother, info_health, and educ_mother_secondary.* However, there are 3 important changes from the previous model: mother's secondary education is now positive and significant, with a marginal effect that shows that women who are daughters of women who completed secondary education have a higher probability of initiating with the use of contraception than not initiating (7.4 percentage points). Second, it doubles the impact of having a mother who had her first child during adolescence on the probability of initiating with the use of contraception (14 percentage points). Last, we find a change in the variable *info_education*, which is now associated with a positive coefficient in both alternatives, reducing the probability of initiating as against not initiating, although the marginal effect corresponds to initiating without the use of contraception (-9 percentage points).

All this evidence shows that information and also mother's experience play a very important role in the behaviour of young women's sexual practices.

Conclusion

In this paper, with data for Uruguay, we analyze the factors that explain first sexual intercourse in adolescence of women aged under 24. Results show that, in first place, the multinomial logit specification is adequate as long as the alternatives of not initiating, initiating without the use of contraception or initiating with the use of contraception are relevant and exclusive. Second, it is important to notice that, giving information, specially trough the educational system, substantially reduces the probability of risky sexual behaviour (initiating without the use of a contraceptive method), this has important public policies implications. Although the potential existence of endogeneity problems or biases, information obtained in the health system proves to be at least effective, given the fact that women they get information by this way have a higher probability of initiating in a safe way.

On the other hand, we find a high impact of mother's behaviour on current young women's attitudes towards sex and contraception. The probability of initiating (with or without the use of contraception) is higher for those daughters whose mother gave birth as a teenager. In this sense, belonging to a highly educated household rises the probability of initiation, specially with the use of contraception.

References

[1] Cameron AC, Trivedi PK. **Microeconomic Methods and Applications**. Cambridge University Press, New York 2005.

[2] Creatsas GC. Adolescent pregnancy in Europe. *Int J Fertil Menopausal Stud 1995;* **80**-4.

[3] Ferre Z, González C, Rossi M, Triunfo P. Los Jóvenes en Uruguay: Salud y Redes Sociales Uruguay. Departamento de Economía, FCS-Udelar 2005; DT **5**.

[4] Gage AJ. An assessment of the quality of data on age at first union, first birth, and first sexual intercourse for phase II of the Demographic and Health Surveys program. Calverton, Maryland, Macro International 1995; Occasional Papers **4**.

[5] Gage AJ. Sexual activity and contraceptive use: The components of the decision-making process. *Studies Fam Planning* 1998; **29**(2): 154-166.

[6] Grossman M, Kaestner R, Markowitz S. Get high and get stupid: the effect of alcohol and marijuana use on teen sexual behavior. *Rev Econ Household* 2004; **2**(4): 413-441, 09.

[7] Grossman M, Markowitz S. I did what last night? Adolescent risky sexual behaviors and substance use. *NBER* 2002; **9244**.

[8] Guchin M, Meré JJ. Jóvenes, sexualidad y VIH/Sida en el Uruguay. Conocer para prevenir. Programa Sexualidad y Género, Instituto IDES, UNESCO 2004.

[9] Gupta N. Sexual initiation and contraceptive use among adolescent women in Northest Brazil. *Studies Fam Planning* 2000; **31**(3): 228-238.

[10] Guttmacher Institute. Teenage pregnancy statistics national and state trends and trends by race and ethnicity. New York 2006; 23 p.

[11] Hobcraft J, Kiernan K. Childhood poverty, early motherhood and adult social exclusion. *British J Soc* 2001; **52**(3): 495-517.

[12] Kaplan G, Goodman A, Walker I. Understanding the effects of early motherhood in Britain: the effects on mothers. *IZA Discussion Papers Series* 2004; 1131.

[13] Katzman R. Activos y estructuras de oportunidades: estudios sobre las raíces de la vulnerabilidad social en Uruguay. *CEPAL-Oficina Montevideo-PNUD* 1999.

[14] Long S, Freese J. *Regression models for categorical dependent variables using Stata*. Stata Press Publication, Texas 2001.

[15] Lundberg S, Plotnick R. Adolescent premarital childbearing: Do economic incentives matter? *J Labor Econ* 1995; **13**(2): 800-811.

[16] Manning W, Longmore M, Giordano P. The relationship context of contraceptive use at first intercourse. *Fam Planning Perspect* 2000; **32**(3): 104-110.

[17] Ministerio de Salud Pública (MSP)–Programa Nacional de SIDA (PNS). Informe Epidemiológico VIH/SIDA. 2004.

[18] Paredes M, Varela C. Aproximación sociodemográfica al comportamiento reproductivo y familiar en Uruguay. *Unidad Multidisciplinaria-Programa Población* 2005; **67.**

[19] Plotnick R.The effects of attitudes on teenage premariatal pregnancy and its resolution. *Am Socio Rev* 1992; **57**(6): 800-811.

[20] Rashad I, Kaestner R. Teenage sex, drugs and alcohol use: problems identifying the cause of risky behaviors. *J Health Econ* 2004; **23**:493–503.

[21] Rees D, Argys L, Averett S. New evidence on the relationship between substance use and adolescent sexual behavior. *J Health Econ* 2001; **20**(5): 835-845.

[22] Santelli J, Durbestein L, Finer L, Singh S. Explaining recent declines in adolescent pregnancy in the United States: the contribution of abstinence and improved contraceptive use. *Am J Public Health* 2007; **97**(1): 1-7.

[23] Sen B. Does alcohol-use increase the risk of sexual intercourse among adolescents? Evidence from NLSY97. *J Health Econ* 2002; **21**(6): 1085-1093.

[24] Singh S, Darroch JE. Adolescent pregnancy and childbearing: levels and trends in developed countries. *Fam Plan Perspect* 2000; **32 (1):** 14-23.

[25] UNAIDS. 2006 Report on the global AIDS epidemic. Executive summary.

[26] Varela C. Implicaciones de las políticas de población y salud en el embarazo adolescente en el Uruguay. *Unidad Multidisciplinaria - Programa de Población*, FCS, Uruguay 1998.

[27] Varela C. La fecundidad adolescente: una expresión de cambio del comportamiento reproductivo en el Uruguay. *Rev Salud Problema 1999.*

[28] Varela C. Programas y políticas nacionales que afectan la fecundidad: el caso de Uruguay: el reemplazo de la población en el Uruguay, un fenómeno ausente en la agenda estatal. *La Fecundidad en América Latina y el Caribe: Transición o revolución?. Santiago de Chile, CEPAL* 2004.

[29] Varela C. Propuestas para la formulación de políticas. Importante pero urgente. En **Políticas de población en Uruguay**. Calvo JJ, Mieres, P, Eds. Montevideo, Rumbos, UNFPA 2007.

[30] Zavodny M. Does it take two? The effect of partners' characteristics on teenage pregnancy. *Federal Reserve Bank of Atlanta* 2000; WP **99-9**.

Appendix

Table A.1.1 :MULTINOMIAL LOGIT, MODEL 2

| | Alt. 2 (initiating without contrac.) | | Alt. 3 (initiating with contrac.) | |
	Coef.	Marginal effect	Coef.	Marginal effect
Age	3.984***	0.089***	3.984***	0.0491***
	(0.696)	(0.020)	(0.696)	(0.098)
Age²	-0.089***	-0.002***	-0.089***	-0.011***
	(0.018)	(0.000)	(0.018)	(0.002)
Education	-0.311	-0.052	0.149	0.062
	(0.395)	(0.035)	(0.342)	(0.053)
Religiosity	-0.386***	-0.009***	-0.386***	-0.047***
	(0.132)	(0.003)	(0.132)	(0.016)
Catholic	-0.370	-0.002	-0.457	-0.068
	(0.401)	(0.034)	(0.302)	(0.053)
Montevideo	-0.293	-0.017	-0.166	-0.010
	(0.314)	(0.026)	(0.239)	(0.040)
Adolescent_mother	1.215***	0.025***	1.215***	0.138***
	(0.272)	(0.006)	(0.272)	(0.029)
Info_health	0.634	0.013*	0.634	0.071*
	(0.402)	(0.007)	(0.402)	(0.040)
Info_education	-1.490***	-0.094***	-0.802***	-0.038
	(0.369)	(0.029)	(0.291)	(0.046)
Network	-0.165	-0.041	0.226	0.065
	(0.398)	(0.038)	(0.330)	(0.055)
Worker	-0.204	-0.045	0.301	0.077*
	(0.405)	(0.028)	(0.305)	(0.044)
Deprivation	-0.944**	-0.091**	-0.154	0.050
	(0.482)	(0.041)	(0.349)	(0.058)
Educ_mother_secondary	0.612**	0.013**	0.612**	0.074**
	(0.267)	(0.006)	(0.267)	(0.032)
Educ_mother_tertiary	-0.485	-0.039	-0.103	0.016
	(0.639)	(0.047)	(0.396)	(0.070)
	N=715; -lnL=482.450; Pseudo-R²=0.2807			
Hausman Test (IIA)	-0.56/-3.05/-215.56			
Predicted probabilities	Alternative 1=0.1770; Alternative 2=0.1262; Alternative 3=0.6968			
Wald Test	Age: χ²(1)=0.36;Prob>χ²=0.55			
	Age2: χ²(1)=0.49;Prob>χ²=0.48			
	Religiosity:χ²(1)=1.13;Prob>χ²=0.29			
	Adolescent_mother:χ²(1)=0.10;Prob>χ²=0.75			
	Info_health:χ²(1)=0.46;Prob>χ²=0.50			
	Educ_mother_secondary:χ²(1)=1.62;Prob>χ²=0.20			
Note: Base cathegory is Alternative "1", no having initiated.Standard errors in parentheses.				
**Significant at 5% level. ***Significant at 1% level.				

The impact of prenatal care on birthweight: the case of Uruguay[1]

Introduction

This paper presents an analysis of the effect of prenatal care on birthweight in Uruguay, a small country located in the southern cone of South America. Empirical studies have indicated that the expanded use of prenatal medical care leads to increases in birthweight, a commonly used proxy for infant health. Unfortunately, estimating the relationship between birthweight and prenatal care is problematic, since measures of prenatal care use are endogenous if there are unobservable factors that determine the mother's prenatal care behavior as well as the infant's birthweight. For instance, women with inferior health endowments, the exogenous health component unobservable to the researcher, may expect problematic pregnancies (e.g., lower birthweight)

and thereby seek more prenatal care. Neglecting endogeneity generally leads to an underestimation of the positive impact of prenatal care on birthweight.

Using US data, Rosenzweig and Schultz (1991[13]), Grossman and Joyce (1998[5]), and Liu (1998[8]) find that earlier initiation of prenatal care increases birthweight and that the measured effectiveness of prenatal care is biased downward by exogeneity. Also using US data, Rous *et al.* (2003[14]) and Evans and Lien (2005[3]) show that additional penatal care visits lead to increases in birthweight, although the magnitude of this effect is small. Relatively few studies exist that analyze this connection using data from developing countries. Guilkey *et al.* (1989[6]) find that Philippine women with more prenatal care visits generally have higher-birthweight babies. Panis and Lillard (1994[11]) show that increases in prenatal care use results in higher infant survival rates in Malaysia. Maitra (2004[9]) finds that increased use of prenatal care reduces the probability of child mortality in India. These studies also indicate that endogeneity decreases the measured effect of prenatal care, similar to findings using US data.

