UNIVERSIDAD DE SÃO PAULO
FACULDAD DE MEDICINA DE RIBEIRÃO PRETO
DEPARTAMENTO DE MEDICINA SOCIAL

Paulina Belén Ríos Quituizaca

Cobertura nacional e subnacional e desigualdades nas intervenções de saúde reprodutiva, materna, neonatal, infantil e sanitária no Equador: um estudo comparativo 1994 e 2012

Ribeirão Preto - SP
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PAULINA BELÉN RÍOS QUITUIZACA

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Co- orientador: Prof. Aluisio J. D. Barros.

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Banca
Examinadora

Prof. Dr. _____

Instituiçã: _____

Julgamento: _____

Prof. Dr. _____

Instituiçã: _____

Julgamento: _____

Prof. Dr. _____

Instituição: _____

Julgamento: _____

DEDICAÇÃO

À minha família, meu marido e meu filho, com quem passamos longas noites de sacrifício e esforço, mas que finalmente valeu a pena.

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RESUMEN

Rios Quituizaca Paulina B. **Cobertura nacional y subnacional y desigualdades en las intervenciones en salud reproductiva, materna, neonatal, infantil y sanitarias en el Ecuador: un estudio de encuestas nacionales 1994- 2012** [tesis]. Ribeirão Preto: Universidad de São Paulo, Facultad de Medicina de Ribeirão Preto; 2021.

Introducción: La medición de las desigualdades sociales en salud y de las desigualdades en las coberturas de las intervenciones, permite identificar subpoblaciones vulnerables, cuantificar las brechas, y mejorar la toma de decisiones. El análisis de los estratificadores amplía el panorama de entendimiento del problema y las alternativas de solución y el análisis temporal permite entender cómo las circunstancias políticas y económicas están vinculadas con los resultados de las intervenciones en salud. Ecuador posee poca evidencia relacionada con las intervenciones de salud RMNCH (reproductiva, materna, neonatal e infantil). Similar a varios países de América Latina (AL) han atravesado constantes periodos de crisis económicas y políticas que coinciden con periodos de desigualdades sociales en salud, con poca evidencia escrita al respecto. El objetivo de la presente tesis fue analizar las desigualdades en la cobertura de las intervenciones RMNCH y WAS (agua potable y saneamiento) a nivel individual, geográfico y temporal. **Métodos:** Se diseñó un estudio descriptivo analítico transversal, que utilizó las bases de datos de encuestas nacionales de 1994, 1999, 2004 y 2012. Se calculó las coberturas de las intervenciones en base a criterios estandarizados. Los estratificadores utilizados fueron: quintiles como medida de desigualdad socio- económica, residencia urbana- rural, y provincia. Para los periodos 2004 al 2012 se analizó la autoidentificación étnica, considerando la educación de la madre y los quintiles de riqueza. Se utilizaron medidas absolutas, relativas, simples y complejas de desigualdades, que incluyeron Índice de Theil, índice de Morán, y modelos de ajuste multivariado para el análisis de la etnia. **Resultados:** Las más significativas brechas de desigualdad RMNCH en el Ecuador coinciden con periodos de políticas neoliberales y menor gasto social (periodo 1994- 2004, a diferencia del 2012). Las intervenciones WAS fueron las más desiguales; los ricos tenían 2,4 veces más cobertura en instalaciones sanitarias mejoradas que los más pobres. Aunque la diferencia de las coberturas entre provincias ha mejorado para el periodo 2012, (Diff 1999 = 31.6, Diff 2004 = 33.5, Diff 2012 = 13.6) se identifican sectores con evidentes e históricas brechas de desigualdad. La población que se autoidentifica indígena mantiene los niveles más bajos de escolaridad (74.4% hasta nivel primario) y en su mayoría pertenecen a los más bajos quintiles de pobreza (50.7% en el quintil 1 más pobre). Después de ajustar por educación y riqueza, persiste 35% menos prevalencia de partos atendidos por personal calificado, 28% menos cobertura de controles prenatales, y 24% menor prevalencia de anticonceptivos modernos. **Conclusiones:** Es urgente fortalecer las políticas que incrementen el gasto social y prioricen la población vulnerable, especialmente aquellos con desventaja histórica como los grupos indígenas y afros. Se requiere identificar los grupos desfavorecidos y analizar los contextos políticos, sociales y culturales de las subpoblaciones para influir en los indicadores de impacto en salud materna e infantil; pues los promedios nacionales esconden realidades locales. Dichas estrategias deben estar adaptadas a lo local, generar indicadores de medición diferentes, que reflejen esta adaptación y ser continuamente monitoreadas.

Palabras clave: Desigualdades en la atención de la salud, Servicios de salud materno-infantil, Servicios de salud reproductiva, Continuidad de la atención al paciente, Factores socioeconómicos, Encuestas de atención de la salud, Estudios transversales

ABSTRACT

Rios Quituizaca Paulina B. **"National and subnational coverage and inequalities in reproductive, maternal, newborn, child and sanitary interventions in Ecuador: a study of national surveys 1994-2012"** [tesis]. Ribeirão Preto: Universidad de São Paulo, Facultad de Medicina de Ribeirão Preto; 2021.

Introduction: The measurement of social inequalities in health and inequalities in the coverage of interventions allows identifying vulnerable subpopulations, quantifying the gaps, and improving decision-making. Ecuador has little evidence of RMNCH health interventions (reproductive, maternal, neonatal, and infantile). Like several countries in Latin America (LA), they have gone through constant economic and political crises that coincide with periods of social inequalities in health, with little written evidence about it. The objective of this thesis was to analyze the inequalities in the coverage of the RMNCH and WAS (drinking water and sanitation) interventions at the individual, geographical and temporal level. **Methods:** A cross-sectional analytical descriptive study was designed, which used national survey databases from 1994, 1999, 2004, and 2012. The coverage of the interventions was calculated based on standardized criteria. The stratifies used were: quintiles as a measure of socio-economic inequality, urban-rural residence, and province. The analysis of the stratifies broadens the understanding of the problem and the alternative solutions, and the temporal analysis allows us to understand how political and economic circumstances are linked to the results of health interventions. For the periods 2004 to 2012, ethnic self-identification was analyzed, considering the mother's education and wealth quintiles. Absolute, relative, simple, and complex measures of inequalities were used, including Theil index, Moran index, and multivariate adjustment models for the analysis of ethnicity.
Results: The most significant RMNCH inequality gaps in Ecuador coincide with periods of neoliberal policies and lower social spending (period 1994-2004, as opposed to 2012). The WAS interventions were the most unequal; the rich had 2.4 times more coverage in improved sanitation facilities than the poorest. Although the difference in coverage between provinces has been enhanced for the 2012 period (Diff 1999 = 31.6, Diff 2004 = 33.5, Diff 2012 = 13.6), evident and historical inequality gaps are identified. The population that identifies itself as indigenous maintains the lowest levels of schooling (74.4% up to primary level), and the majority belong to the lowest quintiles of poverty (50.7% in the poorest quintile 1). After adjusting for education and wealth, there is still a 35% lower prevalence of births attended by qualified personnel, 28% less coverage of prenatal check-ups, and 24% lower prevalence of modern contraceptives. **Conclusions**: It is urgent to strengthen social spending policies and prioritize the vulnerable population, especially those with a historical disadvantage, such as indigenous and Afro groups. It is necessary to identify disadvantaged groups and analyze the political, social, and cultural contexts of the subpopulations, to influence the impact indicators on maternal and child health; since national averages hide local realities. These strategies must be locally adapted, generating different measurement indicators that reflect this adaptation and continuously monitored.

Keywords: Healthcare disparities, Maternal- child health services, Reproductive health services, Continuity of patient care, Socioeconomic factors, Health care surveys, Cross-sectional studies, Ethnic groups.

RESUMO

Rios Quituizaca Paulina B. **Cobertura nacional e subnacional e desigualdades nas intervenções de saúde reprodutiva, materna, neonatal, infantil e sanitária no Equador: um estudo comparativo entre 1994 e 2012** [tesis]. Ribeirão Preto: Universidad de São Paulo, Facultad de Medicina de Ribeirão Preto; 2021.

Introdução: A mensuração das desigualdades sociais em saúde e na cobertura das intervenções permite identificar subpopulações vulneráveis, quantificar as lacunas e melhorar a tomada de decisões. O Equador tem poucas evidências de intervenções de saúde RMNCH (reprodutiva, materna, neonatal e infantil). Como vários países da América Latina (AL), eles passam por constantes crises econômicas e políticas que coincidem com períodos de desigualdades sociais em saúde, com poucas evidências escritas a respeito. O objetivo desta tese foi analisar as desigualdades na cobertura das intervenções RMNCH e WAS (água potável e saneamento) a nível individual, geográfico e temporal. **Métodos**: Foi elaborado um estudo transversal analítico descritivo, que utilizou bases de dados de pesquisas nacionais de 1994, 1999, 2004 e 2012. A cobertura das intervenções foi calculada com base em critérios padronizados. Os estratificadores usados foram: quintis como medida de desigualdade socioeconômica, residência urbano-rural e província. A análise dos estratificadores amplia a compreensão do problema e das soluções alternativas, e a análise temporal permite compreender como as circunstâncias políticas e econômicas estão vinculadas aos resultados das intervenções em saúde. Para os períodos de 2004 a 2012, foi analisada a autoidentificação étnica, considerando os quintis de escolaridade e riqueza da mãe. Foram utilizadas medidas absolutas, relativas, simples e complexas de desigualdades, incluindo o índice de Theil, o índice de Moran e modelos de ajuste multivariados para a análise de etnia.
Resultados: As lacunas de desigualdade de RMNCH mais significativas no Equador coincidem com períodos de políticas neoliberais e menores gastos sociais (período de 1994-2004, em oposição a 2012). As intervenções do WAS foram as mais desiguais; os ricos tinham 2,4 vezes mais cobertura em instalações sanitárias melhoradas do que os mais pobres. Embora a diferença na cobertura entre as províncias tenha aumentado para o período de 2012 (Dif. 1999 = 31,6, Dif. 2004 = 33,5, Dif. 2012 = 13,6), lacunas de desigualdade históricas e evidentes são identificadas. A população que se identifica como indígena mantém os níveis de escolaridade mais baixos (74,4% até o nível fundamental), e a maioria pertence aos quintis mais baixos de pobreza (50,7% no quintil mais pobre 1). Depois de ajustar para educação e riqueza, ainda há uma prevalência 35% menor de partos assistidos por pessoal qualificado, 28% menos cobertura de exames pré-natais e 24% menor prevalência de anticoncepcionais modernos. **Conclusões**: É urgente fortalecer as políticas de gasto social e priorizar a população vulnerável, especialmente aquela em situação de desvantagem histórica, como grupos indígenas e afro. É necessário identificar grupos desfavorecidos e analisar os contextos políticos, sociais e culturais das subpopulações, para influenciar os indicadores de impacto na saúde materno-infantil; já que as médias nacionais escondem realidades locais. Essas estratégias devem ser adaptadas localmente, gerando diferentes indicadores de medição que reflitam essa adaptação e monitorados continuamente.
Palavras-chave: Disparidades nos cuidados de saúde, Serviços de saúde materno-infantil, Serviços de saúde reprodutiva, Continuidade do atendimento ao paciente, Fatores socioeconômicos, Estudos transversais, Grupos étnicos

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LIST OF ABBREVIATIONS

RMNCH: reproductive, maternal neonatal and children

ENSANUT: National Survey of Health and Nutrition (Pesquisa Nacional de Saúde e Nutrição)

RP prevalence ratio

CI confidencial interval

INEC: National Institute of Statistics and Censuses (Instituto nacional de estatísticas e censos)

RMNCH: interventions reproductive, maternal neonatal and children

WAS: interventions of drinking water sources and improve sanitary facilities

ENSANUT: Encuesta Nacional de Salud y Nutrición

RHS: Reproductive health survey

SII: Slope index of inequality

CIX: Concentration index

LMGAI: Ley de maternidad gratuita y atención a la infancia

INEC: Instituto Nacional de Estadísticas y Censos

WHO: World Health Organization

PAHO: Panamerican Health Organization

PRESENTATION

The current doctoral research project entitled **" National and subnational coverage and inequalities in reproductive, maternal, newborn, child and sanitary interventions in Ecuador: a study of national surveys 1994-2012"** It arises with the need to understand the situation of inequalities in health in Ecuador, from a temporal, geographic and ethnic approach; and thus, be able to contribute to the identification of vulnerable groups and support in the decision-making of the national authorities.

The analyses carried out focused on identifying the coverage of reproductive, maternal, neonatal and infant health interventions (RMNCH) and health inequalities. In the time frame, this analysis becomes of greater interest when considering the economic and political situation that occurred in Ecuador between the years 1994 to 2012, during which time it is possible to show essential changes that allow a more comprehensive study, and whose situation is it constantly repeats to the present and with similar scenarios in several Latin American countries. However, it was also identified that minority ethnic groups (also existing in many Latin American countries) go through a problematic inequality situation. Progress is not visualized in this period, which warrants an independent analysis and a different approach to better understanding the problem.

This thesis is divided into three chapters. The first chapter details generalities about health inequalities, concepts and definitions necessary to understand the measurements of inequalities better. In addition, this chapter addresses the situation of health inequalities in Latin America and Ecuador and the main events from 1994 to 2012, which allow a better understanding of the situation of health inequalities that will be addressed.

Chapters II and III are written in scientific article format, with sections that each includes: introduction, methodology, results, and discussion. Chapter two is titled: **Coverage and inequalities in RMNCH health interventions in Ecuador, 1996- 2012** and analyzes the coverage and inequalities of seven essential health interventions RMNCH and discusses the findings within the political and economic events framework that occurred in Ecuador in this period. In addition, it disaggregates the information at the level of "provinces", comparing the evolution of these in three periods of time.

Chapter III, titled **“Ethnic inequalities in reproductive, maternal, newborn and child health interventions in Ecuador. A study of the 2004 and 2012 national surveys”,** and analyzes the situation of health inequalities for three ethnic groups in Ecuador, considering social determinants such as education and poverty of women.

SUMARIO

Chapter I

CHAPTER I. Generalities on health inequalities and the situation of health inequalities in Ecuador

1.1 Social determinants of health and Analysis of inequalities

As doenças não são distribuídas por acaso, mas são profundamente determinadas pela estrutura social, política e econômica em que vivemos. (OMS- CDDS)

The social conditions that generate these inequities in the population's health have been conceptualized under Social Determinants of Health (DSS). DSS are the circumstances in which people are born, grow, live, work and age, including the healthcare system. explain most of the health inequities, that is, of the unjust and avoidable differences observed in and between countries concerning the health situation. (1)

The mechanisms by which determinants cause social inequalities in health have been widely (2) (3). When an individual belongs to a low social class, he is exposed to work of risk, more significant psychosocial stress, which affects the immune system (4), which aggravates illnesses; If there is a financial burden due to illness, reduced activity and social isolation, one can fall into a "poverty trail" (5) from which it is difficult to leave challenging to solve (5)

To reduce inequalities, we must act on the determinants of health at all levels. Thus, at the macro level: efficient economic growth strategies that support the most disadvantaged population, multisectoral policies and actions, such as subsidized public services, occupational safety policies, increase or maintenance of public financing in health, education and transportation and a universal health system, which limits the burden of out-of-pocket expenses (3). It is recommended to identify the most vulnerable groups at an intermediate level and act at the intersectoral level, for example, with "Health action areas" (6) with health promotion and disease prevention activities. Develop community work dynamics, social services, emotional support for vulnerable populations (7) and advice on the family budget to avoid the "medical poverty trap". It is essential to fight corruption, monitor changes and be flexible to possible changes in policies with new successful strategies (3).
More research is needed on mechanisms as determinants cause inequalities (2). To move from discourse to action, one must begin by identifying vulnerable groups through measuring inequalities and knowing their magnitude, information that will serve decision-makers.

1.2 Measurement of health inequalities

The measurement of social inequalities in health contributes to recognizing vulnerable groups, allows defining priorities, and is the basis for incorporating equity in health planning and allocation of resources according to needs (8)(9). These measurable differences (inequality) lead to a sense of social justice (equity) because when a state of health depends on unnecessary and avoidable differences, they are considered unfair and inequitable.

No monitoring cycle, the leading indicators and analysis metrics of inequality (simple or complex, depending on two stratifies to be measured) must be incorporated. The communication of two results must be clear for any public and include the current state. , moves no time, comparisons and priority areas of intervention (9).

1.2.1 Health indicators

To identify the basic indicators that impact maternal, neonatal and infant health (MNCH), a series of standard indicators proposed by the International Alliance for Health (IHP) and international health organizations and adapted by Bryce et al (10). (See Table 1).

These indicators were analyzed and agreed upon within the framework of the “countdown” initiative (Countdown 2015 and countdown 2030), which was created as a commitment by the governments of several countries and international organizations that analyze the progress made in maternal, neonatal and infant survival.

Table N.1 Intervention coverage and behavior change. Maternal, Newborns and Child Survival

Intervention coverage and behaviour change[a]
Nutrition
1. Exclusive breastfeeding (<6 months)
2. Breastfeeding plus complementary food (6-9 months)
Child Health
3. Vitamin A supplementation coverage
4. Measles immunization coverage
5. DPT3 immunization coverage
6. HiB3 immunization coverage
7. Oral rehydration and continued feeding
8. Insecticide-treated net coverage
9. Antimalarial treatment
10. Prevention of mother-to-child transmission of HIV
11. Care seeking for pneumonia
12. Antibiotic treatment for pneumonia
Maternal and Newborn Health
13. Contraceptive prevalence
14. Unmet need for family planning
15. Antenatal care (at least one visit)
16. Antenatal care (four or more visits)
17. Neonatal tetanus protection
18. Intermittent preventive treatment of malaria in pregnancy
19. Skilled attendant at delivery
20. C-section rate
21. Timely initiation of breastfeeding
22. Postnatal care for mothers
23. Postnatal care for babies who were born at home
Water and Sanitation
24. Use of improved drinking water sources
25. Use of improved sanitation facilities
Inequities in Services
Breakdown of the above indicators by gender, urban/rural residence, wealth quintiles and regions of the country.

