Original Research

Health outcomes, utilization, and equity in Chile: an evolution from 1990 to 2015 and the effects of the last health reform

A. Núñez [a,*], C.A. Manzano [b,c], C. Chi [d]

[a] Department of Management Control and Information Systems, School of Economics and Business, Universidad de Chile, Diagonal Paraguay 257, Office 2004, Santiago, Chile
[b] Department of Chemistry, Faculty of Science, University of Chile, Las Palmeras 3425, Nunoa, RM, Chile
[c] School of Public Health, San Diego State University, 5500 Campanile Drive, San Diego, CA, USA
[d] College of Public Health and Human Sciences, Oregon State University, 013 Milam Hall, Corvallis, OR, USA

ABSTRACT

Objective: Chile is an attractive case study because of the deep political changes that it underwent over a short period of time: from a universal health service (60s), through a neoliberal reform (70s) and onto a series of legislative reforms (80s—90s). This article aims to explore and assess the evolution of health outcomes, equity, and utilization in Chile through the last period of these reforms (1990—2015).
Study design: Standardized health equity analysis.
Methods: We conducted a standardized economic analysis on health equity and healthcare utilization using the ADePT software (by the World Bank) and using data from the Chilean National Socio-economic Survey. We evaluated trends of health equity and examined concentration curves of health utilization of healthcare services and health outcomes such as children/elder/pregnant nutritional status, self-reported health, and physical limitations.
Results: Health outcomes such as nutritional problems in children and pregnant women were concentrated among the poor, while others such as high-relevance health conditions were similar for poorest and richest households. The concentration indexes for health outcomes suggested that income makes the distribution *pro-poor*. However, the opposite was true for age, in which the probability of health problems among rich individuals increased with age. The concentration curves for utilization of healthcare services showed that dental visits, laboratory exams, specialty visits, and hospitalizations were concentrated on the richest households, while the use of emergency services and preventive medicine were highly concentrated among poor individuals.

Conclusions: Although a positive trend in the increase of healthcare service use among income groups was observed, a significant impact of the latest health reform was not observed.

Introduction

Inequities in healthcare systems are a major concern for policymakers and stakeholders around the world, as they can affect healthcare services utilization and access and therefore affect general health outcomes.[1] Inequities have been defined as those '*differences which are unnecessary and avoidable but in addition are considered unfair and unjust*'.[2] Based on this, equity could be defined as a type of social justice that is related to the things that one person is entitled to, such as health.[3] Equity in health is therefore closely associated with social justice and should be pursued by defining and eliminating health inequities. The Commission on Social Determinants of Health of the World Health Organization (WHO) attributed these inequities to the circumstances in which people are born, grow up, live, work, and age in, in addition to the healthcare systems established in their locality.[4] Inequities in healthcare systems have long been a distinguishing feature in Latin American politics and policymaking, motivating local governments to take different courses of action to address them.[5] Healthcare systems in Latin American countries have changed at a similar rate than its political landscape, our study area (i.e. Chile) is one example of such changes.

The growing economy and the political changes that the country suffered from the early 1970s to the mid-2010s also triggered changes in its health system administration. The Chilean health system, which was primarily state funded before 1981, was transformed into a public—private mixed system. However, since its return to democracy in 1989, several public policies have been developed to promote socio-economic equity, such as the provision of an adequate level of healthcare services based on an equal opportunity perspective.[6] Specific programs designed to promote access to the opportunities available at that time were developed for vulnerable population groups (e.g. grouped by social class or other categories) between 1990—2000.[6] Between 2000 and 2006 these programs focused on the improvement of social determinants in health and a new comprehensive health reform plan was initiated.[7] The new legal framework for health systems was approved by the Chilean legislative system during 2003—2004, which guaranteed medical attention for certain health conditions and defined basic principles of access, quality, opportunity, and financial protection.[8] The Regime of Explicit Health Guarantees ('GES' in Spanish), designed to strengthen public-sector service provision without replacing the current private or public systems, was implemented in 2005. This reform aimed to ensure the minimum conditions of access for high-relevance health conditions in its different stages to the entire population, regardless of age, gender, economic status, health status, or place of residence, at non-catastrophic costs.[9,10] The GES reform currently includes a total of 80 health conditions, accounting for over 70% of years of healthy life lost in the Chilean population.[10] Additionally, the 'Steps toward the health equity agenda', were implemented by the Chilean Ministry of Health between 2008 and 2010, which were designed to promote concrete actions, embodied in health policies and programs, to reduce inequities in health.[6]