Data for the current study are gathered from the Perinatal Information System (*Sistema Informático Perinatal, SIP*), which is administrated by the Latin American Center for Perinatology and Human Development (*Centro*

Lationamericano de Perinatología y Desarrollo Humano, CLAPDH), and represent all births in the years 1995-2003 that occurred in a public hospital in the capital city of Montevideo Located in the Uruguayan capital of Montevideo, CLAPDH is the regional technical center of the Pan-American Health Organization and the World Health Organization. Since 1983, CLAPDH has developed SIP to improve the monitoring of maternal and infant health in Latin America and the Caribbean. Uruguay adopted SIP in 1990 as the clinical record tool for all institutional deliveries. In Uruguay, both prenatal and obstetric care is provided free of charge; specifically, any Uruguayan woman who wishes to receive prenatal and obstetric care can do so at a public hospital at government expense.These data come from a public hospital that serves the poor women of Montevideo, home to approximately one-half the contry's population. Thus, these data allow for a study that concentrates on urban, poor women, in a population that faces zero out-of-pocket costs for health care.

We limit the data to 32 795 singleton births of nomral gestation (37-42 weeks) to mothers age 16-40. In addition, we analyze each woman's most recent birth; thus, no woman appears in the sample more than once. The results from this study indicate that ignoring the endogeneiy of prenatal care

negatively biases the measured effect of prenatal care on birthweight, a result found in studies using US data. Our estimation technique also enables the simulation of a birthweight production function, allowing for an analysis of the effect of prenatal care on birthweight over the entire range of the input.

Methodology

This paper uses 2SLS to estimate a birthweight production function, concentrating on the effect of the input prenatal care on the output birthweight and controlling for the endogeneity of prenatal care. The sample of pregnant women who give birth is not random, but due to data constraints we cannot control for this potential bias. Thus, the results from this study are conditional on a birth occurring.Prenatal care is measured as month of initiation, the measure most-commonly used in the economic literature. Month of initiation varies from one, implying that prenatal care was initiated in the first month of pregnancy, to ten, implying prenatl care was never initiated. Thus, a large number implies later initiation. Following previous literature, month of prenatal care initiation will be treated as a linear variable. The general form of the production function is given in

$$BW = H[month, BMI, parity, age, education, cigarettes] \qquad (1)$$

BW refers to birthweight, H is the production technology, and month is prenatal care initiation.

BMI is the mother's body mass index based on pre-pregnancy weight. BMI is an indirect measure of maternal health and should positively impact birthweight (Ehrenberg *et al.*, 2003[2]).

Parity indicates the mother's number of previous births and should measure the effect of maternal experience on birthweight. Under the assumption that women with more pregnancy and birthing experience are able to produce infant health more efficiently, parity should have a positive effect on birthweight. In addition, previous birth experience has been linked to anatomical changes that may impact the efficiency of birthweight production (Khong *et al.*, 2003[7]). Age is the mother's age at the time of birth. Past research has shown a clear relationship between age and birthweight, with both younger and older mothers having higher rates of low birthweight babies than other women (Abel *et al.*, 2002[1]).

Education is the mother's level of formal education; education varies from one (no formal education) to six (at least some college coursework). Mother's

education is included in studies of health production because it is assumed that increases in education lead to increases in productive efficiency (Grossman, 1972[4]).

The number of cigarettes smoked per day during pregnancy is also included, since it has been shown that smoking during pregnancy leads to lower birthweights (Permutt and Hebel, 1989[12]).Past research finds evidence that smoking is endogenous in the pregnancy process. Correcting for this issue is impossible within the Uruguayan data. Due to this data limitation, the results may be biased, especially with respect to the estimated coefficient on cigarettes.

Female babies normally weigh less than male babies (Thomas *et al.*, 2000[15]); however, gender is not an input in the birthweight production process. Mothers who have history of low-birthweight infants are more likely than others to have los-birthweight infants in the future (Malloy, 1999[10]).

Also, it is necessary to control for any changes in the birthweight production technology over time. The mother's race is normally included in the birthweight production function, but SIP does not collect this measure.

Including gender, birth history, and technology, Equation (1) becomes

$$BW = H[month, BMI, parity, age, education, cigarettes, male, lowbw, year]$$

(2)

Male equals one if the child is a boy, lowbw indicates at least one prior low-birthweight infant, and year is a linear time-trend indicating the birth year. Equation (2) is estimated in the quadratic form listed in

$$BW_i = \alpha + \beta y_i + \delta y_i^2 + \phi male_i + \gamma lowbw_i + \varphi year_i + \mu_i \qquad (3)$$

The dependent variable is the birthweight of infant i in grams, and y_i is a vector of health inputs of infant $i\prime s$ mother.

2SLS involves a first-stage regression of month on all exogenous variables plus variables to be used as instruments. Based on economics theory, measures of prices and income are obvious candidates for exclusion restrictions. Unfortunately, the dollar price of prenatal care is zero and income measures are unavailable in these data. Another possible exclusion restriction is marital status; married women are more likely to have planned pregnancies and are more likely to invest in the health of their children, but marital status itself does not directly contribute to the infant's birthweight. In addition,

marital status may be an indirect measure of household assets, since married women should have access to greater income or wealth than others. Marital status is measured as a series of dummy variabes (stable union, single, and other status, with excluded category=married). Note that the validity of the exclusion restriction cannot be tested since our model is exactly identified. First-stage results are given in Appendix. The marital status categories are jointly significant at the 1% level (F(3,32 771)=209.22). Table 2.1 reports summary statistics for the entire sample.

Results and discussion

Estimates of Equation (3) using both OLS and 2SLS are listed in Table 2.2. The OLS marginal effect at the sample mean implies that initiating prenatal care one month earlier will increase birthweight by 23.5g, while the 2SLS estimated marginal effect is 57.3 g. Clearly, OLS underestimates the impact of prenatal careon birthweight outcomes among poor women in uruguay by more than one-half. However, given a sample average birthweight of 3,244 grams, even the 2SLS estimates show a relatively small effect of increased prenatal care usage.

Table 2.1: SUMMARY STATISTICS (N=32.795)

	Mean	Standard deviation
Birthweight	3.243.733	476.364
Month	5.585	2.377
BMI	22.866	2.974
Parity	1.734	1.992
Age	24.674	6.319
Education	3.406	0.827
Cigarettes	2.959	5.907
Male	0.513	0.500
Lowbw	0.027	0.163
Year	4.167	2.691
Married	0.254	0.425
Stable Union	0.497	0.500
Single	0.229	0.420
Other Status	0.020	0.141

With the exception of education, the health inputs appear to enter the birthweight production function non-linearly: an increase in BMI, parity, or age increases birthweight at a decreasing rate. As expected, male infants weight consistently more than do females, and the existence of a prior low-birthweight infant is correlated with lower current birthweight. Interestingly, birthweight appears to be decreasing in this sample over time since the cause cannot be determines within this analysis, Uruguayn public health authorities may need to investigate this trend further.

Given the estimation results reported in Table 2.2, we can simulate the entire birthweight production function. Figure 2.1. shows the simulated birthweight production functions for 2SLS and OLS. A comparison of the functions indicates that OLS underestimates the range of the impact of pre-

natal care on birthweight. OLS simulations result in an decrease in average birthweight from 3352 to 3140 g as prenatal care initiation varies from the first month of pregnancy to no initiation. In contrast, 2SLS simulations result in a much larger decrease in average birthweight from 3378 to 2872 g. Thus a woman who chooses to initiate, can expect to see a gain of 506 grams in her infant's birthweight, more than double her expected gain using OLS.

Table 2.2: BIRTHWEIGHT PRODUCTION FUNCTION ESTIMATES

	OLS	2SLS
Month	-23.65***	13.53
	(5.63)	(29.19)
Month2	0.01	-6.34***
	(0.45)	(2.48)
BMI	50.55***	48.08***
	(7.00)	(7.07)
BMI2	-0.62***	-0.57***
	(0.14)	(0.14)
Parity	50.92***	66.18***
	(3.57)	(5.23)
Parity2	-3.22***	-3.98***
	(0.41)	(0.47)
Age	19.11***	15.11***
	(3.58)	(3.81)
Age2	-0.34***	-0.30***
	(0.07)	(0.07)
Education	33.05	15.54
	(16.60)	(17.07)
Education2	-0.93	1.22
	(2.44)	(2.49)
Cigarettes	-15.37***	-14.79***
	(0.87)	(0.89)
Cigarettes2	0.29***	0.30***
	(0.03)	(0.03)
Male	115.05***	116.07***
	(5.04)	(5.07)
Lowbw	-233.57***	-229.62***
	(15.55)	(15.66)
Year	-4.77***	-10,37***
	(0.96)	(1.65)
Constant	2,145.92***	2,265.36***
	(102.43)	(152.05)
Adjusted R-squared	0.084	0.074

The simulations also allow us to evaluate the marginal productivity of prenatal care at each level. The 2SLS marginal effect of prenatal care is largest at late initiation of prenatal care, implying that women who have the lowest use of prenatal care also have the greatest to gain from increasing their use of prenatal care. The marginal benefit of initiating prenatal care in the last month of pregnancy rather than not initiating is 107 g, as compared to 57 at the mean.
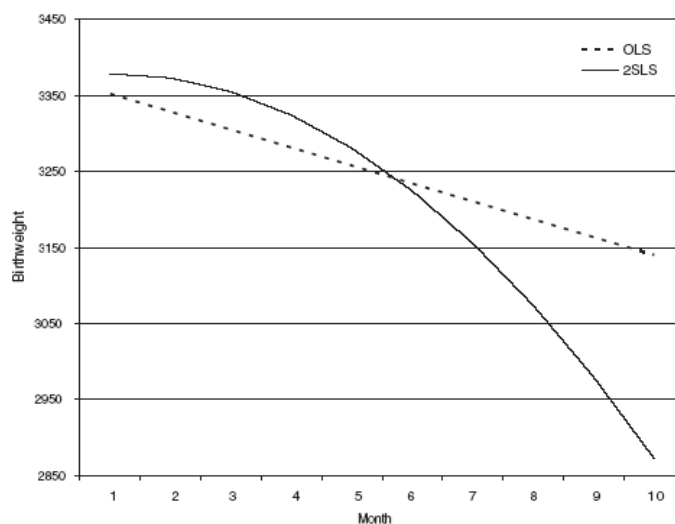
Figure 2.1

Chart 1. Birthweight production function

A visual inspection of the chart reveals further insights with respect to the impact of endogeneity on birthweight production among poor women in Uruguay. As shown in Table 2.2, OLS underestimates the marginal effect

of prenatal care on birthweight; however, Figure 2.1. gives evidence that OLS underestimates the marginal effect of prenatal care on birthweight over almost the entire range of the input. In addition, endogeneity bias appears largest at lower rates of prenatal care use.

Conclusion

The health care system in Uruguay allows poor women to access prenatal health care at zero cost. However, a zero out-of-pocket cost has not induced all poor women to initiate prenatal care, even though the simulations in this paper give evidence that the largest marginal effect of increased prenatal care use is found at low levels of usage. If Uruguayan policymakers wish to lower the total cost of obtaining prenatal care for poor women, they will need to consider non-price costs, such as transportation costs, waiting-time costs, or other opportunity costs. They may also want to investigate alternative ways of informing expectant mothers of the benefits of prenatal care. In any case, the results indicate that increased average prenatal care use among poor women in uruguay will lead to increases in average birthweight, and, therefore, lead to increases in infant health and reductions in the problems

associated with poor infant health. A limitation of this study is the lack of
variation in the quality of prenatal care available. Although not universally
true, public health facilities normally provide lower quality prenatal care.

References

[1] Abel EL, Kruger M, Burd L. Effects of maternal and paternal age on caucasian and native american preterm births and birthweights. *Am J Perinatol* 2002; **19**:49-54.

[2] Ehrenberg HM, Dierker L, Milluzzi C, Mercer BM. Low maternal weight, failure to thrive in pregnancy, and adverse pregnancy outcomes. *Am J Obstet Gynecol* 2003; **189**:1726-1730.