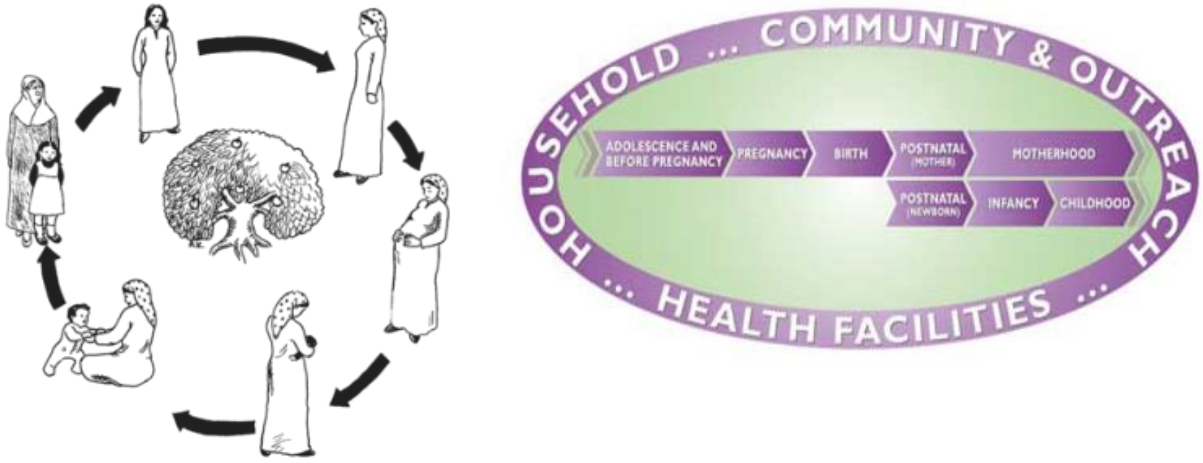
Take and adapted from Countdowns to 2015 for maternal, Newborns and Child Survival., link: http://www.countdown2015mnch.org/.

Indicators that should be analyzed in the “Continuum of care” for reproductive, maternal, neonatal and child health (RMNCH) includes the provision of integrated services for mothers and children from before pregnancy to delivery, the immediate postnatal period and childhood (11) that links the time, from before pregnancy, pregnancy, through childbirth to the first days and years of life; also the connection of the provision between households and health facilities. It is essential to reduce costs and increase the efficiency in health care of the different interventions.

Following the logic of the continuum of care, the preconception consultation of women is encouraged to achieve a pregnancy in the best conditions and reduce the risk of becoming ill

or dying. Once the pregnancy is completed, it is intended to provide the highest quality care during pregnancy, childbirth and the puerperium. From this moment on, the commitment to caring for women continues (contraception, prevention of genital-breast cancer, climacteric, etc.) and care for the newborn and child begins until reaching adolescence again.

Figure 1. Reproductive. Maternal, newborn and child health (RMNCH) Continuum of care

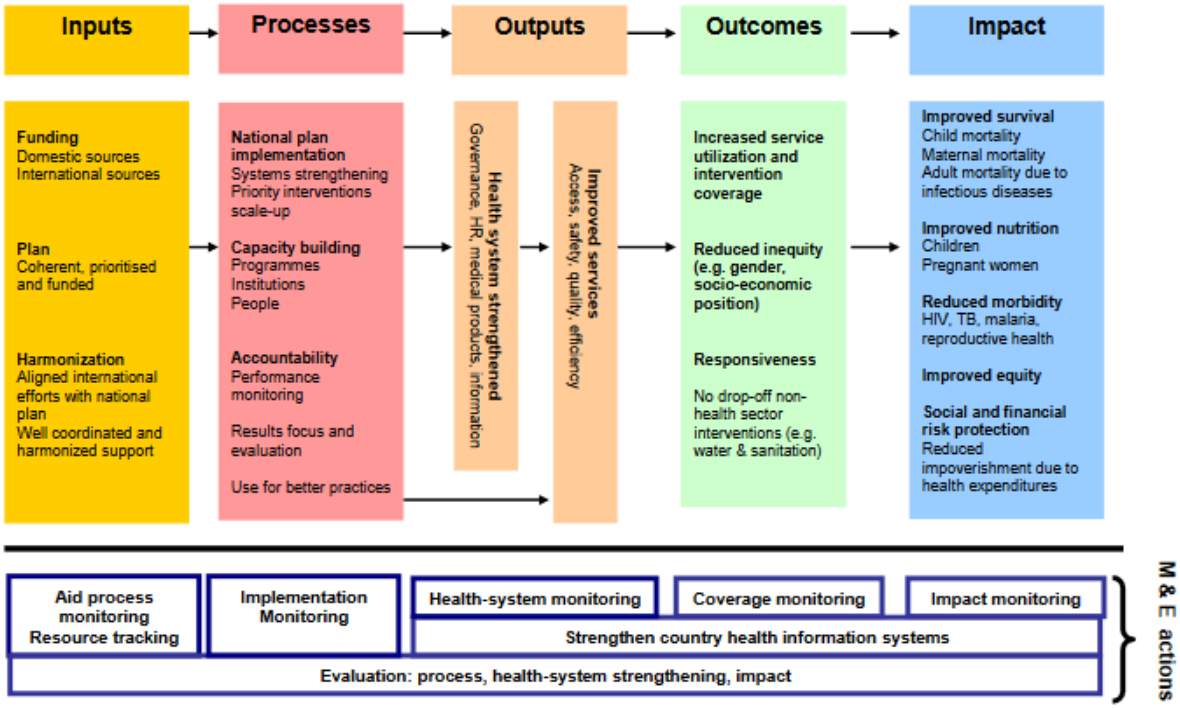


Take and adapted from PMNCH Fact Sheet: RMNCH Continuum of care. Link https://www.who.int/pmnch/about/continuum_of_care/en/ (11)

For the analysis of inequalities, it is necessary to measure the coverage of these indicators, understanding as coverage the proportion of people who need a service or intervention and who receive it. Although this information should be collected through routine systems, low- and middle-income countries (including Ecuador) do so based on representative samples in household surveys. (10)

To carry out a comprehensive analysis that allows decision-making, it is not enough to report the coverage of the indicators but to better understand the reason for possible shortcomings. For this, the “Framework for monitoring and evaluation for the strengthening of health systems” (WHO, 2009) proposes to relate health supplies with products, results and impact on health (Figure 2). The indicators of maternal and child health analyzed are located among the “Outcomes” and reflect the performance of the health systems. Still, these, in turn, depend on the health system's capacity, that is, on the “Inputs, Process and Outputs " (12).

Figure 2. Common framework for monitoring performance and evaluating progress in the scale-up for better health



Take from WHO. Monitoring and evaluation of health systems strengthening: An operational framework. Disponible en: https://www.who.int/healthinfo/HSS_MandE_framework_Nov_2009.pdf

1.2.2 Equity stratifies

Socioeconomic status joins many other relevant stratifies since it describes any characteristic that allows specific minority population groups. According to the Inequalities Monitoring Manual published by the WHO in 2013 (13), the most relevant are those with the acronym PROGRESS, which include: Place of residence (rural, urban, etc.), Race or ethnicity, Occupation, Gender, Religion, Education, Socioeconomic status and Social capital or resources.

Although different indicators can be used for socioeconomic status, the most common is to use the asset index, whose use has been widespread and valid to document the gaps between rich and poor (14). This index was proposed by Filmer and Pritchett in 1998 (15) and is based on a shortlist of household belongings, characteristics of the house and the educational level of household members, information accessible in national surveys and that together with an analysis of principal components, allows each household to assign an asset score and the samples can be divided into quintiles (14).

1.2.3 Measure of inequality on health

Based on the “Manual for measuring inequalities of the WHO and the article by Silva et al. (2008) (13,16), mention will be made of the main simple and complex measures of inequalities. Simple measures make comparisons between two groups (for example, the richest vs the least rich). Among the simple difference measures is the "absolute difference", in which it can be observed that the greater the difference, the greater the inequality, and it is easy to interpret. As a relative measure, there is the "ratio or quotient" between two groups. When applying the simple ratio calculation, the interpretation is made based on 1, as a figure of equality.

However, when there are more than two comparison groups and these groups follow a natural order (for example, ranges of education or wealth), this pairwise analysis ignores the other intermediate groups, before which the “complex measures” of inequality are the best alternative.

When the categories correspond to ordered groups, a difference measure is applied: the “Slope Inequality Index” (SII), for its calculation the subgroups are ordered (ranked) and weighted, reflecting a proportional distribution of the population in each subgroup, so the people of each category are considered in the cumulative distribution of the population and at its midpoint of the range. The health indicator of interest is regressed against the value of this midpoint (ridit) using an appropriate model. The predicted values of the health indicator are calculated for the two extremes (rank one and rank 0). The difference between the predicted values in range 1 and range 0 (spanning the entire distribution) yields the value of the slope inequality index. The interpretation depends on the ranking and on whether or not the indicator is favourable for health. For example, when the level of education is ordered from the most disadvantaged (no instruction) to the most advanced (higher level), and we analyze the “smoking” that is unfavourable, the negative values of the index indicate that this indicator is more prevalent in the most disadvantaged group, thus, smoking with a negative IBS (IBS = -24) indicate that smoking is more prevalent among the less educated, which shows the magnitude of absolute inequality.

As a relative measure of ordered groups, the “Concentration Index” (CIX) is applied, which ranks the groups from the least to the most advantaged (for example, from the poorest quintile 1 to the wealthiest quintile 5); the proportion and the fraction accumulated with the population of each subgroup are calculated, and it is weighted according to this population. The index has a positive value when it is concentrated among the advantaged, measuring the magnitude of the difference (the greater the number, the greater the inequality). The CIX is defined concerning the concentration curve, using an approach analogous to the Gini coefficient. It graphs on the x-axis the cumulative percentage of the sample, ranking individuals according to socioeconomic position. The cumulative percentage of the health variable is plotted on the y-axis. When the concentration curve is below the 45º diagonal line, there is inequality; the health indicator is concentrated among the advantaged.

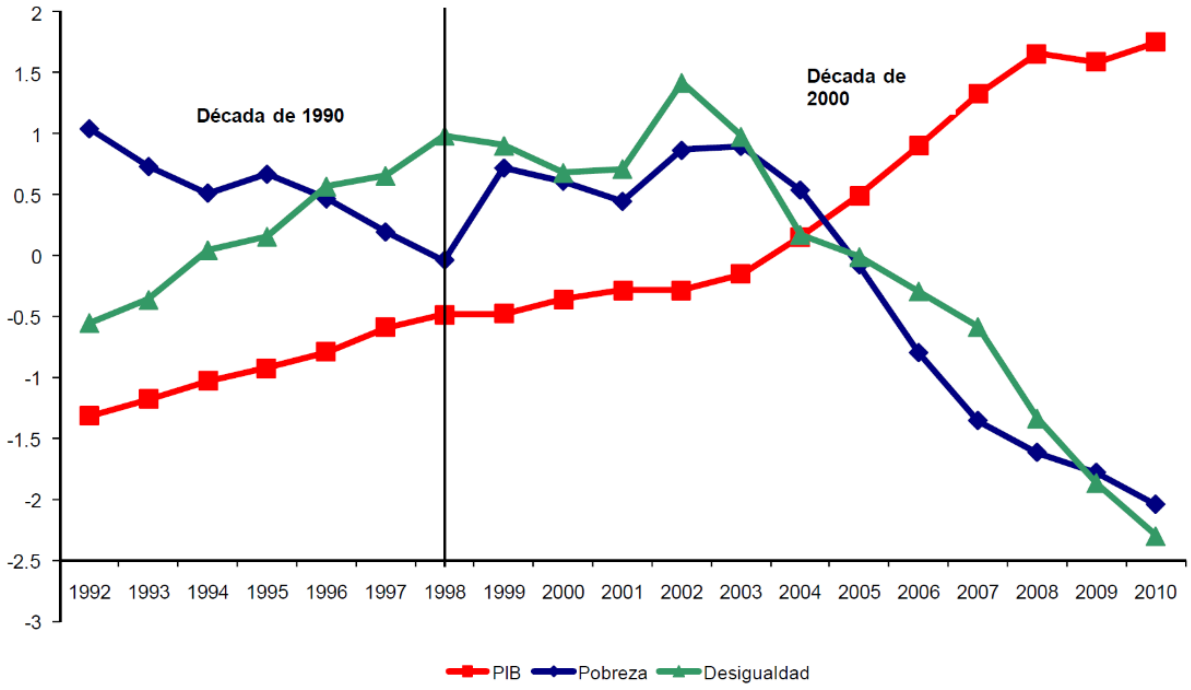
Finally, for groups in which it is not possible to have a natural arrangement (provinces or ethnic groups), the “absolute mean differentiation” and the “Theil index” are used. The difference between absolute average is calculated concerning the general average of each subgroup. For that purpose, the absolute value of the difference between the average health indicator in each population group and the total population is summed up. This sum is divided between the number of groups. Only positive values can be generated for the difference between the general and the general, and thus the subgroups can be identified as a major difference. (16).

Theil's Index makes it possible to measure relative inequality. It is based on the concept of disproportionality. For example, in the case of geographic areas, if an area has a level of health that is much higher than the national average, Theil's index will inflate, which indicates a greater inequality. Consider the proportion of the population in each region and the prevalence ratios of health indicators in each region with the national average value. Theil index has a calculated minimum value of 0 (in regional inequality); as the relative inequality increases, the value becomes bigger, without the upper limit (17).

1.3 The situation of inequalities in health in Latin America and Ecuador

Latin America and the Caribbean, since the 1980s and 1990s, have gone through stages of constant economic and political crisis (18). As can be seen in figure No.… it also shows that in the decade of the 90s, there is a certain degree of economic growth with the growth of inequality. Between the decade of the 90s and the beginning of 2000, economic stagnation was observed. From 2002 onwards, the crisis was over, observing a continuous spread of widespread poverty in all countries and the inequality due to income that coincides. According to data analyzed by the "Center for distributive, labour and social studies" (CDLAS by its acronyms in English) and data from the World Bank and national surveys, there is a high increase in income distribution.

Figure 3. Latin America. Poverty, inequality and growth. 1992-2010

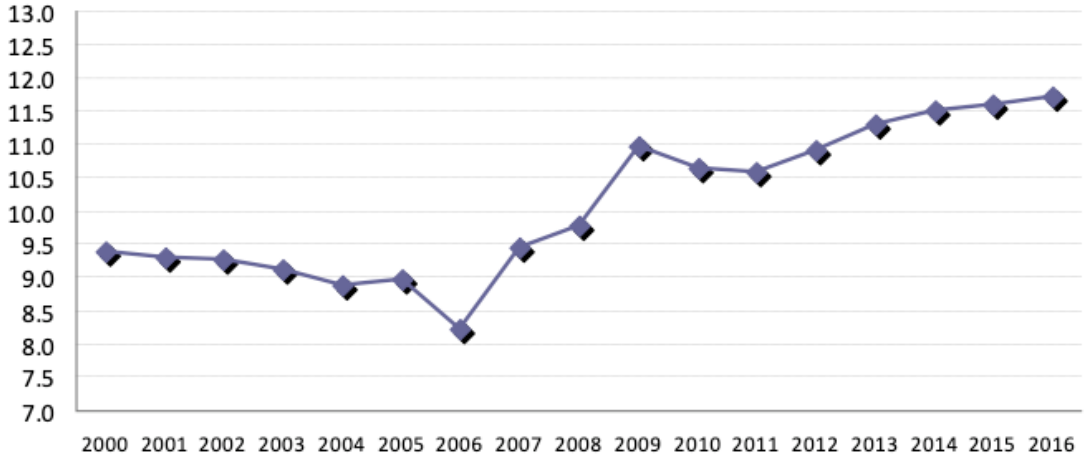


Take from CDLAS GL. Poverty and inequality in Latin America: Diagnosis, proposal and projections based on recent experience [Internet]. Economic Focus. 2012 Link. https://focoeconomico.org/2012/11/14/2143/

The CDLAS study concludes that the poverty reduction is likely to be strongly linked to factors: on the one hand, the more significant part of the region's economies has experienced high levels of economic growth, accompanied by increases in labour and labour inputs. On the other hand, the majority of countries increased social spending and put it on the march, expanded it significantly, through social protection systems in many countries in the region, for example through PCTs (conditional transfer programs) directed at households poor and sustainable reductions in poverty levels have been demonstrated. (18) (See figure 4)

There is evidence that the increase in social spending impacts the health of the population, and public social spending and income per capita significantly contributed to reducing infant mortality in Latin America (19). Since the late 1970s, several countries in Latin America and the Caribbean have repeatedly applied to the International Monetary Fund (IMF) and the World Bank (BM) to request loans from countries in debt to alleviate deficits in the balance of payments (20). Since 1980, we have been associated with the economic measures of the "Washington Consensus" that contain 10 measures from fiscal discipline that include the reduction of public spending, tax reform, the commercial and economic opening of countries, the liberalization of the type of exchange and foreign trade, elimination of restrictions on direct financial investment, privatization and sale of state-owned companies, deregulation and intellectual property rights (21)

Figure 4. Evolution of public social spending of the Central Government in Latin America, period 2000-2016 (% of GDP).