Today, Chile has a mixed healthcare system, both in financing and delivery of services. Public and private health insurance systems share a common financing source that comes from the mandatory contribution of employees (i.e. 7% monthly payroll tax), and Chileans can choose between both. The public healthcare system (i.e. National Health Fund 'FONASA', in Spanish) provides access to health care for everyone, regardless of their ability to pay. It covers 11 million of beneficiaries (i.e. ~78% of population) and is structured under four levels of income groups (i.e. A-D, from lower to higher income).[11] Private health insurance companies in Chile are associated in a group called 'ISAPRE'. There are six open ISAPREs in the country that provide services to approximately 15% of the population[12,13] and provide health services in their own facilities or through a network of providers. ISAPREs can negotiate additional contributions from its members to improve their service plans based on age, gender, and family members.[14] Both the public and private system include intrahospital medication. Primary care medicines do not require copayment in the public system, while copayment is required in the private system according to the group or insurance plan.[15]

The healthcare system historical fragmentation has created an equity gap between public and private sectors. Recent studies have focused on analyzing the equity aspects of the Chilean healthcare system at different points in time and have included the analysis of social determinants of health,[16] income related inequalities,[17] universal healthcare coverage,[18] system utilization,[19] and out-of-pocket payment.[20] The objective of this study was to assess and explore the evolution of equality in health and equity in utilization of healthcare services for a selected set of health outcomes during 1990—2015. The effects of the latest health reform were evaluated based on this analysis. Additionally, we explored trends that contributed to inequities in health and identified potential factors that may contribute to achieve a more equitable healthcare system in the future.

Methods

Data collection

Data were obtained from the Chilean National Socio-economic Survey (CASEN), which is designed to describe the country's general socio-economic situation and includes a section on health status with information regarding nutritional status, insurance system, self-assessed health, illnesses/accidents, and access to medical services, among others.[21] Its sampling method is based on a multistage random sampling with geographical stratification and clustering.[21] The CASEN is reported to be representative at the national, urban national, rural, and regional national level.[21] CASEN data from 1990, 1992, 1994, 1996, 1998, 2000, 2003, 2006, 2009, 2011, 2011, 2013, and 2015 were used. The final sample for each year included ~65,000 households and 260,000 people, with ~49% men and ~51% women.

Data processing

Data were processed in *ADePT* v.5.3 (by the World Bank),[22] and a standardized economic annual analysis on health equity and healthcare utilization was conducted. This software was developed for the analysis of household surveys, and ADePT's tables are in a standardized format and are based on a set of methods that are widely accepted in the literature.[22] Also, ADePT Health (the module used for this analysis) allows to minimize the risk of error given the standardize tables that are produced.[22] Thus, health outcomes were evaluated based on characteristics reported in CASEN and included geographical characteristics (i.e. urban, rural, and Chilean region), demographic characteristics (i.e. age and gender), and economic characteristics (i.e. income expressed as quintiles, private vs public insurance) (Table 1). Health outcomes were treated as binary variables, indicating whether the person (i.e. child, pregnant women, or elder) are underweight or overweight, whether if individuals in the household suffer from a health condition, physical limitations, or GES conditions, and how they self-assess their own health status. Household characteristics included binary variables indicating urban/rural place of residence, categorical variables indicating the geographical region of residence in Chile (i.e. regions I-XV plus the metropolitan region), and the income quintile per equivalent adult and a count variable for household size. Descriptive statistics of the variables selected are available in Online Resource 1.

The statistical analysis presented in this study included analysis of inequalities in health and healthcare utilization by household and individual characteristics, standardized concentration index for health outcomes, concentration curves of health outcomes, decomposition of the concentration index for health outcome, and concentration curves for healthcare utilization.

Results

The results were assessed by analyzing the health outcomes selected (Table 1) by characteristics reported in CASEN.

Hereafter, we present the most relevant results based on some geographic (i.e. urban vs rural areas, Chilean region), demographic (i.e. age and gender), and economic characteristics (i.e. total income, private vs public insurance). Please refer to Online Resource 2 for a complete description of the results.

Analysis of correlations

Geographic characteristics

Urban and rural areas showed similar trends overall during 1990—2015 (Fig. 1), including a general tendency to increase children overweight, physical limitations, and GES conditions. However, some differences emerged when comparing urban and rural areas to each other. In general, people in rural areas reported to have underweight problems (children, pregnant women, and elder) and less than good health (i.e. variables 'self-assessed health', 'physical limitations') (Fig. 1). However, some of these tendencies reverted in 2000 (overweight children and pregnant women) and 2015 (underweight children), and further study is required to determine if they will hold in the future.