[3] Evans WN, lIen DS. The benefits of prenatal care: evidence from the PAT bus strike. *J Econom* 2005; **125**: 207-239.

[4] Grossman M. On the concept of health capital and the demand for health. *J Polit Econ* 1972; **80**:223-255.

[5] Grossman, M, Joyce, TJ. Unobservables, pregnancy resolutions, and birthweight production functions in New York City. *J Polit Econ* 1990; **98**:983-1007.

[6] Guilkey DK, Popkin BM, Akin JS, Wong EL. Prenatal care and pregnancy outcome in Cebu, Philippines. *J Development Econ* 1989; **30**:241-272.

[7] Khong TY, Adema ED, Erwich JJHM. On an anatomical basis for the increase in birthweight in second and subsequent born children. *Placenta* 2003; **24**:348-353.

[8] Liu GG. Birth outcomes and the effectiveness of prenatal care. *Health Serv Res* 1998; **32**: 805-823.

[9] Maitra P. Parental bargaining, health inputs, and child mortality in India. *J Health Econ* 2004; **23**: 259-291.

[10] Malloy MH. Risk of previous very low birthweight and very preterm infants among women delivering a very low birthweight and very preterm infant. *J Perinatol* 1999; **19**: 97-102.

[11] Panis CWA, Lillard LA. Health inputs and child mortality: Malaysia. *J Health Econ* 1994; **13**:455-489.

[12] Permutt T, Hebel JR. Simultaneous-equation estimation in a clinical trial of the effect of smoking on birthweight. *Biometrics* 1989; **45**:619-622.

[13] Rosenzweig MR, Schultz, TP. Estimating a household production function: heterogeneity, the demand for health inputs, and their effects on birthweight. *J Polit Econ*1983*;* **91**:723-746.

[14] Rous JJ, Jewell RT, Brown RW. The effect of prenatal care on birth-weight:a full-information maximum likelihood approach. *Health Econ;* **13**:251-264.

[15] Thomas P, Peabody J, Turnier V, Clark RH. A new look at intrauterine growth and the impact of race, altitude, and gender. *Pediatrics* 2000; **106**:E21.

Appendix

Table A.2.1 : REDUCED FORM

BMI	-0.082**
	(0.034)
BMI2	-0.002**
	(0.001)
Parity	-0.508***
	(0.017)
Parity2	-0.030***
	(0.002)
Age	0.100***
	(0.017)
Age2	-0.001
	(0.000)
Education	-0.352***
	(0.008)
Education2	0.043***
	(0.011)
Cigarettes	0.011***
	(0.004)
Cigarettes2	0.000
	(0.000)
Male	0.027
	(0.024)
Lowbw	0.104
	(0.075)
Year	-0.173***
	(0.005)
Stable Union	0.374***
	(0.031)
Single	0.928***
	(0.038)
Other Status	0.670**
	(0.089)
Constant	8.283***
	(0.489)
Adjusted R-squared	0.143

Note: Dependent variable=Month, standard errors in parentheses.

Obesity and hypertension among the elderly in Uruguay[1]

Introduction

There has been an alarming increase all over the world in the number of people who are overweight or obese, and the problems that stem from this phenomenon have made it a top priority question for those who formulate public health policies. The prevalence of obesity in the global adult population is estimated at 300 million people (5%), and an estimated 1,000 million are overweight (15%) (WHO, 2006 [22]).

There is very limited information available regarding obesity and central obesity in Latin America and The Caribbean. However, despite these limitations there is some evidence that obesity is on rise in Latin America (Drumond, 2004 [9]). According to the 1998 National Survey on Overweight and Obesity (ENSO 1), in Uruguay 17% and 51% of the population are obese

---

[1]Joint paper with Juan Pablo Pagano and Máximo Rossi.

and overweight respectively. With respect to data from the SABE project (PAHO, 2001 [16]), elders from Uruguay have the highest obesity rate followed by those from Chile and Mexico: the mean BMI in the sample was: 27.1 in Barbados, 26.4 in Brazil, 27.9 in Chile, 24.7 in Cuba, 28.0 in Mexico, and 28.2 in Uruguay.[15]

In the literature, the most common indicator of obesity and overweight, measured by the proportion of body fat, is the Body Mass Index (BMI).[16]This index has the drawback that it underestimates the proportion in older people since the elderly typically have less muscle tissue. The World Health Organization (WHO) defines obesity as a BMI of 30 or over and overweight as 25 or over, regardless of age or sex. In Africa and Asia mean BMI is around 22, while in North America, Europe and some Latin American countries mean BMI is over 26.[17]The USA in particular stands out as having the highest mean BMI in the world, and the trend is for this to increase.[18] Another country that gives cause for concern is Spain where, according to the Ministry of Health, one person in two is overweight and 14.5% of the adult population

---

[15]Source: SABE. Data on BMI for Argentina was not available.

[16]BMI is defined as weight in kilograms divided by height in meters squared (kg/m2).

[17]Obesity and overweight fact sheet. Geneva, WHO, 2003. (http://www.who.int/hpr/ NPH/docs/gs_obesity.pdf).

[18]According to the NHANES (National Health and Nutrition Examination Survey), the percentage of obese people increased by 67% between 1971 and 1994.

is obese.

Medical literature shows that obesity leads to health problems such as heart disease, arthritis, diabetes, hypertension, high cholesterol, and even depression. In the United States, obesity and a sedentary lifestyle are second only to tobacco as the leading cause of premature death (McGinnis, 1993 [12]).

The objective of this study is to research the impact of obesity on the older population in Latin America as a risk factor in chronic diseases in general and hypertension in particular, taking into account the potential endogeneity of this kind of studies. We cannot reject the hypothesis that, behind these health problems, there may be some common observable and unobservable factors that could explain both outcomes at the same time, and some unobservable factors that determine the incidence of chronic diseases could be correlated to the determinants of obesity. These considerations make it necessary to research whether it would be more suitable to make separate estimations for each outcome, or whether a joint estimation of the two together would yield more accurate results.

Background

In general terms, obesity and overweight are a consequence of an energy imbalance. Typically, a person gains weight when the quantity of calories ingested exceeds the quantity of calories that are burned. So, in order to explain the increase in obesity rates it is necessary to tackle both of these dimensions, the observed increase in the amount of calories consumed and the decrease in the calories burned (or the increase in sedentary lifestyles).

The literature focuses on different factors to try to explain this worldwide "obesity epidemic". Some studies point to the growth in international fast food franchises, others to the technological changes that have made it possible for cheap, packaged food that is rich in saturated fats to be mass produced, and other researches take a different perspective and study the quantity of calories that are burned in the new kinds of jobs and leisure activities that people engage in.

Some authors argue that there is no strong evidence that the amount of calories burned has decreased substantially, and they focus on the rise in calories consumed that stems from a shift in eating habits towards the consumption of greater amounts of food and/or the preference for food that is richer in calories, and on sedentary lifestyles and jobs that contribute to

the development of this "obesogenic environment".

Cutler et al.(2003 [7]), using data from the 1994 National Health and Nutrition Examination Survey (NHANES)[19] for the US, found that the alarming rise in mean BMI and the increase in the number of cases of morbid obesity, defined as a BMI>40, give cause for serious concern. These authors traced the reasons for this phenomenon to the technological changes that have made it possible to mass produce food, which has brought down the cost of food that is rich in calories and saturated fats and raised the cost of healthier food. Another important finding was that most of the extra calories consumed come from an increase in snacks and not from an increase in the size of meals consumed in restaurants or at home.

Rashad et al.(2005 [18]) used data from the first, second and third NHANES to study the impact on rising BMI of the number of restaurants per capita, taxes on cigarettes, taxes on gasoline, and laws governing clean indoor air. The main results were that the fact that the number of restaurants is increasing has a significant effect, and so has the cigarette tax, which indicates that this "obesity epidemic" could have come about partly as an indirect result

---

[19]The interviewer took anthropological measurements directly, thus avoiding the bias produced by the self-reporting of height and weight especially by overweight people, who tend to under-report their weight.

of the current anti-smoking campaign.

Rashad (2006 [17]) uses instrumental variables to make estimations, putting the focus on the demographic determinants of obesity. Estimations made with two-stage least squares (2SLS), and controlling potential endogeneity problems, show that the strong effects of calorie consumption and smoking that ordinary least squares estimations indicate disappear in all cases except for calorie consumption for women. In this last case, women's working hours have increased and their real wages have fallen, which has led to increased demand for inexpensive prepared food, and this in turn has raised calorie intake. On the other hand, the fact that cigarette smoking in the 2SLS estimation becomes insignificant could be partly because smoking is strongly correlated to other unhealthy habits, and because people smoke with the intention of losing weight.

Morris et al.(2006 [13]) studied the relation between the GP (General Practitioner) supply and the BMI trend in England, with data from the 2000 Health Survey for England (HSE). Using an instrumental variables approach, they found that GP supply has a negative and significant effect on BMI. On average, a 10% rise in GP supply is associated with a mean reduction in BMI of around 1 kg/m2, which suggests that "better primary care in the form of

reduced list sizes per GP can improve the management of obesity."

Many authors have estimated the costs associated with overweight and obesity, and the trend in recent years has been for these costs to increase. This pattern can be seen in aggregated terms (higher health care costs for health problems connected to obesity) and at the individual level (the higher health care costs connected to obesity are passed on to obese workers through employer-sponsored health insurance in the form of lower cash-wages (Bhattacharya and Bundorf, 2005[2]; Wolf and Colditz, 1998 [23]; USDHHS, [21]).

As to the relationship between obesity and chronic diseases, the WHO has sounded an alert about obese people running a greater risk of type II diabetes, cardiovascular diseases, hypertension and some forms of cancer. In fact, the risk for obese people of dying early of suffering from myocardial infraction is 2 to 2.5 times higher than for people of normal weight (Revista Argentina de Cardiología, 2001 [19]). Sturm et al.(2001 [20]) used data from a nationally representative telephone survey carried out in 1998 to research 17 chronic diseases[20], and they found that a BMI of 30 to 35 is associated with one half of an additional chronic condition, and a BMI of over 35 is

---

[20]The chronic health conditions considered in this article include asthma, diabetes, hypertension, arthritis, physical disability such as the loss of an arm or eyesight, breathing problems and cancer.

associated with one additional chronic condition. This result stands in stark contrast, for example, to the effect of smoking, which only amounts to one quarter of an additional chronic condition.

Costa-Font et al. (2005 [6]) studied the joint determinants of obesity and of four chronic diseases: heart disease, diabetes, hypertension and high cholesterol. Using data from the Spanish 1999 Survey on Disabilities, Impairments and Health Status, and a seemingly unrelated probit approach to control for potential endogeneity, authors have found a positive and significant connection between obesity and chronic diseases. Moreover, this result is unchanged when a BMI variable is used for obesity instead of a dichotomous variable, which suggests that even being slightly overweight may affect health.

Himes (2000 [11]) analyzed data on people aged 70 and over from two studies (Longitudinal Study of Ageing (1984), and Assets and Health Dynamics of the Oldest Old Survey (1994)) in the United States, and found that obesity is not only associated with increased risk of arthritis, diabetes and hypertension, but also with certain limitations in activities of daily living (ADLs)[21]. Moreover, the results of a Spanish study show that the incidence

---

[21]These activities include showering, dressing, using the toilet, moving around and eating.

of obesity and the chronic conditions associated with it that involve physical impairment and limitations on ADLs mean a rise in cases of physical dependence, mostly among the elderly (Pascual and Cantarero, 2006 [15]).

Data and methodology

In this study we extended previous research, which has been carried out mostly in developed countries such as Spain and the United States, to Uruguay, the country with the oldest population of the southern hemisphere, and we analyzed the effect of obesity on the prevalence of hypertension, the most widespread health ailment among the elderly.