Take from CDLAS GL. Poverty and inequality in Latin America: Diagnosis, proposal and projections based on recent experience [Internet]. Economic Focus. 2012 Link . https://focoeconomico.org/2012/11/14/2143/

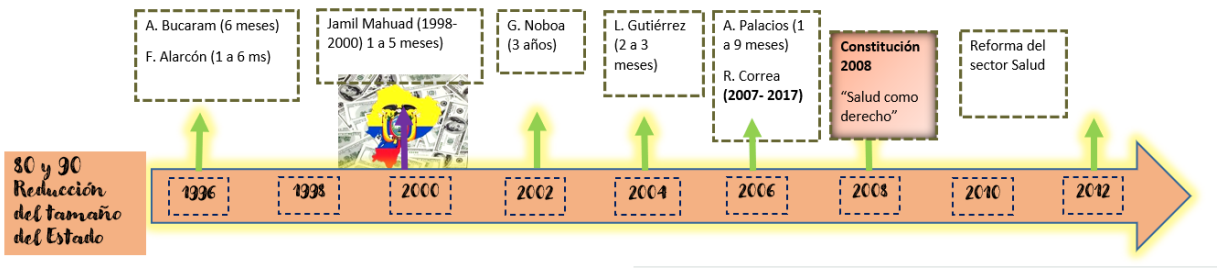
Göttems and Mollo (22) analyzed these neoliberal policies on their impact on health systems reforms and based on the analysis of five countries (Brazil, Argentina, Chile, Colombia, Mexico and Peru). They show that these policies aggravated inequalities in health service delivery systems due to the reducing economic costs and state cuts that will transform the public into private health. This whole process does not allow for the actuality to guarantee the fundamental "right to health" that is less included in the constitution of Ecuador (23) and against the basic principles dictated in PHC (Primary Health Care).

In Latin America and the Caribbean (LAC), progress has been shown in reducing inequalities (24); inequalities persist in maternal and reproductive health interventions. Only 60% of the poorest quintiles have measures such as family planning, prenatal control and the presence of trained parents, which, in the poorest quintiles, will give 100%. In Mexico, it has become clear that, if socioeconomic gaps have been reduced over the past few years, gaps persist in the coverage of preventive interventions in various vulnerable groups. (25) (26).

1.3.1 Economic and political changes in Ecuador (1994 to 2012). Health reform in Ecuador.

The economic and political scenario that went through Ecuador between 1996 and 2012 was exciting and reflected many changes in many Latin American countries. These changes are particularly marked in two periods:

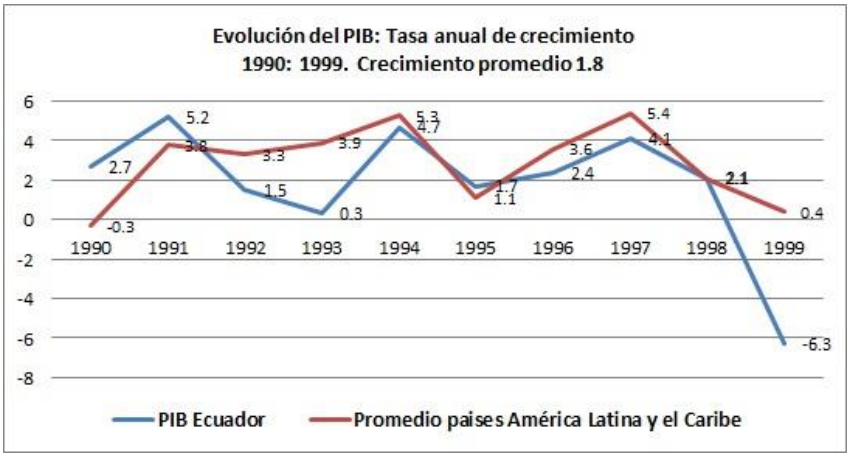
Figure 5. Main political events in Ecuador between 1996-2012



Prepared by the author, with data from (27) (28) (29) (30) (31)

Between 1996 and 2007, Ecuador went through a period of significant political and economic instability. There were eight presidential changes in a decade. The Gini index increased from 49.7 to 53.9 between 1998 to 2004 and even if the dollarization of the economy, with a constant increase in the expenditure of the pocket until 2006, which recurred in the constant social crisis, which was incurred in a circle of instability and poverty (27) (28) (29) (30) (31). GDP per capita was one of the lowest in the whole of Latin America (see figure 6). Studies with data from the year 2004 identified inequalities in access to health services, both preventive and curative for homes of low income, indigenous people and inhabitants of rural areas (32) (33), in addition to the "indigenous ethnicity" was a factor negative predictive for the use of health services, regardless of their economic status (34).

Figure 6. Evolution of GDP. Annual growth rate between 1990 to 1999.

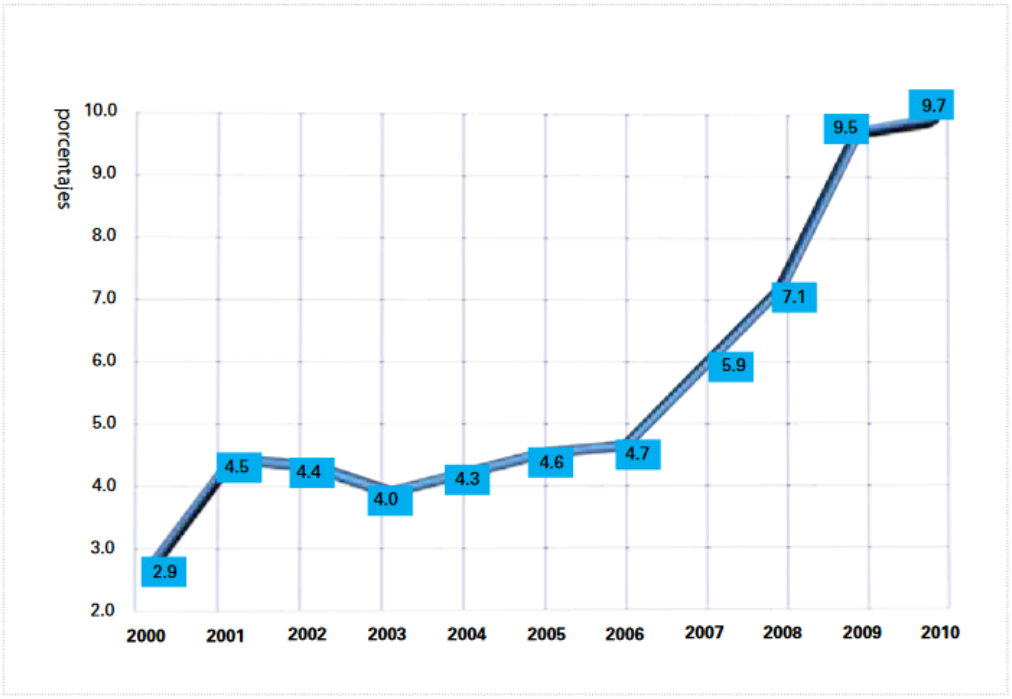


Take and adapted from Beckerman P, Maldonado F, Solimano A. Crisis y Dolarización en el Ecuador. The World Bank, 1818 H Street, NW, Washington, Link https://documents1.worldbank.org/curated/en/508021468248977231/pdf/245560SPANISH0178143134615O1PUBLIC1.pdf

In the period 2007-2012 in Ecuador, essential changes took place. In 2008, the new Constitution strengthened health protection as a human right, linked to the exercise of other rights as access to public services (water, sanitation, electricity), education, work, healthy environments (23). Public investment increased from 4.6% of GDP in the year 2006 to 9.7% for the year 2010 (31) (see figure 6), the Gini index declined from 53.3 in the year 2007 to 46.1 year in 2012, poverty reduced by 37.6% in 2006 to 27.3% in 2012 (28).

Total health expenditure as a percentage of gross domestic product (GDP) increases from 5.86 in 2006 to 9.16 in 2014, and an essential reduction in pocket spending is observed (27). A health reform is implemented, which reinforces the rectory of the Ministry of Public Health with an intersectoral approach, with a system based on primary health care (31) (35) (36). In the WHO Health Care Efficiency (HCE) ranking, in 2014, Ecuador rises from the 111th to the 2000th year to the 20.3th with the implemented health model (37) (38). Between 1990 and 2013, only one of the 11 countries that most reduced maternal mortality (39) and the infant mortality rate decreased from 17.0 for every 1,000 live births in 1994 to 9.7 for every 1,000 live births in 2017 (40).

Figure 7. Execution of social investment as a percentage of GDP. Ecuador 2000- 2010



Fuente: MF/MCDS/BCE (2000-2010)
Nota: Para el periodo 2000-2008 los datos corresponden al Presupuesto del Gobierno Central mientras que para el periodo 2009-2010 corresponden al Presupuesto General del Estado.

Take from MF/MCDS/BCE (2000- 2010). Execution of social investment as a percentage of GDP. Period 2000 to 2008 budget of the central government, period 2009-2010 corresponds to the general budget of the state. World Bank national accounts data, OECD national accounts data files. Ecuador. Data- World Bank. Global

Similar to what has been observed in Latin America and the Caribbean, Ecuador has changed significantly in reducing poverty, especially since 1999 (Gini coefficient of 4.8 points between 2006 and 2014 (41). in indicators of morbidity and mortality and maternal health coverage over the past 15 years (42) (43). With working with planning tools focused on promoting equity (9) (10), potentially effective policies have been adopted to reduce the MM, financing measures, investment in human resources, strengthening of the training of health professionals, if the infrastructure and equipment in health have been expanded, as well as the improvement in the quality of services (44).

As of 2008, the Constitution has been refined by "health as a right" through the Comprehensive Health Care Model (MAIS) and with free care policies. The percentage of the general state intended for Health in 2011 was 5.9%, and in 2012 6.8%. If built, repaired and put into operation 47 hospitals and 74 first-level health centres, allowing to absorb an increase of more than 300% in demand for health services, with a total investment of US $ 16 208 million between 2007 and in 2016 (and an annual average investment five times over the 2000–2006 period, the number of attentions increased from 16 million in 2006 to 34 million in 2011, and the demand curve in 2011 showed a stabilization. An increase in the purchase of medicines of US $ 155 million in 2011 (45).

The measurement of inequalities is the basis for incorporating equity in health planning, based on evidence and valuing current health initiatives promoting equity (9). However, Ecuador does not have many studies related to the coverage of preventive interventions infertility, childbirth and preparation and its equitable distribution in the vulnerable population if you are unaware of relevant changes that have been made between the periods mentioned above.

Ecuador has adopted intervention strategies aligned with the Sustainable Development Goals, Objective No. 10, “Reduction of the inequalities” (46). An analysis of inequalities in health with disaggregated data in vulnerable populations would allow recognizing population issues and prioritizing their intervention. In turn, the knowledge of implementing strategies disaggregated by geographic, ethnic stratifies, that of socio-economic status, will make it possible to focus on interventions and accelerate maternal and neonatal health indicators (47).

1.3.2 Ethnicities and health inequalities in Ecuador

In Latin America, since the time of the colony, the division into castes of human beings (whites, Creoles, Indians, mestizos, mulattos, blacks and blacks) determines the differences in the modes of production, economic and cultural, whose inheritance persists in the form of social inequality, racism and discrimination, there are pueblos and indigenous nationalities and afro-descendant population (48). By self-identification, the indigenous population represents 7.2% of the Ecuadorian population (49). The indigenous population in Ecuador has historically experienced exclusion, social marginality and poverty (50) (51). For the year 2006, the percentage of unsatisfied basic needs (NBI) of the indigenous population was 88.1% (although the population mixed was 50.3%) (52) (48); 34.3% of women do not read or write, illiteracy figures that have even increased between 2001 and 2006 (53).

The indigenous population primarily resides in provinces that present fundamental indicators of essential services, such as the provinces of the central Sierra: Bolívar, Cotopaxi, and Chimborazo, which together with some provinces of the Amazon (Morona Santiago, Napo, Orellana and Pastaza), present the el GDP (Gross Domestic Product) among the 24 provinces of Ecuador (54), the most significant global fertility rates (55) (56). The list of doctors per 10,000 inhabitants is also the lowest among these four provinces, and it is worrying to note that the increase in the number of medical professionals between 2005 and 2014 is minor compared to the rest of the country (55) (56) (57).

There is little evidence related to inequality and ethnicity as equity stratified. Studies in Ecuador with data from the year 2004 identified the “indigenous ethnicity” as a negative predictive factor for the use and access to health services, regardless of their economic status (34) (32). The study by Mesenburg et al. identified “marked ethnic gaps in the coverage of reproductive and maternal interventions” and states that these data have changed since the year 2004 (58). A 2014 study on inequalities in maternal ageing, although the percentage of indigenous population demonstrated to be correlated with RMM (Mortal maternal rate) and socioeconomic indicators, in the model of regression that is effective in maintaining itself (59).

The present proposal has the purpose of identifying the magnitude of economic, geographic inequalities, by the level of education, by sex, and by age, in the coverage of reproductive, maternal and child health indicators, from the National Survey of Health since 1994, 1999, 2004 and 2012. It aims to expand the documented analysis on inequalities by ethnic groups about these indicators to contribute to straight lines and equitable interventions and accelerate the progress of Maternal health indicators (47).

Chapter II

CHAPTER II. Coverage and inequalities in RMNCH health interventions in Ecuador, 1996- 2012

2.1 Abstract of chapter II

Background: Latin America (LA) has experienced constant economic and political crises that coincide with periods of greater inequality. Between 1996-2007 Ecuador went through one of the greatest political and socioeconomic crises in Latin America, a product of neo-liberal economic growth strategies. Between 2007-2012 it regained political stability, promoted redistributive policies, and initiated greater social spending. To understand the possible influence on the political and economic context, we analyzed the coverage and inequalities in five Reproductive, Maternal, and Child Health (RMNCH) and two water and sanitation interventions using survey data from a broad time window (1994-2012), at a national and subnational level. **Methods:** The series cross-sectional study used data from four representative national health surveys (1994, 1999, 2004 and 2012). Coverage of RMNCH and sanitary interventions were stratified by wealth quintiles (as a measure of the socioeconomic level), urban-rural residence and the coverage for each province was mapped. Mean difference, Theil index and Variance-weighted least squares regression were calculated to indicate subnational and temporal changes. **Results:** From 1994 to 2004, Ecuador evidenced large inequalities whose reduction becomes more evident in 2012. Coverage in RMNCH health service-related interventions showed a rather unequal distribution among the socioeconomic status and across provinces in 1994 and 2004, compared to 2012. Sanitary interventions on the contrary, showed the most unequal interventions, and failed to improve or even worsened in several provinces. While there is a temporary improvement also at the subnational level, in 2012 several provinces maintain low levels of coverage. **Conclusions:** The remarkable reduction of inequalities in coverage of RMNCH interventions in 2012 clearly coincides with periods of regained political stability, promoted redistributive policies, and greater social spending, different from the former neo-liberal reforms which is consistent with observations made in other Latin American countries. Territorial heterogeneity and great inequalities specially related with sanitation interventions persists. It is necessary to obtain high quality information with sharper geographic desegregation that allows to identify and understand local changes over time. This would help to prioritize intervention strategies, introduce multisectoral policies and investments that support local governments.

Keywords: Healthcare Disparities, Maternal- child health Services, Reproductive Health Services, Continuity of patient care, Socioeconomic Factors, Health care surveys, Cross-Sectional Studies.

2.2 Introduction of chapter II

Inequality is a major global challenge, including in Latin America, which has experienced periods of dramatic decline in levels of social spending accompanied by economic crises and political instability (60). The widespread adoption of neo-liberal economic growth strategies has increased poverty and widened income inequalities in the provision of health services (3,22). In countries such as Ecuador, Bolivia, Argentina and Brazil, periods of greatest economic and political crisis coincide with marked increases in inequality, as measured by the Gini Index (61,62).

Initiatives like Countdown to 2015 and 2030 have placed emphasis on Reproductive, Maternal, Neonatal and Child Health (RMNCH) interventions globally, relying on publicly available Demographic and Health Surveys. Over the past two decades, several Latin American countries have reported increasing coverage of essential RMNCH interventions (63,64). To what extent larger economic and political crises have impacted coverage has been scarcely studied (9,65,66). Moreover, the distribution of coverage across population subgroups remains understudied; and more needs to be done to identify underserved groups, and (re)allocate resources according to varying needs (9,67). Further, based on how interventions are faring across population groups, they may need to be integrated, reducing costs, duplication, and inefficiencies (68).

Ecuador is among those Latin American countries that endured a long period of political and socioeconomic crisis during the 1990s and 2000s. From 1996 to 2006, the country had a troubled economy and unstable governance. This peaked with a hyperinflation in 2000, followed by ‘dollarization’ and liberalization of fiscal policies (28–30). Between 1998 and 2004, Ecuador’s modified Gini index increased from 49.7 to 53.9, the highest value ever seen in the country's history; accompanied by a consistent increase in out-of-pocket expenditure through the year 2006 (27,29,31). In 2004, access to health services was found to be constrained among people with low-income households, indigenous population and inhabitants of rural areas in comparison to higher income, non-indigenous and urban populations (32,33).

During the subsequent period - 2006 to 2012- however, there were drastic changes in the country: the prevalence of poverty declined from 37.6% to 27.3%; the gross domestic product (GDP) increased from 4.2% to 12.6% (27), and the Gini index fell from 52.2 to 46.1.

Total health expenditure as a percentage of GDP increased from 5.9 in 2006 to 9.2 in 2014 (31); out-of-pocket expenses reduced significantly (27) given a notable increase in public investment in health. As a result of these features, Ecuador rose from the 111th rank in 2000 to the 13th in 2014 according to the World Health Organization's (WHO) Health Care Efficiency (HCE) Index. (37,69). Between 2006 and 2014 inequalities in access to health services by socioeconomic status decreased. (36).

Existing studies have compared health inequalities in shorter periods of time (36,70,71), and there remains a lack of scientific evidence about inequalities in intervention coverage that reflects the changing macroeconomic and political contexts, particularly through analyses that examine subnational level. Using data from four national health surveys in Ecuador, we describe inequalities in coverage of RMNCH and sanitary interventions during and after periods of marked political, economic, and social crisis, between 1994 to 2012.

2.3 Materials and Methods of chapter II

2.3.1 Data sources and Selection of Indicators

The present study is a series cross-sectional analysis using nationally representative surveys. For the years 1994, 1999 and 2004, we analyzed data from the Reproductive Health Surveys (RHS), which provide data on women of childbearing age from 15 to 49 years (13,582; 14,285 and 10,814, women for each survey respectively), children under 3 and 5 years (8,837; 8,691 and 4,184 children for each survey respectively) and information on household assets (14,084; 19,896 and 10,985 households for each survey respectively) (72–74). The 2012 survey included 18,213 women from 15 – 49 years; 19,949 homes and 10,098 children under 5 years of age (75). More information is available in official reports which are publicly available (76). RHS was not available after 2004, so we relied on the national survey of health and nutrition (ENSANUT) of 2012 (75), which had comparable indicators.

