UNIVERSIDAD DE MURCIA

ESCUELA INTERNACIONAL DE DOCTORADO

TESIS DOCTORAL

Essays on maternal and child health, care and malnutrition in early childhood: Analysis from inequality and armed conflict in Colombia.

Ensayos de salud materno-infantil, cuidado y malnutrición en la primera infancia: Análisis desde la desigualdad y el conflicto armado en Colombia.

D. Gustavo Alfonso Romero Olmedo

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A mi esposa Elizabeth, por estar siempre al lado del timón. Motivadora y compañera incansable de mis sueños, desafíos y aprendizajes.

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Resumen

La equidad de género ha demostrado tener un impacto económico, ya que las disparidades en la distribución de beneficios sociales y económicos pueden afectar la participación y la productividad de la mitad de la población, lo que afecta la competitividad económica (Bertrand, 2020; Devadas & Kim, 2020; Miller et al., 2016; Pirela Rios et al., 2023). Los estudios de desigualdad social han mostrado que la pobreza y la desigualdad han disminuido en las últimas décadas gracias al crecimiento económico, pero aún existen desigualdades en términos de participación económica y acceso a servicios sociales (Gálvez, 2001; Instituto Peruano de Economía, 2023). Por lo tanto, la lucha contra la desigualdad social requiere no solo un crecimiento económico sostenido, sino también políticas que garanticen que los beneficios de este crecimiento se distribuyan equitativamente a toda la población. La desigualdad económica de género también puede verse afectada por la desigualdad en las políticas de cuidado infantil. Según la investigación específica, en las sociedades latinoamericanas, la responsabilidad principal de brindar atención recae en los hogares, especialmente en las mujeres. La desigualdad económica de género puede ser causada por la organización social del cuidado de niños y niñas pequeñas y la heterogeneidad estructural. La protección social se encuentra articulada con los rasgos de los mercados laborales, y las diferencias en la distribución de derechos y recursos económicos según la inserción en el mercado laboral pueden ser más pronunciadas en las mujeres que cuidan a menores (Alonso & Marzonetto, 2021; Casarico et al., 2023; Plomien, 2019).

La desigualdad en la política de cuidado infantil es un problema global, con 89 de 176 países que carecen de políticas de cuidado infantil de más de 5 años. En muchos países, las políticas de licencia y los servicios universales de atención y educación de la primera infancia no garantizan la prestación estatutaria y continua de cuidado infantil. Esto puede resultar en una falta de derechos derivados de políticas de cuidado, y las necesidades de cuidado se cubren principalmente con trabajo no remunerado o soluciones de cuidado pagadas por las familias. (Organización Internacional del Trabajo, 2023). En el análisis del bienestar socioeconómico toman relevancia los indicadores de salud, entre ellos la malnutrición infantil. Los países con mayores niveles de desnutrición también tienen menores niveles de desarrollo socioeconómico, lo que refleja la importancia de estos

indicadores en la lucha contra la pobreza y la desigualdad (Instituto Peruano de Economía, 2023; Romero et al., 2022). La desigualdad social y la pobreza, que a menudo están relacionadas con el conflicto armado, también pueden afectar a la salud materno infantil. La pobreza puede limitar el acceso a los servicios de salud y la nutrición, lo que puede aumentar la mortalidad materna y neonatal. La desigualdad social también puede crear condiciones desfavorables para la salud y el desarrollo de los niños, como la falta de acceso a la educación y la carencia de oportunidades económicas (Ferrera & Arrufat, 2023).

El conflicto armado puede provocar el desplazamiento de personas, lo que puede afectar a la accesibilidad a los servicios de salud y la nutrición, especialmente en las zonas de conflicto. Además, la violencia durante el conflicto armado puede aumentar la mortalidad materna y neonatal, lo que puede afectar a la salud y el desarrollo de los niños (Ferrera & Arrufat, 2023; Luis Ramos-Ruiz et al., 2017). La desigualdad en América Latina y Colombia se debe a varios factores, como la pobreza, la falta de acceso a la educación y el mercado laboral formal, la violencia y la inseguridad, y la carencia de políticas sociales y tributarias efectivas. Colombia es un país con ingresos medio alto, de los pocos países latinoamericanos que hacen parte de la OCDE y a pesar de que la economía colombiana se ha recuperado después de la crisis del COVID-19, mostrando crecimiento del PIB del 10,7% en 2021 y 7,3% en 2022. Sin embargo, sigue siendo uno de los países más desiguales del mundo (Departamento Administrativo Nacional de Estadística, 2024). La desigualdad es la más alta de todos los países de la OCDE, con un índice de Gini que, de acuerdo con el reporte del Banco Mundial de 2022, es de 54.8. La pobreza y la desigualdad en Colombia están condicionadas por la trayectoria de vida y la accesibilidad a oportunidades (Mejía & Núñez, 2022).

Factores como la procedencia geográfica, el género, la etnia y el nivel socioeconómico influyen en la desigualdad, siendo más pronunciada en áreas rurales, entre grupos indígenas y afrodescendientes. La educación de la primera infancia y la participación laboral de las mujeres son cruciales para reducir la desigualdad. Sin embargo, la pobreza y la falta de derechos asociados con las políticas de cuidado infantil pueden afectar negativamente la productividad de la población y la participación laboral de las mujeres. La desigualdad en Colombia también se ve afectada por el desplazamiento forzado y la

violencia especialmente en las zonas de conflicto, afectando la participación laboral y la productividad (Mejía & Núñez, 2022).

A pesar de las mejoras en los indicadores de salud materna e infantil en Colombia, estas mejoras no se distribuyen de manera uniforme en todo el país. Los departamentos (primeras subdivisiones administrativas en Colombia), en el quintil más bajo según el Índice de Pobreza Multidimensional tienen una tasa de mortalidad materna tres veces mayor que los departamentos en el quintil más rico (Ministerio de Salud y Protección Social, 2019). Las visitas de atención prenatal (ANC) son fundamentales para la salud materno-infantil. Estas visitas permiten vigilar la evolución del embarazo, detectar tempranamente riesgos, prevenir complicaciones y preparar a la mujer para el parto, la maternidad y la crianza. De 1990 a 2015, hubo un aumento a nivel nacional en el porcentaje de mujeres que asistieron a cuatro o más visitas de atención prenatal, aumentando del 69.7% al 89.8% (Profamilia & Ministerio Nacional de Salud y Protección Social, 2015). Sin embargo, en departamentos como Vaupés, por ejemplo, en la periferia del país, solo el 34% de las mujeres informaron haber asistido al menos a cuatro visitas de ANC, mientras que en Quindío (en el centro del país) la cifra fue del 96.5%.

Estas brechas se han convertido en un tema crucial para el desarrollo económico, y los gobiernos están con gran atención a encaminar políticas de salud principalmente en la primera infancia, los organismos multilaterales y académicos ven los indicadores de salud de la primera infancia como un factor clave para medir el bienestar en la niñez (UNICEF, 2013).

En Colombia, la malnutrición infantil es una problemática sensible. Aunque los indicadores de desnutrición han mejorado, según la Encuesta Nacional del Estado Nutricional (ENSIN), el porcentaje de niños menores de 5 años con retraso en el crecimiento sigue siendo alto: 10.8% en 2015. Pasa lo contrario con relación al exceso de peso y en sincronía con las cifras globales este viene creciendo en mayor proporción pasando del 3.1% (2005) al 6.4% (2015).

Además, existen grandes diferencias de acuerdo con el lugar de residencia, evidenciando que el entorno que crece el niño es un factor determinante para observar disparidades socioeconómicas a partir de los indicadores de malnutrición infantil. El entorno determina

las oportunidades individuales y expone a las personas a diferentes riesgos y recursos a lo largo de su vida. (Ham & Manley, 2012; Manley et al., 2011; O. A. Uthman, 2009).

Las ciudades y pueblos sudamericanos son altamente desiguales y aunque se puede afirmar que en promedio los niños que viven en áreas urbanas están mejor que sus pares rurales, también es cierto que millones de niños en zonas urbanas luchan contra la pobreza. En Colombia la desigualdad intraurbana ha aumentado recientemente como consecuencia de los procesos de migración interna como consecuencia de la violencia en las zonas rurales del país (Gómez Builes et al., 2008), de la migración internacional de venezolanos que buscan oportunidades en las principales ciudades del país (de acuerdo con datos de Migración, en enero de 2024 se encontraban presentes en Colombia 2,857,528 migrantes de Venezuela, más del 45% en las 5 principales ciudades del país (Observatorio de Migraciones Migrantes y Movilidad Humana, 2024)).

El estudio de la malnutrición infantil es cada vez más relevante en el estudio de las inequidades sociales y el desarrollo económico. Tanto las oportunidades, como las ventajas y carencias en términos de la salud infantil, se distribuyen desigualmente, observando grandes brechas en los indicadores de desnutrición que dependen de variables como la riqueza del país de origen, el género, el estatus socioeconómico de la familia a la que pertenecen, la zona geográfica de procedencia y la riqueza o pobreza de sus barrios y lugares de residencia (O. A. Uthman, 2009). En el contexto de América Latina, las variables relacionadas con la comunidad, el hogar y la familia han demostrado tener influencia en la salud y bienestar de los niños menores de 5 años (Osorio et al., 2018). Siendo la estructura familiar el principal locus para la provisión de los cuidados del hogar, tradicionalmente predomina que sean administrados por mujeres y niñas.

El cuidado infantil surge como un determinante crítico en la asignación de responsabilidades de cuidado. Las mujeres que residen en hogares con niños menores de cinco años están predispuestas a asignar mayores cantidades de tiempo a las actividades de cuidado (Karimli et al., 2016). Esta asignación de tiempo puede atribuirse a la naturaleza intrínsecamente intensiva en tiempo, físicamente exigente y dependiente de habilidades del cuidado infantil (Fontana & Elson, 2014).

Este grupo demográfico está consecuentemente cargado con una doble o incluso triple carga de trabajo, limitando así sus oportunidades en educación, empleo formal y actividades de ocio (Batthyány, 2015). Esta distribución por genero de las responsabilidades de cuidado infantil, se vuelve particularmente evidente al considerar el tiempo asignado a estas tareas. En Colombia, se registra que el 76% de todo el trabajo de cuidado no remunerado es realizado por mujeres, una brecha de género que persiste en diversas demografías de edad e ingresos (DANE, 2020). Ospina-Cartagena & Garcia-Suaza (2020) evidencian que las mujeres emprenden predominantemente tareas de cuidado no remuneradas, reduciendo así sus horas en empleo remunerado, principalmente en hogares con niños menores de 5 años.

La presente investigación afronta 3 temáticas que están intrínsecamente relacionadas entre sí al centrarse en aspectos cruciales de la salud y el bienestar en Colombia. El primer tema se enfoca en cómo el conflicto armado afecta la atención prenatal. Este tema es relevante y pertinente, ya que la atención prenatal es crucial para la salud de la madre y el niño, y cualquier interrupción debido al conflicto puede tener consecuencias a largo plazo. El segundo examina la brecha de malnutrición entre los niños pobres y no pobres. Este estudio está relacionado con el primero porque la nutrición adecuada es esencial para el desarrollo saludable del niño, y cualquier interrupción en la atención prenatal puede afectar la nutrición del niño. El tercero analiza las disparidades de género en el cuidado infantil. Este tema se relaciona con los dos primeros porque el cuidado infantil, incluyendo la atención prenatal y la nutrición, a menudo recae en las mujeres. Además, las disparidades de género en el cuidado infantil pueden exacerbar los efectos del conflicto armado y la pobreza en la salud materna e infantil. En conjunto, estos estudios nos presentan un panorama complejo donde el conflicto armado, la pobreza y las disparidades de género se interrelacionan, intensificando las condiciones de vulnerabilidad de las poblaciones más marginadas, especialmente las mujeres y los niños. Cada uno de estos estudios contribuye a una comprensión más completa de cómo estos factores interactúan afectando la salud y el bienestar de las madres y niños en Colombia.

El panorama que enfrenta Colombia en los tópicos mencionados hace parte de los desafíos más importantes que enfrenta el mundo actual, tales como la pobreza, la desigualdad, la degradación del medio ambiente y la falta de acceso a la educación, la salud y la justicia. Como un llamado universal para poner fin a la pobreza, proteger el planeta y garantizar

que para el año 2030 todas las personas disfruten de paz y prosperidad, la Asamblea General de las Naciones Unidas en el año 2015 establecieron los Objetivos de Desarrollo Sostenible (ODS), son un conjunto de 17 metas globales para abordar los desafíos más importantes que enfrenta el mundo. Estos objetivos están diseñados para ser alcanzados hasta el año 2030 y están relacionados con los temas planteados en el presente estudio, abordando temas como la igualdad de género, la nutrición infantil, la seguridad alimentaria, la salud y el bienestar.

En general, el análisis del contexto colombiano en términos del bienestar infantil, que se abordó desde las actividades de cuidado y la malnutrición en niños menores de 5 años, desde un enfoque de pobreza urbana, intensidad del conflicto armado y la salud materno-infantil, logra evidenciar factores claves que influyen en los ejes problemáticos que se han planteado y se vislumbran propuestas de política pública para hacer las respectivas intervenciones y aportarle al bienestar social en el contexto colombiano y a su vez a los objetivos de desarrollo sostenible 1 (Fin de la pobreza) que busca erradicar la pobreza en todas sus formas y dimensiones, incluyendo la pobreza extrema, 2 (Hambre cero) se enfoca en erradicar el hambre, lograr la seguridad alimentaria, mejorar la nutrición y promover la agricultura sostenible, 3 (Salud y Bienestar) que busca garantizar una vida saludable y promover el bienestar para todos en todas las edades, 5 (Igualdad de género) que busca alcanzar la igualdad de género y empoderar a todas las mujeres y niñas, 10 (Reducción de las desigualdades) cuyo objetivo es reducir la desigualdad dentro y entre los países y 16 (Paz, justicia e instituciones sólidas) que busca promover sociedades pacíficas e inclusivas para el desarrollo sostenible, proporcionar acceso a la justicia para todos y construir instituciones eficaces, responsables e inclusivas a todos los niveles.

Abordar estos desafíos planteados requiere estrategias integrales que consideren las dimensiones sociales, económicas y políticas que subyacen a las problemáticas identificadas. Encontrando hallazgos que evidencian la necesidad de fortalecer los sistemas de salud, especialmente en zonas afectadas por el conflicto, garantizar el acceso a educación y oportunidades laborales para las mujeres, y promover políticas públicas que fomenten la equidad de género en el cuidado infantil. En definitiva, estos estudios nos invitan a reflexionar sobre las raíces profundas de las desigualdades en Colombia y a trabajar por una sociedad más justa y equitativa, donde la salud y el bienestar de todas las personas sean una prioridad.

Contenido

1. Introduction

Gender equity has been shown to have an economic impact, as disparities in the distribution of social and economic benefits can affect the participation and productivity of half of the population, affecting economic competitiveness (Bertrand, 2020; Devadas & Kim, 2020; Miller et al., 2016; Pirela Rios et al., 2023). Studies of social inequality have shown that poverty and inequality have decreased in recent decades thanks to economic growth, but inequalities still exist in terms of economic participation and access to social services (Gálvez, 2001; Peruvian Institute of Economics, 2023). Therefore, the fight against social inequality requires not only sustained economic growth, but also policies that ensure that the benefits of this growth are distributed equitably to the entire population. Gender economic inequality can also be affected by inequality in childcare policies. According to specific research, in Latin American societies, the primary responsibility for providing care falls on households, especially women. Economic gender inequality may be caused by the social organization of care for young children and structural heterogeneity. Social protection is articulated with the features of labor markets, and differences in the distribution of economic rights and resources according to labor market insertion may be more pronounced in women who care for young children (Alonso & Marzonetto, 2021; Casarico et al., 2023; Plomien, 2019).

Inequity in childcare policy is a global problem, with 89 out of 176 countries lacking childcare policies for children over 5 years old. In many countries, licensing policies and universal early childhood care and education services do not ensure the statutory and continuous provision of childcare. This can result in a lack of rights derived from care policies, and care needs are mainly met by unpaid work or care solutions paid for by families. (International Labour Organization, 2023). In the analysis of socioeconomic well-being, health indicators, including child malnutrition, become relevant. Countries with higher levels of malnutrition also have lower levels of socioeconomic development, reflecting the importance of these indicators in the fight against poverty and inequality. (Peruvian Institute of Economics, 2023; Romero et al., 2022). Social inequality and poverty, which are often related to armed conflict, can also affect maternal and child health. Poverty can limit access to health services and nutrition, which can increase

maternal and neonatal mortality. Social inequality can also create unfavorable conditions for children's health and development, such as lack of access to education and lack of economic opportunity (Ferrera & Arrufat, 2023).

Armed conflict can lead to displacement of people, which can affect accessibility to health services and nutrition, especially in conflict areas. In addition, violence during armed conflict can increase maternal and neonatal mortality, which can affect the health and development of children (Ferrera & Arrufat, 2023; Luis Ramos-Ruiz et al., 2017). Inequality in Latin America and Colombia is due to several factors, such as poverty, lack of access to education and the formal labor market, violence and insecurity, and lack of effective social and tax policies. Colombia is an upper middle-income country, one of the few Latin American countries that are part of the OECD (The Organization for Economic Cooperation and Development), and although the Colombian economy has recovered after the COVID-19 crisis, showing GDP growth of 10.7% in 2021 and 7.3% in 2022, it remains one of the most unequal countries in the world. (National Administrative Department of Statistics, 2024). Inequality is the highest of all OECD countries, with a Gini index of 54.8, according to the World Bank's 2022 report. Poverty and inequality in Colombia are conditioned by life trajectory and accessibility to opportunities (Mejía & Núñez, 2022).

Factors such as geographic origin, gender, ethnicity and socioeconomic level influence inequality, which is more pronounced in rural areas and among indigenous and Afro-descendant groups. Early childhood education and female labor force participation are crucial to reducing inequality. However, poverty and lack of rights associated with childcare policies can negatively affect the population's productivity and women's labor participation. Inequality in Colombia is also affected by forced displacement and violence especially in conflict zones, affecting labor participation and productivity (Mejía & Núñez, 2022).

For the analysis of inequality between departments (first administrative subdivisions in Colombia), it is necessary to contextualize the social problems and specifically the internal armed conflict, since it is a conflict of more than 60 years. Illegal armed groups, including guerrillas, paramilitaries and criminal gangs associated with drug trafficking, have caused 267,505 deaths between 1958 and 2020, according to the National Center of

Historical Memory (2021). It is important to note that 80% of the total victims were civilians, with women and children being the most vulnerable population groups (Historical Memory Group of the National Commission for Reparation and Reconciliation, 2011). According to the Single Registry of Victims - RUV as of January 2021, women constituted 50.3% of the registered victims, which is equivalent to a substantial figure of more than 4.5 million women (Registro Único de Víctimas (RUV), 2021). Violence has been shown to have an impact on maternal health indicators, evidencing inequities according to place of residence (Cameron et al., 2019; Kawachi & Berkman, 2003; Kuhnt & Vollmer, 2017).

Despite improvements in maternal and child health indicators in Colombia, these improvements are not evenly distributed across the country. Departments in the lowest quintile according to the Multidimensional Poverty Index have a maternal mortality rate three times higher than departments in the richest quintile (Ministry of Health and Social Protection, 2019). Antenatal care visits (ANC) are fundamental to maternal and child health. These visits make it possible to monitor the evolution of pregnancy, detect risks early, prevent complications, and prepare women for childbirth, motherhood, and parenting. From 1990 to 2015, there was a nationwide increase in the percentage of women attending four or more antenatal care visits, increasing from 69.7% to 89.8% (Profamilia & National Ministry of Health and Social Protection, 2015). However, in departments such as Vaupés, for example, in the periphery of the country, only 34% of women reported attending at least four ANC visits, while in Quindío (in the center of the country) the figure was 96.5%.

These gaps have become a crucial issue for economic development, and governments are with great attention to address health policies mainly in early childhood, multilateral agencies and academics see early childhood health indicators as a key factor to measure the well-being of children (UNICEF, 2013).

In Colombia, child malnutrition is a sensitive issue. Although malnutrition indicators have improved, according to the National Nutritional Status Survey (ENSIN), the percentage of children under 5 years of age with stunted growth remains high: 10.8% in 2015. The opposite happens in relation to overweight and in synchrony with global figures this has been growing in greater proportion from 3.1% (2005) to 6.4% (2015). In addition, there

are large differences according to place of residence, showing that the environment in which children grow up is a determining factor in observing socioeconomic disparities based on indicators of child malnutrition. The environment determines individual opportunities and exposes people to different risks and resources throughout their lives. (Ham & Manley, 2012; Manley et al., 2011; O. A. Uthman, 2009).

South American cities and towns are highly unequal, it can be stated that on average children living in urban areas are better off than their rural peers, it is also true that millions of children in urban areas struggle with poverty. In Colombia, intra-urban inequality has recently increased as a result of internal migration processes due to violence in rural areas of the country (Gómez Builes et al., 2008), international migration of Venezuelans seeking opportunities in the country's main cities (according to migration data, in January 2024 there were 2,857,528 migrants from Venezuela in Colombia, more than 45% of them in the country's five main cities (Migration and Human Mobility Observatory, 2024).

The study of child malnutrition is increasingly relevant in the study of social inequalities and economic development. Both opportunities and advantages and deficiencies in terms of child health are distributed unequally, with large gaps in malnutrition indicators that depend on variables such as the wealth of the country of origin, gender, the socioeconomic status of the family to which they belong, the geographical area of origin and the wealth or poverty of their neighborhoods and places of residence (O. A. Uthman, 2009). In the context of Latin America, variables related to community, household and family have been shown to have an influence on the health and well-being of children under 5 years of age (Osorio et al., 2018). Being the family structure the main locus for the provision of household care, it traditionally predominates that they are managed by women and girls.

Childcare emerges as a critical determinant in the allocation of caregiving responsibilities. Women residing in households with children under the age of five are predisposed to allocate greater amounts of time to caregiving activities (Karimli et al., 2016). This time allocation may be attributed to the inherently time-intensive, physically demanding, and skill-dependent nature of childcare (Fontana & Elson, 2014).