The purpose of our work is to assess the effect of excessive body weight in the probability of suffering from hypertension, investigating whether endogeneity problems are present in the determinants of both outcomes. In the presence of endogeneity, our main aim is to provide a model that takes it into account, presenting the corresponding corrected coefficients and marginal effects. Our main hypothesis is that both outcomes are in part determined by common factors, which leads to endogeneity biases that make it inappropriate to simply use obesity as another explanator in a hypertension equation.

We used data from the Survey on Health, Well-being and Ageing (the SABE Project), which was conducted in 2001 by the Pan-American Health Association (PAHO) in association with the Ministry of Public Health. The SABE project was carried out in urban areas in seven Latin American countries, namely Bridgetown (Barbados), Buenos Aires (Argentina), Havana (Cuba), Mexico City (Mexico), Montevideo (Uruguay), Santiago de Chile (Chile) and Sao Paulo (Brazil).

The objective of the SABE project is to describe the health condition of the elderly (60+) in selected urban areas. The universe of study consists of people aged 60 and over living in private homes. The questionnaire was designed in such a way as to permit comparisons between information from different countries. The questionnaire was divided into modules, namely basic demographic characteristics, socio-economic information, household ownership and characteristics, self-assessment on health and chronic conditions, use of and access to health care services, medicines, a nutritional evaluation, daily life activities, etc. This second part of the survey consists of anthropological measurements taken directly by the interviewer (height, weight, etc) and also some simple tests like standing on one foot, etc., to gauge func-

tional status.[22] We decided to use only the Uruguay database because of the situation as regards the availability of other data at the time of our study.

We estimated a health production function for the elderly (60+), measured through morbidity and the presence of hypertension, and we focused on the effect that obesity and socio-economic variables have on these variables.

Hypertension was detected through an affirmative response to the question, "Have you ever been diagnosed with high blood pressure, that is to say hypertension, by a doctor or nurse?" Therefore, although illnesses are detected through self-assessment, a clinical diagnosis is involved. In spite of the fact that it is still a self-reported variable, it is the usual way in this kind of surveys in Latin America, since the costs of performing individual examinations[23] of each of the interviewed are high. The paper assumes that people provide survey answers to questions about high-blood pressure difficulties in a relatively objective way. Moreover, it is known in the medical literature that self-reports of hypertension are correlated with objectively measured readings of blood pressure and seem to have high validity (Blanchflower and OSwald, 2007 [4]).

---

[22] For more information, see: http://www.ssc.wisc.edu/sabe/home.html.

[23] This is the case, for example, of the National Health and Nutrition Examination Survey (NHANES) in the United States, where examinations are performed in specially designed and equipped mobile examination centres.

To assess older people's weight status, the BMI was constructed from anthropological measurements taken directly by the interviewer, thus avoiding any possible bias or missing measurements that could result from self-reporting. Although BMI is considered to be a limited measure of fatness and obesity because it does not distinguish body composition (Cawley et al, 2006 [5]), we choose it as our fatness indicator because of its wide utilization in the literature, and given the difficulty in measuring the amount of body fat. One alternative measure of obesity is waist circumference, which is available in the dataset. We have ran the same models using this variable as a measure of obesity, obtaining similar results to the ones presented. [24]

To choose a continuous specification for the presence of morbidity (for example a chronic illnesses index) and a continuous BMI specification, the most common way to proceed is through a two-stage analysis (two-stage probit least squares, TSP, linear probability model, LPM etc). In the first stage, fitted values of the endogenous variable (BMI) based on instrumental variables are derived, and in the second stage the health outcome of interest (morbidity) is regressed on the fitted values of the treatment. This estimator is consistent as long as the instruments are valid (Bhattacharya et al, 2006

---

[24]These results are available upon request from the authors.

[3]; Wooldridge, 2002 [24]).

Another possibility is to use a binary specification for the two variables, weight status and morbidity. The obese category takes the value 1 when the individual has a BMI of 30 kg/m2 or over and 0 otherwise, and the hypertension category takes the value 1 if this illness is present. In this scenario a similar procedure as the above would work, but the TSP and LPM estimators would be consistent for the structural parameters only up to a factor of proportionality that cannot generally be recovered from the analysis (Bhattacharya et al, 2006 [3]).

In the above-cited article, Bhattacharya et al. (2006 [3]) conduct a Monte-Carlo experiment to compare the performance of four different estimators: naïve probit, TSP, LPM and a bivariate probit, which accounts for the selectivity of the treatment. The results of the experiment show that bivariate probit estimation outperforms all the other estimators not only for the treatment coefficient but also for average treatment effect. The naïve probit ignores selectivity of treatment, and emerges as the worst estimation procedure.

Using this evidence as a base, we proceeded to carry out a bivariate probit model that consists of two equations, to test the presence of endogeneity

87

problems. In the first equation, the health product of interest (*hypertension*) is regressed, as a probit regression, on a group of exogenous variables (X_2) and the potentially endogenous variable (obese). In the second, obese is the dependent variable, and all exogenous variables from the first are included plus the possible instruments ($X_1 = X_2 + Z$) that are excluded from the *hypertension* equation (exclusion restrictions) for identification purposes.

$$
\begin{aligned}
y_{2i}^* &= \beta_2' y_{1i} + \delta_2' X_{2i} + u_{2i} \\
y_{1i}^* &= \beta_1' X_{1i} + u_{1i}
\end{aligned}
\tag{1}
$$

In this case y_{1i}^* is the latent variable measuring obesity, and y_{2i}^* is the latent variable behind hypertension. At the same time, it is possible to specify these variables as observed of the form:

$$
y_{1i} = \begin{cases} 1 \; if \;\; y_{1i}^* > 0 \\ \\ 0 \; if \;\; y_{1i}^* \leq 0 \end{cases} (obese)
$$

$$
y_{2i} = \begin{cases} 1 \; if \;\; y_{2i}^* > 0 \\ \\ 0 \; if \;\; y_{2i}^* \leq 0 \end{cases} (hypertension) \tag{2}
$$

The error terms in both equations are assumed to be independent and

identically distributed as a bivariate normal with a zero mean and unitary variance, with $\rho = corr(u_1, u_2)$. The exogeneity condition can be stated in terms of ρ, which can be interpreted as the correlation between unobserved or omitted variables in both equations. The Wald test of ρ, means that if the null hypothesis is not rejected, y_{1i} and u_{2i} are uncorrelated, and therefore y_{1i} is exogenous in the second equation of the model. Different approaches to exogeneity testing are discussed in the econometrics literature (Bhattacharya et al, 2006 [3]; Wooldridge, 2002 [24]; Baum et al, 2003 [1]).

In the presence of endogeneity, which is one of the hypothesis of our work, we found two ways of proceeding to correct the coefficients presented: the first procedure consists of running an Instrumental Variables probit (IV probit, two-step probit with endogenous regressor) using the obese category as the dependent variable of the first stage.[25] As the command used is intended to work with a continuous specification of the potentially endogenous variable in the first stage, we followed a two-stage procedure

On a first stage we ran a probit regression of *obese* on the $X_1^{''}$s (all the exogenous plus the instruments) and obtain fitted values of *obese*, that is, the $\hat{O}_i$. These fitted values are then used in the second stage as instruments

---

[25]In both cases, the command IVPROBIT of Intercooled Stata 9.2 is used.

of *obese* in an IV probit regression of hypertension.

The second procedure assesses whether a slight change in BMI can affect the probability of suffering from hypertension, by using the variable BMI itself as measure of fatness, instead of a dichotomous indicator. With BMI as the dependent variable on the first stage (which is a linear regression of BMI on all the exogenous variables and the instruments), we ran the IV probit directly, using the same instruments as in the obese equation.

We also present the results of a naïve probit estimation for comparison purposes, since these kinds of models ignore the potential endogeneity of obese in the health product of interest.

With respect to the exogenous variables, vectors X_1 and X_2 include the demographic and socio-economic information described below.

Age is specified with two continuous variables, *Age* (years of age) and Age^2 (square of years of age divided by 1000), which seeks to capture any non-linear age effect.

Woman, takes value 1 if the individual is female. At the same time, an interactive variable between sex and age is specified, namely *Women*age*.

Because the people in this age group could have had different marriage status in the course of their lives, we choose to specify the binary variable

Married, which takes the value 1 if the person was married or in a common-law union at the time of the interview. The purpose of this variable is to capture the possible positive effects of living with a partner, like emotional support and mutual care in lifestyles.

The *Alone* and *Support* variables were constructed to analyze the social capital that each individual has access to. The concept of social capital has to do with the stock of social relations based on rules, cooperation networks and trust that promote collective action. As an approach to that concept, the Alone variable is dichotomous and takes the value 1 if the individual lives alone. The *Support* variable shows access to different kinds of help (economic help, company, or help with services or housework) from four categories of people: people sharing the home, sons and daughters, siblings and other relatives, and friends that do not live in the same house. This is a count variable that takes values from 0 to 4 depending on whether the person is helped by people in the above-mentioned categories.

In the epidemiological literature, a sedentary lifestyle is considered to be a factor in the deterioration of health stock. We include two variables *Sedentary* and *Drinker.*

Sedentary takes the value 1 if the individual did not do any physical

exercise, sports, dancing or heavy work on a regular basis (at least 3 times a week) in the last year.

Drinker is a binary variable that takes the value 1 if the person drank alcohol an average of 3 times a week or more in the last 3 months, and the value 0 otherwise.

We used factor analysis for variables that capture the individual's socio-economic level. There are a number of variables that give information of this kind, like level of deprivation of goods, medical coverage, the need to work, and contentment with one's level of income for daily living. [26]Factor analysis by principal components allows us to define each component's eigenvalue as its sum of squared correlations with the original variables, and can be interpreted as the amount of variance the factor explains. In this study we chose to keep as many factors as the number of eigenvalues greater than one, and this meant that only two factors were kept: *Socio_1* and *Socio_2*

---

[26]Goods deprivation was approached through information on possessing certain home appliances such as refrigerator, washing machine, TV, VHS, heating, etc. A binary variable was created that takes the value 1 if the household has a deprivation level higher than the mean. Health coverage or insurance is measured through a binary variable that takes the value 1 if the individual only has public health insurance. As to education, we used a binary that equals 1 if the elderly person went no further than completing elementary school. Sufficient income was captured through an affirmative response to the question of whether the person considered him/herself to have enough money for daily life. Last, we employed a binary variable that takes the value 1 if the elderly person declared that he/she worked because he/she needed the money or to help the family.

(Fabbri et al, 2004 [10]). The interpretation of the former is intuitive, it increases as the socio-economic level of the individual decreases.

In Tables 3.1 and 3.2. present the results of the factor analysis concerning the construction of *Socio_1* and *Socio_2* variables.

Table 3.1: PRINCIPAL COMPONENTS

Factor	Eigenvalue	Difference	Proportion	Cumulative
1	1.997	0.957	0.333	0.333
2	1.040	0.113	0.173	0.506
3	0.927	0.171	0.155	0.661
4	0.756	0.094	0.126	0.787
5	0.663	0.046	0.110	0.897
6	0.617	-	0.103	1

In this case, we followed the Guttman-Kaiser rule and retained only those factors with an eigenvalue larger than one, that is why we kept two factors. Also, we present the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test), which states that the sample is adequate if the value of KMO is greater than 0.5, which is our case (Fabbri et al, 2004 [10]).

Table 3.2: KAISER-MEYER-OLKIN

Variable	Kaiser-M-O
Public	0.715
Depriva	0.689
Initial	0.686
Need_work	0.607
Money	0.745
Elementary	0.713
Total	0.709

Its sign cannot be interpreted intuitively because of its construction. The aim of this type of analysis is to find any kind of pattern in the joint variance

of a group of variables that are correlated, and if such a pattern is found it would be possible to work with a reduced number of liner combinations of variables.