We selected intervention indicators that are considered essential across the continuum of RMNCH care at the community level (9) and used in global Sustainable Development Goal (SDG) monitoring efforts, such as the Countdown to 2030 initiative (10,12). We further identified interventions related to access to safe water and improved sanitation (WAS), which are established in the existing literature as being highly complementary to RMNCH, and are associated with great gains in mother and child survival (79).

All indicators were operationalized based on standardized definitions of coverage of interventions (80) which represent the proportion of individuals who access the intervention at the national level and by subgroups, with their respective standard error; these indicators were constructed in simple Microsoft Excel sheets from both surveys (RHS and ENSANUT) ensuring comparability across datasets and time periods. The definitions of the indicators, their numerator and denominator are presented in the Supplementary annex 1.

Comparability of indicators over time is a well-known challenge in studies that use household surveys, due to differences in data collection and instrumentation (78,81). This study analyzes seven temporally comparable indicators in a representative sample while considering the disaggregation by population subgroups. Five were **RMNCH indicators**: *Use of modern contraceptive, Antenatal care (4+ visits), Institutional delivery, Early initiation of breastfeeding, Full immunization;* and two were Water and Sanitation (**WAS) indicators:** *Improved sanitary facility, Improved drinking water source*.

2.3.2 Dimensions of inequality

Socioeconomic status was assessed in this study using an asset index, following the convention used in various Low and Middle-Income Countries (LMICs) (14,64,81,82). Indicators on active assets of the selected households, materials used for housing construction and types of water and sanitation access facilities were analyzed using Principal Component Analysis (PCA) to generate the wealth score for each household. Each individual was classified according to the total score of the family in which s/he resided and finally, the sample was classified and divided into quintiles with the Quintile 1 (Q1) representing the 20 poorest percent and Quintile 5 (Q5) representing the 20 wealthiest percent of households (82,83). The same methodology was applied for all four surveys. There were no marked demographic changes in the study period, which facilitated the interpretation of temporal trends (84).

We also disaggregated by place of residence (rural versus urban) and geographic region, as has been done for inequality analysis in several countries (85). Following the definitions used in prior work (86), we compared intervention coverage among the population living in urban areas (those living in populated centers with 2,000 or more inhabitants), to those living in rural areas (less than 2,000 inhabitants).

The subnational desegregation allows us to identify the sectors that achieved improvements and learn from the implemented actions and successful experiences that can be replicated, as well as identify neglected subpopulations prioritizing interventions in vulnerable sectors. The difference in the coverage between provinces for each year was considered in inequality analyses, as explained in the following section.

2.3.3 Inequality analyses

Change in overall coverage over time on a national level

We calculated and plotted coverage and standard errors for each intervention. We used variance-weighted least squares regression to estimate the absolute annual change in intervention coverage (85).

For inequality analysis, we created *equiplot* graphs for the seven health interventions, showing the gap across wealth quintiles and between urban- rural residence over time, as done in earlier studies (9,64,66). The equiplot is a data visualization tool that allows us to see all of the indicators and their level of coverage at the same time, providing a visual indication of absolute inequality over time (14,87). An analysis of complex inequality measures was carried out with data from the 2012 survey presented in the supplementary annex 2.

Change in coverage and inequalities over time by subnational level

We measured coverage of the five indicators across the four natural regions that make up Ecuador (Coast, mountain, Amazon and insular region). However, the Amazon region did not have a breakdown by province in 1994, so following the convention used in other studies (72–75), we calculated the coverage and their respective standard error for each province for only three years 1999, 2004 and 2012. Two summary measures were used: “mean difference from best” was an absolute measure for unordered inequality dimensions that calculates the mean difference in relation to the best coverage for each indicator and year (the higher the value, the greater the difference). The second, the Theil index, is a relative summary measure for unordered dimensions of inequality where “zero” may be interpreted as the absence of inequality and as the value becomes larger, inequality is greater. (17)

We also measured the variation coverage over time and information for the provinces over the four-year survey periods was plotted to show the slope of change. Variance-weighted least squares regression was used to estimate the average of absolute annual change in the prevalence of each intervention, which allows us to consider the different time intervals between surveys (from 1994 to 2012), and to test the statistical significance of the observed trends (88).

The Moran Index was applied to the values of the regression coefficient, which helps to understand the degree to which one province spatially behaves similar to another (indicated by positive values), allowing the identification of autocorrelated patterns.

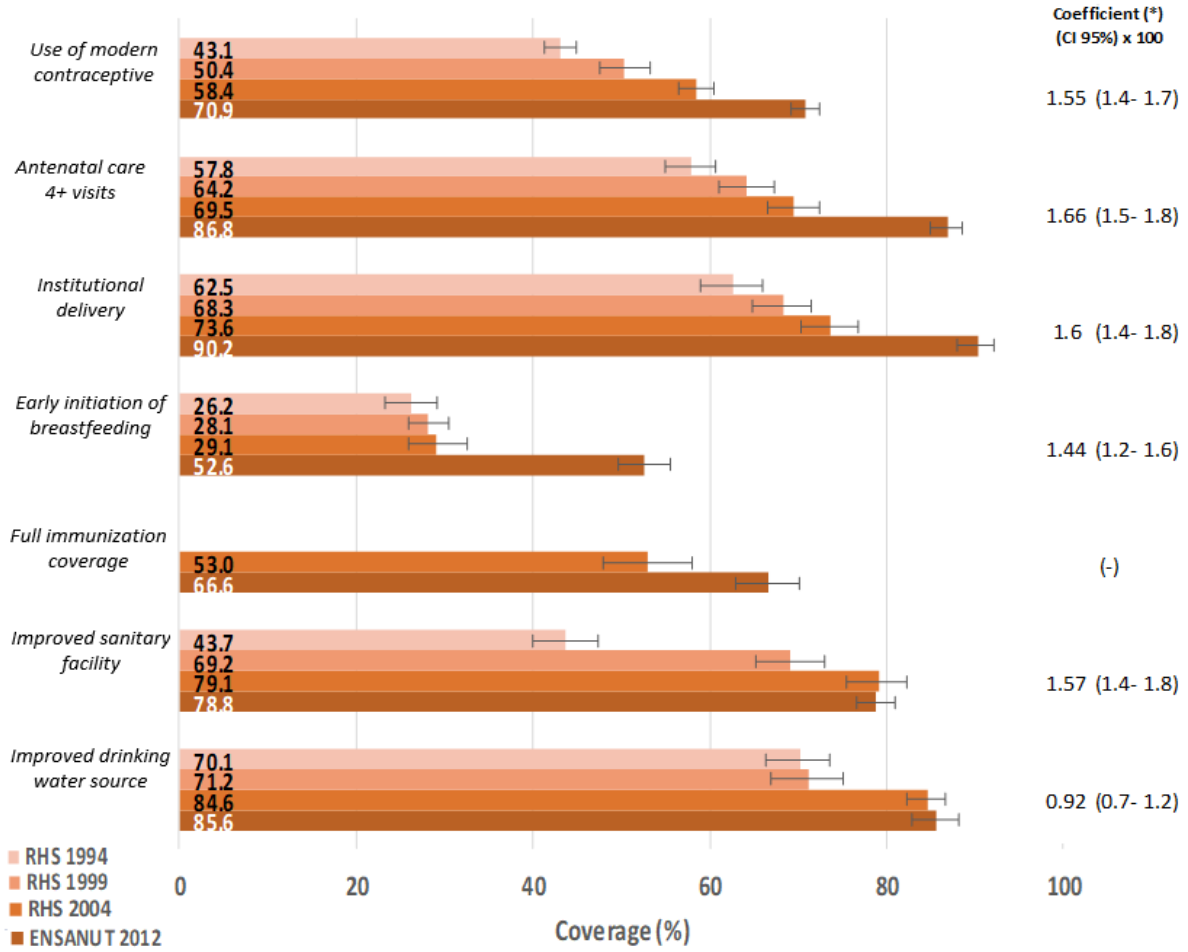
We used STATA (Stata corp.) version 15.0 (89) for all analyzes, considering the design of the survey, such as sampling, grouping and stratification weights. The program R was used for plotting of the maps.

2.4 Results of chapter II

2.4.1 Change in overall coverage over time

Coverage of all the RMNCH interventions analyzed in the present study tended to increase significantly over the given period, and most drastically between 2004 and 2012 at the national level (see Figure 8). The coverage of **health service- related RMNCH interventions** *(use of modern contraceptive, Institutional delivery, and antenatal care 4+ visits)* showed the highest slope values, with coverage progressively increasing at a rate of roughly 1.5% to 1.6% each year. The lowest coverage between 1994-2004 was of *early initiation of breastfeeding* with notable improvement between 2004-2012 (29.1% to 52.6%). In contrast, coverage of **interventions related to sanitation** showed a different pattern, where *improved sanitary facilities* showed an important progress from 43.7% to 69.2% between 1994 to 1999, but it did not show any progress between 2004 to 2012, while *Improved drinking water source* merely increased from 84.6% to 85.6 between 2004 to 2012.

Figure 8. Coverage of RMNCH and WAS interventions

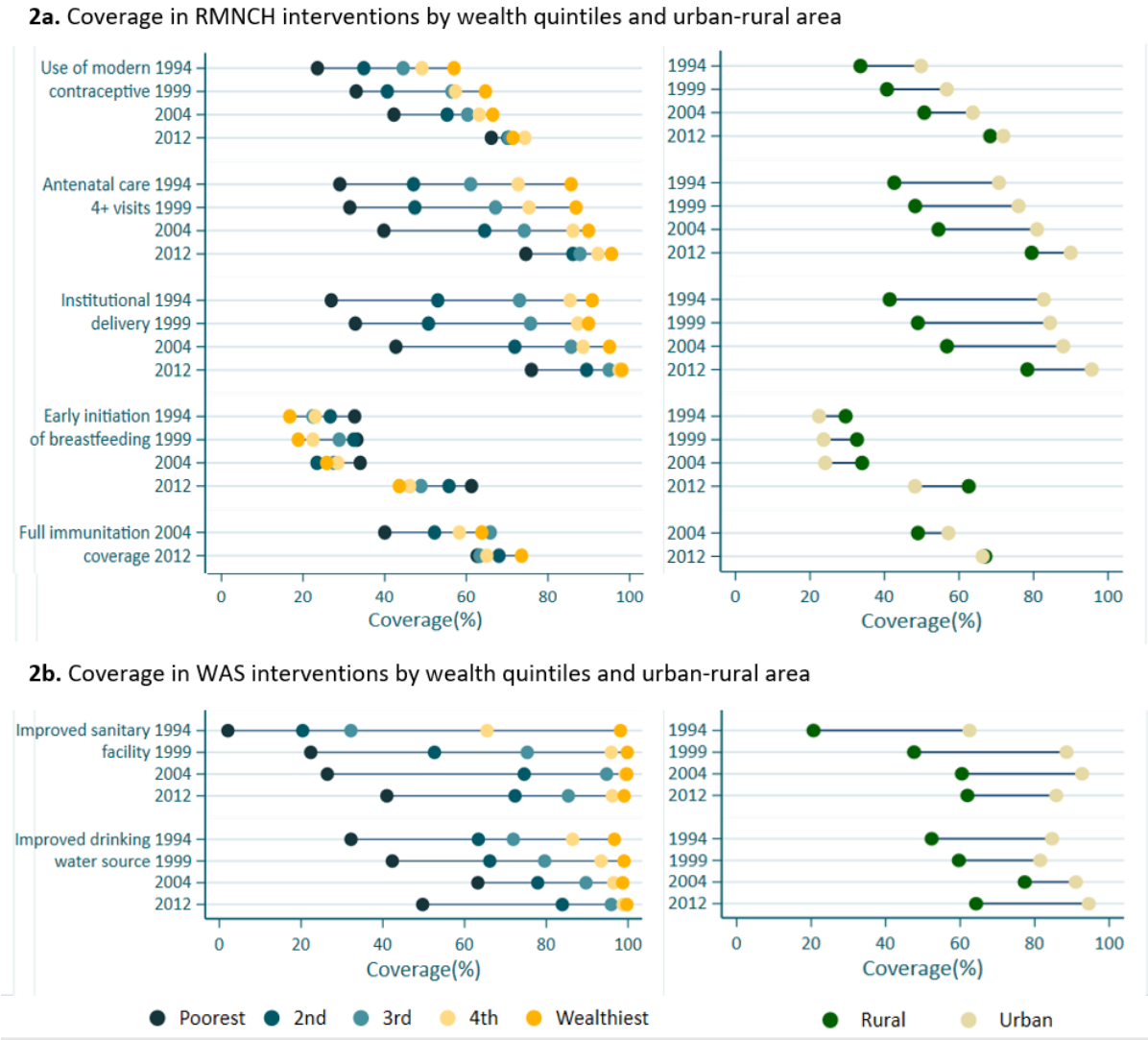


2.4.2 Socioeconomic and geographic inequalities in coverage over time

The gaps of the coverage of RMNCH interventions for each socioeconomic stratifier decreased over time (Figure 2a). There was a remarkable difference in the reduction of inequalities between the period 2004 to 2012. Until 2004, a social gradient can be clearly observed, with a change in 2012 towards a pattern of marginal exclusion where all but the poorest quintile have reached reasonable levels of coverage. An inverse pattern of inequality was observed in the coverage of *early initiation of breastfeeding* such that the poorest quintile presented greater coverage.

The greatest inequality was observed in WAS interventions. Over time the population of the poorest quintile maintained low levels of about 50% coverage in basic services, indicating a wide gap compared to the richer population. Even in 2012, where *WAS* interventions show high level of national coverage, the disaggregation of information by wealth quintiles, demonstrates that still around half of the poorest quintile lacked coverage. (Figure 2b). We quantified these inequalities in RMNCH and WAS interventions for 2012 data, where, rich people had 2.4 times greater coverage in *improved sanitary facilities* than the poorest (see Supplementary annex 2).

Figure 9. Coverage of intervention by Wealth quintiles and urban-rural area: 2a. RMNCH interventions **2b.** WAS interventions



Sources: Ecuador RHS 1994, RHS 1999, RHS 2004, ENSANUT 2012.

Figure 9 further indicates greater differences in coverage in favor of the population residing in urban areas, for all RMNCH interventions except for the breastfeeding intervention. Although coverage increased from 1994 to 2004 for all health service-related interventions the breach between rural and urban coverage remained about the same, most notably for institutional delivery which kept a difference of about 40%. These coverage differences decreased by at least half in 2012. These observed differences are even more accentuated considering WAS interventions. In Ecuador, there is a historical trend of poorer populations residing in rural areas (90), which we sought to understand more granularly using geographically disaggregated analyses.

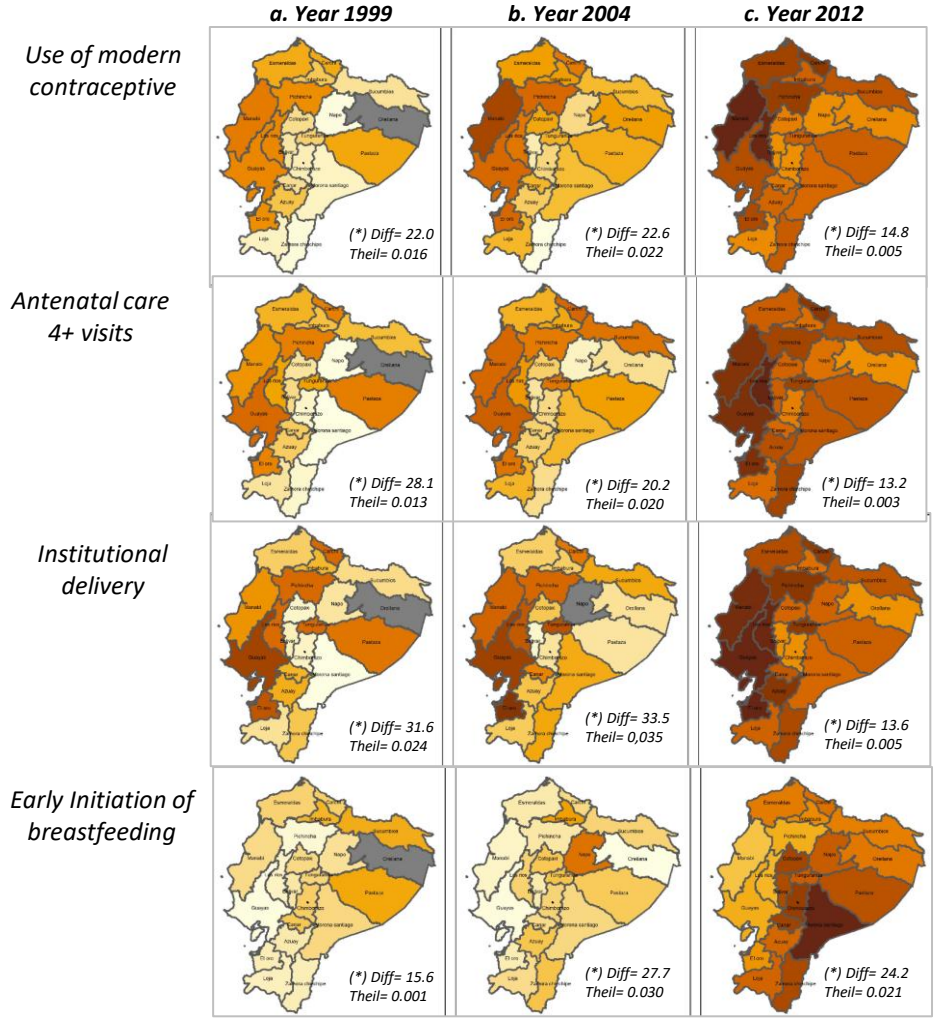
2.4.3 Subnational Inequalities in coverage over time

Disaggregated analysis by provinces allow us to explore whether changes in coverage were distributed equally between provinces at three points of time. High absolute weight mean differences (Diff) were observed in the years 1999 and 2004. *Institutional delivery* was the intervention with the greatest differences in the years 1999 and 2004 (Diff 1999=31.6, Diff 2004= 33.5, Diff 2012= 13.6) with evident improvements in coverage in 2012. Coverage of health services related interventions in 1999 and 2004 were more unequally distributed, with coverage becoming more equitable in 2012. The exception to this, as above, was *early initiation of breastfeeding* (Diff 1999=15.6, Diff 2004= 27.7, Diff 2012= 24.2), with poor coverage in the Ecuadorian coastal region. (See Figure 10a). In sanitation coverage the weighted mean difference by province decreased over time (Diff 1999 = 30.4, Diff 2004 = 23.7, Diff 2012 = 16.8) (see Figure 10b).