This demographic is consequently burdened with a double or even triple workload, thus limiting their opportunities in education, formal employment and leisure activities (Batthyány, 2015). This gender distribution of childcare responsibilities becomes particularly evident when considering the time allocated to these tasks. In Colombia, it is recorded that 76% of all unpaid care work is performed by women, a gender gap that persists across diverse age and income demographics (DANE, 2020). Ospina-Cartagena & Garcia-Suaza (2020) evidence that women predominantly undertake unpaid care work, thus reducing their hours in paid employment, mainly in households with children under 5 years of age.

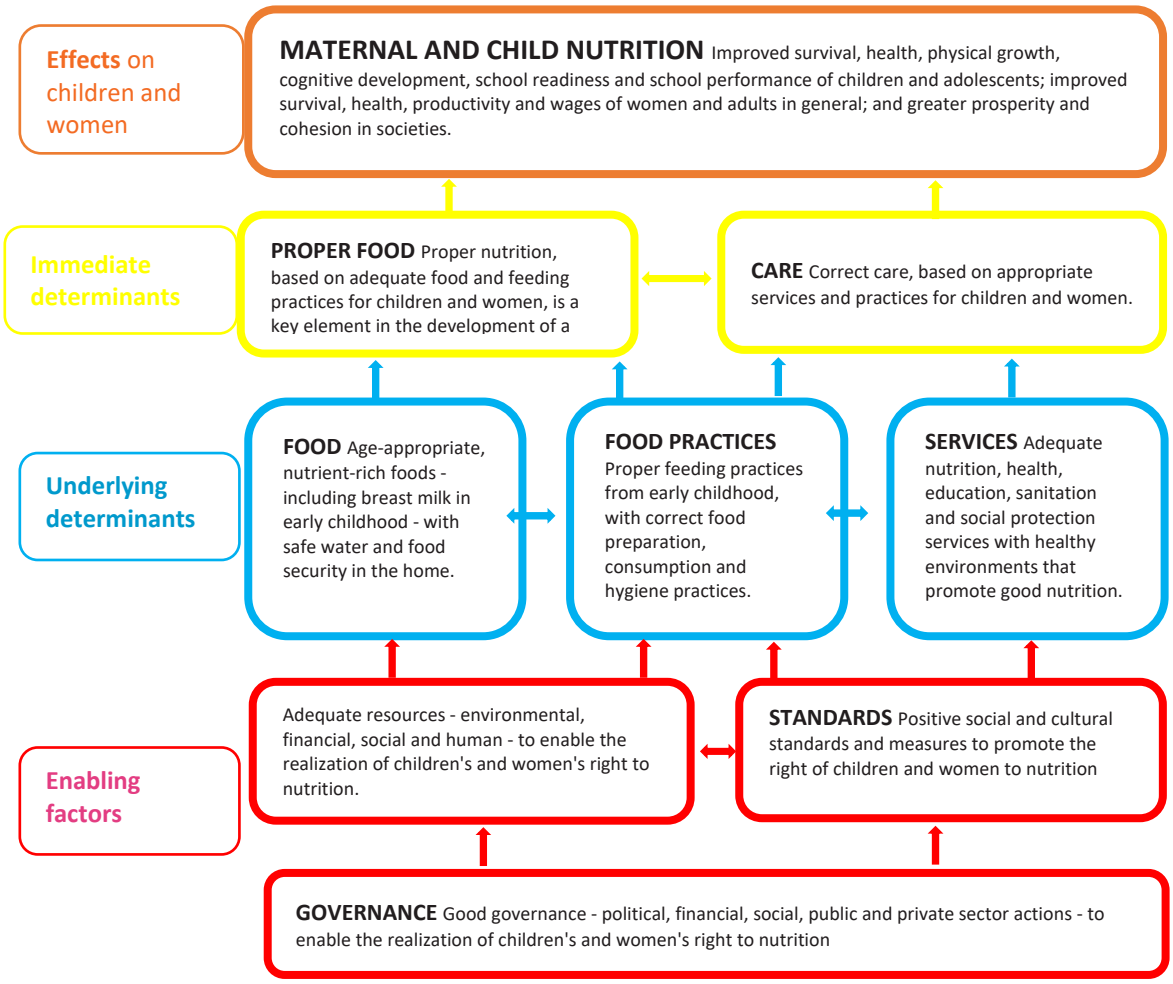
Conceptual Framework of the Determinants of Nutrition

The study of child welfare is undoubtedly one of the topics of global interest that has received the most attention in recent decades from national governments and multilateral organizations. Institutions such as the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) are today the major references in the global struggle to meet the basic needs of children, expand their opportunities and promote the best health conditions for them.

In 2020, UNICEF adopted a nutrition action strategy that aims to "protect and promote adequate food, services and practices that support optimal nutrition, growth and development for all children, adolescents and women". The purpose is to collaborate with the goal of the 2030 Agenda for Sustainable Development, which seeks to ensure that all children have healthy diets and to eradicate all forms of child malnutrition.

This strategy draws on UNICEF's Maternal and Child Nutrition Determinants Conceptual Framework, developed in 2020 (Figure 1). This framework, in turn, builds on previous UNICEF conceptual work and in relation to the context of this study takes the double burden of child malnutrition. In addition, it highlights the importance of food and care as immediate determinants of nutrition in mothers and children (UNICEF, 2020).

Figure 1: UNICEF's 2020 Maternal and Child Nutrition Determinants Conceptual Framework.



Source: United Nations Children's Fund (UNICEF), (2020).

The framework highlights that child malnutrition is a direct cause of inadequate nutrition and disease. These in turn underlie lack of food, childcare and inadequate health services for women and children, sanitation and water. It is observed that the basic or structural cause is influenced by the political, social and economic environment in which children develop. It also suggests that the reasons for hunger and malnutrition in early childhood may be avoidable, which indicates that they can be addressed through practices linked to proper health and hygiene management, as well as education and nutritional promotion.

Based on the above, interventions on the manifestations of malnutrition are based on two pillars: the generation of information on the problem and its repercussions, and the promotion of governmental commitment and social participation. Meanwhile, interventions at the three levels of the determinants are focused on issues as indicated by

the WHO (2006), explicitly identifying breastfeeding as the biological norm for child growth and development, family food security, child and women's care, access to health services and basic sanitation, injuries caused by accidents or violent intentions, as well as the healthy environment at family and community level; interventions are oriented to improve access, standards, resource management and policy actions that enable the exercise of the right of children and women to nutrition (United Nations Children's Fund (UNICEF), 2020; Van de Poel et al., 2007).

Demand for children's health

In studies conducted by authors such as (Alderman et al., 2003, 2006)); (Rajaram et al., 2007)); (Black et al., 2008)); (Fotso et al., 2012)); (Osorio et al., 2012); (Osorio et al., 2013); (Osorio et al., 2018) and García (2013), it is possible to identify some variables that affect child malnutrition and are incorporated in a health demand function. Therefore, the model of human capital and the demand for health initially proposed by Grossman (1972) with new estimates and improvements by Wagstaff (1986) y Grossman (2000)(2000), where different types of behavior are observed that promote health (preventive health consumption, healthy eating, care, etc.) and others that certainly deteriorate it (cigarette consumption, alcohol consumption, medical absenteeism, etc.).

The theoretical framework of the health demand model analyzes the specific demand for children's health. To this end, a utility function is defined that incorporates both the quantity of health for children and the quantity of goods and services. This function, together with a function of child health states and a function of characteristics, allows us to obtain the demand model for child health, which is presented below:

$$U = U(h, c, x_h) \qquad (1)$$

Where h is the health allocation of children assumed by households, c is the consumption of goods and services and x_h is a vector of individual and household characteristics.

Child health is composed of a health production function and is expressed by the form:

$$h = f(y, X_{ch}, X_{hh}, X_{co}; \mu) \qquad (2)$$

Note that *y* is a vector of health, which means that it takes into account components of the child related to nutrient and vitamin intake, immunization, parental care time, and incidence of disease; X_{ch} is a vector of child characteristics such as age, gender and birth order; X_{hh} is a vector of household characteristics composed of variables such as parental education, household resources and demographics; X_{co} is a vector of community factors that may have an impact on children's health, as well as access to and quality of health services; and μ is a vector of unobservable characteristics of the child, household and community (Behrman & Skoufias, 2004).

The model indicates that the demand for child health depends on the utility that parents derive from their children's health and the availability of goods and services. The child health state function and the characteristics function determine how the quantity of goods and services translates into a health state. The household income constraint (Y) is conditioned by the prices of a basket of consumer and leisure goods (p_x), the prices of health costs (p_y) and total household income (Y), as shown in the following equation:

$$Y = f(p_x, p_y, y)$$

$$p_x x + p_y y = Y \qquad (3)$$

To optimize household demand for health care, we maximize the utility function (1), which results in a characteristic function (h) of the form:

$$h = \phi(y, X_{ch}, X_{hh}, X_{co,} p_x, p_y, Y, \mu) \quad (4)$$

The functional structure of $\phi(.)$ depends on the characteristics and preferences in the household and the health production function, which when applying a second-order Taylor approximation reduces to the expression:

$$h_i = X_i'\beta + Y_i'\delta + P'\gamma + \varepsilon_i \qquad (5)$$

Where, h_i is the health status of child i, X_i', Y_i' y $P'$are the values of child, household and community characteristics, income and price of health services respectively. The parameter vector β reflects the impact of child and household characteristics on health, δ is the parameter reflecting the impact of income on health, γ is a parameter vector reflecting the impact of price on health, and ε_i is the error term.

Scheme

This research addresses 3 themes that are intrinsically related to each other by focusing on crucial aspects of health and well-being in Colombia. The first theme focuses on how the armed conflict affects antenatal care. This topic is relevant and pertinent, as antenatal care is crucial to maternal and child health, and any interruption due to the conflict can have long-term consequences. The second examines the malnutrition gap between poor and non-poor children. This study is related to the first because adequate nutrition is essential for healthy child development, and any interruption in antenatal care can affect the child's nutrition. The third looks at gender disparities in childcare. This issue is related to the first two because childcare, including antenatal care and nutrition, often falls to women. In addition, gender disparities in childcare can exacerbate the effects of armed conflict and poverty on maternal and child health.

Taken together, these studies present a complex picture where armed conflict, poverty and gender disparities interrelate, intensifying the conditions of vulnerability of the most marginalized populations, especially women and children. Each of these studies contributes to a more complete understanding of how these factors interact to affect the health and well-being of mothers and children in Colombia.

The panorama faced by Colombia in the aforementioned topics is part of the most important challenges facing the world today, such as poverty, inequality, environmental degradation and lack of access to education, health and justice. As a universal call to end poverty, protect the planet and ensure that by 2030 all people enjoy peace and prosperity, the United Nations General Assembly in 2015 established the Sustainable Development Goals (SDGs), a set of 17 global targets to address the most important challenges facing the world. These goals are designed to be achieved by 2030 and are related to the issues raised in this study, addressing topics such as gender equality, child nutrition, food security, health and well-being.

The present study is presented in three chapters among which we manage to analyze urban poverty and the intensity of the armed conflict on maternal and child health in Colombia (2015), with a particular focus on gender disparities in care (2021) and their impact on the well-being of early childhood.

A quantitative methodological approach is used with data from the Colombian Demographic and Health Survey 2015, The National Center of Historical Memory and Single Registry of Victims (RUV) with twelve additional sources until 2018 and the National Time Use Survey (NTUS) 2021.

The second chapter of this study entitled "Intensity of the Armed Conflict and Maternal Health Outcomes: Analysis of Prenatal Control Visits in Colombia" examines the influence of the intensity of the armed conflict, defined as the frequency and severity of violent incidents in a given area, on antenatal care visits in Colombia. It suggests the importance of designing specific maternal health care strategies based on the specific conditions of high conflict areas in the country. It contributes to the empirical literature on conflict and maternal health by examining the interaction between individual and contextual factors, as well as possible interactions at different levels. The hope is that the findings can inform policies and practices to improve maternal and child health in conflict contexts.

This second chapter is framed within Sustainable Development Goal (SDG) 3: Health and Well-being, which seeks to ensure healthy lives and promote well-being for all at all ages. In this sense, the issues of maternal and child health and the impact of armed conflict on

maternal health are directly related to this goal. It is also linked to Sustainable Development Goal (SDG) 16: Peace, justice and strong institutions, which seeks to promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable and inclusive institutions at all levels. In this context, armed conflict and its impact on maternal health are closely related to this goal, as maternal health is a fundamental component for building peaceful, equitable and just societies.

The third chapter entitled "Decomposing the intraurban malnutrition gap between poor and non-poor children in Colombia" identifies the contribution of the factors that explain the gap in stunting and overweight between poor and non-poor children under 5 years of age in urban areas of Colombia. Contributing to public policy makers to reduce socioeconomic gaps. This chapter is closely related to Sustainable Development Goals (SDGs) 1 and 2. First, SDG 1: End Poverty, seeks to eradicate poverty in all its forms and dimensions, including extreme poverty. Urban poverty and socioeconomic gaps, which are discussed in Chapter 2, are key to understanding and addressing this goal. Second, SDG 2: Zero Hunger, focuses on eradicating hunger, achieving food security, improving nutrition and promoting sustainable agriculture. Child malnutrition in poor urban areas, which is also discussed in this chapter 3 and is directly related to this goal.

Chapter four, entitled "The gender panorama of care of children in Colombia: Analysis of the National Time Use Survey", exposes gender disparities in unpaid child care within Colombian households. These disparities are analyzed in detail, classifying the types of care provided and examining their correlation with gender roles, highlighting the bargaining power within the household. The analysis links directly to Sustainable Development Goal (SDG) 5: Gender Equality, which seeks to achieve gender equality and empower all women and girls. The results of the study show that childcare falls more heavily on women, which may be a factor that perpetuates gender inequality. Similarly, the study relates to SDG 10: Reducing Inequalities, which aims to reduce inequality within and between countries. The analysis of childcare in Colombian households can provide valuable information on how the distribution of child care may reflect and perpetuate socioeconomic inequalities.

In general terms, addressing these challenges requires comprehensive strategies that consider the social, economic and political dimensions underlying the problems identified. The findings show the need to strengthen health systems, especially in areas affected by the conflict, to guarantee access to education and job opportunities for women, and to promote public policies that foster gender equity in childcare. In short, these studies invite us to reflect on the deep roots of inequalities in Colombia and to work for a more just and equitable society, where the health and well-being of all people are a priority.

2. Intensity of the Armed Conflict and Maternal Health Outcomes: Analysis of Prenatal Control Visits in Colombia

Abstract

This research examines the impact of armed conflict-intensity- defined as the frequency and severity of violent incidents in a given area- on antenatal care visits in Colombia, an upper-middle-income country, classified as one of the world's most unequal countries, with a protracted internal armed conflict that has lasted over 60 years.

We employed multilevel logistic regression models, incorporating data from the 2015 Colombian Demographic and Health Survey (DHS) and the National Center for Historical Memory, from 1985 to 2015. The results indicate that, all else being equal, women residing in departments (first administrative subdivision in Colombia) with high conflict intensity are less likely to attend four or more antenatal visits compared to those in departments with low conflict-intensity (OR=0.737, $p<0.005$). Notably, household wealth moderates this relationship. Individually, higher levels of women's wealth, autonomy, and education increase the likelihood of attending at least four antenatal visits. Conversely, the childbirth interval, the number of children under five living in the same household and residence in urban areas decrease the likelihood of attending four or more antenatal visits. Our findings underscore the importance of designing specific maternal health care strategies tailored to the unique conditions of high conflict zones in the country.

Keywords: armed conflict-intensity, antenatal care, individual and contextual determinants, Colombia

2.1. Introduction

Colombia's internal armed conflict has now lasted for over 60 years. Illegal armed groups, including guerrillas, paramilitaries, and criminal gangs associated with drug trafficking have caused 267,505 deaths between 1958 and 2020, according to the *Centro Nacional de Memoria Histórica* (National Center for Historical Memory 2021). Importantly, 80% of the total casualties were civilians, with women and children being among the most vulnerable population groups (Historical Memory Group of the National Commission for Reparation and Reconciliation 2011). According to the *Registro Único de Víctimas –RUV* (Register of Victims) as of January 2021, women constituted 50.3% of the registered victims, which equates to a substantial figure of over 4.5 million women. (RUV 2021).

Despite improvements in maternal and child health indicators in Colombia, these improvements are not evenly distributed across the country. Departments (first administrative subdivisions in Colombia) in the lowest quintile according to the Multidimensional Poverty Index have a maternal mortality rate three times higher than departments in the wealthiest quintile (Ministry of Health and Social Protection 2019). From 1990 to 2015, there was a nationwide increase in the average percentage of women attending four or more antenatal care (ANC) visits, rising from 69.7% to 89.8% (Profamilia, and Ministry of Health and Social Protection 2015). In departments like Vaupés, for example, on the country's periphery, only 34% of women reported attending at least four ANC visits, while in Quindío (in the centre of the country) the figure was 96.5%.

Armed conflict hinders both the demand and supply for maternal health services, including ANC visits, which is one of the most cost-effective strategies for reducing maternal mortality, and that it is strongly correlated with better outcomes in maternal and child health (Carroli, Rooney, and Villar 2001; Kuhnt and Vollmer 2017; Cameron, Suarez, and Cornwell 2019). The importance of both physical and social context in affecting health outcomes has in fact already been documented (Kawachi and Berkman 2003).

The aim of this study is to examine the influence of armed conflict-intensity on attendance at ANC visits using a multilevel approach that includes information from women and

departments, representing two different levels of aggregation. We contribute to the empirical literature on conflict and maternal health, by examining the interplay between individual and contextual factors, as well as possible cross-level interactions. The rationale behind for these cross-level interactions is that women's socioeconomic status may influence the effect of conflict intensity on ANC visits.

Studies assessing the effects of conflict on maternal and child health usually focus on child and maternal characteristics as key factors, largely because Demographic and Health Surveys (DHS) collect data at these levels. This is the first study measuring the influence of armed conflict on ANC during the protracted Colombian conflict using subnational-level representative microdata. To control and measure the importance of higher-level conflict related factors, this study combines 2015 Colombian DHS microdata with information from the *Centro Nacional de Memoria Histórica* (National Center for Historical Memory 2021). The recent study by Ramos et al. (2020) describes changes in the use of maternal and child health indicators between municipalities with high and low levels of conflict. However, it does not measure the direct influence of conflict on these health outcomes. Another contribution of this study is that it constructs two composite indexes: one index for measuring women's autonomy level and the other for armed conflict-intensity. These indexes are thought to capture the complexity of the conflict and women's autonomy, instead of having only one single dimensional measure for such concepts.

2.1.1. Armed conflict and maternal health

Armed conflict has direct and indirect effects on women's health by affecting both the supply and demand of maternal health services (Druetz et al. 2020). On the supply side, armed conflict destroys health infrastructure and reduces the possibility of retaining qualified health staff as well as obtaining enough medical inputs to offer services. Thus, conflict reduces the quantity and the quality of health services (Keasley, Blickwedel, and Quenby 2017; Kadir, Shenoda, and Goldhagen 2019). On the demand side, women living in conflict zones experience serious difficulties attending medical services, such as a lack of secure transportation, the fear and stress of being physically hurt under the presence of conflict (Leone et al. 2019) and forced displacement to neighbouring areas (Alsaba and Kapilashrami 2016). Additionally, conflict increases teenage pregnancy and gender-

based violence, making women the most affected group (Alsaba and Kapilashrami 2016; Peterman et al., 2011).

To the best of our knowledge, there are few studies that relate armed conflict to ANC care visits. Ziegler et al. (2020) classified regions of the Democratic Republic of Congo in three levels of conflict-intensity and found that women in regions with extremely high conflict had a lower probability of meeting the optimal level of ANC, than those in regions with moderate levels of conflict. In a subsequent study conducted in 2021, extended their analysis to Burundi, a country with one of the highest maternal mortality rates in the world, using 2016-2017 Demographic and Health Surveys (DHS) data, they found an association between conflict and maternal health care, specifically with ANC and Skilled Birth Attention (SBA). Their results indicated that while women in the highest conflict regions were less likely to have four antenatal visits, they were more likely to use SBA (Ziegler et al. 2021).

Druetz et al. (2020) used a longitudinal quasi-experimental analysis to measure the impact of terrorist attacks on the use of maternal care services in Burkina Faso. They found that for each additional attack, the use of ANC care services decreased by 1.8%. Mirzazada et al. (2020) reported that women living in provinces in Afghanistan with severe conflict levels have a lower probability of attending ANC compared with those living in areas with less severe levels. They also conducted a qualitative analysis that identified factors relating to insecurity, a lack of resources, personal health, and in some cases cultural customs, that affect a woman's decision to utilize ANC services. Amberg et al., (2023) demonstrated that the sustained armed conflict has a negative effect on ANC, using DHS data for 35 countries in sub-Saharan Africa, comparing georeferenced event data for the period from 1990 to 2020, conducting a linear probability and fixed effects models to capture the effect of nearby armed conflict (within 50 km of the survey cluster) on four Service coverage indicators along the continuum of maternal and child health care. Solanke (2018) examined the influence of individual and community factors on ANC and their changes after the Boko Haram insurgency in North-East Nigeria. The results showed that community characteristics were more associated with ANC attendance than many individual characteristics in conflict affected areas. Price and Bahora (2013) estimated the impact of conflict on ANC visits in Nepal and found a reduction of between 0.33 and 1.49 controls on average for women living in high conflict-intensity locations.

The use of multilevel models can help understand the effects of armed conflict on antenatal care by analyzing the association between conflict and maternal and child health outcomes (Jawad et al., 2021). It can assess the impact of conflict on the utilization of antenatal and childbirth care, showing that women exposed to armed conflict during pregnancy tend to receive insufficient care (Nguyen & Le, 2022). Additionally, it can estimate the decline in coverage of maternal and child health services after nearby armed conflicts (Amberg et al., 2023).