The variable denominated Initial is created as a factor underlying nutritional outcomes, socio-economic condition and health status in the first 15 years of life.[27]

Endogeneity might be the result of omitted variables, measurement errors, simultaneity, etc. Instruments should satisfy two conditions: they have to be correlated with the endogenous variable, but they should not be directly associated with the main outcome of interest (*hypertension*). Therefore, as the instruments are supposedly uncorrelated with the error term in the main equation, the fitted values of the endogenous regressor would also be uncorrelated. Nevertheless, it is known that in finite samples two-stage analysis can be biased, depending on the number of instruments and the correlation between the error terms in the two equations.

The most common instruments used in the literature are prices (of cigarettes, food, etc.), per capita number of restaurants, average temperatures in different seasons, clean indoor air laws, etc. However, in this study we worked

---

[27]The tables concerning the construction of this factor are available upon request from the authors.

with cross section data so there are no time-variant or regional variables, and it was not possible to follow that kind of strategy. Therefore we imposed the following three exclusion restrictions to capture tobacco consumption, religiosity and eating habits.

The literature shows that there is a negative association between cigarette smoking and weight status. This is the result of two factors: first, smokers have a different metabolic rate which means they burn more calories than non-smokers, and second, smokers tend to eat less because, as is well known, smoking has an appetite-suppressant effect.

We include *Cigarettes* as an ordinal variable that takes 3 possible values: 0 for a non-smoker, 1 if the individual smokes up to 10 cigarettes per day, and 2 if he/she smokes more than 10 cigarettes a day. We choose this approach in stead of the classic dichotomous variables smoker/not smoker because the level of tobacco consumption seems to matter in these grounds and not only the fact of smoking.

We consider that religiosity captures non-observable lifestyles, and also access to social networks. Having larger social networks provide financial, physical and emotional support, and may in turn have a causal effect on health. Beyond support, this social networks provide peer recognition or dis-

approval that influence negative behaviors such as overeating. The expected impact of this variable on obesity would be negative if religion gives an individual self-control or self-criticism (such as considering that gluttony is a sin, for example), and positive if religion operates as moral support after the problem (obesity) becomes manifest.

We used the binary variable *Religion*, which takes the value 1 if the person interviewed declared that religion was important or very important in his/her life.

Lastly, we come to eating habits. Although the questionnaire does not give clear information about diet that could affect the prevalence of hypertension, it does give data on the amount of daily meals. This information is very important since digestion has a thermic effect (more often an individual eats, the more calories are burned), and this has a bearing on obesity but not hypertension. We included the *Meals* binary variable – this takes the value 1 if the individual has 3 or more complete meals every day (including breakfast).

The descriptive statistics of all variables considered are given in Table 3.3

Results

Table 3.4 shows results of the bivariate probit estimations. We find a negative
and significant value of ρ, at the 10% level , which justifies estimating the two
outcomes jointly. The sign of this result was not what we expected since there
were a priori reasons to believe that unobservable factors that determine the
prevalence of obesity could affect hypertension in the same direction.

Table 3.3: DESCRIPTIVE STATISTICS

Variable	Mean	Variable	Mean
Hypertension	0.45	Initial	0.83
Obese	0.34	Sedentary	0.84
Woman	0.63	Drinker	0.26
Age	71	Meals	0.51
Age²	45.1	Cigarettes	0.25
Woman*age	5.08	Religion	0.51
Married	0.53	Public	0.32
Support	1.28	Depriva	0.42
Alone	0.19	Need_work	0.13
Socio_1	0.01	Money	0.45
Socio_2	0.01	Elementary	0.66

In spite of that, this result could be a consequence of opposed self-selection
mechanisms resulting from these unobservable factors, which is consistent
with other applications (Sturm and Wells, 2001 [20]; Baum et al, 2003 [1]).

Table 3.4: RESULTS OF BIVARIATE PROBIT

Variables	Hypertension	Obesity
Woman	-0.637	-0.292
	(0.834)	(0.943)
Age	0.241***	-0.011
	(0.094)	(0.087)
Age²	-1.750***	0.001
	(0.651)	(0.598)
Woman*age	0.006	0.014
	(0.012)	(0.013)
Married	0.070	-0.600
	(0.087)	(0.095)
Support	-0.041	0.053
	(0.053)	(0.057)
Alone	-0.022	-0.018
	(0.110)	(0.121)
Socio_1	-0.055	0.159***
	(0.050)	(0.049)
Socio_2	0.03	-0.017
	(0.043)	(0.048)
Inicial	-0.146	0.047
	(0.107)	(0.121)
Sedentary	0.163	0.08
	(0.115)	(0.121)
Drinker	-0.240***	-0.003
	(0.103)	(0.107)
Obese	1.387***	
	(0.295)	
Meals		-0.131*
		(0.073)
Cigarettes		-0.262***
		(0.076)
Religion		0.132*
		(0.071)
	-0.785*	
	(0.223)	
N	1019	

Note: Robust standard errors between brackets.
*,**,*** significant at the 10, 5, and 1% level respectively.

It also could be that for the elderly, unobserved factors common to obesity actually have a protective effect that may be correlated with reduced hypertension.[28] ρ can also be interpreted as the extent to which the troublesome explanator (obese) was correlated with the error term in the original

---

[28]We would like to thank the comments provided by an anonymous referee.

regression. It can be positive or negative, and determines whether the direction of two-stage least squares' bias will be positive or negative (Darlington, 2005 [8]).[29]

As to the relevance and validity of the instruments we employed, in the literature there is not a unique way for doing this kind of test. When it comes to the validity of the exclusion restrictions, in this study we choose to estimate 3 bivariate probit models that include two of the three instruments in the main equation (hypertension), and we tested the joint significance of the two instruments with a Wald test. In all cases we were not able to reject the null hypothesis of zero coefficients for the two variables at the 99% level, and this led us to the conclusion that these variables are not directly associated with hypertension, so we were correct to exclude them from the equation. On the other hand, the relevance of the instruments was contrasted by testing their joint significance in the Obese equation, and in this the null hypothesis was rejected at the 99% level. [30]As regards the instruments' signs in the Obese equation, we find a negative association with Meals, which is

---

[29]Marginal effect computed as the change in the marginal probability of suffering from hypertension given a discrete change in the obese variable from 0 to 1.The remaining variables at the mean

[30]The $\chi^2(3)$ statistic on the joint significance Wald test of the 3 variables is 18.26. As regards the validity of the exclusion restrictions, the values of the same statistics were 0.75, 3.14 and 3.25 for the models that excluded from the hypertension equation only *Cigarettes*, *Religion* and *Meals*, respectively.

consistent with the thermic effect mentioned in the literature, and also with Cigarettes, which confirms either that tobacco has an appetite-suppressant effect or that the metabolism of smokers tends to produce a reduction in body mass. The positive sign of Religion may reflect the fact that it works as a support mechanism once the problem of obesity has become manifest rather than as a self-control or self-criticism mechanism.

In Table 3.5 we present the results of both IV probits together with a naïve probit for comparison reasons.

As to the coefficient signs, it is important that the *Socio_1* factor has a positive sign in the probit estimation and negative in both IV probits. This could be because the negative effects of a worse socio-economic status might work through nutritional outcomes, which seems likely when we consider that the coefficient of this variable is positive and significant in the BMI equation and also in the *Obese* equation (see Table 3.6).

Age and Age^2 show a non-linear effect of age on hypertension but not on obesity or BMI (it is not significant). This could be because of a selection problem since individuals who live longer are usually healthier, so one would expect the older people in the sample to be healthier.

Table 3.5: Results of Estimations

Variables	Naïve probit	IV Probit	IV Probit (BMI) Hypertension	Obese
Woman	-0.829	-0.562	-0.625	-0.407
	(0.937)	(0.872)	(-1.088)	-4.368
Age	0.289***	0.249**	0.259**	0.271
	(0.094)	(0.098)	(0.111)	(0.424)
Age²	-2.146***	-1.804***	-1.876**	-2.173
	(0.646)	(0.688)	(0.764)	-2.894
Woman*age	0.013	0.006	0.003	0.068
	(0.013)	(0.013)	(0.016)	(0.061)
Married	0.037	0.070	0.074	-0.177
	(0.096)	(0.089)	(0.112)	(0.465)
Support	-0.025	-0.040	-0.088	0.527*
	(0.056)	(0.052)	(0.076)	(0.272)
Alone	-0.030	-0.026	-0.038	-0.015
	(0.116)	(0.109)	(0.137)	(0.567)
Socio_1	0.024	-0.050	-0.115	0.996***
	(0.047)	(0.054)	(0.098)	(0.229)
Socio_2	0.033	0.031	0.044	-0.106
	(0.048)	(0.045)	(0.056)	(0.232)
Inicial	-0.145	-0.150	-0.256*	0.792
	(0.115)	(0.109)	(0.146)	(0.561)
Sedentary	0.257**	0.165	0.176	0.513
	(0.116)	(0.121)	(0.142)	(0.559)
Drinker	-0.286***	-0.242**	-0.380***	0.534
	(0.104)	(0.109)	(0.129)	(0.501)
Obese	0.168**	1.367***		
	(0.088)	(0.480)		
BMI			0.138*	
			(0.076)	
Marginal effect	0.067	0.503	0.138	
Meals	-0.044			-0.958**
	(0.082)			(0.400)
Cigarettes	-0.242***			-0.577
	(0.081)			(0.382)
Religion	0.044			0.560*
	(0.066)			(0.322)
Wald test of exogeneity P>|z|		0.061	0.046	
ALN p-value			0.118	
LR / Wald χ²	60.60	86.96	35.72	
Prob > χ²	0.000	0.000	0.001	
F (15, 1003)				9.83
Prob > F				0.000
N	1285	1019	1019	

Note: Robust standard errors between brckets. *,**,*** significant at the 10, 5 and 1% level respectively. Marginal effect computed as the change in the marginal probability of suffering from hypertension given a discrete change in the obese variable from 0 to 1. The remaining variables at the mean.

On the other hand, Drinker shows a negative and highly significant result. This is consistent with the epidemiological literature, which indicates that moderate consumption of some alcoholic drinks reduces the probability of suffering from some cardiac conditions and hypertension.

Lastly, it is important to comment on the effect of the main variables of interest, *Obese* and *BMI*. The estimation procedure that does not account

for endogeneity (naïve probit) shows an underestimation of the effect of obesity on hypertension. With an associated coefficient and a corresponding marginal effect (0.168 and 0.067, respectively) that are lower than the ones presented in the IV probit estimations.

Table 3.6: 1ST STAGE PROBIT

Variables	Obesity
Woman	-0.292
	(0.943)
Age	-0.011
	(0.087)
Age²	0.001
	(0.598)
Woman*age	0.014
	(0.013)
Married	-0.600
	(0.095)
Support	0.053
	(0.057)
Alone	-0.018
	(0.121)
Socio_1	0.159***
	(0.049)
Socio_2	-0.017
	(0.048)
Inicial	0.047
	(0.121)
Sedentary	0.08
	(0.121)
Drinker	-0.003
	(0.107)
Meals	-0.131*
	(0.073)
Cigarettes	-0.262***
	(0.076)
Religion	0.132*
	(0.071)
Wald $\chi^2(15)$	87.62
Prob > χ^2	0.00
Note: Robust standard errors between brackets. *, **, *** significant at the 10, 5 and 1% level respectively.	

The marginal effect associated with obesity in the IV probit estimation is of 50 percentage points. This result means that an average individual (for

102

whom all variables except BMI are at the mean) who has a BMI greater than or equal to 30 kg/m2 has a probability of suffering from hypertension of around 90%. This marginal effect is outstanding when we compare it with the one we found in the naïve probit estimation, which was lower than 10 percentage points.