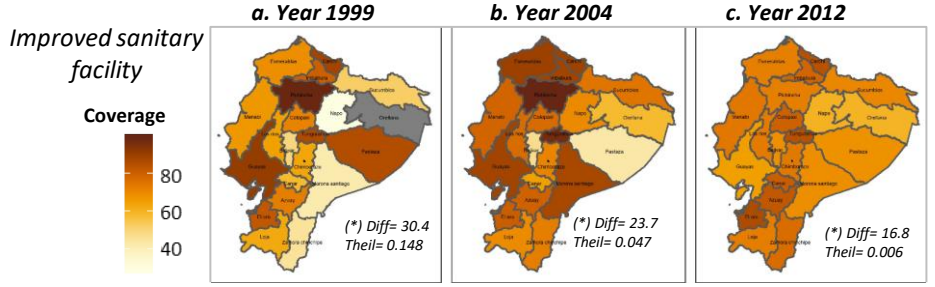
Average absolute annual change between all provinces – measured using variance weighted least squares regression - were positive and statistically significant in most of the measured interventions. Despite the notable improvements in the coverage of RMNCH interventions in several provinces of the Amazon region, coverage trailed other regions throughout all measured time periods. In Sanitation interventions in contrast, most of the coefficient values were low and not significant, meaning that the improvements between 1994 to 1999 were not sustained and even suffered a reduction of coverage in a few provinces for these indicators observing the period from 2004 to 2012. Neither RMNCH nor sanitary interventions presented hereby significant spatial autocorrelation applying Moran´s index. This means that no regional patterns were identified, with exception of early initiation of breastfeeding, with low coverage in almost all the coastal provinces of Ecuador (see supplementary annex table 2 and fig.2).

Figure 10. Differences between RMNCH and Sanitary interventions by provinces. Ecuador 1999- 2012.

3a. *Coverage in RMNCH interventions by provinces*



3b. *Coverage in sanitary intervention by provinces*



(*) Absolute weighted mean difference (Diff) from best (percentage points)

Sources: Ecuador RHS 1994, RHS 1999, RHS 2004, ENSANUT 2012

Table 2. Average annual absolute change in percentage points by province and selected intervention. Ecuador 1994- 2012

Geographical Regions	**Province**	**A. Use of modern contraceptive**	**B. Antenatal care 4+ visits**	**C. Institutional delivery**	**D. Early initiation of breastfeeding**	**E. Improved sanitary facility**
Cost	Guayas	1.3*	1.5*	0.9*	1.2*	0.5*
Cost	El Oro	1.3*	1.8*	1.2*	1.4*	1.4*
Cost	Manabi	1.8*	**2.2***	**2.4***	0	1.5*
Cost	Esmeraldas	2.0*	1.6*	**2.3***	1.2*	1.2*
Cost	Los Rios	**2.1***	**2.7***	1.8*	1.1*	1.8*
Mountain	Pichincha	1.4*	1.1*	1.2*	1.5	0.1
Mountain	Imbabura	1.7*	1.2*	1.3*	1.5*	0.9*
Mountain	Carchi	1.9*	1.1*	1.0*	2.0*	0.4
Mountain	Tungurahua	1.9*	1.9*	1.4*	**2.2***	0.9*
Mountain	Azuay	1.6*	**2.1***	**2.6***	1.9*	1.4*
Mountain	Canar	1.7*	1.6*	2.0*	2.1*	**2.1***
Mountain	Bolivar	1.7*	2.2*	1.9*	**2.4***	1.7*
Mountain	Chimborazo	1.6*	1.6*	3.1*	**3.0***	1.4*
Mountain	Loja	1.7*	**2.2***	**2.3***	**2.4***	1.9*
Mountain	Cotopaxi	1.8*	**2.2***	**2.8***	**2.3***	1.8*
Amazon	Pastaza	1.2*	1.3*	1.7*	1.9	0.7
Amazon	Sucumbios	**2.6***	1.6*	**2.6***	1.1*	0.9
Amazon	**Morona santiago**	**2.6***	**3.6***	**3.7***	**3.9***	-1
Amazon	**Napo**	**2.6***	**3.4***	**2.7***	**2.4***	1.8*
Amazon	Orellana	0.5	2.6	**5.5***	**5.6***	0.2
Amazon	**Zamora Chinchipe**	**3.5***	**4.0***	**2.6***	**3.7***	1.7*
Insular	Galapagos	1.1*	1.4*	0.3	1	-0.2*
	Moran Index	- 0.047	-0.103	0.028	**0.143[ł]**	-0.036

(*) Statistically significant increase (positive values in percentage points) or decrease (negative values in percentage points) on coverage over time.
([ł]) Coefficient statistically significant in the Moran Index

2.5 Discussion of chapter II

This is the first study in Ecuador that explored the coverage and inequalities pertaining to seven essential RMNCH and sanitary interventions at national and sub-national levels in the period 1994-2012. During the decade from 1994 to 2004 Ecuador had large inequalities, with a general tendency towards a reduction in inequalities until 2012.

This is significant because Ecuador, like other countries in Latin America, has endured economic crisis and political instability through this period of time. Of all presidents democratically elected from 1970 to 2003 in the region, 23% were forced to leave their positions before the end of their terms and 40% faced challenges in their tenure (61,91). In 2004, the percentage of poor in Latin America reached 46.9% (51), much higher than it was the case in 1990 (92). The political and economic instability in several Latin American countries (Brazil 1990, Mexico 1995, Ecuador 2000, Bolivia and Argentina 2002) (61) coincided with the largest increase in inequality (Gini Index) (62), all of which made it difficult to meet the objectives of the 2030 Sustainable Development Goals agenda (60). Despite chronic political conflicts, liberalization policies have been consistently pursued. Since 1982, most of the Latin American countries applied structural adjustment policies, based on the guidelines of the "Washington Consensus", including the control of public spending and fiscal deficits (93). Frustration over inequality has resulted in massive mobilizations in the Latin American region in 2019. However, Ecuador joined the ranks of countries with apparent improvements in their average health indicators such as Chile and Colombia (94,95).

2.5.1 Inequalities in coverage over time - RMNCH interventions on a national level

The reduction of inequities in health services related RMNCH interventions between the periods 1994-2004 were not as evident as those between 2004 and 2012; which may be attributable to the prolonged period of political crisis faced between 1997 and 2006 as well as a financial crisis in 1999 (28,29,96). In 2002, Ecuador allocated less than 5% of expenditure to public social spending (average in the region 15%)(97) and in 2005 it was one of the countries with the lowest public spending on health (only 5.9% of GDP)(31). The decade between 1994 and 2004 was characterized by political instability (30), with a stagnation of the coverage of interventions occurring despite reported financial investments in the health sector (98). However, programs like the Law on Free Maternity and Child Care from 1999 to 2004 were launched, and may have catalyzed improvements in primary healthcare services utilization and decreased neonatal mortality (99). As these programs stabilized or were enhanced in the following period, gains from such interventions may have begun to emerge in the subsequent period.

Our results show that Ecuador remarkably reduced RMNCH intervention inequalities between 2004 and 2012, which is consistent with other studies and indicators that showed a reduction in inequalities in the use of health services after 2006 (36,70,71). That could be related with the process of transformation of the health sector that started in 2007, reinforced by the

Constitution of 2008 bolstering the protection of health as a human right (23). Various actions were taken which reinforced the leadership of the Ministry of Public Health based on primary health care (31,36,37,100). Improvements in provisioning of health infrastructure, equipment and investment in medicine (31,101); increase in health human resources (the number of medical professionals per 10,000 inhabitants increased from 9.9 to 15.7 between 2008 to 2012) (57). The benefits of these shifts in priority and investment appear to have had equity impacts: another study found that the percentage of live births attended by health personnel in rural areas (constant from 1990 to 2007), increasing 1.2 percentage points each year between 2008 to 2016 (102).

The reduction in inequalities has been associated with greater investment in education, more equitable social spending, and the implementation of social policies that support vulnerable population subgroups (62,103,104). It is noted that the quality of governance measured by institutional capacity in the spending efficiency (bureaucracy, controls) for such reforms also plays a critical role (105).

The proportion of total expenditure on health as a proportion of GDP was 8.3% in 2014, increasing 2.8 percentage points between the period 2007 and 2014 (106). Our analysis suggests that there may have been a positive and long-term influence of higher public spending on health coverage (107,108) as has been observed in other Latin American countries (104). This is in line with the established indirect relationship between public spending decline in the Gini index seen in the period 2004- 2012 in several Latin American countries (103,109,110). Overall, the increase in the total health expenditure as a percentage of GDP in Ecuador, together with other factors such as economic growth, poverty reduction (31,111), improved access to education (112) and reduced income inequalities (113) may have contributed to this trend.

Early Initiation of breastfeeding in Ecuador nearly doubled between 2004 and 2012. This change may be attributable to the aforementioned spending, as well as a host of interventions specifically targeting breastfeeding, including the "Baby friendly Hospital initiative" (114), the Law on Promotion, Support and Protection of Breastfeeding (115) and compliance with the international code for the marketing of breast milk substitutes (116), reinforced in 2009, whose interventions can rapidly improve breastfeeding practices, when properly administered (117). This intervention favored the poorest and rural populations, reflective of a global trend where more advantaged populations tend to have lower rates of breastfeeding coverage (64). Regardless of these advances, the national coverage in 2012 remained low (around 50%) similar to countries like Peru or Bolivia. (118). Therefore, research and investment in this area should be expanded.

Despite the aforementioned overall improvements in RMNCH intervention, coverage in 2012 was still low compared to other countries such as Peru, Brazil and Colombia (119,120), and inequality in favor of the wealthiest population subgroups persisted. Only the coverage use of modern contraceptive in 2012 was the intervention that achieved superior coverages compared to Peru, Mexico, Bolivia, Guatemala, Colombia and Argentina (75,121); indicating a success in intervention strategies which should be further analyzed in future studies.

2.5.2 Inequalities in coverage over time – WAS interventions on a national level

Access to improved water sources and sanitation facilities also influence women's and children's health and their ability to receive essential interventions (77). Ecuador did not show improvements over time, in these coverage indicators, despite the fact that the 2008 Constitution promulgated access to public services, education, employment and healthy environments (23). While Ecuador joins other countries in the region that have shown significant improvement in sanitary facility coverage over time (122), it has not been equitable. For *improved sanitary facilities,* the greatest increase was from 1994 to 1999, likely attributable to the FASBASE project (98) which started in 1992 to support projects of basic services and sanitation nationwide. Unfortunately, 1999 onwards, this intervention stagnated, with coverage reducing by 2012 in many provinces, except for those whose local governments prioritized this intervention. Interestingly, while coverage for the WAS indicators was 80% nationwide, it was only around 50% for the poorest quintiles, suggesting marginal exclusion. Other studies are consistent with these findings, since they show that Ecuador in 2015 was among the countries with relatively lower degrees of concentrated poverty, but great inequalities in access to drinking water and sanitation regardless (123).

According to the Constitution of the Republic of Ecuador, it is the responsibility of municipal governments to provide the public with drinking water, sewerage, sewage treatment, solid waste management and environmental sanitation activities established by law. (23). Health concerns are a shared responsibility between the ministries of health and social areas, as well as the municipal governments, given the direct impact on the health of the population, especially the most vulnerable. This analysis suggests that greater attention and intersectoral action is clearly needed to reduce geographic inequalities in drinking water and sanitation access (77) which has the potential to bring about lasting and positive change for women, children, families and communities. (79).

Overall, the achieved national average is not a sufficient indicator of the country's progress in terms of health. Intervention coverage distribution across population subgroups must be

assessed to identify vulnerable population and reduce inequality (9,67). Additionally, lessons could be drawn from provinces with successful intervention outcomes over time, to see whether their strategies are applicable to similar populations.

2.5.3 Inequalities in Coverage interventions over time on a sub-national level

Although previous studies conducted with data from 2004 and 2009 showed no difference in access to health services by provinces (32,70), the present study extends the analysis to three different points in time, observing that the differences between provinces in 1999 and 2004 were greater compared to the differences observed in 2012, that is, the coverage achieved at the national level in this year, were also distributed more equitably at the subnational level. This is consistent with previous studies that showed an improvement in coverage over time that has favored vulnerable areas (84).

Different inequality patterns where seen by geographic regions. For instance, Pichincha the province in the mountain region that includes Quito, the capital of Ecuador shows consistently high coverage compared to other mountain provinces with high degrees of poverty, such as Bolivar, Chimborazo and Cotopaxi. These provinces share the lowest coverage of interventions due to a number of characteristics like large percentage of rural population, high rates of illiteracy, high total fertility rates, and they also present the lowest rate of doctors per 10,000 inhabitants (56,57). In the Amazon region, the greatest improvement in the coverage were observed in the provinces that had low intervention coverage in 1999 (56). Most of the provinces of the Amazon region have low Gross Domestic Product (GDP) per capita (54), with large rural, indigenous, and relatively less educated population groups (56), Despite this improvements, 2012 coverage levels within this region remained comparatively low. In fact between 1995 and 2006, a pronounced increase in poverty and social inequality in rural households was observed in Paramos of the central highlands and the dispersed colonized areas of the Amazon (90).

This study did not identify significant regional patterns with exception of the breastfeeding intervention which is related with factors such as rurality and indigenous belonging (124). More consistent information – by ethnic status and other proxies for social determinants together with a higher level of geographic disaggregation - is needed given that these factors prevail in smaller subpopulations within provinces. This would allow for the identification of regional patterns across provincial borderlines as province boundaries also mask internal inequalities.

2.5.4 Strengths and Limitations of the study

Adding to the literature on health inequalities in Ecuador (34,36,70) the present study compares coverages of RMNCH and WAS indicators using a broad time-frame of analysis. Critically, data analysis was disaggregated by subnational level using geographic information systems for mapping, which is especially important for Ecuador, which has four socially and structurally distinct regions. The present study can provide useful lessons to other countries on the effectiveness of comprehensive analyzes with geographical and temporal disaggregation.

However, the reporting periods of data in this survey were not equidistant – i.e. between 1994, 1999 and 2004, there was a gap of 5 years each, but between 2004 to 2012, the gap was 8 years. Such analyses could reveal clearer insights if the periodicity of surveys were fixed. Nevertheless, available information provides a reasonable basis for the present analysis. This study analyzes data up to the year 2012, but it is possible that other changes have occurred in a more current period, which should be evaluated when more recent surveys are available.

To achieve comparability throughout the four surveys, all indicators used in the present analyses have been standardized at the International Center for Equity in Health (ICEH; www.equidade.org).

It was not possible to include more coverage indicators, as information to calculate them was limited. In the *full immunization coverage* indicator, a change was recorded in the vaccination schedule among those reported by the 1999 survey and the 2004 survey, which limits comparability (74). Moreover, the indicator *improved drinking water source* showed a change in the elements forming the indicator for 2012, but this did not affect the result when it was compared with official reports (75). However, in the breakdown by province, due to the weakness in this indicator, we considered it better to disaggregate only the indicator *Improved Sanitary Facilities* which showed a similar behavior between provinces and the same conclusion was reached. Finally, with regard to the indicator on *early initiation of breastfeeding,* the survey of 2012 related questions were referring only to children younger than 24 months whereas in the 2004 survey they were referring to children under 5 years (75). Therefore, these three indicators should be interpreted with caution.

Inequality analysis by geography is not easy to measure in national surveys, especially due to sampling problems that do not allow for a very fine geographic stratification (81). For the first time we have analyzed intervention coverage of RMNCH geographically disaggregated by provinces in the indicated time period. It must be noted, however, that most official survey reports suggest not considering data of the Amazonian region disaggregated by provinces,

due to the lack of statistically representative samples (72,73), with exception of the last survey 2012 (75). It was also difficult to obtain high-quality information in this region, which must also be interpreted with caution. We need solid evidence on subnational health inequalities and other social and cultural determinants to improve the analysis.

It was beyond the scope of this analysis to examine the coverage of RMNCH interventions in indigenous population using ethnicity as a dimension of inequality which is recommended by international organizations and other studies (125,126). Analysis related to this sub-group (which overlaps with those in the poorest quintiles, living in rural areas), is currently underway.

2.6 Conclusions of Chapter II

Ecuador is a country that has endured economic and political crises, and yet has achieved progress in both RMNCH coverage of interventions, as well as reducing inequalities between 1994 and 2012. In 2012 inequalities in RMNCH health service-related interventions show a more marked reduction, compared to the previous decade (1994-2004). These reductions in inequality coincided with regained political stability, the promotion of redistributive policies, and greater social spending, different from the neo-liberal reforms that had been applied for more than 20 years before. These changes together with other factors such as improvements in economic conditions and reduction of poverty may have had an important positive impact on health inequality. In contrast, inequalities in coverage of basic sanitation and drinking water remained high. Notwithstanding improvement at the subnational level, geographic inequality persists in Ecuador and warrants further study. Policy and research attention should also turn to understanding and acting on the nature and causes of these inequalities so that Ecuador may join other countries on the UHC path of “leaving no one behind” (127).

Chapter III

CHAPTER III. Ethnic inequalities in reproductive, maternal, newborn and child health interventions in Ecuador. A study of the 2004 and 2012 national surveys

3.1 Abstract of Chapter III

Introduction: Analysis of social inequalities in health by ethnicity is critical to achieving the Sustainable Development Goals (SDGs). In Ecuador, indigenous and Afro-descendant populations have long been subject to racism, discrimination and inequitable treatment. In recent years, however, there has been progress in health achieved by Ecuador, particularly with respect to reproductive, neonatal maternal and child (RMNCH) health intervention coverage. However, whether inequalities by ethnic status remain is relatively understudied.