For Colombia, Ramos et al. (2020) described maternal and child health indicators, comparing high and low conflict zones, A mixed convergent triangulation study was used, identifying a pattern of inequality in health outcomes in the municipalities most affected by the armed conflict. It was found that the percentage of women who made four or more ANC visits was lower among women in municipalities with higher victimization rates between 1998 and 2000 in Colombia. This could be considered an indirect effect of the conflict, as the armed conflict did not directly affect antenatal care itself, but rather affected the conditions that allowed access to these care services. Rivillas et al. (2018), who also used Colombian data, found a relationship between armed conflict exposure and inequality in access to ANC services between 2005 and 2015. This study shows how conflict contributes to conditions that make access to antenatal care difficult (displacement, violence, insecurity, poverty, etc.), and although not explicitly mentioned, could be considered an indirect effect of conflict. Unlike studies that have been carried out for Colombia, which use municipalities as the unit of analysis, our research uses microdata representative of women. This approach allows us to directly measure the influence of armed conflict on ANC visits at a more detailed level.
Table 1 shows the relationship between the direct and indirect effects of the armed conflict and the supply and demand of health services, including antenatal care.

2.1.2. The importance of ANC visits for maternal and child health

ANC visits are essential to prevent maternal and neonatal mortality and are highly cost-effective programs (Adam et al. 2005). They can contribute to the achievement of Sustainable Development Goal (SDG) 3.1, which sets reducing the maternal mortality

ratio to less than 70 deaths per 100,000 live births in the world by 2030 (United Nations 2015).

Table 1. Matrix of Direct and Indirect Effects of the Armed Conflict on the Supply and Demand of Health Services

	Direct effects	Indirect effects
Supply	Armed conflict can damage health infrastructure, resulting in reduced provision of health services. Disruption of access to antenatal care services due to active violence. Shortages of medical supplies and health personnel due to displacement or threats to their safety. Difficulties in recruiting and retaining health personnel in high-conflict areas.	Conflict may displace healthcare workers or affect the capacity to train new healthcare workers, thus reducing the ability to provide services. Interruption of activities outside the hospital (extra-mural) due to insecurity, limiting access to education and contraceptive methods.
Demand	Conflict can lead to an increase in the need for medical care (e.g., due to injuries), which in turn can result in increased demand for health services.	Populations displaced by conflict may have less access to healthcare services, which can lower apparent demand (due to lack of access rather than lack of need). Moreover, trauma and stress generated by the conflict may increase the demand for mental health services.

Source: own compilation. (Adapted from Alibhai et al., 2022; Druetz et al., 2020; Garry & Checchi, 2020; Gonzalez-Uribe et al., 2022; Nguyen & Le, 2022**)**

Recent research supports the association between an optimal number of ANC visits and the reduction of maternal deaths. Conway and Kutinova (2006), Using the Child Health Production Framework, the effects of ANC on several different measures of maternal health, including the direct and indirect influences it has on mothers, are estimated using 2SLS and bivariate probit models. They found a reduction in excessive maternal hospitalization between mothers with an adequate number of ANC visits, compared to mothers with less than adequate ANC visits. A similar pattern and results are found when looking at mothers becoming overweight. Overall, they suggest that adequate use of ANC care improves maternal health.

Kuhnt and Vollmer (2017) analyzed data from 69 countries between 1990 and 2013 using DHS through the application of linear probability regression models. They demonstrated the benefits of ANC visits, not only on maternal mortality, but also on child mortality. Their results suggest that at least one ANC visit during pregnancy could reduce the probability of infant death by 1.07%. Swartz et al. (2017) identified a natural experiment for measuring the effect of access to ANC visits over health outcomes for mothers and infants in Oregon, USA. They found a reduction in the infant mortality rate (-1.04 per 1,000) and positive effects on various aspects of maternal health.

According to the World Health Organization (WHO), the effectiveness of ANC on maternal and child health depends on education. Mothers can learn about the importance of ANC visits for pregnancy, identifying or detecting early complications and reducing the risk of disease or maternal death. This allows them to become informed about good childcare practices, signs of pregnancy complications, obtaining psychological support, physiological and nutritional treatment, and early disease detection and prevention (World Health Organization 2016).

2.2. Methods

2.2.2. Data

We used data from the 2015 Colombian Demographic and Health Survey. This is the most recent microdata available set about maternal and children health care services used nationwide. The survey was constructed as a subsample of the Master Sample of

Households for Health Studies, overseen by the Colombian Ministry of Health and Social Protection. The sample used clustered, stratified, and multistage sampling and included a national representative sample of women of reproductive age (13-49) and men between 13-59 years old, distributed into 295 municipalities, from 32 departments and Bogotá. Individuals were selected based on the 2005 National Population and Household Census. The survey contains information about 38,718 women and 35,783 men in 44,614 households and includes urban and rural people from different socioeconomic characteristics (Profamilia and Ministry of Health & Social Protection, 2015). The survey is freely accessible to the public conditional on a prescribed registration and approval process by the Colombian Ministry of Health and Social Protection. Questions related to pregnancy and ANC were only asked to women who had a live childbirth in the five years preceding the survey (n=11,759). After the debugging process, excluding missing data, and "do not know" answers, the final sample used in this study included 9,856 women.

For the study's conflict component, we used data from the National Centre for Historical Memory. The National Centre collects information through field work, interviewing each person involved in a registered case of violence. The cases are identified from files, newspapers, internet searches, public institutions information systems, and field work. The National Centre for Historical Memory reduce underreporting by supplementing the data from the Single Victim Registry (RUV) with twelve additional sources. These sources provide information on 98 documents, including newspapers that are included in the databases of the Institute of Political Studies and International Relations of the National University of Colombia (IEPRI) (National Centre for Historical Memory 2018).

In addition, Colombians have incentives to report these cases of violence. People identified and recognized as victims of the armed conflict in Colombia can access subsidy programs for education at all levels, access the health system free of charge, receive assistance with the funeral costs of family members who died amid the conflict, relocate their family of origin, and even receive occupational guidance and income generation (Unit for Comprehensive Care and Reparation for Victims 2019).

Finally, in order to include health infrastructure at department level we used data from the Registro Especial de Prestadores de Servicios de Salud-REPS (Special Registry of

Health Service Providers), with a cut-off date of December 31, 2015 as well as the DANE population projection to 2015.

2.2.3. Variables

Outcome variable

The outcome variable in this study is optimal ANC visits, as the World Health Organization -WHO defined it, before 2016. The variable takes a value of 1 if a woman attended at least four ANC visits and a value of zero if she did not. The WHO updated the number of optimal visits to eight in 2016 (WHO 2018). However, because we used data from 2015, we kept the previous definition of four visits as a recommended number of visits for this study.

Explanatory variables

Following the conceptual framework developed by Andersen (2008) on the use of health care services, we consider characteristics from both the individual level and contextual level as determinants of ANC use.

At the individual level, we included the following characteristics for the mother and her household*:* i) age (<19, 20-29, 30-39, >40); ii) education level (no education, primary, secondary and higher education); iii) occupation (not working, agricultural/unskilled manual, clerical/sales/services/skilled manual, and professional/technical/manager); iv) affiliation to the health system[1] (no affiliation, affiliated to the subsidized regime and affiliated to the contributory regime); v) birth interval (first birth, births that occurred in less than 24 months and if preceding birth interval was 24 months or more); vi) marital status (living with a partner, other living situation); vii) autonomy index (a composite index constructed with the following information: who decides on a woman's own health care, daily household's purchases, who usually decides about visits to family or relatives, who decides about food cooked each day, and finally who usually decides on having sex and study). Given the discrete nature of the variables, the index was calculated using principal component analysis (PCA), based on a polychoric correlations matrix (Kolenikov and Angeles 2009). This method measures the association between ordinal

[1] Subsidized regime refers to a system which a person obtains a government subsidy to health services. Contributory regime refers to people that pays a fee to access to health services.

variables, assuming these variables follow an underlying joint continuous distribution (Ekström 2011). The index was categorized into three levels: low, intermediate and high autonomy; viii) household wealth index: index is constructed following Filmer and Pritchett (2001) and combines in one measure: ownership of some durable goods such as radio, tv, fridge, motorcycle and car with dwelling characteristics such as access to electricity, material used to construct walls and floors, source of drinking water and type of toilet. Next, households are classified in quintiles from "poorer" to "richer." As with the previous index, we used polychoric correlations to estimate PCA; ix) number of children under-five in the household and x) Place of residence (urban, rural).

At department level, in order to account for the role of conflict-intensity and control for some contextual characteristics that might influence the attendance of antenatal care services, we included*:* i) Conflict-intensity index: a composite index using PCA was constructed with the following information: number of terrorist attacks victims, sexual violence, civil property attacks, forced displacement, kidnapping, enforced disappearance, forced recruitment, massacres, targeted killings, and antipersonnel mines. The data corresponds to the aggregated number of victims between 1985 and 2015 and were normalized by population and standardized. The departments were classified into three groups: low, intermediate and high intensity, according to their distribution into three quantiles of the index; ii) mean level of education: corresponds to the average level of women's education in the department. The values in each category of the variable (low, intermediate and high) were derived using non-self mean proportions and aggregated information from all women in the full sample; iii) hospital beds per 1,000 people: is the number of hospital-beds per 1,000 habitants in the department and iv) rural population share: is the proportion of people living in rural areas for each department.

2.2.4. Statistical analysis: Multilevel models

Multilevel models are frequently used in medical and social sciences when individual outcomes are influenced by the individuals' characteristics at a higher level of aggregation. In other words, data have a hierarchical structure, and the usual assumption of independence between sample observations does not hold. In this study, we used the multilevel logistic regression model with random effects at the departmental level (second level) to control for individual characteristics of women and contextual characteristics of

departments, including the conflict intensity index. We assume that both individual and contextual characteristics may influence women's individual decisions regarding antenatal care visits.

Multilevel analysis allows us to explore the nature of between-group variability and the within-group effects (Steele 2008). Here, we tested four models of random effects following a sequential routine to observe the differences between and within groups as suggested in Hox, Moerbeek, and Van de Schoot (2017). The simplest model is the Null Model, which estimates the mean of our variable of interest without controlling for any explanatory variable. The next model includes characteristics at the first level, i.e.; the individual level. The next model adds variables at the second level, i.e., the department level; and the final model includes the so called cross-level interactions, i.e., interactions between individual and departmental characteristics.

Random effects allow us to capture the variability between departments and the correlation between observations within each department, thus providing better precision and generalization of the model (Bell et al., 2019; Bosker & Snijders, 2012; Hamaker & Muthén, 2020). We tested cross-level interactions to explore the moderate effect that could be generated by some contextual variables over individual characteristics, or in the opposite direction (Hox, Moerbeek, and Van de Schoot 2017). All the estimates were obtained using the statistical software Stata 14. The design and weighting sample were taken into account using the command *svy.* Multilevel logistic models were fitted using the command *xtmelogit*.

3. Results

Figure 1 categorizes departments according to the conflict-intensity index. Departments with high levels of conflict intensity, i.e., Guaviare, Arauca, Putumayo, and Caquetá, are departments historically affected by illegal armed groups, illegal crops, and the lack of institutional presence of the Colombian state.

Table 2 shows the percentage of women who attended at least four ANC visits in 2015 by selected variables. Women with higher levels of education and wealth are more likely to meet the WHO-recommended number of ANC visits.

Figure 1. Conflict-Intensity Index by Colombian Departments, 1985-2015

Source: own compilation. Note: Darker colour corresponds to a higher level of conflict-intensity.

Table 2. Percentage of women who attended 4 or more ANC visits by selected characteristics, 2015 Colombian DHS (N=9,856)

Variables	4 or more ANC visits (%)
Mothers' characteristics	
Education level	
No education	53.3%
Primary	83.6%
Secondary	90.8%
Higher	97.6%
Occupation	
Not working	86.5%
Agricultural, unskilled manual	84.4%
Clerical, sales, services, skilled manual	91.9%
Professional, technical, manager	98.1%
Health system affiliation	
No affiliation	87.0%
Subsidized regime	88.7%
Contributory regime	95.0%
Preceding birth Interval	

First birth	94.2%
Less than 2 years	79.0%
More than 2 years	91.0%
Autonomy level	
Low	88.4%
Intermediate	93.1%
High	91.9%
Current marital status	
Not cohabitating	89.5%
Cohabitating	91.9%
Household' wealth index	
Very poor	74.5%
Poor	87.7%
Middle class	93.6%
Rich	94.0%
Very rich	97.1%
Hospital Beds per-1000 People	88.9%
Urbano	92.5%
Rural	80.5%
Place of residence	
Urban	93.8%
Rural	84.5%
Department characteristics	
Conflict Intensity	
Low	92.9%
Intermediate	90.6%
High	89.0%
Mean level of mother's education	
Low	85.5%
Intermediate	91.5%
High	93.7%

The proportion of women with four or more ANC visits is greater for women who cohabitate with their partner than those who do not. Regarding occupation, the table shows that the highest percentage of women with at least four ANC visits corresponds to women working in professional/ technical/ manager activities. This same percentage, with respect to the place of residence, corresponds to women in urban areas. As the

conflict intensity level increases, the percentage of women who attend four or more ANC visits decreases.

Table 3 shows the results of the multilevel logistic regression models. Model 0, the null model, is a model with no covariates, which allows us to identify the variation in the likelihood of attending four or more ANC visits among departments (see random effect variances). In our case, the variance between departments is statistically significant and the Variance Partition Coefficient (VPC) indicates that 11% of the chances of attending four or more ANC visits is explained by between-department differences. In other words, women living in the same department are more likely to function in the same way than women living in different departments. This percentage decreases as we include controls while passing from Model 1 to Model 4.

Table 4, Model 1, indicates that at the individual level; age, mother's educational level, affiliation to the health system, cohabitation with a partner, women's autonomy and socioeconomic status according to the wealth index, increase the likelihood of completing four or more ANC visits. The increasing effects of the mother's educational level and socioeconomic status stand out in terms of magnitude. Women with higher education are 7 times more likely to attend four or more antenatal care visits than those without any education. Similarly, very wealthy women are three times more likely to attend four or more antenatal care visits compared to very poor women.

Conversely, several factors negatively impact the likelihood that a woman will attend the recommended number of ANC visits. Notably, a birth interval of less than two years significantly reduces the probability of attending four or more ANC visits; specifically, it decreases by 52%. Additionally, women engaged in agricultural or unskilled jobs, as opposed to those not working, and those with an increasing number of children under five years old in the household, also show a reduced likelihood of adequate ANC attendance.

The influence of armed conflict on ANC visits is statistically significant in Model 2, Table 4, for high, but not for intermediate levels of conflict. In light of these findings, high levels of conflict-intensity reduce the chances of attending four or more ANC visits by 33%, compared to low conflict-intensity level departments. In general, the higher the influence, the lower the probability of reaching four or more ANC visits.

In Model 3, due to the fact that the influence of conflict on ANC visits may vary depending on additional factors at the department level, we introduced controls as a way of robustness check for the conflict-intensity association influence. The aim being, to see if the conflict-intensity effect is still relevant after controlling for the aggregate department educational and health infrastructure levels. The results in table 5 indicate that the effect is still relevant and increases both in statistical and practical significance, i.e., high levels of conflict-intensity reduce the chances of attending four or more ANC visits by 37%, compared with low conflict-intensity level departments.

Furthermore, we hypothesize that factors like wealth might moderate the influence of conflict intensity on our outcome variable. Women with high levels of wealth living in departments with high levels of conflict could attend their ANC visits as they can afford the extra costs imposed by the armed conflict. To test this hypothesis, we ran a model including cross-level interactions between wealth, an individual characteristic, conflict-intensity, and a departmental characteristic.

Table 3. Random effect variances †

	Model 0	**Model 1**	**Model 2**	**Model 3**	**Model 3[a]**	**Model 4**	**Model 5**
	Null model	Individual level controls	Model 1 + Conflict-intensity	Model 2 + Department level controls	Department level controls + Conflict intensity	Model 3 + Cross-level Interactions 1	Model 3 + Cross-level Interactions 2
Variance at department level	0.403***	0.230***	0.205***	0.108***	0.143***	0.0023***	0.0023***
Variance Partition Coefficient (VPC)	0.109	0.0625	0.0587	0.0318	0.0417	0.0007	0.0007
Likelihood ratio test	Reference	134.03	119.39	44.10	91.82	171.27	173.97

†Model (0) contains no controls, Model (1) contains individual-level controls only; Model (2) corresponds to Model 1 plus the conflict-intensity index; Model (3) corresponds to Model (2) plus department-level controls; and Model (4) corresponds to Model (3) plus cross-level interaction controls.

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

Table 4. Multilevel logistic regression models for four or more antenatal care visits, 2015 Colombian DHS (N=9,856)

	Model 1	Model 2	Model 3	Model 3a
	Individual level controls	Model 1 + Conflict-intensity	Model 2 + Department level controls	
Individual characteristics	OR (95% CI)	OR (95% CI)	OR (95% CI)	
Age in years (ref: <19)				
Age (19-29)	**1.66*****(1.33- 2.08)	**1.66*****(1.33 - 2.07)	**1.66*****(1.33 - 2.07)	
Age (30-39)	**2.08*****(1.58- 2.73)	**2.07*****(1.58 - 2.72)	**2.07*****(1.58 - 2.71)	
Age (>39)	**2.04*****(1.42 - 2.91)	**2.03*****(1.42 - 2.89)	**2.03*****(1.42 - 2.90)	
Education level (ref: no education)				
Primary	**2.53*****(1.84- 3.47)	**2.53*****(1.84 - 3.48)	**2.54*****(1.85 - 3.49)	
Secondary	**3.85*****(2.76- 5.36)	**3.83*****(2.75 - 5.34)	**3.84*****(2.75 - 5.34)	
Higher	**7.12*****(4.72 - 10.75)	**7.10*****(4.71 - 10.72)	**7.15*****(4.74 - 10.80)	
Occupation (ref: not working)				
Agricultural, unskilled manual	**0.76****(0.59 - 0.98)	**0.76****(0.59 - 0.96)	**0.76****(0.59 - 0.97)	
Clerical, sales, services, skilled manual	**1.09**(0.89 - 1.33)	**1.09**(0.88 - 1.33)	**1.09**(0.89 - 1.33)	
Professional, technical, manager	**1.42**(0.86 - 2.36)	**1.42**(0.86 - 2.36)	**1.43**(0.86 - 2.37)	
Health system affiliation (ref: no affiliation)				
Contributory	**1.69*****(1.23 - 2.32)	**1.68*****(1.22 - 2.31)	**1.71*****(1.24 - 2.34)	
Subsidized	**1.57*****(1.19- 2.07)	**1.57*****(1.19 - 2.07)	**1.59*****(1.215 - 2.10)	
Preceding birth Interval (ref: first birth)				
less than 2 years	**0.48*****(0.37 - 0.61)	**0.48*****(0.37 - 0.61)	**0.48*****(0.37 - 0.61)	
more than 2 years	**0.74*****(0.61- 0.90)	**0.74*****(0.61 - 0.90)	**0.74*****(0.61 - 0.90)	
Autonomy level (ref: low)				
intermediate	**1.31*****(1.10 - 1.56)	**1.31*****(1.10 - 1.56)	**1.31*****(1.10 - 1.56)	
high	**1.13**(0.95 - 1.35)	**1.13(**0.95 - 1.35)	**1.13**(0.95 - 1.35)	
Cohabitating with partner (ref: no)	**1.57*****(1.33 - 1.84)	**1.57*****(1.33 - 1.85)	**1.56*****(1.32 - 1.84)	
Number of children under-five	**0.76*****(0.69 - 0.83)	**0.76*****(0.69- 0.83)	**0.76*****(0.69 - 0.83)	
Household wealth index (ref: very poor)				
Poor	**1.67*****(1.37 - 2.05)	**1.68*****(1.37 - 2.05)	**1.69*****(1.37 - 2.06)	
Middle class	**2.03*****(1.59 - 2.59)	**2.04*****(1.59 - 2.60)	**2.03*****(1.58 - 2.59)	
Rich	**2.29*****(1.74 - 2.99)	**2.29*****(1.74- 3.00)	**2.27*****(1.72 - 2.97)	
Very rich	**3.02*****(2.07 - 4.41)	**3.02*****(2.07- 4.42)	**2.99*****(2.05 - 4.38)	
Place of residence (ref: urban)				
Rural	**0.74*****(0.62 - 0.89)	**0.74*****(0.61 - 0.89)	**0.74*****(0.62 - 0.89)	
Department characteristics				
Conflict Intensity (ref: low)				
Intermediate		**0.97**(0.63- 1.49)	**1.05**(0.71 - 1.57)	**0.86**(0.55- 1.33)
High		**0.67***(0.44 - 1.04)	**0.63****(0.42 - 0.95)	**0.62****(0.38-0.98)
Mean level of education (ref: low)				
Intermediate			**1.11**(0.69- 1.78)	**1.64***(0.97-2.77)

High	**0.68**(0.37 - 1.24)	**1.34**(0.69-2.60)
Hospital Beds per-1000 People	**10.42**(0.83 - 1.30)	**1.12**(0.88-1.42)
Rural Population Share	**0.99*****(0.96 - 0.99)	**0.98****(0.97-0.99)

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

Table 5 presents the results of the model, including cross-level interactions between conflict and wealth. The coefficients for the interaction terms between the high conflict-intensity index and wealth were all statistically significant. This result means that wealthier women in a high conflict-intensity department can reduce the negative effect of conflict-intensity on ANC visits, with respect to the comparison group of women in a department with lower conflict influence and classified as very poor.

Table 5. Multilevel logistic regression models for four or more antenatal care visits, 2015 Colombian DHS (N=9,856) including cross-level interaction controls.