Another important finding is the significant results when we use BMI itself as a measure of overweight. The associated coefficient is positive and significant as we expected, with a corresponding marginal effect of 13 percentage points, indicating that even a slight degree of overweight affects the probability of suffering from hypertension. In the case of this model, we present the value of the chi-squared statistic of the Amemiya-Lee-Newey (ALN) test of overidentifying restrictions. The null hypothesis of this test establishes that the excluded instruments are valid, which cannot be rejected.

Conclusion

In Uruguay, like in the rest of Latin America and the Caribbean, the population is ageing. This calls for specific public policies that are specially designed for the 60 and over age group and that cater to people suffering

from the chronic ailments that come with longevity.

Most researchers consider indicators of chronic diseases to be more objective, and prefer these as indicators of non-observable individual health. The aim of this study is to make a contribution to the analysis of the effect of obesity and socio-economic status on hypertension, which is the most common chronic illness among the elderly in Latin America, proving a model that accounts for the potential endogeneity of this kind of phenomena. Also, it is our intention to better understand the underlying causes of obesity as an illness itself.

Using a survey carried out by the Health Well-being and Ageing program in Montevideo in 2001 (SABE, PAHO/WHO), we estimated the probability of suffering from hypertension. We used a bivariate probit to test the potential endogeneity of obesity, finding that the existence of hypertension is endogenously determined with obesity. To take this into account, we proceed with an IV probit and present the corrected coefficients and marginal effects of interest.

Our results confirm that jointly estimating the probability of being obese and hyper tense is a suitable approach as there are unobservable and omitted factors that determine both outcomes at the same time. Through the use of

104

an IV probit we came to the conclusion that being obese raises the probability of older adults being hyper tense by 50 percentage points, while in the naïve model this marginal effect was substantially lower. Our findings also evidence that even a slight degree of overweight represent a risk factor, since we find a substantial and significant marginal effect in the model that uses BMI instead of the dichotomous indicator.

Furthermore, instruments that capture smoking, religiosity and eating habits turned out to be valid and relevant in the estimation, and their coefficients had the signs we expected. Tobacco consumption reduces the probability of being obese, which indicates either that smokers have different metabolic rates that make them burn more calories or that the well-known appetite-suppressant effect of smoking is in operation. We also found that there is a positive association between obesity and the fact that religion is important or very important in the person's life. This may be because religion works as a support mechanism once the obesity problem is manifest rather than as a mechanism of self-criticism or self-control. Lastly, we confirmed that digestion has a "thermic-effect" since the Meals variable coefficient in the obese equation is negative and significant.

Based on our findings, we conclude that public health policies should tar-

get obesity as a disease, because of its implications in other chronic diseases. In particular, hypertension is a major cause of heart failure and stroke, what makes it very difficult to estimate the indirect costs of obesity in the region. That is why an effort to tackle the causes of sedentary lifestyles and unhealthy eating behaviors, which redound to obesity, will pay-off in the sense of reduced public health care costs and better health conditions of the population, especially of older adults.

In this study we did not find a significant association among the elderly between poor health, measured by the presence of chronic hypertension, and a low socio-economic situation. The variable that captures socio-economic status is positive and significant in the obese equation, and the negative effects it has on health status may work through nutritional outcomes. On the other hand, a selection bias might be operating here in that people from lower socio-economic strata have a higher probability of early death (the survival effect), and the public provision of health services with an emphasis on the elderly tends to reduce the gap between purchasing power and access to healthcare services.

References

[1] Baum C.F., Schaffer M.E., Stillman, S., (2003): "Instrumental Variables and GMM: Estimation and Testing", The Stata Journal.

[2] Bhattacharya J, Bundorf MK. The Incidence of the healthcare costs of obesity, *NBER* 2005*;* WP **11303**.

[3] Bhattacharya J, Goldman D, McCaffrey D. Estimating probit models with self-selected treatments, *Statist Med* 2006; **25**: 389–413.

[4] Blanchflower D, Oswald A. Hypertension and hapiness across nations, *Institute for the Study of Labor* 2007*;* IZA **2633**.

[5] Cawley J, Burkhauser R. Beyond BMI: the value of more accurate measures of fatness and obesity in social science research. *NBER* 2006; WP **12291**.

[6] Costa-Font J, Gil J. Obesity and the incidence of chronic diseases: a seemingly unrelated probit approach, *Econ Human Biology* 2005; **3**(2): 188-214.

[7] Cutler DM, Glaeser EL, Shapiro JM. Why have Americans become obese?.*J Econ Perspect* 2003; **17**(3): 93-118.

[8] Darlington R. Factor Analysis. *University at Albany, State University of New York* 2005; working paper.

[9] Drumond F.Obesity and central obesity in elderly people in Latin America and the Caribbean: are we fat?". *University of Wisconsin, Department of Sociology*, WP 2004.

[10] Fabbri D, Monfardini C, Radice R. Testing exogeneity in the bivariate probit model: Monte Carlo evidence and an application to health economics. *Department of Economics, University of Bologna, Italy*, 2004.

[11] Himes CL. Obesity, disease, and functional limitation in later life. *Demography* 2000; **37**(1): 73-82.

[12] McGinnis JM, Foege WH. Actual causes of death in the United States, *JAMA* 1993; **270**: 2207-2212.

[13] Morris S, Gravelle H. GP supply and obesity. *Centre for Health Economics, University of York* 2006; Research Paper **13**.

[14] Murray M. Avoiding invalid instruments and coping with weak instruments. *J Econ Perspect* 2006; **20**(4): 111-132.

[15] Pascual M, Cantarero D. Desigualdades en salud por comunidades autónomas: un estudio empírico con el PHOGUE y la ENS, *XIII Encuentro de Economía Pública* 2006.

[16] Pan American Health Organization (PAHO). Division of Health Promotion and Protection. Survey on health well-being and ageing 2001; http//www.paho.org/Spanish/HDP/HDR/CAIS-01-05.PDF; http://www.ssc.wisc.edu/sabe.

[17] Rashad I. Structural estimation of caloric intake, exercise, smoking and obesity. Quarterly Rev Econ Fin 2006; **46**(2): 268-283.

[18] Rashad I, Grossman M, Chou S. The supersize of America: an economic estimation of body mass index and obesity in adults. *Eastern Econ J* 2005: **32**(1): 133-148.

[19] Revista Argentina de Cardiología. Comisión de Obesidad. Consenso SAC 2001; **69** suplemento 3**.**

[20] Sturm R, Wells KB. Does obesity contribute as much to morbidity as poverty or smoking?, *Public Health* 2001*;* **115**: 229-236.

[21] United States Department of Health and Human Services, Public Health Service, Office of the Surgeon General [USDHHS]. The Surgeon General's call to action to prevent and decrease overweight and obesity 2001. Rockville, MD: Author.

[22] World Health Organization (WHO). Global strategy on diet, physical activity and health. 2004; http://www.who.int/dietphysicalactivity/media/en/gsfs_obesity.pdf (accessed July, 2006).

[23] Wolf AM, Colditz GA. Current estimates of the economic cost of obesity in the United States, *Obes Res* 1998; **6**: 97-106.

[24] Wooldridge JM. **Econometric Analysis of Cross Section and Panel Data.** The MIT Press, Cambridge, England 2002.

Conclusiones generales

Las estadísticas vitales del Uruguay lo hacen comparable a países desarrollados: bajas tasas globales de fecundidad (2.1), bajas tasas brutas de natalidad (15 por mil), alta esperanza de vida al nacer (76 años promedio poblacional) y bajas tasas brutas de mortalidad (9 por mil promedio general, infantil 11 por mil). Sin embargo, esos indicadores globales encubren condiciones deficitarias de la reproducción biológica y social del país, como ser: mayores tasas de fecundidad a menor nivel educativo y socioeconómico, alto porcentaje de hijos de madres adolescentes, casi la mitad de los niños menores de seis años perteneciendo a un hogar pobre, y teniendo un proceso de envejecimiento de la población, que ha convertido al Uruguay en el país más envejecido del hemisferio. El proceso de envejecimiento afecta no sólo a los adultos mayores sino también a la población joven a través de los sistemas de seguridad social, mercados laborales, transferencias intergeneracionales, distribución del ingreso, etc.

Los artículos presentados analizan diferentes comportamientos de salud, encontrando sistemáticamente el gradiente de educación.

En el primer caso, ante la conducta de iniciación sexual se observa que la probabilidad de que una mujer joven tenga relaciones sexuales (utilizando métodos anticonceptivos o no) antes de los 20 años es 93.35%, mientras que la de iniciarse utilizando algún método anticonceptivo es 77.71%. A su vez, la mayoría de las jóvenes uruguayas deciden iniciarse con su pareja y utilizando condón, método que implica un acuerdo entre partes. Los resultados muestran que si la mujer obtiene información en el sistema educativo reduce la probabilidad de iniciarse sin utilizar métodos anticonceptivos en 12 puntos porcentuales. Lo anterior es complementario con el hallazgo de que una mujer que tiene un nivel educativo adecuado para la edad, tiene 8 puntos porcentuales más de probabilidad de iniciarse cuidándose. Por otra parte, el obtener información en el sistema de salud aumenta la probabilidad de iniciarse utilizando algún método en 6 puntos porcentuales, y apenas en 1 punto porcentual en iniciarse sin utilizar métodos. Finalmente, destaca el impacto de la madre de la joven, tanto su educación como su experiencia reproductiva. De hecho, aumenta la probabilidad de que la joven se inicie cuidándose en 7.4 puntos porcentuales si la madre tiene educación secundaria, y en 14 puntos porcentuales si ésta tuvo su primer hijo en la adolescencia.

Por lo tanto, y con énfasis en las derivaciones de política, resalta que

el brindar información, y en especial a través del sistema educativo, reduce sustancialmente la probabilidad de llevar a cabo conductas sexuales riesgosas (iniciarse sin utilizar ningún método anticonceptivo). La información obtenida en el sistema salud, a pesar de poder estar sesgada por problemas de endogeneidad, muestra que al menos es efectiva, ya que las mujeres que la obtienen tienen más probabilidad de iniciarse utilizando algún método. Por otra parte, se observa un alto impacto de la madre en las conductas actuales de la joven, aumentando la probabilidad de iniciarse (ya sea cuidándose o no) para aquellas jóvenes hijas de madres que lo fueron por primera vez en la adolescencia. En el mismo sentido, el pertenecer a un hogar con alto nivel educativo aumenta la probabilidad de que la mujer se inicie, pero aun más que lo haga cuidándose.

Al analizar el comportamiento materno durante el embarazo, se encuentra que más del 20% de las mujeres en Uruguay realiza controles prenatales inadecuados (iniciación tardía y/o bajo nivel de uso) a pesar de ser gratuitos. El primer hallazgo relevante, es que los mismos son endógenos al proceso de nacimiento, por lo que estimaciones que no controlen por esta característica subestiman el efecto marginal en casi todo el rango del insumo, siendo mayor el sesgo por endogeneidad a menores tasas de uso. En este sentido, las sim-

ulaciones permiten afirmar que el beneficio marginal de iniciar los cuidados prenatales en el último mes de embarazo con respecto a no iniciarlos es de 107 g. Con la excepción de la educación, los insumos de salud entran en la función de peso al nacer de una manera no lineal: un incremento en el índice de masa corporal de la madre, su paridad, o edad aumentan el peso al nacer a una tasa decreciente, mientras que un incremento en cigarros lleva a una caída en el peso al nacer a una tasa creciente. Por lo tanto, cero costos de bolsillo no han inducido a todas las mujeres pobres a iniciar los cuidados prenatales. Si los hacedores de política desean disminuir el costo de la obtención de cuidados prenatales para las mujeres pobres, deberían considerar los costos no asociados con el precio, como ser costos de transporte, de espera y otros costos de oportunidad. También deberían investigar caminos alternativos para informar a las mujeres sobre los beneficios de los controles prenatales en la salud de sus hijos.