Methods: Analysis was drawn from two national representative cross sectional health surveys from 2004 and 2012, where ethnicity was self-reported. Six service coverage indicators representing the RMNCH continuum of health care were selected. Coverage was analyzed for ethnic groups by level of education, area of residence and wealth quintiles. Absolute and relative inequality measures were calculated and multivariate analysis using poisson regression was undertaken.

Results: Most of the indigenous population had low levels of education and were in the poorest quintile. From 2004 to 2012 the coverage of RMNCH interventions increased for each of the ethnic strata, and there was a decline in in absolute inequality. However, in 2012, considerable ethnic inequality remained for almost all of the indicators, regardless of education level, area of residence and wealth quintiles. Self-identified indigenous ethnic groups had lower skilled birth attendance and Institutional delivery rates respectively, compared to ethnic majority populations in the country.

Conclusions: While gaps have declined, the indigenous population in Ecuador continues to be underserved by RMNCH services, which is also the product of a historical burden that unfavorably influences their economic and social situation and access to essential reproductive and maternal health interventions. Beyond inequality analysis using surveys, there is a need to understand the “how” and “why” of these inequalities using participatory approaches, and also to collaboratively re-design/co-design of strategies in order to reduce inequalities.

Key words: Ethnic Groups, Maternal-child health Services Continuity of patient care, Healthcare Disparities, health care surveys.

3.2 Introduction of Chapter III

In the global fight against social inequalities in health, as well as the path to achieving the Sustainable Development Goals (SDGs), discrimination on the basis of ethnicity is a prominent barrier – one that should be measured and analyzed systematically and routinely (3,128). In Latin America, the generation of evidence on ethnicity and health to reorient health services with an intercultural approach, is a critical strategy which is part of the first regional policy on ethnicity and health (129).

In Latin America, since colonial times, populations have been divided into caste-like, racialized categories (eg. whites, creoles, indigenous, mestizos, mulattos, zambos and afro-descendant), and social inequality persists in the form of racism and discrimination directly towards indigenous people and afro-descendant populations (48). Self-identifying indigenous persons represent 7.2% of the Ecuadorian population (49) and they have historically experienced exclusion, social marginalization and poverty (50,51). The majority of indigenous people live in rural areas (14.2% vs 2.9% in urban areas); Indigenous households have the least supply of drinking water (76%), 12.2% of the population does not have any type of solid waste disposal method, and have the least coverage of conventional telephone services (33.8%), mobile phones (77.1%), as well as the highest rates of overcrowding (17.2%). (75). In 2018, the proportion of those with basic unmet needs among indigenous Ecuadoreans was 45.5% (as compared to 22.2% in the mestizo population) (130). Indigenous women between the ages of 15 and 49 have a high percentage of illiteracy (17.4%) as opposed to 2.2% of mestizo women (75).

Studies with 2004 data show that Ecuador is one of the Latin American countries with the greatest ethnic discrepancies in sexual and reproductive health: the percentage of Indigenous women who attended prenatal care, gave birth in a health facility, and received follow-up attention was systematically lower than among the non- Indigenous and about five out of 10 indigenous women do not use any contraceptive method (131). Indigenous ethnic group have poorer use of and access to health services, regardless of their economic status (32,34), and marked ethnic gaps in coverage of reproductive and maternal interventions (58).

Looking at the period between 2006 to 2014, another study found reductions in inequality by ethnicity for skilled birth attendance, although no significant reductions in the use of modern contraceptives (71). Sahuenza et al, analyzing data from 2014, did not identify ethnicity as a factor associated with maternal deaths, after adjusting for other determinants (132). Data for other population level outcomes is un/under-reported.

Ecuador joins other countries in Latin America that have made significant progress in improving health care access and reducing inequalities (36,133). Between 2006 and 2012, as the GDP increased from 4.2% to 12.6%, public investment in the social sector increased (31), the Gini index fell from 52.2 to 46.1, and the proportion of the population living in poverty decreased from 37.6% to 27.3%. Total health expenditure as a percentage of gross domestic product (GDP) increased from 5.9 in 2006 to 9.2 in 2014, and a significant reduction in out-of-pocket spending was observed (27). Between 2004 to 2012 the infant mortality rate decreased from 11.3 to 8.8 per 1,000 live births (40). Despite this progress, there are few studies (71) that analyze the changes in the RMNCH coverage by ethnic subpopulations and if the benefits have reached the indigenous peoples equally.

Considering the progress in health achieved by Ecuador in some periods, it is important to know what has been the evolution of inequalities in coverage of RMNCH health interventions in relation to ethnic stratification; in this way, decision-makers may have guidance on prioritizing and shaping strategies and policies implemented to ensure no population in the country is left behind.

3.3 Material and Methods of Chapter III

A descriptive ecological study design was used. The objective was to analyze social inequalities in RMNCH by ethnic group and compare measures between 2004 and 2012, based on two national representative surveys of Ecuador. This study consisted of an analysis of secondary data; the institutions that carried out the surveys received the relevant ethical approvals (76,134).

3.3.1 Data sources

For this study, we used “Reproductive Health Survey (RHS)” 2004 as database, which provides data on women of childbearing age from 15 to 49 years (10,814 women), and children under 5 years (6,140 children) (74). We compared this survey to the 2012 round of the national health and nutrition survey (ENSANUT), which was not the most recent survey, but had RHS-corresponding information (more so than, for instance, the national survey of living conditions (CVD) 2014). The 2012 survey included 18,213 women of reproductive age, 5,972 children from 0 to 3 years of age, and 10,199 children under 5 years. (135). The data sets analyzed during this study are publicly available in the repository of the National Institute of Statistics and Censuses of Ecuador (INEC), as well as in the World Bank database (76,136).

3.3.2 Selection of indicators

We selected a set of essential indicators that correspond to each stage of the continuum of care for RMNCH (137). For its construction, we used standardized criteria (80) to ensure comparability throughout the four surveys. The selected indicators were: *Use of modern contraceptive, Antenatal care (4+ visits), Skilled birth attendance, Institutional delivery, Early initiation of breastfeeding, and Full immunisation.*

3.3.3 Dimensions of inequality

We examined inequalities by ethnic status, wealth quintile, education, and place of residence. Until the 2001 population and housing census, Ecuador identified indigenous populations by language, which led to the exclusion of the Afro-Ecuadorian population (52,138). The RHS and ENSANUT survey analyzes the variable "ethnicity" through "ethnic self-identification". We can see that the information is consistent when comparing percentages of women of childbearing age who self-identify as indigenous, which in the RHS 2004 survey was 7%, while for the ENSANUT 2012 survey it was 6.2%; In the case of Afro-Ecuadorian women, in the RHS survey it was 4.7%, and in the ENSANUT survey, 4.3%.(75) . The "reference group" combines groups that identify as mestizo, white or others. There is an additional group that self identifies as “montubios,” however since the 2004 survey did not recognize this self-identification, we were unable to consider it.

We constructed wealth quintiles by calculating household assets, housing construction materials, and access to sanitation and water and subsequent application of the principal component analysis. It is divided into quintiles: Q1 is the poorest 20% and Q5 is the 20% of the wealthiest households (83,139)

For the present study, we considered the levels of maternal education, identified in national surveys in three categories: none, primary education and secondary education or higher. Place of residence was based on standard definitions and characterized whether the individual was from a household in an urban or rural area.

3.3.4 Analysis of data (inequality measures)

We performed a descriptive analysis of coverage prevalence at the national level by ethnic group (for indigenous people and for Afro-descendants separately) according to level of education, area of residence and wealth quintiles, with 95% confidence intervals. We created equiplots to show the coverage level and gaps between groups by ethnic self-identification in 2004 and 2012, for each of the six health interventions (87).

We calculated simple and complex absolute measures of inequality for each intervention and year to examine trends (14). As a simple inequality measure, we calculated the difference between the indigenous and the reference group (mestizos or whites) alongside 95% confidence intervals. As a complex measure, we calculated the “mean difference from best performing subgroup”, which is suitable for non-ordered inequality dimensions and we take into count all of the populations subgroups (complex measure) and the populations size of subgroups (weighted measure) (140,141). For both measures, larger values indicate higher levels of inequality, and zero if there is no inequality.

We applied a multivariate analysis using a Poisson regression model, which allows the adjustment of the variables of education level, area of residence and wealth quintiles. This model has proven to be robust and a good alternative to logistic regression (142).

Because of we are working with a binary outcome, to estimate the prevalence ratio via Poisson regression, we calculate the incidence rate ratio (irr) after adjusting the model and we interpreted this as a prevalence ratio (RP). All estimates took into account the sample weights. We used STATA (Stata corporation) Version 15.0, for all analyzes, using the “svy” series of commands, which together with the robust variance option guarantees that the assumptions behind the regression model are not violated (142).

3.4 Results of Chapter III

3.4.1 Socio demographic characteristics according to ethnicity in Ecuador, from 2004 to 2012

More than 50% of the women self-identifying as indigenous had attained primary education in 2004, and only a quarter had attained secondary education by 2012. The proportion of women with no education was stagnant at roughly 15% between 2004 and 2012. Conversely, the highest percentage of women who have higher education or more are those in the group of reference as well as those of Afro-Ecuadorian ethnicity (Table 3).

Although the highest percentage of women who self-identified as indigenous resided in rural areas in both time periods, the reduction observed in this percentage between 2004 and 2012 was suggestive of migration from rural to urban areas. Similar behavior was observed in all ethnic groups, however for the reference group, this reduction in rurality was less than that observed in the other two groups. About 50% of the population of women who self-identified as indigenous were in the poorest quintile, unlike the population of reference group whose percentage of the population is more equally distributed among all quintiles. This situation did not change much in 8-year period between surveys. However, it is striking that the population that identified itself as Afro-Ecuadorian increased in the poorest quintile and considerably reduced the percentage in the richest quintile between the years 2004 to 2012 (Table 1).

T**able 3**. Proportion of women according to ethnic group and level of education, place of residence and wealth quintile. Ecuador from 2004 to 2012

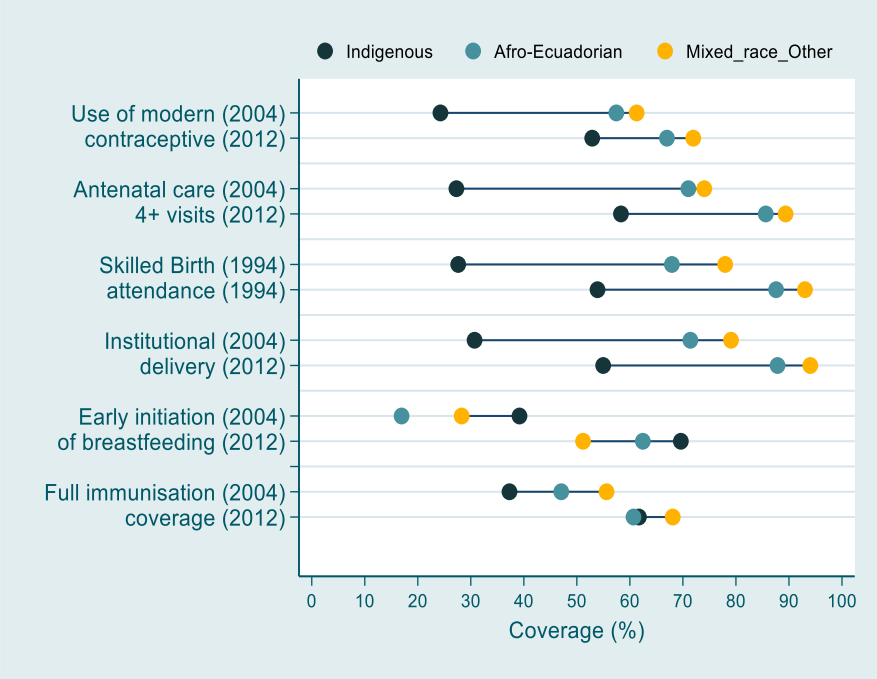
Ethnic group	Year	None		Primary		Secondary +		Rural		Urban	
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Indigenous	2004	**15.0**	(11.0- 20.0)	**56.5**	(51.1- 61.7)	**28.5**	(22.8- 35.0)	**81.7**	(72.2- 88.4)	**18.3**	(11.6- 27.8)
	2012	**15.4**	(11.6- 20.1)	**59.0**	(53.0; 64.8)	**25.6**	(21.2; 30.6)	**68.4**	(57.0- 77.9)	**31.6**	(22.1- 43.0)
Afro- Ecuadorian	2004	**3.2**	(1.5; 6.6)	**46.5**	(38.0; 55.2)	**50.3**	(42.8; 57.8)	**34.3**	(17.9- 55.5)	**65.7**	(44.5- 82.1)
	2012	**4.9**	(2.8; 8.3)	**46.3**	(39.5; 53.3)	**48.8**	(42.5; 55.2)	**21.6**	(11.3- 37.3)	**78.4**	(62.7- 88.7)
Reference group	2004	**2.4**	(1.9; 2.9)	**34.4**	(30.6; 38.5)	**63.2**	(59.1-67.1)	**35.7**	(28.4- 43.9)	**64.3**	(56.1- 71.6)
	2012	**2.0**	(1.6- 2.5)	**39.4**	(37.1; 41.7)	**58.6**	(56.2; 61.0)	**26.5**	(20.2- 33.9)	**73.5**	(66.1- 79.8)

Ethnic group	Year	Poorest		2nd		3rd		4th		Wealthiest	
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Indigenous	2004	**51.8**	(42.2- 61.3)	**24.4**	(19.7- 29.8)	**12.8**	(8.6- 18.6)	**7.8**	(5.1- 11.7)	**3.3**	(1.7- 6.4)
	2012	**50.7**	(41.8- 59.6)	**25.2**	(20.0- 31.2)	**13.7**	(10.8- 17.2)	**7.5**	(5.3- 10.6)	**2.9**	(1.5- 5.6)
Afro- Ecuadorian	2004	**17.5**	(12.3- 24.3)	**27.0**	(21.7- 33.0)	**22.2**	(15.3- 31.0)	**17.0**	(11.1- 25.3)	**16.3**	(11.9- 21.9)
	2012	**20.5**	(15.5- 26.8)	**22.8**	(17.1- 29.7)	**22.0**	(18.8- 25.7)	**24.8**	(17.5- 33.8)	**9.8**	(7.1- 13.5)
Reference group	2004	**13.3**	(10.7- 16.3)	**18.4**	(16.0- 21.1)	**20.8**	(19.8- 21.9)	**21.5**	(19.6- 23.6)	**26.0**	(22.9- 29.4)
	2012	**15.3**	(13.1- 17.9)	**19.0**	(16.7- 21.6)	**20.0**	(18.5- 21.6)	**21.5**	(19.8- 23.3)	**24.1**	(20.8- 27.8)

3.4.2 Measures of inequality by ethnic groups in Ecuador

Equiplot of five RMNCH interventions show interesting patterns. Overall, the magnitude of inequality appears to have declined between 2004 and 2012 in most cases, although the indigenous group continued to have the lowest coverage across groups. In the case of *full immunisation, in* 2012, the population of indigenous and Afro-Ecuadorian children had very similar coverage. In the case of early initiation of breastfeeding, the pattern is reversed: in both years coverage was higher for indigenous groups (Figure 11).

Figure 11. Equiplot of intervention coverage by ethnic groups. Ecuador 2004 – 2012



In all the interventions there is a marked difference in coverage in favor of the reference group (best performing subgroup, except in breastfeeding), as opposed to the indigenous group (worst performing subgroup). We found a reduction in absolute measures of inequality between 2004 to 2012. The reduction in percentage points was similar in almost all indicators (between 4.6 to 5.6 percentage points in use of modern contraceptive, antenatal care and skilled birth attendance and full immunisation). The one exception was *Institutional delivery,* where the reduction between the years 2004 and 2012 was 2.4 percent. (Table 4).

Table 4. Coverage and magnitude of inequalities by intervention between ethnic groups. Ecuador 2004 – 2012

Intervention	Year	Overall Coverage % (CI 95%)	Indigenous group Coverage % (CI 95%)	Afroecuadorian group Coverage % (CI 95%)	Reference group (Mixed) Coverage % (CI 95%)	Difference Indigen. - ref. Percentual points (CI 95%)	Mean difference from best Percentage points (CI 95%)
Use of modern	2004	**58.4** (56.4 - 60.4)	**24.3** (19.5 - 29.8)	**57.4** (49.9 - 64.6)	**61.3** (59.3 - 63.2)	**37.0** (29.3 - 44.8)	**13.6** (9.6 - 17.6)
contraceptive	2012	**70.9** (69.2 - 72.5)	**52.9** (48.9 - 56.8)	**67.0** (58.3 - 74.7)	**72.0** (70.2 - 73.6)	**19.1** (18.7 - 19.4)	**8.0** (7.8 - 8.2)
Antenatal care 4+	2004	**69.5** (66.4 - 72.4)	**27.3** (22.4 - 32.7)	**71.0** (63.3 - 77.7)	**74.0** (50.5 - 65.8)	**46.7** (38.0 - 55.5)	**16.6** (12.1 - 21.1)
visits	2012	**86.8** (84.9 - 88.5)	**58.3** (50.5 - 65.8)	**85.6** (77.8 - 91.0)	**89.4** (87.6 - 90.9)	**31.0** (30.7 - 31.4)	**11.6** (11.4 - 11.8)
Skilled birth	2004	**72.0** (68.6 - 75.1)	**27.6** (21.7 - 34.5)	**67.9** (56.6 - 77.4)	**78.0** (74.9 - 80.8)	**50.3** (43.5 - 57.2)	**20.1** (16.6 - 23.7)
attendance	2012	**89.5** (88.1 - 90.7)	**53.9** (45.6 - 62.0)	**87.6** (81.9 - 91.6)	**93.0** (91.5 - 94.3)	**39.1** (38.8 - 39.5)	**14.9** (14.6 - 15.1)
Institutional	2004	**73.6** (70.3 - 76.7)	**27.8** (22.0 - 34.5)	**69.7** (56.1 - 80.5)	**74.9** (70.9 - 78.5)	**47.1** (42.0 - 52.2)	**17.4** (14.7 - 20.1)
delivery	2012	**90.2** (88.0 - 92.1)	**55.0** (47.0 - 62.6)	**87.9** (82.2 - 91.9)	**94.0** (92.4 - 95.3)	**39.1** (38.7 - 39.4)	**15.1** (14.9 - 15.3)
Early iniciation of	2004	**29.1** (25.9 - 32.5)	**36.4** (30.2 - 43.2)	**17.9** (10.0 - 30.0)	**27.9** (24.7 - 31.3)	**-8.6** (-13.0 - -4.2)	**9.0** (5.5 - 12.5)
breastfeeding	2012	**52.6** (49.7 - 55.5)	**69.6** (62.7 - 75.8)	**62.4** (52.8 - 71.2)	**51.2** (48.2 - 54.2)	**-18.4** (-18.9 - -18.0)	**8.5** (8.3 - 8.8)
Full immunisation	2004	**53.0** (48.0 - 58.0)	**37.3** (23.3 - 53.7)	**47.1** (26.2 - 69.0)	**55.6** (49.9 - 61.2)	**18.3** (7.1 - 29.5)	**8.9** (2.3 - 15.6)
coverage	2012	**66.6** (62.9 - 70.1)	**61.7** (50.4 - 71.9)	**60.7** (46.6 - 73.2)	**68.1** (64.2 - 71.8)	**6.4** (5.7 - 7.1)	**4.6** (4.0 - 5.2)

The largest “mean difference” in inequality in 2012 is observed in *Skilled birth attendance* and *Institutional delivery*, while the ethnic inequality gap in *full immunisation* appears to have reduced. However, for almost all of the reproductive and maternal interventions, significant gaps remained in 2012 between self-identifying indigenous population and non-indigenous populations (Table 4).