	Model 4	**Model 5**
	Model 3 + Cross-level Interactions 1	Model 3 + Cross-level Interactions 2
	Wealth x Conflict	Place x Conflict
Individual characteristics	OR (95% CI)	OR (95% CI)
Age in years (ref: <19)		
Age (19-29)	**1.05*****(1.03 - 1.07)	**1.05*****(1.03 - 1.07)
Age (30-39)	**1.07*****(1.04 - 1.09)	**1.07*****(1.04 - 1.09)
Age (>39)	**1.07*****(1.04 - 1.11)	**1.07*****(1.04 - 1.11)
Education level (ref: no education)		
Primary	**1.22*****(1.17- 1.26)	**1.21*****(1.17- 1.26)
Secondary	**1.28*****(1.23 - 1.33)	**1.28*****(1.23 - 1.33)
Higher	**1.31*****(0.99 - 1.02)	**1.31*****(1.26 - 1.28)
Occupation (ref: not working)		
Agricultural, unskilled manual	**0.96*****(0.93 - 0.98)	**0.96*****(0.93 - 0.98)
Clerical, sales, services, skilled manual	**1.006** (0.99 - 1.02)	**1.006** (0.99 - 1.02)
Professional, technical, manager	**1.01** (0.98 - 1.04)	**1.01** (0.98 - 1.04)
Health system affiliation (ref: not affiliated)		
Contributory	**1.05*****(1.02 - 1.08)	**1.05*****(1.02 - 1.08)
Subsidized	**1.05*****(1.02 - 1.08)	**1.05*****(1.02 - 1.08)
Childbirth interval (ref: first birth)		
less than 2 years	**0.93*****(0.91 - 0.95)	**0.93*****(0.91 - 0.95)
more than 2 years	**0.99*** (0.97 - 1.00)	**0.99*** (0.97 - 1.00)
Autonomy level (ref: low)		
intermediate	**1.02*****(1.01 - 1.04)	**1.02*****(1.01 - 1.04)
high	**1.01** (0.99 - 1.03)	**1.01** (0.99 - 1.03)
Cohabitating with partner (ref: no)	**1.03*****(1.02 - 1.05)	**1.03*****(1.02 - 1.05)
Number of children under-five	**0.96*****(0.95 - 0.97)	**0.96*****(0.95 - 0.97)

Household wealth index (ref: very poor)		
Poor	**1.06**** (1.01 - 1.11)	**1.09***** (1.07 - 1.11)
Middle class	**1.06**** (1.01 - 1.11)	**1.10***** (1.08 - 1.13)
Rich	**1.05**** (1.00 - 1.10)	**1.10***** (1.00 - 1.10)
Very rich	**1.07***** (1.02 - 1.13)	**1.11***** (1.08 - 1.14)
Place of residence (ref: urban)		
Rural	**0.97***** (0.96 - 0.99)	**1.01** (0.98 – 1.03)
Department characteristics		
Conflict Intensity (ref: low)		
intermediate	**0.96**	**1.01**
	(0.91 - 1.02)	(0.96 - 1.05)
high	**0.90***** (0.85 - 0.96)	**0.98** (0.94 – 1.02)
Rural Population Share		
Conflict_Intermediate#Poor	**1.02** (0.96 - 1.08)	
Conflict_Intermediate#Middle_class	**1.04** (0.98 - 1.09)	
Conflict_Intermediate#Rich	**1.04** (0.98 - 1.09)	
Conflict_Intermediate#Very_rich	**1.01** (0.95 - 1.07)	
Conflict_High#Poor	**1.05*** (0.99 - 1.11)	
Conflict_High#Middle_class	**1.08***** (1.02 - 1.14)	
Conflict_High#Rich	**1.10***** (1.04 - 1.17)	
Conflict_High#Very rich	**1.06*** (0.99 - 1.13)	
Conflict_Intermediate#rural		**0.97*** (0.94-1.01)
Conflict_High#rural		**0.95***** (0.92-0.98)
*** p<0.01, ** p<0.05, * p<0.1		

2.3. Discussion

This study analyses the influence of conflict-intensity on the likelihood of a woman attending four or more antenatal care visits in the context of an upper-middle-income country with a protracted internal armed conflict: Colombia. As expected, our results show that living in a high conflict-intensity department is associated with reductions in ANC visits. In other words, the conflict-intensity context matters for ANC visits. While low and intermediate levels of conflict do not affect the likelihood of attending ANC visits, high conflict-intensity does. In this regard, our results are in line with recent studies that explore the association between conflict and maternal health services (Ziegler et al. 2020; Mirzazada et al. 2020; Druetz et al. 2020). Several factors may explain the negative association of conflict-intensity and ANC visits. For example, the infrastructure damage caused by terrorist attacks, the fear that conflict imposes on women attending health centres, and transport problems in these areas, due to guerrilla forces or other armed forces. For Colombia, Ramos et al. (2020) found that security and geographical barriers

are the most important reasons that limit women attending antenatal care. A similar qualitative study carried out for Afghanistan reveals that the lack of health workers, supplies, governance, funding, and information systems in ongoing conflict zones affect the delivery and continuity of maternal health services (Mirzazada et al. 2020).

Notably, despite the importance of context, individual characteristics are still crucial for attending ANC visits. Consistent with the literature, we found a positive relationship between education and ANC visits; more educated women can improve their understanding of the importance of ANC visits and are more willing to change cultural beliefs about women's health services. (Babalola 2014; Osorio et al. 2014; World Health Organization 2016). We found that higher education had the highest positive association with attending ANC visits than any other variable in any of the models we estimated. A similar result was found regarding wealth. There was a positive relationship between household wealth and the likelihood of attendance four or more ANC visits. Wealthier women can potentially overcome the financial costs imposed by high conflict intensity. For example, they can move to other places with lower conflict intensity and continue with ANC visits. In fact, the results from the model (the one including cross-level interactions) provides evidence of the role of wealth as an important protector factor for women to secure the use of maternal health services.

In rural areas, we found there is a reduction of 26% in the likelihood of attending ANC visits compared to urban areas. The findings from the interaction analysis between the level of armed conflict and place of residence, indicate that in rural environments experiencing intermediate to high levels of conflict, the likelihood of a woman being able to adhere to the World Health Organization’s recommended prenatal visits decreases. This particular result is different from the previous work by Osorio et al (2014) for Colombia. In that study, the authors used the DHS 2010, but didn’t find a significant difference between living in rural or urban areas after controlling for the community context. Thus, our work provides insights for public policies seeking the amelioration of the negative effect of conflict-intensity on women's health outcomes. Under high conflict-intensity levels, support for other socio-cultural practices must be in place along with humanitarian assistance.

Other individual determinants such as women's autonomy, cohabitating with a partner, and affiliation to the health system have a positive effect on the chance of attending ANC visits. Our autonomy index for women reveals the significance of empowering women, thereby enabling them to make autonomous decisions regarding their own health care. Women who make decisions of their own free will tend to take care of their health more effectively (Bloom et al 2001). This finding is in line with previous research that points out the importance of women's autonomy for improving health related outcomes (Osorio et al. 2014; Ziegler et al. 2020).

To the best of our knowledge, this is the first study that constructs an index of armed conflict-intensity using variables that measure conflict in a multidimensional perspective and analyses how it can influence women's behavior concerning their maternal health using a multilevel approach.

Despite these strengths, this study has some limitations. Firstly, our data are a cross-section and so our results cannot be interpreted as causal effects, but only as empirical correlations. Secondly, the dataset does not contain all the relevant information that can influence the use of maternal health services, such as the distance to the nearest health facility, the presence of non-governmental organizations (NGOs), or cultural practices and beliefs. For developing countries, having a partner is highly influential for women's health outcomes (Simkhada et al. 2008). Having a partner can be significant for women's health decisions, because the partner might be the primary source of income within the household and decide how to assign income, as well as being involvement during the pregnancy period. Although the DHS 2015 data for Colombia includes a question about partners' roles in women's health decisions, this study excluded that information due to a high number of missing values. It would be important to explore the role of the partner on women's health outcomes in future research.

Additionally, the survey is not statistically representative at the municipal level. Therefore, we cannot control for municipal heterogeneities within departments. It is essential to say here, that there is no microdata for municipalities in Colombia that turned out to be statistically representative. Future research could address the importance of cultural ethnic related issues given the presence of indigenous groups in many of the most conflict-intense departments.

Given that the Colombian government is in the implementation process of the recently signed peace agreements, this study may contribute as an input for the design of public polices concerning women's health services in the most conflict-intense departments in Colombia.

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3. Decomposing the intraurban malnutrition gap between poor and non-poor children in Colombia.

Abstract

In Colombia, although it can be said that on average children living in urban areas have better quality of life than their rural peers, it is also true that within cities there are high levels of socioeconomic inequality. Our objective was to identify the contribution of the factors that explain the gap in stunting and excess weight between poor and non-poor children under 5 years of age in urban areas of Colombia. We used data from the 2015 National Nutritional Status Survey, and two nonlinear decomposition techniques based on the classical decomposition method developed by Blinder-Oaxaca. With a sample of 6,877 observations, the results showed that the intraurban gap of stunting between poor and non-poor children in urban areas was 4.8 percentage points. Its main determinants were the mother's educational level (46.5%), health system affiliation (19.4%), and assisted delivery in a medical institution (16.6%). For excess weight, the gap was -2.1 percentage points, and its main determinants were the mother's educational level (39.2%) and birth attended by a physician (21.8%). This study suggests the coexistence of a double burden of malnutrition (DBM) in children under 5 years of age living in urban areas of Colombia. Stunting was associated with low-income levels while excess weight was associated with higher income levels. The identification of the main determinants of DBM and its relative importance, constitutes a contribution for public policy makers aimed at reducing socioeconomic gaps.

Key words: Child malnutrition, stunting, excess of weight, intraurban gap, poor, non-poor, Colombia.

3.1. Introduction

On average, in Latin America, children living in urban areas have better levels of quality of life than their rural peers. However, within cities there are high levels of socioeconomic inequality (Habitat, 2012). In fact, quality of life indicators for children living in urban areas are far from equitable in Latin America (Born et al., 2019). In Colombia, intraurban inequality has increased as a consequence of internal migration processes due to violence in rural areas (Gómez Builes et al., 2008), international migration[2] (Migración Colombia, 2020) and the impact of the Covid-19 health crisis that has unequally affected the poorest (CEPAL, 2020).

In this manuscript we focus on intraurban child malnutrition inequalities. Malnutrition issues include obesity and stunting and are of great concern due to their impact on health and economic outcomes. In terms of health, stunted children have a higher probability of dying during their first five years of life, and they are more prone to get sick and perform worse at school (Osorio et al., 2018; UNICEF, 2013). In addition, stunting generates difficulties in cognitive and motor development throughout life, reflecting lower productivity and lower contribution to the growth of the economy (Barrera et al., 2017; McGovern et al., 2017). Similarly, excess weight represents a problem from the first 5 years of life, leading in many cases to stigmatization and depression, and to overweight in the rest of a child's life. It can also have very serious repercussions on health such as coronary heart disease, type 2 diabetes, hypertension, high levels of total cholesterol or triglycerides, stroke, sleep apnea and respiratory problems, liver and gallbladder disease, osteoarthritis and gynecological problems (Heart National et al., 1998; Stamatakis et al., 2010). The global economic impact of excess weight is estimated to be approximately 2 trillion dollars annually, putting a strain on health care systems and budgets (Petri Gornitzka, 2020). There is also evidence between the growth of socioeconomic disparities and the relationship with excess weight in childhood (Stamatakis et al., 2010).

Regarding economic outcomes, children with malnutrition problems are expected to be less productive in the future, thus, negatively affecting their future income levels, employment opportunities, and possibilities to escape poverty (Todaro & Smith, 2020).

[2] According to Migration Colombia, in recent years more than 1,750,000 Venezuelans have migrated to Colombia, with about 40% located in the country's five main cities (Migración Colombia, 2020).

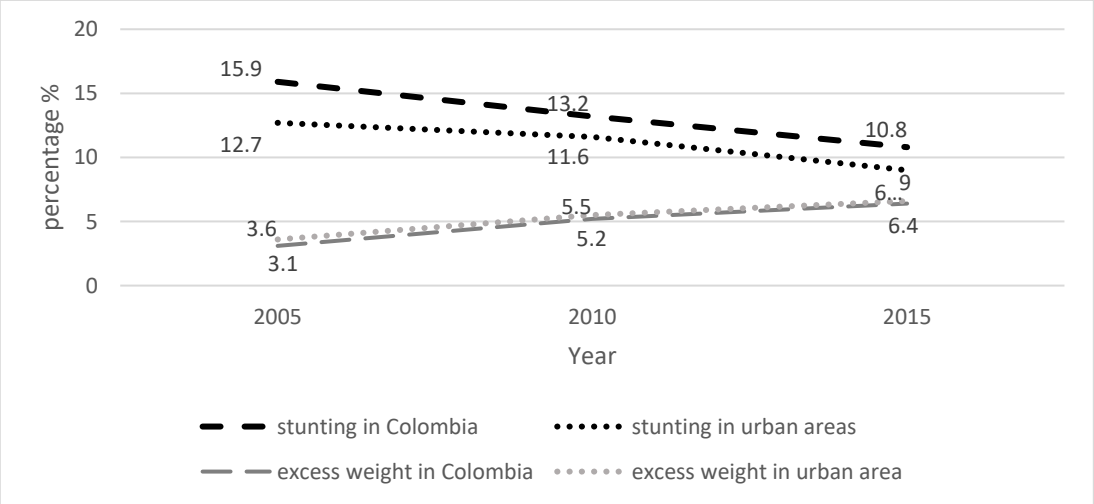
Indicators such as stunting (low height-for-age) and excess weight (overweight and obesity) have been used to assess present and future well-being conditions in childhood because of the serious consequences they can have on such outcomes (Petri Gornitzka, 2020; Stamatakis et al., 2010). Additionally, households with malnourished children see their economic conditions affected due to increased health expenditures, while for society in general the costs of the health system increase due to higher demand (Todaro & Smith, 2020).

General Trends

According to a UNICEF report (Keeley et al., 2019), there was a decrease in stunting globally (from 29.3% in 2005 to 23.3% in 2015), and an increase in excess weight (from 5.1% in 2005 to 5.7% 2015).

Figure 1, based on data from the National Nutritional Status Survey (ENSIN), shows that in Colombia the percentage of children under 5 years of age with stunting decreased from 15.9% (2005) to 10.8% (2015), whereas excess weight has been growing at higher rates from 3.1% (2005) to 6.4% (2015), in line with global figures.

Figure 1. Trends in stunting and excess weight prevalence for children under 5, Colombia 2005-2015



The presence of obesity and undernutrition in the same unit of analysis (e.g. city, country, individual, household, etc.) is known as double burden of malnutrition (DBM). Currently,

DBM affects most low- and middle-income countries (Hanandita & Tampubolon, 2015; Popkin et al., 2020).

In general, socioeconomic inequalities in terms of wealth, gender, family socioeconomic status, area of origin, wealth level of children's neighborhoods and the regions where they live, are highly associated with inequalities in children's health outcomes, including child malnutrition (Uthman, 2009). There is evidence of sociodemographic disadvantages in the intergenerational processes of malnutrition (Hasan et al., 2020) and there is an inverse association between the socioeconomic status of parents and the nutritional status of children (Braveman & Gottlieb, 2014). This demonstrates that the level of household income is a resource that can guarantee the supply of nutritional food and products that generally improve children's health. It has been pointed out that the characteristics of the area where children live affect their malnutrition status and that most of the nutritional gap between urban and rural areas, is mainly due to characteristics such as better parental education and/or better household economic situation (Mussa, 2014). Maternal education has been shown to have a high degree of importance in malnutrition indicators both in Colombia (Cardenas et al., 2022; Garcia et al., 2013; Osorio et al., 2018) and in countries such as Ethiopia (Bukulu & Kalu, 2020), Bangladesh (Sarker et al., 2020), Philippines (Ulep et al., 2021), Peru, Kyrgyzstan, Nepal, Senegal, Ethiopia (Bhutta et al., 2020) among others.

Most studies on child malnutrition have focused on the analysis of socioeconomic gaps i.e., between poor and non-poor (Chauhan et al., 2019; Joe et al., 2009; Kumar & Mohanty, 2011; Wagstaff & Watanabe, 2000) and malnutrition, or between urban and rural areas (Van de Poel et al., 2007). However, very few analyze the existence of intraurban malnutrition gaps (Kumar & Singh, 2013; Mussa, 2014). There are no studies linking socioeconomic gaps with DBM at the urban level for Colombia. To the best of our knowledge, this study is the first to make such an analysis. The aim of this paper was to identify the relative importance of the factors that explain the gap in stunting and excess weight between poor and non-poor children under 5 years of age in urban areas of Colombia. We contribute to the literature by identifying the role of the main determinants of children's malnutrition in explaining the poor/non-poor urban malnutrition gap and its relative importance using non-linear decomposition techniques.

3.2. Methods

Data

The data used in this study were taken from the ENSIN 2015, which is the most recent available data, that were released in 2019. The survey was made up of the non-institutional civilian population that usually reside in households throughout the country. It has been conducted every five years since 2005 and is one of the population surveys of strategic interest for public policy. The survey is nationally representative and covers urban and rural areas; six regions, 14 sub-regions and 33 departments (first administrative division), including the Capital District (Bogotá). The survey collects information on body measurements and biological tests, according to international standards, which allows for international comparisons, and uses a multi-stage, stratified, clustered, and probabilistic sample.

In 2015, 44,202 households were interviewed in 295 municipalities. The survey included 12,910 children under 5 years of age, of which 9,244 lived in urban areas. Considering the fact that questions relating to the number of prenatal checkups, place of birth and whether birth was attended by a physician, were only asked for the latest live births, the sample was reduced to 7,558. The final sample corresponds to n=6,877 responses after excluding responses with "missing values" or "don't know/no response".

Outcome variables

Two outcome variables related to malnutrition were used. The first variable was stunting. A child is considered to be stunted when the height-for-age Z-score is below minus two standard deviations (-2SD) from the median reference established according to the World Health Organization-WHO growth standards (OMS et al., 2014). This anthropometric indicator is key to measure well-being in childhood to the extent that it reflects inadequate nutrient intake in the long term and is associated with poor socioeconomic conditions (Mosley & Chen, 1984; Osorio et al., 2018). The second indicator, excess weight, is calculated from the body mass index (BMI), which uses height and weight measurements to estimate the amount of body fat a person has. When the Z-score for BMI is above two standard deviations (+2SD) of the reference median, it is considered overweight (Ekholuenetale et al., 2020).

Operationally, the child malnutrition outcome variables, Y_i, are binary variables that can only have two outcomes for each observation i. $Y_i = 1$ when the child suffers from malnutrition according to the definitions of the two outcome variables described above, and, $Y_i = 0$ in any other case.

Explanatory variables

Following the conceptual framework proposed by the authors and detailed elsewhere (Bhutta et al., 2020; Grossman, 2000; Mosley & Chen, 1984; Osorio et al., 2018), that combine structural and intermediate determinants for child health, we have included the following variables.

Child's characteristics: sex (boy or girl), ethnicity (Afro-Colombian, indigenous or non-ethnic), birth interval (First birth, <24 months or ≥24 months) and breastfeeding (Yes or no). Mother's characteristics: age at childbirth (≤19, 20-29 or >30), education level (No education, primary, secondary, or higher), number of prenatal checkups attended (≤3 or ≥4), BMI (≤18.5, 18.5-25, ≥25), health system affiliation (Contributor, subsidized or unaffiliated), delivery attended by a health professional (Yes or no), and delivery in a health institution (Yes or no). Household's characteristics: region (Atlantic, Eastern, Orinoquia, Central, Pacific or Bogotá - Capital District) and wealth index (categorized by quintiles). The bottom two quintiles of the wealth index are identified as "poor" and the others as "non-poor". This classification is consistent with previous studies (Joe et al., 2009; Kumar & Singh, 2013).

Statistical analysis

First, for the intraurban gap analysis, we quantified the socioeconomic inequality for each child nutritional status indicator and calculated a concentration index (CI) using the concentration curve. The concentration curve was used to visualize whether it was above or below the equality line and to attribute a greater number of poor or non-poor people to the malnutrition indicator. In constructing the curve, the "Y" axis determined the cumulative percentage of children in a state of malnutrition, and the "X" axis the percentage of children classified according to household wealth status, starting with the poorest quintile. The CI is positive when the concentration curve is below the diagonal,

and negative when it is above the diagonal (Mokalla & Mendu, 2020; Wagstaff et al., 2007).

In addition, considering that our outcome variables were dichotomous we used the Yun and Fairlie's decomposition techniques (Fairlie, 2017; Yun, 2004), which are based on the Oaxaca and Blinder's seminal works (Blinder, 1973; Oaxaca, 1973).

Yun's non-linear decomposition allows us to explain the difference in the probability of being stunted or excess weighted between our two groups of interest, i.e., poor, and non-poor, as the sum of two independent effects: characteristics and coefficients. The characteristics effect measures the portion of the gap that is explained by existing differences in the socioeconomic characteristics between the two groups. The coefficients effect measures the part of the gap that can be attributed to structural, unobservable differences. This technique also allowed us to identify the individual contributions of each characteristic to explain the difference in outcomes through the detailed decomposition (Yun, 2004).

Similarly, Fairlie's decomposition technique estimates the characteristics (explained) and coefficients (not explained) effects, and detailed decomposition. This technique has been widely used in the literature, exploring the possible causes of racial and gender differences in many economic studies, and provides similar results to the original applications of the Blinder-Oaxaca technique (Fairlie, 2017).

These two techniques address (in different ways) the so-called path dependency problem for non-linear decompositions, in which the relative contribution of each characteristic in the detailed decomposition is sensitive to the order of replacement of values from one group into the other (Fairlie, 2017). We calculated the characteristics and coefficients effects, and the detailed decomposition using the two decomposition techniques to check the robustness of our results.

Data analysis was conducted using Stata v14. To calculate the Yun decomposition with the explained and unexplained components, we used the *oaxaca* command with the *logit* option. For the Fairlie decomposition we used the *fairlie* command. To calculate the CI and plot the concentration curve we used the command *conindex*.