Health outcomes were also assessed based on geographical location. The probability of having underweight children and pregnant women decreased in every Chilean region from 1990 to 2015, as well as people reporting less than good health (i.e. 'self-assessed health') (Fig. 1). Conversely, a strong increase in the probability of finding a GES condition was observed for every region (Fig. 1). These trends were not evident for other variables such as 'physical limitations', 'elder under/overweight', possibly because this information was collected only from 2006. Although the geographic regions could be strongly correlated to the urban vs rural analysis (i.e. most of the Chilean urban population resides in the V, metropolitan, and VI regions), some differences were observed particularly between the northern and southern regions of Chile (Fig. 1). Children in the southern regions were in general more prone to have nutritional problems, and more GES conditions were reported in the south (Fig. 1). The region with the highest probabilities to find underweight children in the last year analyzed (i.e. 2015) was the metropolitan region, whereas people reporting more health problems belonged to the X and XI region (i.e. southern end of Chile). The variable 'health problem', which showed temporal variability in the urban vs rural assessment, did not show the same behavior for geographic regions (Fig. 1).

Demographic characteristics

In general, women showed worse health outcomes than men. The probability of reporting health problems or a lower health status (i.e. 'self-assessed health') was higher for women from 1990 to 2015 or the years reported. The prevalence of health problems in 2015 amount to 19.5% for men and 25.4% for women. Additionally, some health outcomes showed expected behavior relative to the respondent age, such as 'physical limitations' and 'GES conditions', which were observed to be more correlated with men and women over 50 years old (Fig. 2).

Economic characteristics

Higher income level was observed to be correlated with better health outcomes overall: better children nutritional

Table 1 – Variables selected from the CASEN survey 1990–2015. Refer to Online Resource 1 for a complete description of the variable by year (summary statistics).

Variable	Type	Range	Description
General information			
Age	Continuous variable	0 to 110	Respondent's current age
Gender	Dummy variable	0 = female, 1 = male	Respondent's gender
Education	Categorical variable	1 = no education, 2 = elementary incomplete, 3 = elementary complete, 4 = high school incomplete, 5 = high school complete, 6 = technical school incomplete, 7 = technical school complete, 8 = technician studies incomplete, 9 = technician, 10 = university incomplete, 11 = undergraduate degree, 12 = graduate school incomplete, 13 = graduate degree	Highest level of education attained by respondent
Work	Dummy variable	0 = no, 1 = yes	Work status
Urban	Dummy variable	0 = rural, 1 = urban	Area of residence
Region [a]	Categorical variable	1 = I region, 2 = II region, 3 = III region, 4 = IV region, 5 = V region, 6 = VI region, 7 = VII region, 8 = VIII region, 9 = IX region, 10 = X region, 11 = XI region, 12 = XII region, 13 = Metropolitan region, 14 = XIV region, 15 = XV region	Region
Household size	Continuous variable	1 to 26	Number of people living in the same house
Living standard measure			
Income	Continuous variable	0 to 65,647,564	Household income per equivalent adult
Health outcomes			
Child nutrition	Categorical variable	1 = malnutrition, 2 = underweight, 3 = normal weight, 4 = overweight, 5 = obese	Nutritional status for the child 0–6 years old
Pregnant nutrition	Categorical variable	1 = underweight, 2 = normal weight, 3 = overweight, 4 = obese	Nutritional status for the pregnant women 12–49 years old ([b])
Older nutrition	Categorical variable	1 = underweight, 2 = normal weight, 3 = overweight, 4 = obese	Nutritional status for the older 65 years or more ([c])
Self-assessed health	Dummy variable	1 = less than good health, 0 = otherwise	Self-assessed health status for people 15 years or more
Health problem	Dummy variable	0 = no, 1 = yes	Health problems in the last 3 months
Physical limitations	Dummy variable	0 = no, 1 = yes	Have you a limitation: physical, hear, talk, see, mental or psychiatric?
GES condition	Dummy variable	0 = no, 1 = yes	AUGE condition in the last 12 months ([d])
Health utilization			
Medical visits	Continuous variable	0 to 90	Number of medical visits in the last 3 months
Specialty visits	Continuous variable	0 to 90	Number of specialty visits in the last 3 months
Emergency visits	Continuous variable	0 to 50	Number of emergency visits in the last 3 months ([e])
Mental visits	Continuous variable	0 to 70	Number of emergency visits in the last 3 months ([f])
Dental visits	Continuous variable	0 to 65	Number of dental visits in the last 3 months
Lab exams	Continuous variable	0 to 90	Number of lab exams in the last 3 months
X-rays	Continuous variable	0 to 45	Number of X-rays or ultrasound scams in the last 3 months
Preventive care	Continuous variable	0 to 90	Number of preventive care visits in the last 3 months
Hospitalizations	Dummy variable	0 = no, 1 = yes	Hospitalizations in the last 3 months
Health coverage			
Insurance	Categorical variable	1 = FONASA A, 2 = FONASA B, 3 = FONASA C, 4 = FONASA D, 5 = FONASA unknown group, 6 = ISAPRE, 7 = Other, 8 = no health insurance	Healthcare insurance type