Despite a significant increase in coverage between 2004 and 2012, after adjusting for the model, coverage rates remain significantly low for indigenous women in five of six reproductive and maternal interventions. In other words, even after adjusting for the effect of wealth, education and urban-rural residence area, the indigenous ethnic group had 36% and 35% less coverage of Skilled birth attendance and Institutional delivery respectively, compared to the reference group. (See table 5)

Table 5. Crude and adjusted coverage rates for 6 interventions in indigenous women and children compared to the reference category

	Ethnic Indigenous					Ethnic Afro-ecuadorian				
Variables	**Year**	**Crude RP**		**Adjusted RP**		**Year**	**Crude RP**		**Adjusted RP**	
		RP	**95% CI**	**RP**	**95% CI**		**RP**	**95% CI**	**RP**	**95% CI**
Use of Modern Contraceptive	2004	**0.40**	0.32 - 0.48	**0.45**	0.37 - 0.54	2004	**0.94**	0.81 - 1.08	**0.96**	0.83 - 1.11
	2012	**0.74**	0.68 - 0.80	**0.76**	0.70 - 0.83	2012	**0.93**	0.83 - 1.05	**0.94**	0.83 - 1.06
Antenatal care 4+ visits	2004	**0.37**	0.31 - 0.44	**0.47**	0.40 - 0.55	2004	**0.96**	0.87 - 1.06	**1.00**	0.90 - 1.11
	2012	**0.65**	0.57 - 0.74	**0.71**	0.63 - 0.80	2012	**0.96**	0.88 - 1.04	**0.98**	0.92 - 1.05
Skilled Birth attendance	2004	**0.35**	0.28 - 0.44	**0.46**	0.37 - 0.57	2004	**0.87**	0.74 - 1.02	**0.90**	0.79 - 1.03
	2012	**0.58**	0.51 - 0.66	**0.64**	0.57 - 0.73	2012	**0.94**	0.89 - 1.00	**0.96**	0.91 - 1.00
Institutional delivery	2004	**0.39**	0.32 - 0.47	**0.49**	0.41 - 0.59	2004	**0.90**	0.76 - 1.07	**0.93**	0.81 - 1.07
	2012	**0.58**	0.51 - 0.67	**0.65**	0.57 - 0.74	2012	**0.93**	0.88 - 0.73	**0.95**	0.90 - 1.00
Early initiation of breastfeeding	2004	**1.39**	1.09 - 1.76	**1.24**	0.94 - 1.63	2004	**0.60**	0.36 - 0.99	**0.62**	0.39 - 0.99
	2012	**1.36**	1.22 - 1.52	**1.15**	1.01 - 1.31	2012	**1.22**	1.04 - 1.44	**1.22**	1.02 - 1.45
Full inmunization coverage	2004	**0.67**	0.43 - 1.06	**0.74**	0.46 - 1.19	2004	**0.85**	0.51 - 1.40	**0.90**	0.55 - 1.47
	2012	**0.91**	0.76 - 1.09	**0.95**	0.80 - 1.14	2012	**0.89**	0.73 - 1.09	**0.90**	0.73 - 1.12

(*) RP prevalence ratio, equivalent to IRR incidence rate ratio

Differences in Immunisation coverage by ethnic group were insignificant. In contrast, using adjusted estimates, early initiation of breastfeeding was reported 15% more in the population that identified itself as indigenous than in the reference population. This situation was similar in the self-identifying Afro-Ecuadorian population, however, the latter did not show statistically significant raw or adjusted values, for both 2004 and 2012 in almost all the indicators analyzed.

3.5 Discussion of Chapter III

This is the first study that compares the progress and inequalities coverage of essential health interventions RMNCH with a focus in ethnic groups in Ecuador over two time periods. This study joins efforts to increase evidence that identifies inequalities as an important step towards their elimination. There is a great need to study in inequities by ethnic groups over time – ideally with data more recent than 2012; and to evaluate a broader range of coverage indicators across the continuum of essential health services for women, across the life course.

This study coheres with what has been identified by other studies (143,144) on the low level of education and high level of poverty befalling the indigenous population of Ecuador, a situation that has not markedly improved in the last eight years. Nationally, 3.7% of women of childbearing age have no education (75), this percentage being four times higher in women who identify themselves as indigenous. Although approximately 50% manage to finish primary education, when they do not go on to secondary education, they have great deficiencies in reading and writing (50). This is worrying, since mother's educational situation is linked to the health of the children and linked to a cycle of poverty and ill-health in children. According to the national survey 2012, the prevalence of diarrhea without dehydration is similar in indigenous and mestizo (1.5%), while the prevalence of diarrhea with severe dehydration doubles to 5.4% in indigenous group (2.7% in the mestizo group) (75). The infant mortality rate in children under 5 years of age was 25 per 1,000 live births in 2012 while for the population considered “mestizo, white or other” it was 15 per 1,000 live births. The infant mortality rate in rural areas is 23 and in urban areas it is 13 per 1,000 live births (75).

The increase in migration of the self-identifying indigenous population from rural to urban areas is not always synonymous with progress, as in several cases they access precarious, poorly paid and low-quality jobs (145), accompanied by absenteeism or family breakdown and loss of community values (51). Indeed, in many parts of the world, the situation of the urban poor is worse than that of rural populations overall. There is a need to look at double disaggregation to understand the difference that factors like migration may have on inequalities.

Recent studies carried out in similar periods of time show in Ecuador an increase in access to health services, as well as an increase in coverage of RMNCH health interventions (36,133,146) and reduction of inequality gaps by wealth index and area of urban-rural residence, possibly attributed to economy growth, the reduction of poverty (111), higher public health spending and the health reform process that occurred in the period 2006- 2014 (31). Similar to identified by another study that analyzed the same period (71), the present study found progress in increasing the coverage of health interventions between the years 2004 to 2012 for each of the ethnic strata. Although a reduction of the absolute gaps of inequality was identified, - in 2012 they remain important health gaps at the expense of the indigenous population, for reproductive and maternal interventions.

In Ecuador, more efforts have recently been made that seek to improve the information disaggregated by indigenous peoples and Afro-descendants, in order to build differentiated health diagnoses, to monitor health equity gaps that affect these groups, thanks in part to the presence of social movements and the fight for the recognition and realization of research projects (52) (138) (147). Despite measurement limitations of our variable on “ethnicity,” the two surveys used in this study are comparable since in both years "ethnic self-identification" was analyzed. This may still have resulted in some under-estimation of coverage, given that the category of “mestizo” in the reference group, (138)(148). Understanding ethnicity in a more nuanced fashion, in relation to language and other intersections of identity, should be attempted in future analyses.

Antenatal care seeking has been found to be low in Ecuador among populations of self-identifying indigenous women in other studies as well (149). In the current study, Institutional delivery and Skilled birth attendance were the interventions with the greatest differences to the detriment of the indigenous population. 50% of the women who identify themselves as indigenous give birth in their homes. Although this fact is justified for cultural reasons, since the phenomenon of birth and death are family and domestic events (50), the risk of maternal death and neonatal complications in childbirth and immediate delivery is well known, and it is undeniable that deliveries attended in a qualified manner have less risk to the health of the mother and the newborn. (150).

There is evidence that proves that the determining factor is not the place, but the conditions in which labor occurs (151). In Latin America the place of delivery is directly related to the type of care, since generally only in health centers deliveries are attended professionally (152). Several studies have identified discrimination by health providers against indigenous and Afro-descendant women as a first barrier to access to health services in Latin America (153) (154) (155).

Similar to what has been identified by other studies in Latin America (156) (152) early initiation of breastfeeding coverage was higher for the indigenous children's population, which seems to be more a cultural factor, since indigenous population does not receive more counseling. The full immunisation coverage gaps improved in both time periods and were shortened considerably for groups of children whose mothers were considered indigenous and Afro-Ecuadorian, similar to the study by Messenburg et al., (58), although the Rivadeneira study, which disaggregates the information at the cantonal level, identifies clear social inequalities in vaccination coverage for measles, inversely related to the proportion of indigenous and Afro-Ecuadorian residents. (157) RMNCH indicators in Afro-Ecuadorian women showed similar coverage to reference group, as identified in the study by Messenburg et al.(58).

Ecuador, along with other Latin American countries, approved the policy on ethnicity and health, which is part of the 2030 agenda (129), It promulgates the need to reorient health services with an intercultural approach to improve the health conditions of indigenous and Afro-descendant peoples. Likewise, normative documents have been generated for the incorporation of intercultural practices in health services, such as the involvement of traditional midwives in health teams (158) and "vertical childbirth"(159) initiatives that enhance the meaningful participation of indigenous actors (160), that even in populations where these strategies have been implemented for a long time, it could be related to a reduction in maternal mortality (161). In addition to providing culturally appropriate care, these types of interventions should consider the economic, geographic, and social factors that affect access to ethnic minority groups, as well as include community participation, and respectful care (162). These require national and local political wills, they need to be expanded, disseminated and evaluated.

In Ecuador, for 2012 significant figures of ethnic inequality are maintained “independent” of socioeconomic status, education and urban-rural area of residence. However, these indicators are linked and reflect a confluence embedded in a historical burden of social marginality, lack of education and poverty, which cumulatively affect the life course, and unfavorably influence the health of women and children (163). Therefore, it is recommended that the analysis be from the perspective of “social determinants”, since it helps to better understand the circumstances that enhance or interrelate in the state of health of indigenous populations. The little increase in institutional delivery in this period shows that cultural factors persist that should be analyzed to implement better address strategies and bring the health system closer to the community, minimizing the risks for the mother and child.

Although the present study shows us the problem of ethnic inequalities in Ecuador, such analyses using national databases do have limitations. For example, surveys “variablise” realities and are also underpowered to look at within group realities: the context of poverty in indigenous populations residing in rural areas could be different in the face of certain “deficiencies” or in the “precariousness of the home” that on several occasions is due to regional issues (Amazon, coast or mountains). Similar situation with some health indicators. Therefore, it is recommended that the measurement of social determinants be framed in local context and considering the socio-spatial heterogeneity of poverty (50), as well as expanding on selection of indicators or reinterpreting conventional indicators (152), in order to better understand reality and local context. It is suggested to reinterpret conventional indicators from the point of view of “general well-being - Sumak Kaysay”, which is the basis of the indigenous worldview (164), and influence the proximal social determinants for an effective reduction of health inequalities.

While it is essential to continue monitoring ethnic inequalities, however, the approach to monitoring health inequalities in the indigenous context must be through a "participatory model" that not only looks at the "factors" but also understands the process of comprehensive determination, the context in which it takes place and the actors involved (165) (166). This will allow the development of comprehensive health improvement plans, research with the appropriate combination of traditional medicine, primary health care strategies and high-tech medical services in relation to the needs of the general population (167), among others.

3.6 Conclusions of chapter III

This study found that Ecuador showed a significant increase in coverage of health interventions, as well as reduction in ethnicity related inequalities between 2004 and 2012, although coverage did remain lower among indigenous people in 2012, regardless of education level, economic level or area of residence.

Additional temporal analyses of service coverage by ethnic group will be important. It is suggested that more local research with participatory monitoring take place, mindful of local context, social determinants, and indigenous worldviews. Such approaches may better inform strategies, improve acceptability and accountability of services to ethnic minorities and support their health, well-being and rights.

To achieve improvements in coverage, in countries like Ecuador, where ethnic belonging to certain groups has a burden of social marginality, it is necessary not only to prioritize this group, but also to act on social determinants - improve education levels, reduce poverty levels and give local development opportunities - that means interventions with a more comprehensive approach.

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APPENDIX AND SUPPLEMENTARY ANNEXES

APPENDIX AND ANNEXES

Supplementary annex 1

Table 1. List of Indicators and calculate made with standardized definitions

Categories	**Indicator name**	***Indicator denominator***	***Indicator numerator***	***Interpretation***
Sexual and reproductive health *(RMNCH)*	Current use of any contraceptive method (CPMO)	Women aged 15-49 years currently married or in union	Who are using (or whose partner is using) any method	*Percentage of women between the ages of 15 and 49 who are currently married or in common union, using a modern contraceptive method*
Antenatal care *(RMNCH)*	Antenatal care (four or more visits)	Women 15-49, live birth in the last 3/5 years, last-born child	4+ visit(s) with skilled provider	*Percentage of women aged 15 to 49 years whose last child was born 3-5 years ago, who made 4 or more visits during pregnancy with trained professionals*
Delivery assistance *(RMNCH)*	Institutional delivery	All live births in the last 2 years	Delivered in a health facility	*Percentage of live births in the last 2 years that were attended in a health institution*
Child health *(RMNCH)*	Full immunization coverage	Livechildren, 12-23/18-29/15-26 months	3 doses of DPT & 3 doses of Polio & received Measles & received BCG	*Percentage of children up to 26 months of age who received detailed vaccine doses*
Breastfeeding *(RMNCH)*	Exclusively breastfeeding	Last born, living with respondents, specific age groups	Breastfed exclusively (only breastmilk)	*Percentage of live births who, up to 6 months, received only exclusive breastfeeding*
Water and Sanitary interventions (WAS)	Improved drinking water access	All household members	With access to an improved source of drinking water in the household	*Percentage of households that have access to household water sources*
Water and Sanitary interventions (WAS)	Improved sanitation	All household members	With improved sanitation (non-shared) facility	*Percentage of households that have access to sanitary improvements*

Supplementary annex 2:

An analysis of complex inequality measures was carried out with data from the 2012 survey following the recommendations of the literature (14). We calculated two absolute summary measures of inequality, the difference of Q1 and Q5 (Q5 – Q1) and the Slope Index of Inequality (SII) and two relative measures, the ratio of Q1 vs. Q5 (Q5:Q1) and the Concentration Index (CIX) (9,168). The SII takes all the subgroups into consideration, not only the most- advantaged and the most-disadvantaged (using regression model); the value zero is interpreted as no inequality while positive values indicate higher coverage in the advantaged subgroups and negative values indicate higher coverage in the disadvantaged subgroups. The relative measure based on a ratio of Q1 vs. Q5 means that if health services coverage were 100% and 50% in two subgroups, this would equal 2 times higher coverage in the richest compared to the poorest (9) subgroups. The CIX is related to the Gini coefficient, where 0 implies an absence of inequality, values between -1 and 1 imply favorable indicators, negative values imply greater intervention coverage among the poor and positive values imply greater coverage among the rich (14). All measures were calculated with the 95% confidence interval and were multiplied by 100 for easy interpretation.
In 2012, median coverage of interventions was 79%, and for most of the interventions the interquartile range was 69% to 87%. Between RMNCH interventions, *the ratio Q5:Q1 for Antenatal care 4+ visits and institutional delivery was 1.3, that means* rich people had 1.3 times greater coverage than the poorest (CIX 5.1; 95%; CI 4.6-5.7% and CIX 6.7; 95%; CI 6.3-7.2%, respectively). *Early initiation of breastfeeding* showed significant inequality favoring the poorest quintiles (CIX -4.5; 95%; CI -6.0- -3.1%). (see Table 1).