3.3. Results

Descriptive statistics

The prevalence of stunting in urban Colombian children was 8.6%, and the excess weight was 6.4%. Table 1 shows the malnutrition indicators between urban poor and non-poor children. Poor children had a higher prevalence of stunting (11.4%) than non-poor children (7.8%), but they had a lower prevalence of being overweight (4.9%) than non-poor children (6.8%). Additionally, Table 1 shows descriptive statistics for the explanatory variables for poor and non-poor children. There were notable intraurban differences between poor and non-poor children. Regarding ethnicity, there are more Afro-Colombian and Indigenous children in the poor group. With regards to children who had no siblings at birth, we found a difference of 10.4 percentage points (pp) between poor (40.6%) and non-poor (51%). Mothers who were under 19 years old when the child was born presented a difference of 7.3 pp between the poor (27.5%) and the non-poor (20.2%). There was a large difference in the mother's education level between poor and non-poor children, revealing that 51.6% of the mothers of poor children, had primary school education at most, as opposed to the mothers of non-poor children, who had mostly had secondary- and/or higher-level education (75.7%). Non-poor children were mostly affiliated to a contributory health system (60.4%), in contrast to poor children with 75.7%, who were affiliated to the subsidized system. The above-normal body mass index (>25 kg/m2) of the mothers of non-poor children (52.8%) showed a difference of 4 pp with respect to the mothers of poor children (48.8%).

Finally, it can be seen that more than 47% of children under 5 years of age living in urban areas were located in the Central and Atlántico regions, with the highest concentration of poor children being in the Atlántico region (44.1%). The highest concentration of non-poor children was located mainly in the Central region of the country (24%) and the capital city Bogotá (23%).

Table 1. Sample characteristics by poor and non-poor children under 5 years of age in urban areas, Colombia 2015

Variables	%Total	% Poor	% Non poor	Difference	Pearson chi2 (p)
Stunting	8.6	11.4	7.8	3.5	0.001***
Excess weight	6.4	4.9	6.8	-1.9	0.001***
Children's characteristics					
Sex					0.178
Boy	51.1	49.3	51.7	-2.4	
Girl	48.8	50.7	48.3	2.4	
Ethnicity					0.001***
Afro-Colombian	8.7	16.8	6.3	10.5	
Indigenous	1.9	5.7	0.7	5.0	
Not belonging to an ethnic group	89.4	77.5	93.0	-15.5	
Birth interval					0.001***
First birth	48.6	40.6	51.0	-10.4	
< 24 months	5.7	7.6	5.2	2.5	
≥ 24 months	45.7	51.8	43.8	8.0	
Currently breast-feeding					0.001***
Si	32.0	33.3	31.6	1.7	
No	68.0	66.7	68.0	-1.3	
Mother's characteristics					
Age when the child was born					0.001***
≤ 19	21.9	27.5	20.2	7.3	
20 - 29	51.7	49.0	52.5	-3.6	
> 30	26.4	23.6	27.3	-3.7	
Educational level					0.001***
No education	4.5	11.2	2.5	8.6	
Primary	26.0	40.4	21.7	18.7	
Secondary	60.0	46.4	64.1	-17.7	
University	9.5	2.0	11.6	-9.7	
Number of prenatal checkups					0.001***
3 o less	7.1	11.4	5.8	5.7	
4 o more	92.9	88.6	94.9	-6.4	
Affiliation to health system					0.001***
Contributory regime	50.8	18.6	60.4	-41.7	

Subsidized regime	45.4	75.7	36.3	39.4	
Not affiliated	3.8	5.7	3.3	2.4	
Birth attended by a physician					0.001***
No	3.2	5.4	2.5	2.8	
Si	96.8	94.6	97.5	-2.8	
Birth took place in a medical institution					0.001***
No	0.8	2.4	0.3	2.1	
Si	99.2	97.6	99.7	-2.1	
Body Mass Index					0.739
18.5 o menos	3.2	4.4	2.9	1.5	
18.5 - 25	44.9	46.8	44.4	2.4	
25 o más	51.9	48.8	52.8	-4.0	
Household's characteristics					
Region					0.001***
Atlántico	23.9	44.1	17.8	26.3	
Oriental	15.7	8.1	18.1	-9.9	
Orinoquia	3.2	8.1	1.8	6.3	
Bogotá	18.7	4.4	23.0	-18.5	
Central	23.5	21.8	24.0	-2.2	
Pacífico	15.0	13.6	15.5	-1.9	

*p<0.10. **p<0.05. p<0.01***

Figure 2 shows the distributions of the Z-scores of the anthropometric indicators by level of wealth. With reference to stunting, the poor showed a greater deviation to the left of the mean. However, in the case of the excess weight indicator, the distributions deviated to the right of the mean, with a slight difference between the non-poor and the poor. The Z-scores for the malnutrition indicators intuitively describe the double burden of malnutrition, since there was evidence of greater malnutrition in the poor and at the same time, greater excess weight in the non-poor.

Index and concentration curve

The concentration index for stunting was -0.19, with a SD of 0.02. The negative value indicates that there was a greater probability of stunting in poor children in relation to children with a higher level of wealth. Additionally, the concentration index for excess

weight was 0.12 (SD = 0.03). The positive value represents a greater probability of excess weight for non-poor children in relation to poor children.

Figura 2. Histogram and Kernel density of Z-scores for poor and non-poor children under 5 years of age in urban area, Colombia 2015. (a) Z-score for height-for-age. (b) Z-score for body mass index.

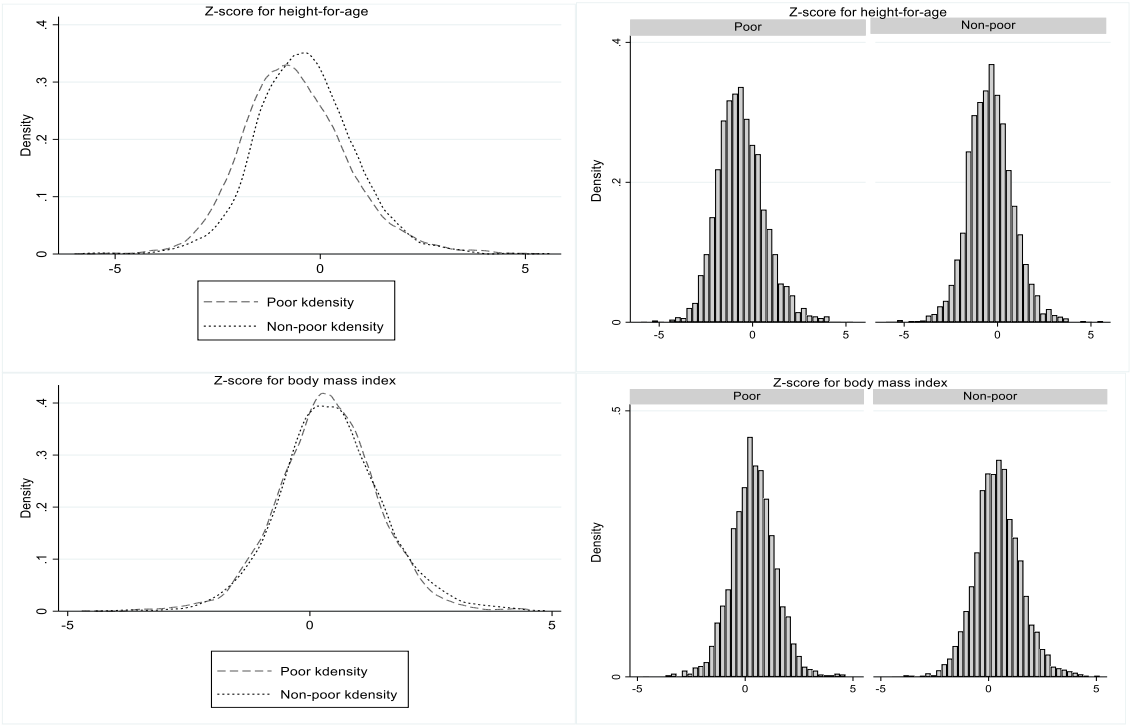
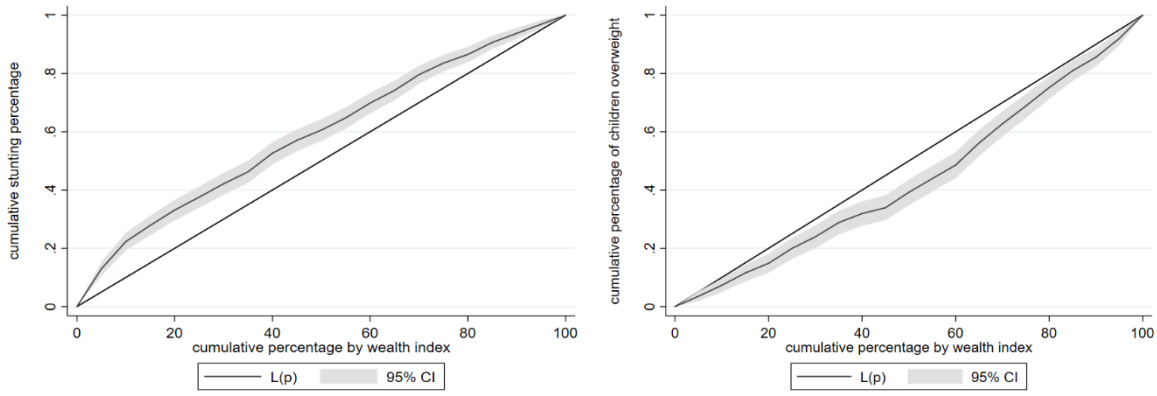


Figure 3. Colombia 2015. Concentration curves in malnutrition indicators, for children under 5 years of age in urban areas, Colombia 2015.



In Figure 3 the concentration curves for the two malnutrition indices (consistent with the CI), show that stunting was above the equality line and excess weight was below.

Decomposition Analysis

Table 2 presents the findings of the intraurban gap between poor and non-poor using Yun's decomposition. Stunting presented a gap of 4.8 pp against the poor. Its main explanatory determinants were the mother's educational level (46.5%), affiliation to the health system (19.4%), and giving birth in a health institution (16.6%). The gap between poor and non-poor for excess weight showed a difference of -2.1 pp, 50% of which was explained by the effects of characteristics (endowments). The determinants with the highest percentage of participation were the mother's educational level (39.2%), delivery attended by a medical professional (21.8%), and affiliation to the health system (20.3%). In the coefficient effects, the mother's body mass index was the only statistically significant variable, explaining 69.3% of the gap.

In the results obtained through Fairlie's decomposition, it can be seen that the values were very similar to those found by Yun's decomposition, which strengthens the results of the decomposition of the gap between poor and non-poor. For the stunting indicator, the characteristics effect explained the gap to a greater extent. Specifically, the mother's education, breastfeeding and prenatal controls were those that drove this indicator. In relation to excess weight, the variables; child's sex, mother's body mass index and birth attended by a medical professional, were shown to be statistically significant. The results for Fairlie's decomposition are reported in the appendix.

Table 2

Decomposition of the poor and non-poor gap for children under 5 years old in urban areas, Colombia 2015.

	Stunting		Excess weight	
	Coef.	P>|z|	Coef.	P>|z|
Poor	0.118	0.000***	0.053	0.000***
Non-poor	0.070	0.000***	0.074	0.000***
Difference	0.048	0.000***	-0.021	0.000***
Explained *(characteristics effect)*	0.026	0.000***	-0.010	0.000***
Unexplained (*coefficients effect)*	0.022	0.000***	-0.010	0.046*

Variables	Characteristics effect 54%		Coefficients effect 46%		Characteristics effect 50%		Coefficients effect 50%	
	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Sex	-0.000 (-1.2%)	0.243	-0.004	0.845	-0.000 (3.5%)	0.204	-0.000	0.987
Ethnicity	0.001 (2.5%)	0.728	-0.084	0.023**	-0.001 (9.2%)	0.515	-0.004	0.870
Birth Interval	0.001 (3.9%)	0.109	-0.023	0.174	-0.001 (4.9%)	0.235	-0.005	0.679
Breastfeeding	-0.002 (-7.1%)	0.004***	0.009	0.721	0.001 (-4.6%)	0.187	0.014	0.375
Mother's age when child born	0.002 (7.4%)	0.021**	0.030	0.177	-0.000 (2.9%)	0.599	-0.014	0.401
Mother's educational level	0.012 (46.5%)	0.000***	-0.040	0.201	-0.004 (39.2%)	0.033**	-0.029	0.146
Number of prenatal checks	0.003 (13.4%)	0.003***	-0.048	0.281	-0.000 (3.6%)	0.706	0.020	0.536

Body Mass Index	0.000 (1.0%)	0.458	0.022	0.192	-0.000 (3.1%)	0.453	0.027	0.010***
Affiliation to health system	0.005 (19.4%)	0.066*	-0.018	0.441	-0.002 (20.3%)	0.302	0.002	0.919
Birth attended by a physician	-0.001 (-5.3%)	0.240	-0.066	0.153	-0.002 (21.8%)	0.020**	0.025	0.353
Birth took place at a medical institution	0.004 (16.6%)	0.001***	0.080	0.190				
Region	0.001 (2.9%)	0.366	-0.022	0.090*	0.000 (-3.7%)	0.508	0.002	0.808
Constant			0.186	0.059*			-0.050	0.446
Group effects	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
Demographic factors	0.002 (8.1%)	0.366	-0.133	0.007***	-0.001 (13.9%)	0.426	-0.007	0.833
Maternal characteristics	0.016 (61.1%)	0.000***	-0.027	0.647	-0.005 (44.0%)	0.028**	0.019	0.670
Health care use and access	0.008 (30.7%)	0.006***	-0.004	0.947	-0.000 (42.1%)	0.046**	0.027	0.417

*p<0.10. **p<0.05. p<0.01***.

Demographic factors: Sex - Birth interval - Ethnicity - Region. Maternal characteristics: Mother's age when child born - Mother's educational level - Breastfeeding - Number of prenatal checks - Body Mass Index, Health care: Affiliation to health system - Birth attended by a physician - Birth took place at a medical institution.

3.4. Discussion and conclusion

This study made it possible to identify the contribution of the factors that explain the gap in stunting and excess weight between poor and non-poor children under 5 years of age in urban Colombia. It is important to emphasize that this study was carried out in the context of a highly unequal country in socioeconomic terms and allows for providing inputs for the creation of public policy, particularly aimed at reducing socioeconomic gaps, which should be directed at the indicators associated with the double burden of child malnutrition.

Stunting in children under 5 years of age, as previously mentioned, has been reduced in the last 10 years. However, the results show that the gap between the poor and non-poor in urban Colombia persists in malnutrition indicators.

From the non-linear decomposition of Yun and Fairlie based on the classical Blinder-Oaxaca decomposition, the probability of stunting in poor children was 4.8 pp higher than that of non-poor children. 54% of this difference can be explained by the characteristics effect of the explanatory variables themselves. This suggests that if we could give poor children the higher contributing characteristics that non-poor children have, this 54% of the gap would disappear. In other words, the distribution of determinants in the characteristics effect plays an important role in explaining the gap. This result corroborates the socioeconomic inequalities in health observed in the literature (Born et al., 2019; Joe et al., 2009; Kumar & Singh, 2013; Mokalla & Mendu, 2020).
The group effects results indicated that the set of mother's characteristics is the most important group of variables for explaining urban children's malnutrition gap in Colombia. After the group of maternal characteristics, access to and use of medical care services was the next most significant group of variables in explaining the gap.

The most relevant characteristic within the group of maternal characteristics was the mother's educational level. The importance of maternal education in explaining malnutrition gaps is a common finding in the literature (Cardenas et al., 2022; Ekholuenetale et al., 2020; Joe et al., 2009; McGovern et al., 2017; Osorio et al., 2018; Sarker et al., 2020; Ulep et al., 2021). Our results suggested that the role of education was crucial in the case of Colombia as well. Specifically, the mother's educational level

explained 46.5% of the children's stunting gap and 39.2% of the children's excess weight gap within urban zones. In India, the mother's educational level explained 11% of the same children's stunting gap within urban zones (Kumar & Singh, 2013). In general, lower levels of maternal education can negatively influence lifestyles, affecting the decisions made about essential issues in the household. In addition, mothers with lower levels of education have fewer employment opportunities and may be less able to identify and solve health problems (Braveman & Gottlieb, 2014). Higher educational levels were associated with higher use of health services. Education can provide socially valued skills and give women a higher status which increases self-confidence and facilitates social interaction. Mothers with a higher educational level are able to access better health and nutritional services (Ulep et al., 2021).

In Colombia, high levels of income inequality are associated with high inequalities in access to quality education (Barrera-Osorio et al., 2012; Delgado, 2014). Thus, it is difficult for poor women to access high-quality education and better job opportunities. This may help explain the important weight of the mother's educational level in the case of stunting. In the case of excess weight, women with high levels of education may have better-paid jobs in the skilled job market and more sedentary lifestyles, including more frequent use of electronic devices and feeding their children with fast food (Cardenas et al., 2022; Egerter et al., 2011; Gwozdz et al., 2013). A previous study found that the mother's educational level is important in explaining children's stunting gap between rural and urban areas in Colombia (Cardenas et al., 2022). However, the present study highlighted the importance of the mother's educational level in the context of urban areas.

Evidence of the significant validity of having access to the number of prenatal checkups recommended by the WHO in 2015, and having a child delivered in a health institution such as a hospital, helps to reduce inequalities in child health in the short term (Solar & Irwin, 2006).

The socioeconomic gap in the excess weight indicator was prevalent among the non-poor, with 2.1 pp above the poor. Part of this gap was attributed to the characteristics effect, revealing that the statistically significant variables are "birth attended by a physician at the time of delivery" and "mother's educational level".

The other part of the gap that is "unexplained" (which presents the coefficients effect), was given to the payoffs of the characteristics. In the findings, the mother's body mass index was the only variable with statistical significance and accounted for 69.3% of the coefficients effect. This finding suggests the presence of structural factors such as the inherited biological or cultural factors affecting child's excess weight through the mother's body mass index.

Moreover, previous studies have shown that variables relating to lifestyle and eating habits are related to the mother's body mass index, and in turn show an intergenerational association with indicators of excess weight and obesity (Egerter et al., 2011; Ortiz-Félix et al., 2015). To increase the robustness of the findings in relation to excess weight, a logistic regression was performed using a subsample with information relating to the lifestyle and eating habits of preschool children, from 3 to 5 years of age (we used this range of age due to data availability from the survey). The analysis found that weekly consumption of cookies, not eating at home habitually, and physical activity were determinant variables, which increased the probability of being overweight. These results can be provided on request.

The fact that the mothers of "non-poor" children have a higher level of education increases the probability of enter to the labor market, causing a change of routine within the household. These changes will probably increase children´s fast food consumption, due to a lack of time. Moreover, their diet is likely to be strongly influenced by the wide offer of processed food products, technology, the media, and devices such as cell phones, PCs, and television (Egerter et al., 2011; Gwozdz et al., 2013).

The analysis of the association between malnutrition indicators and the explanatory variables mentioned above, revealed social inequity. Our findings are consistent with studies conducted in countries with similar socioeconomic characteristics such as Nepal, Ethiopia, Senegal, Peru (Bhutta et al., 2020), Malawi (Mussa, 2014), Egypt, Jordan, Yemen (Sharaf & Rashad, 2016) and India (Nie et al., 2016). Those studies have used Blinder-Oaxaca decomposition or other techniques such as quantile regression decomposition (Aheto, 2020) and conclude that the socioeconomic determinants commonly associated with child malnutrition are parental education and access to the health system. Our results agree with the preponderance of the effects of characteristics

over the effect of coefficients in explaining the gap in child malnutrition. However, the effect of the coefficients that the mother's body mass index may have on a child's excess weight (whether due to dietary changes or practices, lack of physical activity or sedentary behaviors) played an important role in the analysis and the objective of our study.

The findings allow us to affirm that ensuring that mothers have a high school and/or higher level of education could be a public policy for the protection of children. Attending secondary school reinforces healthy sexual and reproductive behaviors, appropriate dietary practices and promotes women's empowerment (Egerter et al., 2011).

The reported findings have very different policy implications. First, public policies aimed at reducing the stunting gap should focus on programs promoting mothers' education and thus strengthen issues such as exclusive breastfeeding, methods of complementary feeding, and antenatal care during pregnancy. It is also necessary to expand health services coverage for lower-income levels (UNICEF, 2020). Second, regarding the excess weight gap, public policies must promote more healthy lifestyles, including appropriate sleep time, balanced nutritional intake and physical activity, or active play in the children's daily routine, and moderate use of social media and screen entertainment devices. Thus, there is an evident need for integrated actions between health and education professionals (including children and family members), to plan and implement strategies to prevent and combat childhood obesity, embedded in lifestyle changing habits (World Health Organization, 2016).

Some limitations of the present study are that urban areas are not homogeneous between regions. It is possible that variables that can contribute to the identification of the gap, are not included in the survey (such as the mother's autonomy) or have been left out of the estimates (such as context variables including the average education of mother's in the community, among others (Osorio et al., 2018)). For future studies, we recommend expanding research into the qualitative data to strengthen the evidence (Bhutta et al., 2020; Huicho et al., 2020), including the relationship between malnutrition with the type of education that mothers should have, breastfeeding practices, complementary feeding of the child, lifestyles, habits, and dietary changes. The gap between poor and non-poor, and the coexistence of the double burden of child malnutrition, has shown that child malnutrition indicators (stunting and excess weight) are strongly associated with the

socioeconomic position of the household. This finding is a contribution to those in charge of public policies aimed at reducing socioeconomic gaps and their contributors in urban Colombia.

Finally, excess weight is not a problem that is exclusive to high-income households, since the poor also have a prevalence of this indicator. Therefore, it is even more necessary to implement prevention policies in poor communities since they present a double burden of malnutrition.

3.5. References

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Appendix

Fairlie's decomposition of the poor and non-poor gap for children under 5 years old in urban areas, Colombia 2015.