A efectos de profundizar este estudio, se incluyeron en la función de producción del peso al nacer factores de riesgos (epidemiológicos, fetales y maternos), a ser controlados especialmente en las visitas prenatales, tales como edades extremas de la madre, corto período intergenésico, antecedentes de niños con bajo peso, óbitos o abortos previos, amenaza de parto prematuro,

114

malformaciones e infecciones connótales, estados hipertensivos del embarazo, diabetes, tabaquismo, hemorragias del tercer trimestre y anemia crónica. Los mismos pueden considerarse como una aproximación a la dotación genética de la salud de la madre, variable que, en general, es no observada o no medida, por lo que su inclusión permite reducir los sesgos de endogeneidad de las variables que sí son insumos de la función de producción, y en las cuales existe interés para el diseño de la política pública.Los resultados muestran que la mayoría de los factores de riesgo incluidos son significativos predictores, tanto del peso al nacer como del bajo peso al nacer. Aquellos que pueden ser influidos por políticas públicas (uso de cuidados prenatales y educación) tienen un efecto significativo en el peso al nacer; sin embargo, también lo tienen los factores de riesgo epidemiológicos. Por tanto, es importante incrementar la utilización adecuada de los controles prenatales y la educación materna, pero también lo es para los hacedores de política considerar caminos que reduzcan la ocurrencia de ciertos factores de riesgo epidemiológicos "evitables", como el hábito de fumar de la madre, los cortos períodos interembarazos y las edades extremas de la madre.

Finalmente, el tercer artículo haciendo hincapié en los adultos mayores, se detiene en un grupo etario que tiene requerimientos ineludibles en políticas

específicas de salud, de educación, programas de servicios sociales y servicios médicos que atiendan las condiciones crónicas que acompañan la longevidad. En el mismo se brinda cierta evidencia acerca de preferencias intertemporales en la eleccion de salud, ya que conductas de autocontrol, observadas a través del índice de masa corporal como indicador estructural de la dieta llevada acabo por el individuo, determinan la salud en el largo plazo, medida a través de la enfermedad crónica de mayor prevalencia, la hipertensión. El hecho de ser obeso aumenta la probabilidad de que un adulto mayor sea hipertenso en 50 puntos porcentuales, incluso un pequeño grado de sobrepeso representa un factor de riesgo, ya que se encuentra un efecto marginal significativo y sustancial en el modelo que utiliza el índice de masa corporal en lugar del indicador binario. Sin embargo, el 35% de los adultos mayores montevideanos son obesos y el 45% declara habérsele diagnosticado hipertensión. Este tipo de comportamiento está influenciado por el riesgo y la efectividad percibidas del comportamiento en salud. El consumo de tabaco reduce la probabilidad de ser obeso, mostrando o bien que los fumadores poseen un metabolismo diferente lo cual los lleva a quemar una mayor cantidad de calorías que los no fumadores, o bien que se da el reconocido efecto supresor del apetito del tabaco. En segundo lugar, se encuentra una asociación positiva entre

obesidad y el hecho que la religión sea importante para el individuo, lo cual podría mostrar que la misma opera como contención o apoyo una vez presente el problema más que como un mecanismo de autocontrol o censura. Por último, se confirma el "efecto térmico" hallado en la literatura, en el sentido que cuantas más comidas se realizan al día menor es la probabilidad de ser obeso.

Sin embargo, no se encuentra una asociación significativa entre pobre salud, medida a través de la morbilidad (presencia de la enfermedad crónica hipertensión) y bajo nivel socioeconómico en los grupos de edades avanzadas. Los efectos negativos sobre la salud de una peor situación socioeconómica podrían estar operando a través de los logros nutricionales. Por otra parte, también podrían existir sesgos de selección, el sentido que los individuos de estratos bajos tienen mayor probabilidad de morir antes (efecto sobrevivencia), y además la provisión pública de servicios de salud con énfasis en el adulto mayor, reducen las brechas entre capacidad de pago y acceso a los cuidados de salud.

Resúmenes

1 Decisión sobre iniciación sexual: caso de adolescentes uruguayas, Patricia Triunfo

En los últimos años ha aumentado la discusión pública acerca de la importancia de los comportamientos sexuales riesgosos, en particular debido a la epidemia del HIV/SIDA, a la alta prevalencia de otras enfermedades de trasmisión sexual (ETS, tales como clamydia y gonorrea), y a las elevadas tasas de embarazo no deseado.

Esta problemática cobra especial importancia en los adolescentes y jóvenes, para los cuales el riesgo de contraer ETS y tener embarazos no deseados es significativamente mayor que en el resto de los tramos etarios, pudiendo generar abortos clandestinos –en países donde es ilegal-, mayor morbilidad y mortalidad de la madre y el niño. Además puede provocar efectos futuros, tales como truncamiento de oportunidades educativas, y menores niveles de ingreso familiar futuro.

En el caso del Uruguay, país donde es ilegal el aborto, entre 1963 y 1996 se dio un crecimiento de la fecundidad adolescente (33% para las mujeres entre 15 y 19 años, y 66% para las mujeres entre 10 y 14 años) y un descenso sostenido de la reproducción en las mujeres de 20 a 29 años, aumentando la contribución de las adolescentes a la tasa de fecundidad total. Entre 1996 y 2004, a pesar de disminuir la tasa de fecundidad adolescente (15 a 19) en un 16%, se mantiene el aporte que estas tienen en la fecundidad total. En este sentido, el aumento que ha tenido la fecundidad adolescente en los últimos 50 años, es destacado por los demógrafos como el cambio más importante en el comportamiento reproductivo de las mujeres, siendo el principal responsable del mantenimiento del nivel de reproducción del país, en particular hasta mediados de los noventa.

Diferentes marcos analíticos, que incluyen enfoques epidemiológicos, psicológicos y sociológicos, han intentado establecer determinantes causales en dichos comportamientos sexuales. En este trabajo se realiza una aproximación empírica al comportamiento de iniciación sexual de las mujeres que tuvieron su primera relación antes de los 20 años, teniendo especial énfasis en los determinantes económicos del mismo, y en particular en aquellos que pueden ser alterados a través de políticas públicas.

A estos efectos se utiliza la Encuesta de Reproducción Biológica y Social de la Población Uruguaya: una aproximación desde la perspectiva de género y generaciones (GGS), realizada en el marco del Proyecto Género y Generaciones (Programa Población del Fondo de las Naciones Unidas) entre setiembre y diciembre de 2004.

El comportamiento sexual seguido por una adolescente puede derivar en diferentes resultados, como ser tener o no relaciones sexuales, y en el caso de

tenerlas usando o no métodos anticonceptivos. Por este motivo, en este trabajo se opta por especificar un modelo *logit* multinomial, el cual supone la independencia de las alternativas irrelevantes, esto es, que la probabilidad relativa solo depende de las alternativas especificadas y no de cualquier otra disponible.

Respecto a los datos utilizados, dado que el objetivo de este trabajo es estudiar el comportamiento sexual de las mujeres adolescentes (15 a 19 años), se opta por incorporar además las experiencias de las mujeres de 20 a 24, para tener un panorama más amplio de las tendencias de este comportamiento en el correr de diez años. La muestra seleccionada de la Encuesta GGS indica que el 72% de las mujeres menores de 24 años se iniciaron antes de los 20 años, el 14% lo hizo sin usar ningún método anticonceptivo, a la vez que de usar, una amplia mayoría opta por el condón (95%), y el 94% declara haberse iniciado con su pareja estable (novio, esposo, compañero).

En cuanto a las variables independientes, hay que destacar que la mayoría de las preguntas realizadas refieren a la situación actual de la joven, por ejemplo, ocupación, educación, situación conyugal, información sobre métodos antinconceptivos, ETS, etc. De todas formas se entiende que muchas de estas variables son una buena aproximación a su situación en el momento de la iniación sexual, debido a la proximidad temporal o porque son características de tipo estructural.

Se consideran variables personales, tales como edad, educación, religión, y lugar de residencia; variables relacionadas, tales como si la joven es hija de una madre que lo fue por primera vez en la adolescencia, la disponibilidad de información, y la posibilidad que tiene de hablar de asuntos íntimos; y variables socioeconómicas, como ser, si es trabajadora, carencia de bienes en el hogar, estructura y nivel educativo del hogar.

Los resultados muestran que las alternativas que tiene la joven (no tener relaciones sexuales con hombres, haberse iniciado sexualmente sin utilizar un método anticonceptivo o haberse iniciado utilizando algún método) son pertinentes y excluyentes.

En segundo lugar, la prueba conjunta de que todos los coeficientes sean iguales entre las dos últimas alternativas es rechazada, no apareciendo como adecuada la estimación a través de un modelo logit. Sin embargo, no es posible rechazar la hipótesis que algunos coeficientes de variables sean iguales, por lo que se imponen dichas restricciones en la estimación.En base a esta estimación, es posible afirmar que la probabilidad de que una mujer joven tenga relaciones sexuales (utilizando métodos anticonceptivos o no) antes de los 20 años es 93.35%, mientras que la de iniciarse utilizando algún método anticonceptivo es 77.71%.

Centrándonos en la magnitud de los efectos marginales, destaca el hecho de que si la mujer obtiene información en el sistema educativo reduce la probabilidad de iniciarse sin utilizar métodos anticonceptivos en 12 puntos porcentuales, lo cual tiene implicaciones para el diseño de políticas públicas. Lo anterior es complementario con el hallazgo de que una mujer que tiene un nivel educativo adecuado para la edad, tiene 8 puntos porcentuales más de probabilidad de iniciarse cuidándose. Por otra parte, el obtener información en el sistema de salud aumenta la probabilidad de iniciarse utilizando algún método en 6 puntos porcentuales, y apenas en 1 punto porcentual en iniciarse sin utilizar métodos.

Finalmente, debido a la alta cantidad de no respuestas, se estima un segundo modelo que no considera la situación marital de los padres cuando la joven entrevistada era adolescente. Los resultados muestran tres cambios relevantes respecto al modelo anterior. En primer lugar, la educación secundaria de la madre ahora es significativa y positiva, con un efecto marginal que muestra que las jóvenes hijas de madres con secundaria completa tienen 7.4 puntos porcentuales más de probabilidad de iniciarse cuidándose que de no iniciarse. En segundo lugar, se duplica el impacto de tener una madre que tuvo su primer hijo en la adolescencia, en particular en la probabilidad de iniciarse y cuidarse (14 puntos porcentuales). Por último, el obtener información a través del sistema educativo ahora tiene un impacto negativo, reduciendo la probabilidad que la mujer se inicie respecto a no hacerlo, aunque el mayor efecto marginal corresponde a iniciarse sin cuidarse (-9 puntos porcentuales).

Por lo tanto, y con énfasis en las derivaciones de política, resalta que el brindar información, y en especial a través del sistema educativo, reduce sustancialmente la probabilidad de llevar a cabo conductas sexuales riesgosas (iniciarse sin utilizar ningún método anticonceptivo). La información obtenida en el sistema salud, a pesar de poder estar sesgada por problemas de endogeneidad, muestra que al menos es efectiva, ya que las mujeres que la obtienen tienen más probabilidad de iniciarse utilizando algún método.