The greatest inequality was observed in WAS interventions. *Improved sanitary facilities* and *drinking water sources* had average coverage levels of 78.8% and 85.6% respectively, but when disaggregating the information by wealth quintiles, only around 50% of the poorest quintile had coverage, indicating a wide gap between rich and poor.
In 2012, the ratio Q5:Q1 of *improved sanitary facilities* was 2.4, that means individual whose incomes were in the highest quintile had 99.1% of coverage while the poorest quintile had 44% or in other words, rich people had 2.4 times greater coverage in improved sanitary facilities than the poorest (CIX 14.9; 95%; CI 13.8-16.0%). Similar results were observed for the *improved drinking water* indicator where coverage was 2.0 times greater in the wealthiest quintile. Complex measures (SII and CIX), which take into account the values of intermediate quintiles, showed larger, significant magnitudes of inequality than simple measures (which are calculated using just the extreme quintiles for all indicators) in all indicators except *for full immunization coverage*. (see Table 1)

Supplementary annex 2:

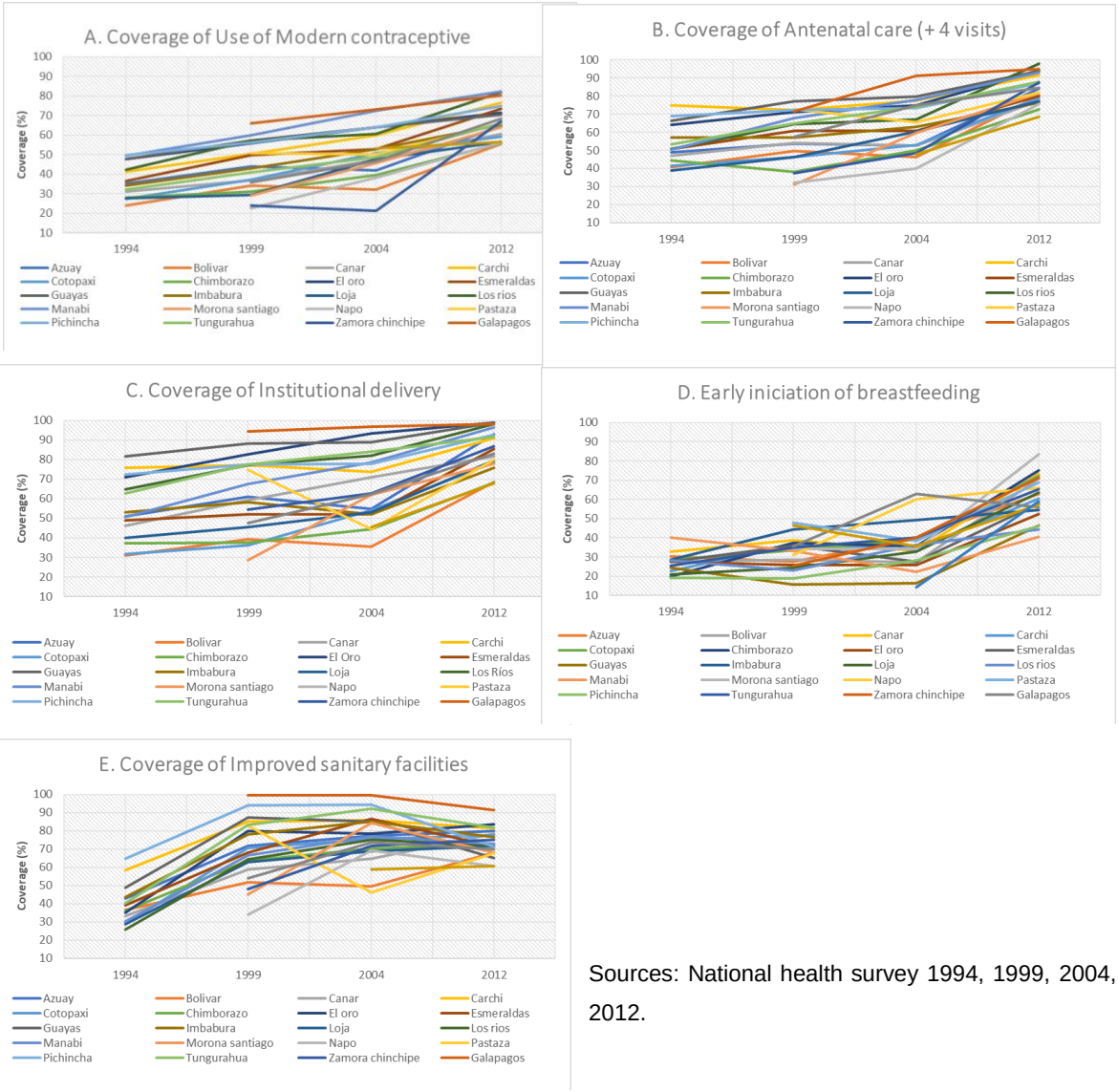
Table 2. Coverage and magnitude of inequalities by intervention in Ecuador 2012

Intervention	Overall Coverage % (CI 95%)	Quintile 1 Coverage % (CI 95%)	Quintile 5 Coverage % (CI 95%)	Difference Q5-Q1 * (CI 95%)	Slope Index of Inequality * (CI 95%)	Ratio (Q5:Q1)	Concentration Index x100 (CI95%)
Use of modern contraceptive	**70.9** (69.2 - 72.5)	**66.6** (62.3 - 70.6)	**71.9** (68.9 - 74.7)	**5.3** (2.6 - 8.0)	**7.3** (3.0 - 11.6)	**1.1**	**3.6** (3.0 - 4.3)
Antenatal care 4+ visits	**86.8** (84.9 - 88.5)	**75.0** (71.0 - 78.6)	**96.0** (92.8 - 97.8)	**21.0** (18.8 - 23.2)	**24.7** (19.1 - 30.3)	**1.3**	**5.1** (4.6 - 5.7)
Institutional delivery	**90.2** (88.0 - 92.1)	**76.4** (70.6 - 81.3)	**98.5** (96.9 - 99.3)	**22.1** (20.5 - 23.8)	**31.1** (23.0 - 39.3)	**1.3**	**6.7** (6.3 - 7.2)
Early initiation of breastfeeding	**52.6** (49.7 - 55.5)	**61.7** (56.4 - 66.7)	**44.0** (39.5 - 48.7)	**-17.7** (23.1 - -12.2)	**-22.9** (28.5 - 17.4)	**0.7**	**-4.5** (-6.0 - -3.1)
Full immunization coverage	**66.6** (62.9 - 70.1)	**63.1** (56.0 - 69.6)	**74.0** (64.4 - 81.7)	**10.9** (4.0 - 17.8)	**8.0** (-3.0 - 19.1)	**1.2**	**4.2** (2.4 - 6.1)
Improved sanitary facility	**78.8** (76.6 - 80.9)	**41.0** (37.5 - 44.6)	**99.1** (98.4 - 99.4)	**58.1** (56.6 - 59.5)	**67.8** (64.8 - 70.9)	**2.4**	**15.4** (15.0 - 15.9)
Improved drinking water source	**85.6** (82.8 - 88.1)	**49.8** (45.3 - 54.2)	**99.7** (99.1 - 99.9)	**50.0** (48.5 - 51.4)	**62.9** (57.9 - 67.8)	**2.0**	**10.9** (10.5 - 11.3)

Sources: Ecuador ENSANUT 2012. * Percentual point

Supplementary annex 3:

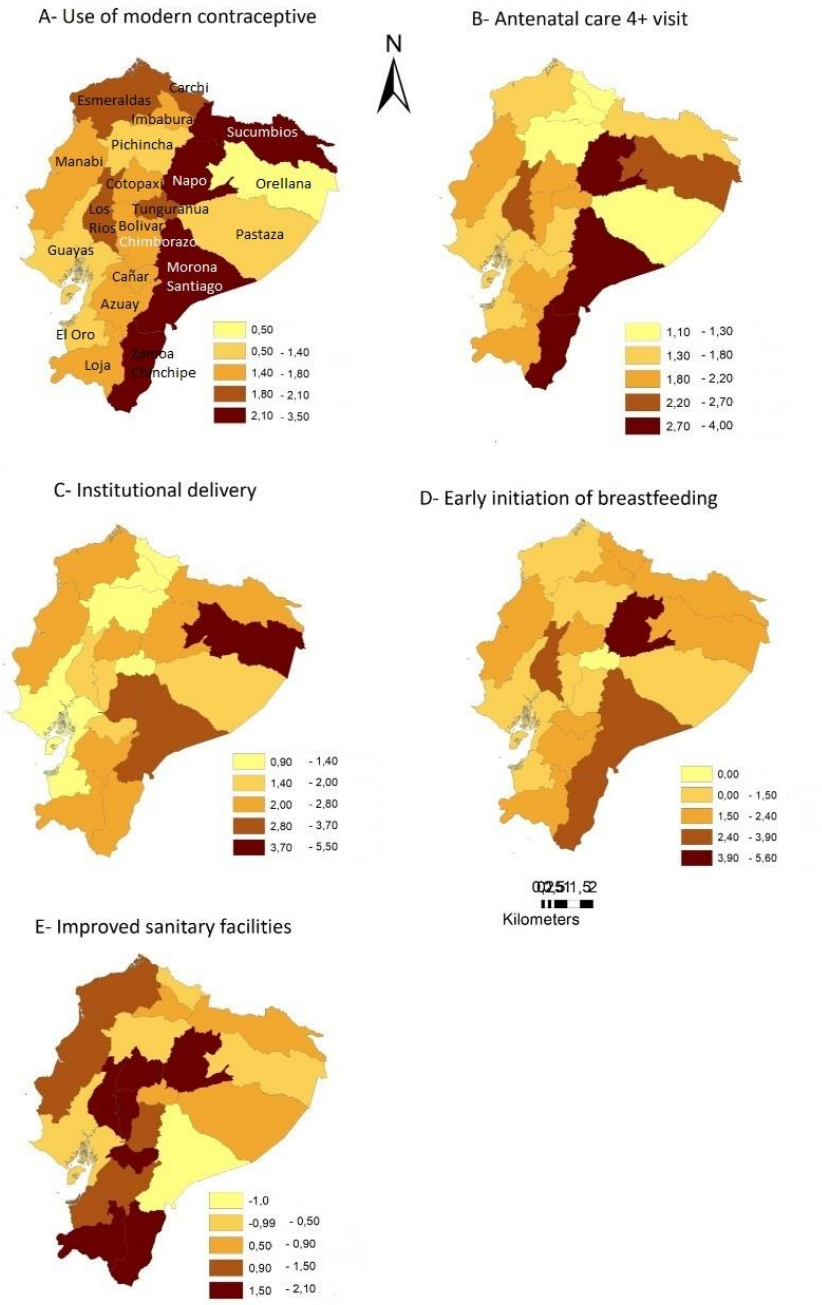
Figure 1. Trend of four intervention coverage by province (A-E). Ecuador 1994 to 2012.



Sources: National health survey 1994, 1999, 2004, 2012.

Supplementary annex 4:

Figure 2. Average annual absolute change in percentage points by province and intervention (A-E). Ecuador 1994- 2012.



Sources: Ecuador RHS 1994, RHS 1999, RHS 2004, ENSANUT 2012

Supplementary annex 1. Chapter 3

Table 3. List of Indicators and calculate made with standardized definitions

Categories	**Indicator name**	***Indicator denominator***	***Indicator numerator***	***Interpretation***
Sexual and reproductive health *(RMNCH)*	Current use of any contraceptive method (CPMO)	Women aged 15-49 years currently married or in union	Who are using (or whose partner is using) any method	*Percentage of women between the ages of 15 and 49 who are currently married or in common union, using a modern contraceptive method*
Antenatal care *(RMNCH)*	Antenatal care (four or more visits)	Women 15-49, live birth in the last 3/5 years, last-born child	4+ visit(s) with skilled provider	*Percentage of women aged 15 to 49 years whose last child was born 3-5 years ago, who made 4 or more visits during pregnancy with trained professionals*
Delivery assistance *(RMNCH)*	Skilled birth attendance	All live births in the last 2 years	Children delivered by a skilled attendant	*Percentage of live births in the last 2 years that were attended by a skilled attendant*
Delivery assistance *(RMNCH)*	Institutional delivery	All live births in the last 2 years	Delivered in a health facility	*Percentage of live births in the last 2 years that were attended in a health institution*
Child health *(RMNCH)*	Full immunization coverage	Livechildren, 12-23/18-29/15-26 months	3 doses of DPT & 3 doses of Polio & received Measles & received BCG	*Percentage of children up to 26 months of age who received detailed vaccine doses*
Breastfeeding *(RMNCH)*	Exclusively breastfeeding	Last born, living with respondents, specific age groups	Breastfed exclusively (only breastmilk)	*Percentage of live births who, up to 6 months, received only exclusive breastfeeding*

Adapted of Int'l Center for Equity in Health. Indicators & Stratifiers.

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Table 4. (Supplementary annex 2). Chapter. 3

Adjusted coverage rates for 6 interventions for each parameter compared to the reference category.

	Use of Modern Contraceptive				Antenatal care 4+ visits				Skilled Birth attendance				Institutional delivery				Full inmunization coverage				Early initiation of breastfeeding			
	2004		2012		2004		2012		2004		2012		2004		2012		2004		2012		2004		2012	
Parameters	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**	**RP**	**95% CI**
Ethnic																								
Reference group (mestizo)																								
Indigenous	**0.46**	0.38 - 0.56	**0.76**	0.70 - 0.83	**0.47**	0.40 - 0.56	**0.72**	0.64 - 0.80	**0.48**	0.39 - 0.59	**0.65**	0.58 - 0.73	**0.51**	0.42 - 0.61	**0.65**	0.57 - 0.75	**0.75**	0.48 - 1.16	**0.95**	0.79 - 1.13	**1.23**	0.93 - 1.63	**1.15**	1.02 - 1.31
Afro-Ecuadorian	**0.96**	0.82 - 1.11	**0.94**	0.83 - 1.06	**0.99**	0.89 - 1.10	**0.98**	0.92 - 1.05	**0.88**	0.78 - 1.00	**0.96**	0.91 - 1.01	**0.91**	0.80 - 1.04	**0.95**	0.91 - 1.00	**0.88**	0.54 - 1.44	**0.90**	0.72 - 1.12	**0.65**	0.41 - 1.05	**1.21**	1.02 - 1.44
Place of residence																								
Urban (ref)																								
Rural	**0.95**	0.89 - 1.02	**0.99**	0.94 - 1.04	**0.95**	0.89 - 1.00	**0.99**	0.94 - 1.03	**0.91**	0.85 - 0.97	**0.91**	0.88 - 0.94	**0.89**	0.83 - 0.95	**0.91**	0.88 - 0.95	**1.14**	0.98 - 1.33	**1.08**	0.97 - 1.20	**1.38**	1.11 - 1.73	**1.23**	1.09 - 1.39
Wealth quintile																								
Q1 (ref)																								
Q2	**1.18**	1.07 - 1.29	**1.06**	0.97 - 1.15	**1.39**	1.22 - 1.59	**1.11**	1.06 - 1.16	**1.48**	1.32 - 1.67	**1.10**	1.05 - 1.15	**1.45**	1.30 - 1.60	**1.10**	1.02 - 1.17	**1.26**	0.97 - 1.64	**1.07**	0.94 - 1.22	**0.81**	0.64 - 1.01	**1.02**	0.90 - 1.16
Q3	**1.22**	1.09 - 1.37	**1.05**	0.94 - 1.17	**1.47**	1.29 - 1.67	**1.11**	1.06 - 1.17	**1.58**	1.42 - 1.76	**1.12**	1.07 - 1.17	**1.57**	1.42 - 1.72	**1.12**	1.06 - 1.19	**1.56**	1.21 - 2.01	**1.01**	0.84 - 1.22	**1.05**	0.76 - 1.45	**0.96**	0.81 - 1.15
Q4	**1.25**	1.10 - 1.42	**1.10**	0.98 - 1.22	**1.60**	1.43 - 1.80	**1.15**	1.09 - 1.20	**1.59**	1.43 - 1.77	**1.12**	1.07 - 1.17	**1.53**	1.39 - 1.68	**1.12**	1.07 - 1.18	**1.36**	0.96 - 1.94	**0.99**	0.80 - 1.21	**1.15**	0.76 - 1.73	**0.92**	0.76 - 1.12
Q5	**1.29**	1.11 - 1.49	**1.05**	0.96 - 1.15	**1.62**	1.43 - 1.83	**1.17**	1.12 - 1.21	**1.61**	1.45 - 1.78	**1.10**	1.05 - 1.15	**1.59**	1.43 - 1.76	**1.10**	1.05 - 1.14	**1.44**	1.08 - 1.92	**1.10**	0.91 - 1.34	**1.07**	0.69 - 1.66	**0.91**	0.74 - 1.11
Level of Education																								
None (ref)																								
Primary	**1.21**	1.01 - 1.46	**1.04**	0.94 - 1.14	**1.09**	0.85 - 1.39	**1.16**	0.94 - 1.42	**1.74**	1.32 - 2.30	**1.10**	0.95 - 1.28	**1.39**	1.06 - 1.83	**1.11**	0.91 - 1.34	**1.29**	0.77 - 2.14	**1.15**	0.72 - 1.86	**0.89**	0.64 - 1.24	**0.93**	0.74 - 1.16
Secondary+	**1.26**	1.05 - 1.51	**1.06**	0.96 - 1.17	**1.37**	1.08 - 1.73	**1.24**	1.01 - 1.51	**2.08**	1.57 - 2.75	**1.18**	1.02 - 1.37	**1.62**	1.24 - 2.12	**1.19**	0.98 - 1.43	**1.53**	0.92 - 2.55	**1.34**	0.77 - 2.34	**0.84**	0.59 - 1.21	**0.86**	0.69 - 1.07
Constant	**0.42**	0.35 - 0.50	**0.65**	0.57 - 0.75	**0.42**	0.33 - 0.55	**0.67**	0.55 - 0.82	**0.30**	0.22 - 0.39	**0.76**	0.65 - 0.89	**0.39**	0.29 - 0.51	**0.76**	0.63 - 0.93	**0.29**	0.18 - 0.49	**0.51**	0.30 - 0.85	**0.28**	0.19 - 0.41	**0.56**	0.44 - 0.71

The three interventions related to the provision of health services (Antenatal care, Skilled birth attendance, Institutional delivery) showed to have the lowest prevalence in the group that self-identifies indigenous, in relation to the reference group, which remains even after adjusting for place of residence, wealth quintile, and level of education. Indigenous women had a prevalence of 35% lower than the reference group (mestizo) in Skilled birth attendance and institutional delivery. In addition, in these three interventions, all individuals who are located in the wealth quintiles: Q2, Q3, Q4 and Q5, have a higher prevalence when compared with the population that is located in quintile 1 (Q1), in 2004 and 2012.

Indigenous women have a 24% lower prevalence of modern contraceptive use, compared to the reference group. There is an evident improvement in the prevalence between the years 2004 to 2012, and for 2012 the prevalence is not related to the wealth quintile.

The early initiation of breastfeeding is higher among the indigenous and afro-Ecuadorian population and those living in rural areas (15% more prevalence of use among indigenous people and 21% among Afro-Ecuadorian, compared to the reference population).

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