	Stunting		**Excess weight**	
	Coef.		Coef.	
Poor	0.118		0.053	
Non-poor	0.070		0.074	
Difference	0.048		0.021	
Explained *(characteristics effect)*	0.027		-0.004	
Variables	Characteristics effect		Characteristics effect	
	Coef.	P>|z|	Coef.	P>|z|
Sex	-0.002	0.071*	-0.001	0.030**
	-5.7%		36.3%	
Ethnicity	0.003	0.334	0.000	0.987
	10.8%		1.0%	
Birth interval	0.000	0.913	-0.001	0.425
	0.5%		17.7%	
Breastfeeding	-0.004	0.007***	0.000	0.909
	-16.2%		-1.4%	
Mother's age when child born	0.0006	0.486	0.000	0.661
	2.3%		-9.5%	
Mother's educational level	0.015	0.00***	-0.000	0.872
	55.5%		-11.7%	
Number of prenatal checks	0.006	0.009***	-0.001	0.551
	22.1%		14.8%	
Body Mass Index	0.000	0.193	-0.001	0.049**
	1.6%		24.8%	
Affiliation to health system	0.001	0.893	-0.001	0.809
	2.2%		23.7%	
Birth attended by a physician	-0.001	0.806	-0.001	0.072*
	-2.5%		12.9%	
Birth took place at a medical institution	0.005	0.075*	0.000	0.800
	20.2%		-8.7%	
Region	0.002	0.37		
	9.1%			

*p<0.10. **p<0.05. ***p<0.01

4. The gender panorama of care of children in Colombia: Analysis of the National Time Use Survey

Abstract

Care contributes to the generation, development, and maintenance of human capabilities, which yields benefits for individuals and society. Childcare is one of the most important predictors of care work. Women living in households with dependents and children under six years of age dedicate more hours to care activities. The objective of this study is to identify gender gaps in unpaid care of children in Colombian homes. We are also interested in disaggregating gaps by type of care and differences related to gender roles within households. We analyze data from the National Time Use Survey (ENUT) of Colombia 2020/2021 to explore disparities in the allocation of care time between genders for various care activities.

The study uses the Blinder-Oaxaca decomposition method to understand the factors that contribute to the gender gap.

The results show that there is an unequal allocation of time between women and men; this gap is more pronounced in childcare activities that involve children under five years of age. The gender gap is wider in rural and dispersed urban areas compared to municipal capitals. Women who subscribe to traditional social norms regarding gender roles demonstrate a wider gender gap in caregiving time. More than half of the gender gap can be attributed to observable characteristics such as occupation, education, marital status, and adherence to social norms.

This research highlights the significant gender gap in unpaid childcare within Colombian households.

Keywords: Gender gap, early childhood care, Colombia, caregiving time, social norms

4.1.Introduction

Caregiving lies at the heart of human existence. All individuals, whether as providers or recipients, rely on caretakers. The very fabric of societies, the workforce, and the overall well-being of each person hinges upon the provision of care. This report broadly defines care work, drawing from existing literature, as encompassing the physical, psychological, and emotional support provided to adults, children, the elderly, and young individuals. Whether addressing the needs of fragile or healthy individuals, those with physical, cognitive, or emotional requirements, or even healthy adults, varying degrees of protection, care, and support are demanded. Our expanded definition of care work encompasses all forms of care, including activities related to social reproduction.

Two primary categories of care activities exist. First and foremost are direct, personal, and relational care tasks—often referred to as "creational" or "relational" care. These include feeding infants, attending to elderly parents, or assisting older individuals with bathing, medical check-ups, and knowledge transfer to young boys and girls. The second category comprises indirect care activities, which do not involve direct personal interaction. Examples include cleaning, cooking, laundry, and other household maintenance tasks, often termed "personal care" or "domestic work." These indirect activities lay the groundwork for effective personal care (Addati et al., 2018). Carework always occurs within the context of a caring relationship between a caregiver and a recipient. Whether it's the bond between a mother and her child, a nurse and a patient, a domestic worker and a client, or a child and a nurse, the motivations for caregiving include love, duty, responsibility, social and familial pressures, and sometimes financial compensation (Chioda & Verdú, 2016).

Globally, there are currently 215 million caregivers employed in healthcare, social work, and education sectors, alongside 70.1 million domestic workers and caregivers. When considering the entire support system for care provision, the global labor force dedicated to caregiving totals 381 million individuals, representing 11.5 percent of the global workforce.

Notably, 65 percent of this caregiving workforce comprises women. This percentage is even higher among caregiver employees (66%) and those working in domestic settings

(70%). Conversely, men constitute 6.6 percent of the global labor force dedicated to caregiving, while women account for over three times that figure, at 19.3 percent (Addati et al., 2018).

Unpaid caregiving work often perpetuates gender stereotypes, associating childcare with women's "natural" inclinations rather than recognizing the skills acquired through formal education or training. The feminization of caregiving underscores the importance of improving working conditions and compensation for all individuals engaged in care-related fields. Such efforts will directly benefit women and enhance overall caregiving standards.

In early childhood, learning occurs through the attentive care provided by caregivers and teachers. Recent evidence challenges the notion that a high staff-to-child ratio significantly impacts early childhood education outcomes (Esquivel & Kaufmann, 2017). Childcare contributes to the development and maintenance of human capabilities from the first years of life, yielding benefits for both individuals and society (Folbre, 2018). In recent years, studies and measurements on care have gained relevance by revealing gender inequalities in its provision.

In Latin America, care has traditionally been provided by families, primarily by women and girls. This exposes them to a double or even triple workload that limits their opportunities for education, work, and leisure (Batthyány, 2015b). These gaps are reflected in the time that men and women dedicate to care. Data from Colombia shows that in 2021, women dedicated nearly 8 hours per day to care tasks, while men dedicated 3.2 hours (DANE, 2022).

Childcare is one of the most significant predictors of care work. Women living in households with dependents and children under six years dedicate more hours to care activities (Karimli et al., 2016b) because childcare requires a considerable amount of time, energy, and skills (Fontana & Elson, 2014b). For women, having children often results in what is termed a 'child penalty'. This penalty implies that mothers and women in the household increase their care time (Berniell et al., 2023) and have a higher propensity to spend time on activities related to unpaid domestic care, which affects their ability to generate income (Ospina-cartagena & Garcia-suaza, 2020b). Evidence from Denmark shows that the child penalty affects labor market gaps in the long run (Kleven

et al., 2019). Evidence from Latin America shows that the penalty affects women with higher levels of informality, self-employment, and shorter working hours. This penalty implies that mothers and women in the household increase their care time (Berniell et al., 2023). Data from Mexico shows that women experience an increase of more than 15 hours per week of unpaid work when children arrive (Aguilar-Gomez et al., 2019).

The penalty can be partly explained by gender roles and stereotypes that have placed the burden of childcare on women. Within the set of care activities, those that demand more effort, such as direct care: feeding, putting to sleep, or changing diapers, are more likely to be performed by women, while men are more likely to engage in recreational and educational activities (Craig et al., 2014).

For Colombia, 76% of all unpaid care work is provided by women, and the gender gap occurs in all age and income groups (DANE, 2020b). In this line, (Ospina-Cartagena & Garcia-Suaza, 2020) point out "the marked division of roles in the home" when decomposing the categories of unpaid domestic care, which defines that men do more passive care while women do more unpaid work, reducing their hours of paid work; especially in households with children under six years. Factors such as educational level, income, and family structure are important determinants of time distribution.

This study aims to identify gender gaps in unpaid care of children in Colombian homes. We are also interested in disaggregating the gaps by type of care and the differences related to gender roles within households.

The second section addresses the methodological approach, presenting the database, the variables, and the Blinder-Oaxaca decomposition model. The third section showcases the descriptive results and the decomposition model. The fourth section contains the discussion, conclusions and limitations. The final section lists the references.

4.2. Methodology

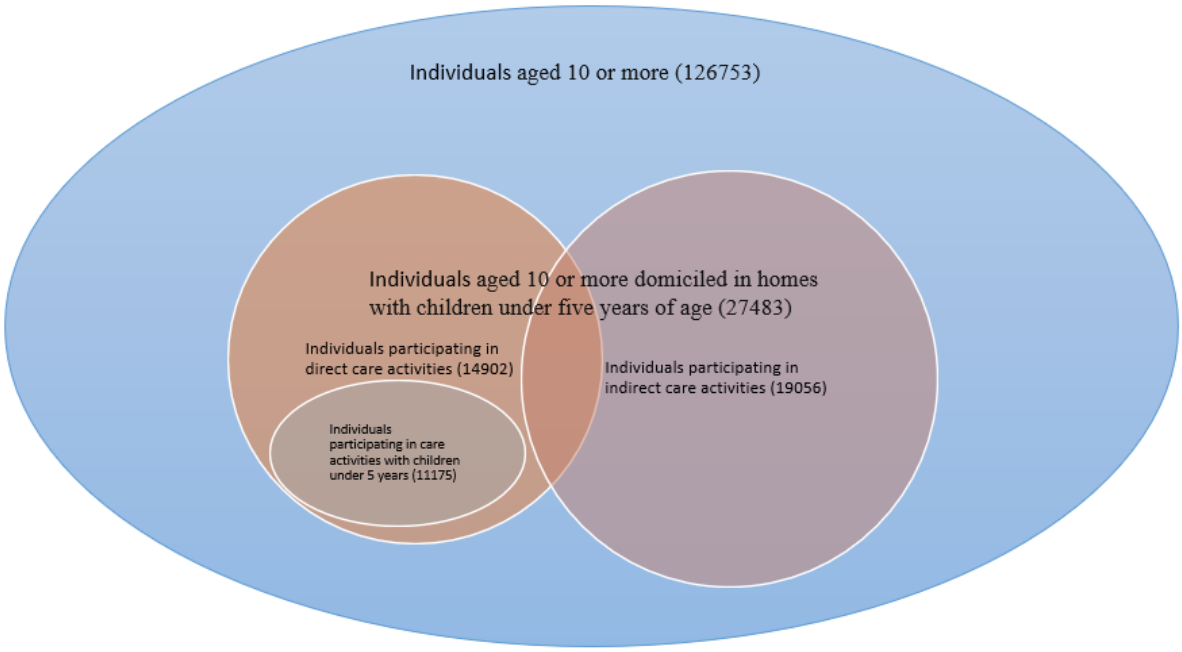
4.2.1. Data Sources

The dataset for this investigation comes from the National Time Use Survey (NTUS), which is designed to gather comprehensive information on how individuals aged 10 and above allocate their time. The survey encompasses data collected from the non-institutionalized civilian populace residing across the national territory, excluding the departments of Orinoquía and Amazonía. Conducted triennially, the most recent data collection phase ran from September 2020 to August 2021. The sample is comprised of 49,051 households, accounting for 49,519 residential units, 147,579 individual respondents, and 126,753 persons of age 10 or older, as documented by DANE in 2022. Figure 1 offers a disaggregated analysis of 27,483 individuals domiciled in households with children under five years of age. Within this specific cohort, 19,056 individuals are engaged in indirect caregiving activities, 14,902 are involved in direct caregiving, and, more precisely, 11,175 are actively participating in caregiving tasks specifically targeted at children under the age of five.

The survey offers an exhaustive examination of caregiving responsibilities assumed by both genders within the Colombian milieu. Data were meticulously harvested via structured interviews and subsequently analyzed. The reported outcomes incorporate expansion factors, based on demographic projections extrapolated from the 2018 National Population and Housing Census.

It merits particular attention that the dataset includes a considerable quantum of missing values, as well as instances of "does not know/does not answer" responses across certain explanatory variables. To compensate for these limitations, we have executed both descriptive and bivariate analyses on pertinent subgroups. This strategy affords valuable insights into the relationships between these variables and the dependent variable under scrutiny.

Figure 1. Sample population with children under 5 years of age and participating in care activities.



4.2.2. Response Variable

The response variable is concerned with caregiving activities conducted by individuals aged 10 and above, and is quantified in hours. Following the guidelines established by DANE (2022), the study focuses on three specific indicators related to caregiving activities (measured in hours) but exclusively within households where children under the age of 5 reside. These indicators are defined as follows:

A. Indirect Care Activities Targeting Household Members (HCI)

• Food provisioning activities

• Clothing maintenance tasks

• Cleaning and upkeep activities

• Household shopping and management functions

B. Direct Care Activities Targeting Household Members (HCD)

• Supportive activities for household members

• Engagements with children under 5 years of age

• Direct caregiving to other household members, encompassing:

- Feeding or assisting in feeding
- Bathing, dressing, putting to sleep or assisting in these tasks
- Assistance in academic tasks or school-related work
- Administration of medications, conduct of therapies, rehabilitations, or treatments
- Accompanying to medical appointments, including time spent on care and transportation

C. Care Activities Specifically Aimed at Children Under 5 Residing in the Household (HCA_u5)

The nomenclature has been formalized to align with the academic rigor expected in scholarly communications.

4.2.3. Explanatory Variables

The study incorporates various sociodemographic variables related to the household, including geographic location (urban or rural), regional affiliation (Caribbean, Central, Eastern, Pacific, Bogotá D.C., or San Andrés and Providencia), and socioeconomic stratum. Additionally, individual characteristics are delineated, such as age, educational attainment (No education, Primary, Secondary, or Higher), marital status (cohabiting, widowed, separated, or single), ethnic group membership (Indigenous, Afro-Colombian, or no ethnic affiliation), occupation (employed, job-seeking, studying, or homemaking), and type of social security affiliation (contributory, subsidized, or special).

Within the framework of the NTUS, six items pertinent to gender identity are identified. These items are utilized to construct a proxy indicator for social norms through the statistical procedure known as Principal Component Analysis (PCA). This composite indicator amalgamates the following measures related to social norms concerning gender identity:

• A mother who works outside the home is as good a mother as one who only works within the home.
• Both men and women should contribute to household income.
• The primary goal of a woman is to marry and bear children.
• Women are better suited for domestic tasks than men.
• Women have the same rights as men to engage in leisure activities.
• The head of the household should be the man.

This detailed categorization of variables serves to provide a robust analytical framework for examining caregiving activities in the Colombian context.

4.2.4. Econometric decomposition method

In examining the gender disparity between "Female" and "Male" in household caregiving activities and given that our response variables are continuous in nature, the classical Blinder-Oaxaca linear decomposition has been extensively employed in the literature. This technique has been instrumental in investigating potential causes of racial and gender differences in numerous economic studies, yielding results analogous to the original applications of the Blinder-Oaxaca method.

The Blinder-Oaxaca decomposition facilitates the disaggregation of contributing factors that impact the said disparity. By bifurcating the gap in the means of an outcome variable between two population groups (gender), the method ascertains one portion attributable to differences in group characteristics (endowments), and another "unexplained" portion, which can be ascribed to differential effects of these characteristics (coefficients). The primary advantage of employing this method lies in its capability to discern between explanatory variables contributing to the gap under investigation.

4.3.Results

Table 1 presents the descriptives of individuals aged 10 years or older who perform caregiving activities for household members, specifically activities aimed at children under 5 years old in Colombia. The data are expressed as percentages and absolute population figures in parentheses. 73.62% of persons aged 10 or older perform direct and indirect caregiving activities, while 40.7% report conducting care activities for children under 5.

The Caribbean region has the highest percentage of persons performing caregiving activities at 24.08%, followed by the Central region at 22.05%. These two regions also exhibit the highest participation rates in childcare for under 5 year olds. In Stratum 1, 37.45% of individuals perform caregiving activities for household members, and 44.88% participate in caregiving for children under five.

The age group between 45 and 59 years old has the highest percentage of participation in caregiving activities at 20.95%. However, in households with under 5 year olds, the

highest participation rate is seen in the 25 to 34 age range. The 15 to 17 age group has the lowest percentage of participation. Over 70% of persons performing caregiving activities have secondary or higher education, a pattern that holds for both overall household care and households with young children. The highest participation rates are seen among cohabiting couples, while separated, widowed or divorced individuals exhibit lower participation in caregiving. The majority of caregivers do not belong to any ethnic group.

Among households with children under five years old, 41.32% of individuals engaged in caregiving activities, are employed, followed by those occupied with household chores or other activities. When enrolled in a subsidized health care scheme, higher participation in caregiving is seen. Those in agreement with the social norm indicator demonstrate increased participation in care activities.

Table 2 describes indirect care, direct care, and childcare for children under 5 year olds in Colombian households. The data show that engagement in indirect care exceeds that in direct care. Both forms of care are more common than childcare for children under 5 years old. Participation in indirect care is 68.45%, direct care is 55.2%, and childcare for under 5s is 55.2%. On average, individuals dedicate 2.43 hours per day to indirect care, 2.43 hours to direct care, and 1.63 hours to childcare for under 5s.

Those living in municipal centers exhibit higher participation in caregiving. Higher socioeconomic strata demonstrate increased participation and time commitment to direct care and childcare. Persons aged 18-34 have greater involvement and time dedication to direct care and childcare. A total of 73.01% of individuals with higher education participate in indirect care. They also spend more time on direct care and childcare compared to those with other education levels. Those occupied with domestic work or other activities have the highest involvement in indirect care (89.14%), direct care (70.1%) and childcare for under 5s (48.41%) compared to other occupations. Individuals enrolled in subsidized health schemes dedicate more time and have higher participation in caregiving. Those agreeing with social norms spend more time on caregiving activities.

Table 1. Distribution of the population carrying out care activities, according to categories of explanatory variables

	Individuals participating in care activities*	Individuals participating in care activities with children under 5 years**		Individuals participating in care activities*	Individuals participating in care activities with children under 5 years**
Variables	**%*** **	**%*** **	**Variables**	**%*** **	**%*** **
Area	**73.62 (93622)**	**40.7 (11175)**	**Marital status**	**72 (91263)**	**39 (10725)**
Municipal head	80.73	64.45	Widowed	5.21	1.45
Populated center and rural dispersed	19.27	35.55	Living with partner/Married	47.81	67.85
Region	**73.62 (93622)**	**40.7 (11175)**	Separated/Divorced	12.05	10.48
Caribbean	22.05	26.7	Single	34.92	20.22
Central	24.08	20.6	**Ethnicity**	**73.9 (93609)**	**40.7 (11174)**
Eastern	17.94	18.99	Indigenous	2,84	3.36
Pacific	16.98	18.16	Afro-Colombian/mulatto/black/raizal/palenquero	5,74	7.78
Bogotá	16.34	13.13	Does not belong to an ethnic group	91,42	88.87
San Andrés	2.61	2.43	**Occupation**	**73.3 (92939)**	**40.6 (11145)**
Stratum	**73.3 (92895)**	**40.7 (11175)**	Working	38.19	41.32
1	37.45	44.88	Looking for a job	7.57	7.36
2	33.95	32.62	Studying	13.16	10.44
3	19.5	14.97	Household chores or other activity	41.08	40.89
4	5.65	3.99	**Social security affiliation**	**68.9 (87282)**	**37 (10166)**
5	2.07	1.29	Contributory regime	47.1	42.56
6	1.39	1.25	Subsidized regime	50.16	55.22
Age	**73.9 (93622)40,7**	**40.7 (11175)**	Special regime	2.75	2.21
Between 10 and 14	7.47	8.46	**Received payments for alimony or separation**	**73.5 (93121)**	**40.7 (11175)**
Between 15 and 17	5.27	3.88	Yes	1.64	3.51
Between 18 and 24	12.66	18.7	No	98.36	96.49
Between 25 and 34	18.65	36.84	**Social norm indicator**	**65.2 (82630)**	**36.3 (9968)**
Between 35 and 44	17	19.69	Strongly disagree	22.91	22.55
Between 45 and 59	20.95	8.49	Disagree	24.85	25.27
Over 60	18	3.94	Agree	33.39	33.66
Education level	**61.3 (77733)**	**34.8 (9577)**	Strongly agree	18.85	18.52
No education	3.97	3.39			
Primary	23.21	13.92			
Secondary	44.03	54.7			
Higher	28.78	29.82			

* People aged 10 or more (126753). **People aged 10 or more domiciled in homes with children under five years of age (27483). ***The values expressed in percentages are weighted values, estimated with 'svy' according to the expansion factor.

Table 2. Hours and participation in care by categories

	Indirect care*		Direct care*		Care for children under 5 years old	
Variables	**hours**	**%**	**hours**	**%**	**hours**	**%**
Participation	**2,43**	**68,45**	**2,43**	**55,2**	**1,63**	**55,2**
Area						
Municipal head	2,35	69,4	2,44	55,67	1,64	42,29
Populated center and rural dispersed	2,7	65,9	2,43	53,92	1,58	40,64
Region						
Caribbean	2,38	65,55	2,28	51,91	1,45	36,28
Central	2,74	67,03	2,36	51,68	1,63	38,9
Eastern	2,2	67,84	2,7	55,89	1,87	42,25
Pacific	2,5	72,2	2,31	62,08	1,57	51,36
Bogotá	2,23	72,92	2,8	58,64	1,75	46,4
San Andrés	2,5	78,52	2,04	63,08	1,4	50,14
Stratum						
1	2,5	67,31	2,34	53,54	1,55	40,2
2	2,36	69,23	2,5	54,79	1,67	41,3
3	2,36	69,99	2,57	58,62	1,71	45,81
4	2,26	70,24	2,48	66,21	1,61	53,28
5	2,41	66,17	2,72	68,52	2	55,25
6	2,42	69	2,69	66,73	2	58,05
Age						
Between 10 and 14	1,13	60,17	1,98	36,69	1,9	34,21
Between 15 and 17	1,69	71,36	2,11	42,65	1,48	35,32
Between 18 and 24	2,51	73,53	2,79	63,85	1,73	48,74
Between 25 and 34	2,67	70,93	2,62	67,8	1,62	49,99
Between 35 and 44	2,62	65,73	2,34	58,58	1,59	42,93
Between 45 and 59	2,64	66,83	1,88	39,49	1,43	29,06
Over 60	2,36	64,68	1,77	30,87	1,41	22,11
Level of education						
Without education	2,55	54,93	1,75	32,73	1,36	21,49
Primary	2,68	63,6	2,16	42,97	1,5	31,75
Secondary	2,61	70,66	2,52	60,68	1,62	45
Higher	2,49	73,01	2,62	68,58	1,67	51,95
Marital status						
Living as a couple/Married	2,66	68,15	2,47	62,15	1,59	46,89
Widowed	2,59	70,15	1,89	32,35	1,48	21,62
Separated/Divorced	2,68	80,73	2,58	65,45	1,64	43,45
Single	1,96	67,44	2,3	40,11	1,64	31,95
Ethnicity						
Indigenous	2,36	71,49	2,23	52,12	1,61	35,59
Afro-Colombian**	2,69	71,07	2,08	56,53	1,5	43,84
Does not belong to an ethnic group	2,41	68,08	2,48	55,23	1,64	41,97
Occupation						
Works	1,88	53,17	1,93	48,74	1,44	39,17
Looking for a job	2,46	75,04	1,48	56,08	1,75	43,52
Studying	1,35	61,39	1,91	37,82	1,65	33,79
Household chores or other activity	3,11	89,14	2,97	70,1	1,78	48,41
Social security affiliation						
Contributory regime	2,25	66,71	2,42	58,35	1,62	45,49
Subsidized regime	2,54	69,66	2,58	53,61	1,74	39,78
Special regime	2,41	65,29	2,44	59,88	1,61	46,86
Received payments for alimony or separation						
Yes	2,91	86,7	3,14	88,32	1,8	59,35
No	2,41	68,05	2,41	54,44	1,62	41,43
Social norm indicator						
Strongly disagree	2,43	60,37	2,23	47,78	1,53	35,08
Disagree	2,54	70,11	2,37	56,22	1,63	42,48
Agree	2,47	72,56	2,42	58,95	1,59	44,6
Strongly agree	2,23	74,17	2,64	63,04	1,7	50,54

*Includes only dwellings with children under 5 years old, **Includes mulatto / black / raizal / palenquero.