Por otra parte, se observa un alto impacto de la madre en las conductas actuales de la joven, aumentando la probabilidad de iniciarse (ya sea cuidándose o no) para aquellas jóvenes hijas de madres que lo fueron por primera vez en la adolescencia. En el mismo sentido, el pertenecer a un hogar con alto nivel educativo aumenta la probabilidad de que la mujer se inicie, pero aun más que lo haga cuidándose.

2 Impacto de los cuidados prenatales en el peso al nacer: el caso del Uruguay, R. Todd Jewell y Patricia Triunfo

Estudios empíricos indican que la expansión en el uso del cuidado prenatal lleva a incrementos en el peso al nacer, comúnmente usado como aproximación de la salud del niño. Desafortunadamente, la estimación de la relación entre peso al nacer y cuidado prenatal es problemática, ya que las medidas de los cuidados prenatales son endógenas si existen factores inobservables que determinan el comportamiento de la madre, así como el peso al nacer del niño. Al no tomar en cuenta la endogeneidad, generalmente se subestima el impacto positivo del cuidado prenatal en el peso al nacer.

Gran parte de la investigación existente ha usado datos para Estados Unidos, pero los resultados no son fácilmente generalizables a países de menor desarrollo, como ser Uruguay. De hecho, existen bien documentadas diferencias en el peso al nacer por raza, etnia y origen geográfico, diferencias que se mantienen incluso luego de controlar por los factores económicos, sociales, demográficos e institucionales, lo que implica que las medidas de raza y etnia contienen información acerca de factores inobservables que afectan el peso al nacer, como ser la genética, la cultura, o la experiencia de vida. Más aún, los niveles de ingreso están altamente relacionados con el peso al nacer, y los Estados Unidos tienen una distribución del ingreso significativamente diferente a la de los países en desarrollo. De hecho, el PIB per cápita de Estados Unidos para el 2005 fue $41,800, mientras que en Uruguay fue tan solo $9,600.

El presente estudio analiza los cuidados prenatales y peso al nacer de los nacimientos ocurridos en la principal maternidad de Uruguay, el Centro Hospitalario Pereira Rossell, entre 1995 y 2003. Los datos recogidos por el Sistema Informático Perinatal (SIP), administrado por el Centro de Perinatología y Desarrollo Humano (CLAPDH-OPS/OMS), son únicos, dado que representan una población urbana de mujeres que tuvieron un hijo en un hospital público universitario que provee cuidados prenatales y obstétricos en forma gratuita.

La muestra seleccionada es de 32,795 nacimientos de gestaciones de término de feto único, y de madres entre 16 y 42 años.

A través de mínimos cuadrados en dos etapas se estima una función de producción del peso al nacer, concentrándonos en el efecto del insumo cuidados prenatales, sobre el producto peso al nacer y controlando por la endogeneidad de este insumo.

La variable dependiente, peso al nacer, es una variable continua medida en gramos, la cual depende de un vector de insumos de salud de la madre del niño, tales como: cuidados prenatales, medidos a través del mes de iniciación, variable lineal de 1 a 10, donde un número mayor implica una iniciación más tardía; IMC, índice de masa corporal de la madre basado en el peso pre-embarazo; paridad, variable que indica el número de nacimientos previos, edad de la madre en el momento del nacimiento; educación, variable continua de 1 (sin educación formal) a 6 (universidad incompleta o completa); y cigarros fumados por día

durante el embarazo. A pesar que el sexo del recién nacido, está fuera de control de las madres, y no es estrictamente un "insumo" en el proceso productivo, se incorpora la variable binaria varón, debido a que se ha encontrado que las mujeres normalmente pesan menos que los hombres. A su vez, se incorpora si la madre tuvo al menos un nacimiento previo de un hijo con bajo peso al nacer, y año, variable lineal de tendencia temporal que indica el año de nacimiento.

El procedimiento de mínimos cuadrados ordinarios en dos etapas (MC2E) involucra en una primera etapa una regresión de mes de iniciación sobre todas las variables exógenos más la variable de exclusión, estado civil. El mismo es considerado como instrumento, debido a que las mujeres casadas o con uniones estables es más común que planifiquen los embarazos y que inviertan en la salud de los niños, pero el estado civil por sí mismo no contribuye directamente en el peso al nacer del recién nacido. Además, el estado civil puede ser una medida del activo del hogar, ya que las mujeres casadas deberían tener acceso a mayores ingresos o riqueza que otras.

El efecto marginal de la estimación por mínimos cuadrados ordinarios (MCO) muestra que iniciar los cuidados prenatales un mes antes incrementa el peso al nacer en 23.5 gramos, mientras que el efecto estimado por MC2E es de 57.3 gramos. Por lo tanto, las estimaciones MCO subestiman el impacto de los cuidados prenatales en el peso al nacer en las mujeres pobres del Uruguay en más de un 50%. Sin embargo, dado un peso al nacer promedio de 3244 g, aún las estimaciones MCO muestran un efecto relativamente pequeño del incremento en el uso de los cuidados prenatales.

Con la excepción de educación los insumos de salud entran en la función de peso al nacer de una manera no lineal: un incremento en el IMC, paridad, o edad aumentan el peso al nacer a una tasa decreciente, mientras que un incremento en cigarros lleva a una caída en el peso al nacer a una tasa creciente. Como era de esperarse el peso de los bebés varones es consistentemente mayor que el de las niñas, y la existencia de un hijo con bajo peso al nacer previo está correlacionada con un bajo peso actual. Interesantemente el peso al nacer aparece como decreciente en el tiempo, debiendo las autoridades de salud pública investigar mejor esta tendencia.

Al simular la función de producción entera para el peso al nacer como función del cuidado prenatal, se observa que el procedimiento MCO subestima el rango del impacto del cuidado prenatal sobre el peso al nacer. Las simulaciones MCO resultan en una caída en el peso al nacer promedio desde 3352 hasta 3140 g si la iniciación del cuidado prenatal varía desde el primer mes de embarazo hasta la no iniciación. En contraste, las simulaciones MC2E resultan en una caída mayor del peso al nacer promedio, desde 3378 hasta 2872 g. Por lo tanto, una mujer que decide iniciar los cuidados prenatales en el primer mes con respecto a no iniciarlos nunca, puede esperar una ganancia en 506 g en el peso al nacer de su hijo, más del doble de la ganancia esperada estimada por MCO.

Las simulaciones también permiten evaluar la productividad marginal del cuidado prenatal para cada nivel de uso. En ese sentido, el efecto marginal del cuidado prenatal de las estimaciones MC2E es más alto a iniciaciones más tardías, implicando que estas mujeres tienen mayores ganancias al incrementar

el uso de cuidados prenatales. El beneficio marginal de incidir los cuidados prenatales en el último mes de embarazo con respecto a no iniciarlos es de 107 g, en comparación con la media que es de 57 g. A su vez, es posible afirmar que MCO subestima el efecto marginal en casi todo el rango del insumo, siendo mayor el sesgo por endogeneidad a menores tasas de uso de cuidados prenatales.

Por lo tanto, cero costos de bolsillo no han inducido a todas las mujeres pobres a iniciar los cuidados prenatales, a pesar de que las simulaciones de este trabajo aportan evidencia de que el mayor efecto marginal del incremento en el uso de cuidados prenatales se encuentra a bajos niveles de uso. Si los hacedores de política uruguayos desean disminuir el costo de la obtención de cuidados prenatales para las mujeres pobres, deberían considerar los costos no asociados con el precio, como ser costos de transporte, de espera y otros costos de oportunidad. También deberían investigar caminos alternativos para informar a las mujeres sobre los beneficios de los controles prenatales en la salud de sus hijos.

3 Obesidad e hipertensión en los adultos mayores uruguayos, Juan Pablo Pagano, Máximo Rossi y Patricia Triunfo

El alarmante incremento que en las últimas décadas ha mostrado la prevalencia del sobrepeso y de la obesidad como fenómeno de trascendencia global, ha puesto a los problemas relacionados con dichos fenómenos en un primer plano de las políticas de salud pública. La incidencia de la obesidad en la población adulta mundial se calcula en unos 300 millones de personas (5%), habiendo un total de 1000 millones con problemas de sobrepeso (15%).

A su vez, en Uruguay, al igual que en el resto de los países de América Latina y el Caribe, se ha dado un proceso de envejecimiento de su población, lo cual implicará requerimientos ineludibles en políticas específicas de salud para el grupo etario de 60 años y más, en particular aquellas que atiendan las condiciones crónicas que acompañan la longevidad.

Las enfermedades crónicas son consideradas por muchos investigadores como más objetivas y preferibles como indicador de salud no observable de los individuos. En este sentido, este trabajo pretende contribuir al análisis del impacto de la obesidad y del nivel socioeconómico en la hipertensión, enfermedad crónica de mayor prevalencia en los adultos mayores latinoamericanos.

A través de la utilización de la encuesta realizada en el marco del Proyecto de Salud, Bienestar y Envejecimiento en Montevideo en el año 2001 (SABE, OPS/OMS; MSP, 2001), se estudia el efecto de una excesiva masa corporal en la probabilidad de sufrir hipertensión, investigando si existen problemas de endogeneidad en los determinantes de ambos productos.

Al especificar los dos productos de interés, hipertensión y obeso, como variables binarias, se utiliza un modelo probit bivariado para detectar problemas de endogeneidad. El producto de salud de interés (hipertensión) es modelado a través de una regresión probit sobre un conjunto de variables exógenas y la variable potencialmente endógena (obeso); mientras que en una segunda ecuación se regresa la variable obeso sobre todas las variables exógenas de la primera ecuación más los instrumentos (hábito de fumar, religión y hábitos alimenticios), los cuales son excluidos de la ecuación de hipertensión por motivos de identificación.

Los resultados confirman que la estimación conjunta de la probabilidad de ser hipertenso y obeso, es una aproximación adecuada, ya que existen factores inobservables u omitidos que determinan ambos productos a la vez.

A efectos de corregir los coeficientes presentados se utiliza un modelo probit con variables instrumentales. Los resultados muestran que el ser obeso aumenta la probabilidad de que un adulto mayor sea hipertenso en 50 puntos porcentuales, incluso un pequeño grado de sobrepeso representa un factor de riesgo, ya que se encuentra un efecto marginal significativo y sustancial en el modelo que utiliza el IMC en lugar del indicador binario.

Los instrumentos elegidos (hábito de fumar, religión y hábitos alimenticios) son relevantes y válidos, teniendo los signos esperados. En este sentido, el

consumo de tabaco reduce la probabilidad de ser obeso, mostrando o bien que los fumadores poseen un metabolismo diferente lo cual los lleva a quemar una mayor cantidad de calorías que los no fumadores, o bien que se da el reconocido efecto supresor del apetito del tabaco. En segundo lugar, se encuentra una asociación positiva entre obesidad y el hecho que la religión sea importante para el individuo, lo cual podría mostrar que la misma opera como contención o apoyo una vez presente el problema más que como un mecanismo de autocontrol o censura. Por último, se confirma el "efecto térmico" hallado en la literatura, en el sentido que cuantas más comidas se realizan al día menor es la probabilidad de ser obeso.

En este trabajo no se encuentra una asociación significativa entre pobre salud, medida a través de la morbilidad (presencia de la enfermedad crónica hipertensión) y bajo nivel socioeconómico en los grupos de edades avanzadas. Dado que la variable que recoge el nivel socioeconómico es positiva y significativa en la ecuación de obeso, los efectos negativos sobre la salud de una peor situación socioeconómica podrían estar operando a través de los logros nutricionales. Por otra parte, también podrían existir sesgos de selección, en el sentido que los individuos de estratos bajos tienen mayor probabilidad de morir antes (efecto sobrevivencia), y además la provisión pública de servicios de salud con énfasis en el adulto mayor, reducen las brechas entre capacidad de pago y acceso a los cuidados de salud.