These data reveal the importance of care work in Colombian society and inequalities according to different factors. It is necessary to recognize and value this work as a contribution to human and social development. The data presented in Table 3 illuminate a marked gender disparity in the allocation of time devoted to indirect caregiving activities. On average, women dedicate substantially more hours to these tasks—2.87 hours, to be exact—compared to their male counterparts, who allocate 1.37 hours, thus engendering a difference of 1.5 hours. This divergence is notably amplified in rural and dispersed urban centers, amounting to a 1.72-hour difference, as opposed to 1.42 hours in municipal capitals. Additionally, the Central and Caribbean regions manifest higher discrepancies relative to other regions. Socioeconomic stratification further delineates this disparity: it is most pronounced in the lowest (Stratum 1, 1.59 hours) and highest (Stratum 6, 1.60 hours) strata. Age-wise, the divergence intensifies in groups aged 25 and above.

With regard to educational attainment, those with higher education exhibit a more attenuated difference in the hours dedicated to indirect care, while the most pronounced disparities are observed among individuals with primary education. Similar patterns emerge among cohabiting couples. Individuals engaged in domestic chores display a 1.75-hour gender difference in indirect care activities. Pertaining to social norm indicators, the largest divergence manifests among those who disagree with prevailing social norms.

Table 3. Hours and participation in care by gender, in households where children under 5 years old live

	Indirect Care						Direct Care						Care for children under 5 years old					
Variables	**Hours**			**Participation %**			**Hours**			**Participation %**			**Hours**			**Participation %**		
	M	**H**	**dif**	**M**	**H**	**dif**	**M**	**H**	**dif**	**M**	**H**	**dif**	**M**	**H**	**dif**	**M**	**H**	**dif**
	2.87	**1.37**	**1.5**	**86.3**	**46.03**	**40.27**	**2.75**	**1.7**	**1.05**	**68.66**	**38.28**	**30.38**	**1.7**	**1.5**	**0.2**	**68.66**	**38.28**	**30.38**
Area																		
Municipal head	2.78	1.36	1.42	85.19	49.04	36.15	2.74	1.73	1.01	68	39.77	28.23	1.71	1.52	0.19	47.3	35.82	11.48
Populated center and rural dispersed	3.16	1.44	1.72	89.38	38.39	50.99	2.76	1.55	1.21	70.5	34.51	35.99	1.67	1.41	0.26	48.36	31.6	16.76
Region																		
Caribbean	2.82	1.26	1.56	86.07	41.08	44.99	2.59	1.48	1.11	68.44	32.19	36.25	1.52	1.32	0.2	42.62	28.72	13.9
Central	3.17	1.6	1.57	85.77	42.84	42.93	2.62	1.7	0.92	64.3	35.4	28.9	1.67	1.55	0.12	43.89	32.45	11.44
Eastern	2.63	1.29	1.34	83.82	48.08	35.74	3.03	1.98	1.05	68.19	40.68	27.51	1.95	1.73	0.22	47.39	35.9	11.49
Pacific	2.91	1.41	1.5	91.01	48.35	42.66	2.63	1.57	1.06	73.13	47.36	25.77	1.68	1.37	0.31	56.76	44.16	12.6
Bogotá	2.75	1.23	1.52	84.82	57.69	27.13	3.22	1.88	1.34	71.46	42.24	29.22	1.84	1.59	0.25	52.96	38.02	14.94
San Andrés	2.81	1.95	0.86	88.58	64.95	23.63	2.18	1.65	0.53	75.18	46.77	28.41	1.32	1.54	-0.22	54.53	44.22	10.31
Stratum																		
1	2.94	1.35	1.59	88.07	42.13	45.94	2.65	1.57	1.08	68.59	35.29	33.3	1.62	1.4	0.22	46.85	32.12	14.73
2	2.81	1.35	1.46	85.45	48.44	37.01	2.82	1.74	1.08	67.05	39.08	27.97	1.73	1.56	0.17	46.27	34.94	11.33
3	2.77	1.44	1.33	83.9	51.4	32.5	2.89	1.88	1.01	69.18	44.5	24.68	1.78	1.59	0.19	49.97	40.25	9.72
4	2.64	1.52	1.12	79.79	57.28	22.51	2.84	1.7	1.14	77.82	50.47	27.35	1.74	1.38	0.36	58.61	46.06	12.55
5	2.78	1.71	1.07	78.79	51.38	27.41	3.04	2.17	0.87	78.65	56.64	22.01	2.14	1.83	0.31	57.09	53.1	3.99
6	2.97	1.37	1.6	77.66	56.67	20.99	3.05	2.02	1.03	73.81	56.65	17.16	2.2	1.69	0.51	61.33	53.39	7.94
Age																		
Between 10 and 14	1.27	0.94	0.33	69.9	51.24	18.66	1.96	2.01	-0.05	40.67	33.04	7.63	1.84	1.97	-0.13	37.77	30.95	6.82
Between 15 and 17	1.96	1.23	0.73	84.96	57.08	27.88	2.44	1.35	1.09	56.06	28.56	27.5	1.59	1.26	0.33	43.46	26.78	16.68
Between 18 and 24	2.85	1.35	1.5	87.12	47.58	39.54	3.07	1.55	1.52	78.71	35.45	43.26	1.82	1.41	0.41	57.61	31.81	25.8
Between 25 and 34	3.12	1.45	1.67	89.36	45.48	43.88	3	1.65	1.35	82.4	47.65	34.75	1.72	1.43	0.29	54.95	43.14	11.81
Between 35 and 44	3.15	1.52	1.63	88.38	42.67	45.71	2.67	1.77	0.9	73.5	43.39	30.11	1.65	1.5	0.15	47.34	38.44	8.9
Between 45 and 59	3.16	1.45	1.71	89.01	43.34	45.67	1.97	1.71	0.26	48.2	30.28	17.92	1.43	1.44	-0.01	30.35	27.69	2.66
Over 60	2.71	1.46	1.25	82.29	41.64	40.65	1.85	1.57	0.28	38.97	20.28	18.69	1.38	1.46	-0.08	25.33	17.89	7.44
Level of education																		
Without education	2.95	1.42	1.53	78.67	28.59	50.08	1.86	1.48	0.38	46.4	17.55	28.85	1.41	1.29	0.12	26.18	16.29	9.89
Primary	3.2	1.34	1.86	89.2	36.6	52.6	2.42	1.6	0.82	56.91	28.26	28.65	1.53	1.46	0.07	37.55	25.63	11.92

	Indirect Care						Direct Care						Care for children under 5 years old					
Variables	**Hours**			**Participation %**			**Hours**			**Participation %**			**Hours**			**Participation %**		
	M	**H**	**dif**	**M**	**H**	**dif**	**M**	**H**	**dif**	**M**	**H**	**dif**	**M**	**H**	**dif**	**M**	**H**	**dif**
Secondary	3.08	1.44	1.64	90.45	45.23	45.22	2.88	1.63	1.25	76.25	40.69	35.56	1.72	1.44	0.28	51.52	36.62	14.9
Higher	2.86	1.54	1.32	85.03	53.96	31.07	2.95	1.81	1.14	78.29	53.19	25.1	1.76	1.51	0.25	54.75	47.52	7.23
Marital status																		
Living as a couple/Married	3.22	1.46	1.76	91.76	43.57	48.19	2.9	1.68	1.22	78.96	44.64	34.32	1.68	1.46	0.22	53.27	40.24	13.03
Widowed	2.68	1.5	1.18	78.75	31.41	47.34	1.87	2.12	-0.25	36.31	14.5	21.81	1.39	2.2	-0.81	23.75	12.06	11.69
Separated/Divorced	2.81	1.37	1.44	85.79	52.61	33.18	2.63	1.82	0.81	71.26	33.21	38.05	1.65	1.51	0.14	46.35	27.37	18.98
Single	2.31	1.26	1.05	79.68	52.2	27.48	2.52	1.57	0.95	53.43	23.52	29.91	1.71	1.43	0.28	40.24	21.63	18.61
Ethnicity																		
Indigenous	2.73	1.42	1.31	89.36	49.39	39.97	2.45	1.61	0.84	69.59	30.5	39.09	1.63	1.57	0.06	43.73	25.53	18.2
AfroColombian/mulatto/ black/raizal/palenquero	3.12	1.56	1.56	89.58	46.48	43.1	2.25	1.66	0.59	68.69	40.35	28.34	1.51	1.47	0.04	48.23	37.99	10.24
Does not belong to an ethnic group	2.85	1.35	1.5	85.86	45.83	40.03	2.81	1.7	1.11	68.6	38.51	30.09	1.72	1.5	0.22	47.7	34.82	12.88
Occupation																		
Works	2.37	1.36	1.01	78.33	40.66	37.67	2.32	1.58	0.74	65.71	40.3	25.41	1.5	1.4	0.1	44.64	36.45	8.19
Looking for a job	3.03	1.71	1.32	92.39	61.71	30.68	2.78	2	0.78	74.29	42.07	32.22	1.82	1.67	0.15	52.41	36.68	15.73
Studying	1.57	1.01	0.56	71.34	51.13	20.21	2.01	1.74	0.27	43.27	32.19	11.08	1.66	1.65	0.01	37.32	30.16	7.16
Household chores or other activity	3.28	1.53	1.75	93.31	61.75	31.56	3.03	2.13	0.9	75.55	34.34	41.21	1.78	1.84	-0.06	51.11	30.75	20.36
Social securityaffiliation																		
Contributory regime	2.68	1.41	1.27	83.27	47.83	35.44	2.79	1.73	1.06	70.1	44.97	25.13	1.71	1.5	0.21	49.8	40.57	9.23
Subsidized regime	2.96	1.33	1.63	88.07	44.28	43.79	3.01	1.9	1.11	68.09	33.64	34.45	1.86	1.59	0.27	46.45	30.58	15.87
Special regime	2.81	1.72	1.09	83.64	47.39	36.25	2.71	1.62	1.09	71.93	48.12	23.81	1.67	1.46	0.21	52.1	41.74	10.36
Received payments for alimony or separation																		
Yes	2.95	1.33	1.62	87.83	59.25	28.58	3.17	1.83	1.34	89.36	62.97	26.39	1.82	1.28	0.54	59.2	62.97	-3.77
No	2.86	1.7	1.16	86.24	45.99	40.25	2.73	1.69	1.04	67.88	38.14	29.74	1.69	1.5	0.19	47.16	34.47	12.69
Social norm indicator	0	0	0	0	0	0	0	0	0	0	0	0						
Strongly disagree	2.98	1.4	1.58	84.46	39.96	44.5	2.58	1.62	0.96	63.6	34.39	29.21	1.6	1.45	0.15	39.68	31.19	8.49
Disagree	3.02	1.37	1.65	88.58	46.47	42.11	2.68	1.66	1.02	69.93	38.68	31.25	1.71	1.5	0.21	47.92	35.51	12.41
Agree	2.83	1.39	1.44	87.3	48.73	38.57	2.67	1.7	0.97	70.17	40.83	29.34	1.64	1.48	0.16	49.46	36.75	12.71
Strongly agree	2.54	1.46	1.08	83.11	59.34	23.77	2.95	1.8	1.15	72.98	46.55	26.43	1.77	1.53	0.24	55.72	41.95	13.77

In direct care and caregiving for children under 5 years of age, women consistently dedicate more time than men. Again, this disparity is more accentuated in rural and dispersed urban centers than in municipal capitals. In terms of regional variances, Bogotá leads with a 1.34-hour gender difference in direct care activities, while the Pacific region exhibits the largest gap in childcare for those under 5 years. The stratified data reveal that gender differences in direct care hours are most pronounced in the lower strata (Strata 1 and 2), while disparities in childcare are more notable in the higher strata. Age-wise, the most prominent disparities are observed among individuals aged between 18 and 34.

Table 4 displays the outcomes of a gender gap analysis concerning time allocated to caregiving activities in Colombia, employing the Oaxaca-Blinder decomposition methodology. The overarching aim of this exercise is to delineate the extent to which the observed gap is attributable to disparate observable characteristics between men and women, as opposed to variations in coefficients that encapsulate elements of discrimination or preference.

The findings reveal that women consistently devote more time to both indirect caregiving (household tasks) and direct caregiving (attending to dependent individuals), with a particular emphasis on exclusive caregiving to children under the age of five. These disparities are statistically significant and persist even when controlling for variables such as geographical area, region, age cohort, socio-economic stratum, educational attainment, marital status, ethnicity, occupational category, and social security affiliation.

The Oaxaca-Blinder decomposition permits the estimation of the characteristics effect and the coefficients effect on the gender gap in caregiving time. The characteristics effect measures how the gap would change if men possessed the same characteristics as women, holding the coefficients constant. Conversely, the coefficients effect measures how the gap would alter if men had the same coefficients as women, while keeping the characteristics constant. The characteristics effect is interpreted as the portion of the gap explained by observable differences between men and women, while the coefficients effect is interpreted as the portion unexplained, which could be attributed to discrimination or preferences.

The findings suggest that the characteristics effect is more substantial than the coefficients effect in the context of care. This implies that observable differences between men and women account for more than half of the gap.

The effect of characteristics is positive and significant for all three caregiving modalities, meaning that women spend more time on caregiving due to their observable characteristics. The effect of the coefficients is also positive and significant for the three care modalities, which means that women spend more time caring even after controlling for their observable characteristics. Among the variables exerting the greatest impact on the gender gap in caregiving time are occupation, educational level, marital status, and social norm indicators. Age has a positive and significant effect on gender difference, implying that the gap broadens with age. The area has a positive and significant effect on the time dedicated to indirect and direct care for people who live in the populated and dispersed rural centers, which indicates that these people dedicate more time to care than those who live in the departmental capitals.

The socioeconomic stratum has a positive and significant effect on the time dedicated to indirect care of people who belong to stratum 2. It is observed that these individuals devote more time to care than those from other strata. The educational level has a positive and significant effect on the three types of care. This shows that the degree of participation is similar across both primary and higher education levels. Individuals who live as a couple or are married have a positive and significant effect on the time dedicated to indirect and direct care, which indicates that these people dedicate more time to care than those who are single, separated or divorced.

Occupation has a positive and statistically significant effect on the caregiving time gap, indicating that working women allocate more time to caregiving than their male counterparts, specifically when engaged in household chores. The social norm indicator has a positive and statistically significant effect on the gap, suggesting that women who are more exposed to traditional social norms commit more time to caregiving than those who are less exposed.

Table 4. Gender gap in time dedicated to care in Colombia.

	Indirect Care		Direct Care		Exclusive care for children under 5 years of age	
	Coef.		Coef		Coef.	
Woman	0.889***		0.732***		0.500***	
Man	0.450***		0.412***		0.373***	
Difference	0.439***		0.319***		0.127***	
Explained (characteristics effect)	0.233***		0.168***		0.082***	
Unexplained (coefficients effect)	0.207***		0.151***		0.045***	
	Characteristics effect (weight%)	**Coefficient effect (weight%)**	**Characteristics effect (weight%)**	**Coefficient effect (weight%)**	**Characteristics effect (weight%)**	**Coefficient effect (weight%)**
Age	0.002*** (1.0%)	-0.016 (3.6%)	0.014*** (6.9%)	-0.182*** (44.1%)	0.011*** (9.3%)	-0.063* (17.9%)
Area: Municipal head	0 (0.1%)	-0.029** (6.5%)	0 (0.0%)	-0.018* (4.4%)	0 (0.0%)	-0.008 (2.3%)
Area: Populated center and rural dispersed	0 (0.1%)	0.010** (2.2%)	0 (0.0%)	0.006* (1.5%)	0 (0.0%)	0.003 (0.8%)
Region: Caribbean	0.002** (0.7%)	0.004 (0.8%)	0.001** (0.6%)	0.005 (1.2%)	0.002** (1.6%)	-0.002 (0.6%)
Region: Central	0 (0.2%)	0.012** (2.7%)	-0.001 (0.3%)	-0.010* (2.4%)	-0.001 (0.6%)	-0.008* (2.4%)
Region: Eastern	0 (0.0%)	-0.003 (0.6%)	0 (0.0%)	0.002 (0.5%)	0 (0.1%)	-0.001 (0.3%)
Region: Pacific	0 (0.2%)	0.006 (1.3%)	0.001* (0.6%)	-0.006 (1.5%)	0.001* (1.2%)	-0.001 (0.4%)
Region: Bogotá	0 (0.0%)	-0.002 (0.4%)	0 (0.0%)	0.004 (1.0%)	0 (0.0%)	0.007** (1.9%)
Region: San Andrés	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Stratum: 1	0 (0.0%)	0.021 (4.6%)	0.001 (0.4%)	-0.009 (2.2%)	0.001 (0.7%)	0.002 (0.7%)
Stratum: 2	0 (0.0%)	0.020** (4.4%)	0 (0.2%)	0.001 (0.4%)	-0.001 (0.5%)	-0.003 (0.9%)
Stratum: 3	0 (0.0%)	0.009* (1.9%)	0 (0.1%)	-0.001 (0.3%)	0 (0.2%)	-0.003 (0.9%)
Stratum: 4	0 (0.0%)	-0.001 (0.2%)	0 (0.0%)	0.003* (0.7%)	0 (0.0%)	0.002* (0.7%)
Stratum: 5	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.001 (0.1%)	0 (0.0%)	0 (0.0%)
Stratum: 6	0 (0.0%)	-0.002* (0.5%)	0 (0.0%)	-0.002 (0.4%)	0 (0.0%)	-0.001 (0.2%)
Education level: No education	0 (0.2%)	0.001 (0.1%)	0 (0.2%)	0.001 (0.3%)	0 (0.2%)	0.001 (0.3%)
Education level: Primary	0.001** (0.5%)	0.010* (2.2%)	0.002** (0.8%)	-0.002 (0.5%)	0.001 (0.6%)	0.004 (1.2%)
Education level: Secondary	0 (0.0%)	-0.002 (0.5%)	0 (0.0%)	-0.003 (0.7%)	0 (0.0%)	-0.008 (2.3%)
Education level: Higher	0.003*** (1.4%)	-0.019*** (4.2%)	0.004*** (1.8%)	-0.009 (2.2%)	0.002*** (2.1%)	-0.012* (3.3%)
Marital status: Living with partner/Married	0.004** (1.9%)	0.061*** (13.5%)	-0.010*** (4.8%)	-0.058** (14.1%)	-0.011*** (9.4%)	-0.081*** (23.0%)
Marital status: Widowed	0 (0.0%)	-0.001 (0.3%)	0 (0.1%)	0.001 (0.2%)	0.001 (0.4%)	0.001 (0.2%)
Marital status: Separated/Divorced	0.010*** (4.3%)	-0.010*** (2.3%)	0.014*** (7.1%)	-0.008*** (1.9%)	0.007*** (5.7%)	-0.005** (1.5%)
Marital status: Single	-0.002*** (0.7%)	-0.005 (1.2%)	-0.005*** (2.6%)	0.014** (3.4%)	-0.004*** (3.4%)	0.021*** (5.9%)

	Indirect Care				Direct Care				Exclusive care for children under 5 years of age			
Ethnicity: Indigenous	0	(0.0%)	0	(0.1%)	0	(0.0%)	-0.001	(0.2%)	0	(0.0%)	-0.001	(0.2%)
Ethnicity: Afro-Colombian/mulatto/black/raizal/palenquero	0	(0.0%)	0	(0.1%)	0	(0.0%)	0.002	(0.4%)	0	(0.1%)	0	(0.1%)
Ethnicity: Does not belong to an ethnic group	0	(0.1%)	-0.003	(0.6%)	0	(0.0%)	-0.002	(0.4%)	0	(0.1%)	0.019	(5.4%)
Occupation: Works	0.085***	(35.7%)	-0.047***	(10.3%)	0.038***	(18.8%)	0.02	(5.0%)	0.024*	(19.9%)	0.035*	(9.9%)
Occupation: Looking for employment	0	(0.1%)	0.004	(1.0%)	0	(0.1%)	0.006*	(1.3%)	0	(0.3%)	0.005	(1.5%)
Occupation: Studying	0	(0.1%)	0	(0.1%)	0	(0.2%)	-0.002**	(0.5%)	0	(0.1%)	-0.001*	(0.4%)
Occupation: Household chores or other activity	0.113***	(47.3%)	-0.087***	(19.4%)	0.099***	(48.9%)	-0.006	(1.4%)	0.041***	(34.3%)	0.011	(3.1%)
Social security affiliation: Contributory regime	0	(0.1%)	-0.016	(3.6%)	0	(0.2%)	-0.006	(1.5%)	0	(0.1%)	-0.01	(2.9%)
Social security affiliation: Subsidized regime	0	(0.1%)	0.001	(0.2%)	0	(0.0%)	0	(0.0%)	0	(0.1%)	0.001	(0.2%)
Social security affiliation: Special regime	0.002*	(0.6%)	-0.014	(3.0%)	0	(0.1%)	0.004	(1.0%)	-0.001	(0.7%)	-0.008	(2.3%)
Social norm indicator: Strongly disagree	0.008***	(3.2%)	0.002	(0.4%)	0.007***	(3.6%)	-0.007	(1.6%)	0.007***	(5.9%)	-0.011*	(3.1%)
Social norm indicator: Disagree	0	(0.0%)	0.005	(1.0%)	0	(0.0%)	0.003	(0.7%)	0	(0.0%)	-0.001	(0.4%)
Social norm indicator: Agree	0.002***	(0.8%)	0.015**	(3.2%)	0.001*	(0.6%)	0.005	(1.2%)	0	(0.4%)	0.006	(1.7%)
Social norm indicator: Strongly agree	0.001**	(0.5%)	-0.013***	(3.0%)	0.002***	(0.9%)	-0.002	(0.5%)	0.002***	(1.9%)	0.003	(0.9%)

*p<0.10. **p<0.05. p<0.01***

4.4. Discussion and Conclusions

The findings of this study provide valuable information about care activities and gender inequality within Colombian households. Descriptive results reveal several notable trends in participation in indirect care, direct care, and under-5 childcare based on demographic factors such as region, age, educational level, and occupation. One key finding is a negative association between educational level and time dedicated to care activities. This contradicts previous research suggesting that more educated people, especially women, tend to spend more time on housework and childcare (Guryan et al., 2008). However, an unexpected result is that those with primary education spend a similar amount of time caring for children as those with secondary and higher education. Additional qualitative research could elucidate the factors influencing this pattern among less educated caregivers. The persistence of gender disparities is evident even among individuals with higher levels of education. This phenomenon can be attributed to women with higher education levels allocating more time to professional endeavors and less to domestic tasks. However, men do not correspondingly increase their contribution to household duties. Instead of sharing domestic responsibilities with their partners, it is more probable that women delegate household tasks or rely on their familial networks for assistance (Rubiano-Matulevich & Viollaz, 2019).

The results of the study are consistent with previous studies (Campaña et al., 2020; Forden et al., 2023; Hess et al., 2022) identifying that there is a greater number of women compared to men, who are busy with activities at home. Campaña et al. (2020) found that women often choose self-employment to improve their work-life balance, indicating that self-employment may allow for a better balance between work and home responsibilities, potentially providing greater flexibility in working hours and more time with young children. However, reducing the gender gap in childcare requires policy changes. These should aim to make formal employment more flexible and encourage both men and women to engage in domestic work (Hess et al., 2022).

Regional variations in caregiving participation also merit further investigation. The high participation rates in the Central and Caribbean regions compared to others imply that geographic and cultural variables may shape gender norms of care. Comparative case studies in various regions could shed light on the impact of gender expectations and

localized family structures. Furthermore, discrepancies between socioeconomic strata suggest that resource availability may enable or hinder participation in unpaid care work.

Social norms related to gender play a significant role in the hours dedicated to care, mainly in homes where children under 5 years of age live. It is suggested that policies aimed at reducing gender inequality primarily in time spent caring for children should focus on redistributing domestic work between men and women, rather than reducing unpaid work in general (Campaña et al., 2018).

This study aimed to identify gender gaps in unpaid care of children in Colombian households. It focused on disaggregating these gaps by type of care and differences related to gender roles within households. The findings reveal significant disparities in care activities generally and specifically in households with children under 5 years of age. The data show that participation in indirect care exceeds direct care, which is more common than care for children under 5 years of age. On average, people dedicate 2.43 hours a day to indirect care, 2.43 hours to direct care, and 1.63 hours to care for children under 5 years of age. The findings demonstrate that there is an unequal allocation of time, with women spending substantially more time on both indirect care (domestic tasks) and direct care (caring for dependent people) compared to men. This gap is particularly pronounced in childcare activities involving children under 5 years of age.

The gender gap in care time is more significant in rural and dispersed urban areas compared to municipal capitals. Stratification also plays a role, with the most pronounced gaps observed in the lowest and highest socioeconomic strata. Individuals adhering to traditional gender norms exhibit a more pronounced disparity in the time allocated to caregiving. The analysis indicates that the influence of observable characteristics exceeds that of the coefficients in caregiving contexts, suggesting these characteristics account for the majority of the gender gap. Key factors influencing this gap include occupational roles, educational attainment, marital status, and adherence to traditional social norms. Occupation significantly influences the caregiving time gap, with working women dedicating more time to caregiving than their male counterparts, particularly in household chores.

Additionally, adherence to traditional social norms also has a significant positive effect on this gap, with women more ingrained in these norms spending more time on caregiving tasks than those less influenced by them. These findings underscore the importance of recognizing and valuing caregiving, especially for children under 5 years old, as a crucial contribution to human and social development. They also emphasize the need for policies and interventions that address gender disparities in caregiving, considering the various factors that contribute to these disparities. Despite these insights, a significant portion of the gap remains unexplained, potentially due to unseen factors such as societal preferences or discrimination.

Our findings contribute to the literature with a detailed analysis of gender disparities in time spent on childcare, especially in households with children under 5 years of age. Highlighting that traditional social norms and attitudes towards gender roles within the home are examined, and how these influence the distribution of childcare time, offering a vision of the persistence of these roles and their impact on gender equality. These contributions are important for advancing the understanding of gender dynamics in childcare and may have practical implications for promoting gender equality in the home and workplace.

Several limitations were identified in this study, mainly related to the National Time Use Survey (ENUT). For example, the representativeness of the survey in all regions of Colombia, particularly in rural areas and indigenous communities, where care practices may significantly differ from those in urban areas. Additionally, self-report biases may affect the accuracy of the data, as participants might not accurately recall or may report their caregiving activities in a socially desirable manner. The analysis is based on data from the 2020/2021 survey, and care dynamics could have changed over time due to factors such as shifts in public policies, socioeconomic events, or the COVID-19 pandemic, which may not be fully captured in the data. Furthermore, the Blinder-Oaxaca decomposition method may not account for other critical unmeasured factors contributing to gender disparities in childcare, such as mental health, extended family support, or local care policies. Lastly, the measurement and categorization of social norms can be subjective and vary significantly among individuals and communities.

Future studies should explore interventions like subsidized childcare, flexible work arrangements, and educational campaigns, which may offer promising ways to redistribute the burden of unpaid work more equitably. This study provides a useful descriptive foundation, but further qualitative and quantitative research is essential to deepen our understanding of how sociocultural norms and political environments shape gender care obligations in Colombia. More robust analytical techniques combined with targeted mixed methods studies could help elucidate these complex dynamics. By shedding light on hidden inequality within households, the findings of this work can inform evidence-based policies to recognize and value the contributions of unpaid carers to social well-being.

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5. General conclusions

The findings of this study provide a comprehensive view of how several interconnected factors impact health and well-being in Colombia, aligning with the Sustainable Development Goals (SDGs). This research examines three important themes: the impact of the armed conflict on antenatal care, the malnutrition gap between poor and non-poor children, and gender disparities in childcare. Each of these issues is not only vital in its own right, but also intrinsically related to the others. Antenatal care is crucial to the well-being of mother and child, and any disruption caused by conflict can have long-term consequences. Adequate nutrition is essential for the healthy growth of the child, and disruption of antenatal care can have a negative impact on child nutrition. In addition, gender disparities in childcare exacerbate the effects of armed conflict and poverty on maternal and child health, as the responsibility for care falls predominantly on women. Taken together, these studies reveal a complex picture where armed conflict, poverty and gender inequalities are intertwined, intensifying the vulnerability of the most marginalized populations, especially women and children. This research not only enriches academic understanding, but also underscores the urgency of addressing these issues from an integrated perspective to advance towards the SDGs and improve living conditions in Colombia.

The second chapter analyzes the degree of influence of conflict intensity on the probability that a woman attends four or more antenatal care visits (ANC) in Colombia, an upper-middle-income country with a high rate of inequality and a prolonged internal armed conflict. Indicating that residing in a department with high conflict intensity is associated with a decrease in antenatal care visits. In other words, the context of conflict intensity is significant for ANC. While low and intermediate levels of conflict do not affect the likelihood of ANC, high conflict intensity does. In this regard, our results are consistent with recent studies exploring the association between conflict and maternal health services (Ziegler et al. 2020; Mirzazada et al. 2020; Druetz et al. 2020). Several factors may explain the negative association between conflict intensity and ANC. For example, damage to infrastructure caused by terrorist attacks, the fear that the conflict generates in women attending health centers, and transportation problems in these areas due to guerrilla or other armed forces. For Colombia, Ramos et al. (2020) found that geographic and security barriers are the most important reasons limiting women from

attending antenatal care. Despite the importance of context, individual characteristics remain crucial for attending ANC. Consistent with the literature, we find a positive relationship between education and antenatal care visits; more educated women may improve their understanding of the importance of antenatal care visits and are more willing to change cultural beliefs about women's health services (Babalola 2014; Osorio et al. 2014; World Health Organization 2016). We found that higher education had the highest positive association with attendance at antenatal care visits than any other variable in any of the estimated models. Similarly, a positive relationship was observed between household wealth and the likelihood of attending four or more antenatal care visits. Wealthier women can potentially overcome the financial costs imposed by high conflict intensity. In fact, the model results provide evidence for the role of wealth as an important protective factor for women to ensure the use of maternal health services.

In rural areas, we found that there is a 26% reduction in the probability of attending antenatal care visits compared to urban areas. According to the analyses of the interaction between the level of armed conflict and place of residence, it is affirmed that in rural settings where intermediate and high levels of conflict are experienced, the probability of a woman being able to comply with the prenatal visits recommended by the World Health Organization decreases. This paper proposes ideas for public policies that seek to ameliorate the negative effect of conflict intensity on maternal and child health outcomes. At high levels of conflict intensity, there should be support for other socio-cultural practices along with humanitarian assistance.

Other individual determinants, such as women's autonomy, living with a partner and health system affiliation, have a positive effect on the likelihood of attending antenatal care visits. Our autonomy index for women reveals the importance of empowering women, thus enabling them to make autonomous decisions regarding their own health care. Women who make decisions of their own free will tend to take care of their health more effectively (Bloom et al 2001). This finding is in line with previous research pointing to the importance of women's autonomy in improving health-related outcomes (Osorio et al. 2014; Ziegler et al. 2020).

After a thorough literature review, we consider that we have contributed to the literature with a first study that constructs an index of the intensity of the armed conflict using

variables that measure the conflict in a multidimensional perspective and analyzes how it influences women's behavior with respect to their maternal health using a multilevel approach. Given that the Colombian government is in the process of implementing a health reform, this study can contribute as an input for the design of public policies related to women's health services in the most conflictive departments of Colombia.

The third chapter identifies the contribution of the factors that explain the gap in stunting and overweight between poor and non-poor children under 5 years of age in urban Colombia. Although stunting in children under 5 years of age has been reduced in the last 10 years, the data show that the gap between the poor and non-poor in urban Colombia persists in malnutrition indicators. From Yun's nonlinear decomposition based on the classical Blinder-Oaxaca decomposition, the probability of stunting in poor versus non-poor children was higher by 4.8 points. The 54% difference is attributed to the characteristic effect of the explanatory variables, showing an important role in explaining the gap. This result corroborates the socioeconomic inequalities in health observed in the literature (Born et al., 2019; Joe et al., 2009; Kumar & Singh, 2013; Mokalla & Mendu, 2020).

It is evident that the characteristics of the mother are the most important factors in explaining the malnutrition gap of children living in urban Colombia. Next comes access to and use of health care services as significant variables in explaining the gap between the poor and the non-poor. Within the group of maternal characteristics, the importance of maternal education in explaining the undernutrition gaps is highlighted; this is a common finding in the literature (Cardenas et al., 20). (Cardenas et al., 2022; Ekholuenetale et al., 2020; Joe et al., 2009; McGovern et al., 2017; Osorio et al., 2018; Sarker et al., 2020; Ulep et al., 2021).

In general, lower levels of maternal education can negatively influence lifestyles, affecting decisions made about essential issues in the household. In addition, mothers with lower levels of education have fewer employment opportunities and may be less able to identify and resolve health problems (Braveman & Gottlieb, 2014). Higher levels of education were associated with greater use of health services. Education can provide socially valued skills and give women a higher status that increases self-confidence and

facilitates social interaction. Mothers with a higher level of education can access better health and nutrition services (Ulep et al., 2021).

In Colombia, high levels of income inequality are associated with high inequalities in the access to quality education (Barrera-Osorio et al., 2012; Delgado, 2014). Therefore, poor women find it difficult to access high quality education and better job opportunities. This may help explain the important weight of the mother's educational level in the case of stunting. In the case of excess weight, it is observed that women with high levels of education may have better paying jobs in the skilled labor market and more sedentary lifestyles, including more frequent use of electronic devices and feeding their children fast food (Cardenas et al., 2022; Egerter et al., 2011; Gwozdz et al., 2013). Evidence of the important validity of having access to the number of prenatal checkups recommended by the WHO in 2015 and having a child in a health institution such as a hospital helps to reduce inequalities in child health in the short term (Solar & Irwin, 2006).

The socioeconomic gap in the excess weight indicator prevailed among the non-poor, with 2.1 points above the poor. Part of this gap was attributed to the characteristics effect, revealing that the statistically significant variables are "delivery attended by a physician at the time of delivery" and "educational level of the mother". The other part of the gap that is "unexplained" (presenting the effect of the coefficients), is found to be the mother's body mass index, being the only statistically significant variable and explained 69.3% of the effect of the coefficients. This result suggests the presence of structural factors such as inherited biological or cultural factors that affect the child's excess weight through the mother's body mass index. In addition, previous studies have shown that variables related to lifestyle and eating habits are related to maternal body mass index, and in turn show an intergenerational association with indicators of excess weight and obesity (Egerter et al., 2011; Ortiz-Félix et al., 2015). To strengthen the robustness of the claims related to excess weight, a logistic regression was performed using a subsample with information regarding the lifestyle and eating habits of preschool children, aged 3 to 5 years (we used this age range due to availability of survey data). The analysis found that weekly consumption of cookies, not eating regularly at home, and physical activity were determinant variables that increased the probability of being overweight.

The analysis of the association between malnutrition indicators and the explanatory variables mentioned above reveals the social inequity perceived in the inequality indicators. Our hits are consistent with studies conducted in countries with similar socioeconomic characteristics, such as Nepal, Ethiopia, Senegal, Peru (Ulep et al., 2021) Malawi (Mussa, 2014) Egypt, Jordan, Yemen (Sharaf & Rashad, 2016) and India (Aheto, 2020; Nie et al., 2016). These studies have used the Blinder-Oaxaca decomposition or other techniques such as quantile regression decomposition (Aheto, 2020) and conclude that the socioeconomic determinants commonly associated with child undernutrition are parental education and access to the health care system.

The results allow us to affirm that if mothers are able to have an intermediate and/or higher level of education, it could be a public policy for the protection of children. Attending secondary school reinforces healthy sexual and reproductive behaviors, appropriate dietary practices and promotes women's empowerment (Egerter et al., 2011). The reported findings have very different policy implications. First, public policies aimed at reducing the stunting gap should focus on programs that promote maternal education and thus strengthen issues such as exclusive breastfeeding, complementary feeding methods, and antenatal care during pregnancy. It is also necessary to expand the coverage of health services for lower income levels. Second, with respect to the overweight gap, public policies should promote healthier lifestyles, including adequate sleep time, balanced nutritional intake and physical activity or active play in children's daily routine, and moderate use of social networks and screen-based entertainment devices. Therefore, there is a clear need for integrated actions between health and education professionals (including children and family members), to plan and implement strategies to prevent and combat childhood obesity, integrated with changing lifestyle habits. Excess weight is not a problem exclusive to high-income households, as the poor also have a prevalence of this indicator. Therefore, it is even more necessary to implement prevention policies in poor communities as they present a double burden of malnutrition.

In the fourth chapter, which addresses the topic of caregiving activities and gender inequality within Colombian households, the descriptions reveal several notable trends in the participation of indirect, direct and under-five caregiving. These trends occur according to demographic factors such as region, age, educational level and occupation.

The negative association between educational level and time spent on caregiving activities contradicts previous research suggesting that more educated people, especially women, tend to spend more time on household chores and childcare (Guryan et al., 2008). However, an unexpected result is that those with primary education spend a similar amount of time caring for their children as those with secondary and higher education. Further qualitative research could elucidate the factors influencing this pattern among less educated caregivers. The persistence of gender disparities is evident even among people with higher levels of education. This phenomenon can be attributed to the fact that as women attain higher levels of education, they spend more time on professional tasks and less on household chores. However, men do not correspondingly increase their contribution to household chores. Rather than sharing household responsibilities with their partners, women are more likely to delegate household tasks or rely on their family networks for help (Rubiano-Matulevich & Viollaz, 2019).

The evidence presented in the present study is consistent with previous studies (Campaña et al., 2020; Forden et al., 2023; Hess et al., 2022) identifying that there is a higher number of women compared to men who are engaged in domestic activities. Our findings suggest that the effect of characteristics is more substantial than the coefficient effect in the caregiving context. This implies that observable differences between men and women account for more than half of the gap. Among the variables that have the greatest impact on the gender gap in caregiving time are indicators of occupation, educational level, marital status, and social norms. Occupation has a positive and statistically significant effect on the caregiving time gap, indicating that working women spend more time on caregiving than their male counterparts, specifically when engaged in household chores.

According to Campaña et al. (2020), women should choose self-employment as a way to improve work-life balance, indicating that self-employment can allow for a better balance between work and domestic responsibilities, potentially providing greater flexibility in working hours and more time with children. However, to reduce the gender gap in childcare, policies aimed at making formal employment more flexible and encouraging domestic work for both men and women must be implemented (Hess et al., 2022).

Regional variation in participation in caregiving activities also deserves special attention, as the high rates of participation in the Central and Caribbean regions compared to others

imply that geographic and cultural variables may shape caregiving norms. Comparative case studies in various regions could shed light on the impact of gender expectations and localized family structures. On the other hand, differences across socioeconomic strata suggest that the availability of resources may enable or hinder participation in unpaid care work.

The social norms indicator has a positive and statistically significant effect on the gap, suggesting that women who are more exposed to traditional social norms spend more time caring than those who are less exposed. Gender-related social norms play an important role in the hours spent on caregiving, mainly in households where children under 5 years of age live. It is suggested that policies aimed at reducing gender inequality mainly in time spent caring for children should focus on redistributing domestic work between men and women, rather than reducing unpaid work in general (Campaña et al., 2018). The results highlight the importance of recognizing and valuing care work, especially in children under 5 years of age, as a contribution to human and social development. They also highlight the need for policies and interventions that address gender disparities in caregiving, taking into account the various factors that influence these disparities. Future studies suggest that testing interventions such as subsidized childcare, flexible work arrangements, and educational campaigns may reveal promising ways to equitably redistribute the burden of unpaid work.

In general, the analysis of the Colombian context in terms of child welfare, which was approached from care activities and malnutrition in children under 5 years of age, from a focus on urban poverty, the intensity of the armed conflict and maternal and child health, This study manages to evidence key factors that influence the problematic axes that have been raised and public policy proposals are envisioned to make the respective interventions and contribute to social welfare in the Colombian context and in turn to the sustainable development goals 1 (End of poverty), which seeks to eradicate poverty in all its forms and dimensions, including extreme poverty, 2 (Zero Hunger) which focuses on eradicating hunger, achieving food security, improving nutrition and promoting sustainable agriculture, 3 (Health and Well-being) which seeks to ensure healthy lives and promote well-being for all at all ages, 5 (Gender Equality) which seeks to achieve gender equality and empower all women and girls, 10 (Reducing Inequalities) which aims to reduce inequality within and between countries and 16 (Peace, Justice and Strong

Institutions) which seeks to promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

Despite its strengths, this study has some limitations. First, the cross-sectional design of the 2015 DHS survey does not allow establishing causal relationships, but only associations between variables. Second, the survey does not include information on relevant variables such as distance to the health center, presence of NGOs, or cultural practices and beliefs, which could influence the use of maternal health services. Another is the lack of municipal representativeness of the data, which limits the ability of the study to control for heterogeneities between municipalities; there are no microdata for municipalities in Colombia that are statistically representative.

In addition, the role of the partner in women's health decisions was not explored, despite being an important factor in developing countries. Urban areas are not homogeneous across regions, and variables that could contribute to the gender gap in health may not be included in the survey or may have been left out of the estimates. In terms of decomposition methods, it may not capture other important unmeasured factors that also contribute to disparities such as mental health, extended family support, or local policies, maternal autonomy, among others that may influence both gender gaps in childcare and between poor and non-poor in child malnutrition. The results may not be generalizable to other cultural contexts or countries, as the dynamics of gender, childcare and maternal and child health may vary considerably between different sociocultural contexts. The study does not delve into how specific government policies and programs, such as family support and childcare programs, affect the distribution of care time between genders. An important part of the gender gap in health remains unexplained, possibly due to unobserved factors such as social preferences or discrimination. Overall, further research should continue to explore and better understand the causes of these gaps and develop strategies to reduce them.

In our modest opinion, future research should extend the investigation with qualitative data to strengthen the evidence. This would allow, for example, to analyze the relationship between child malnutrition and mothers' education in breastfeeding practices, complementary feeding, lifestyles, habits, and dietary changes. Further qualitative and quantitative research is essential to better understand how sociocultural norms and policy

environments shape gendered care obligations in Colombia. More robust analytical techniques combined with mixed methods studies could help elucidate these complex dynamics.

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