GES, Regime of Explicit Health Guarantees.
[a] In the year 2007, Chile created two new regions which break the historical number pattern of 13 regions.
[b] Information not available for the years 1998 and 2015.
[c] Information not available for the years 1990, 1992, 1994, 1996, 1998, 2000, 2003, 2015.
[d] Information available starting from the year 2006.
[e] Information available starting from the year 1992.
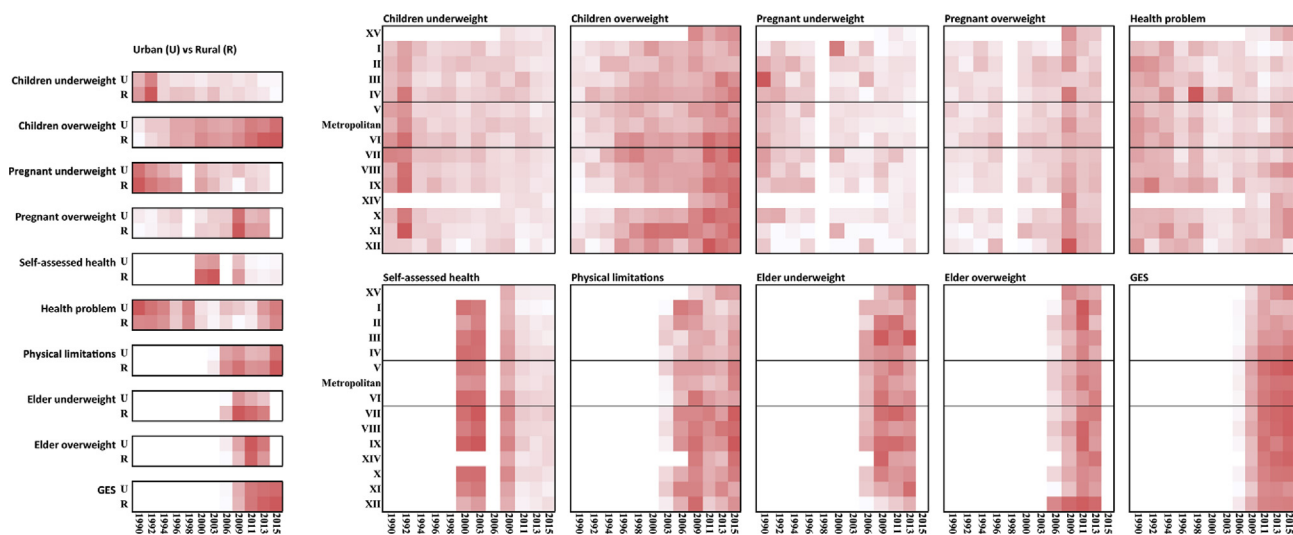[f] Information available starting from the year 2006.

Fig. 1 − Urban vs rural, and Chilean geographical regions (from north to south) assessment of health outcomes (1990−2015). The color intensity represents a relative scale of correlation for each variable (darker = higher correlation). The lines including the Metropolitan, V, and VI regions are expected to have more urban population than the rest of the country. GES = Regime of Explicit Health Guarantees. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

status, self-assessed health, and lowest elder underweight. However, the probability of having overweight elder population was similar or higher than lower income levels (Fig. 3). Other outcomes such as 'pregnant overweight', 'health problems', and 'GES conditions' showed no evident trend among quintiles (Fig. 3). People using public health insurance programs (i.e. FONASA A-D) showed worse health outcomes compared with private insurance users (i.e. ISAPRE), except for 'health problem' and 'GES condition' which showed no apparent differences among insurance groups (Fig. 3).

Concentration curves

Equity analysis
The standard concentration index estimated for several variables was negative from 1998 to 2015 (Table 2). This suggested the decrease of health outcomes with increasing income (e.g. underweight children: −0.1708 for 2015) and reinforced what was observed in the correlation coefficients. Nutritional problems, such as children/pregnant overweight and underweight were concentrated among the poor during 1990−2015; while underweight elders followed the same tendency. Elders'
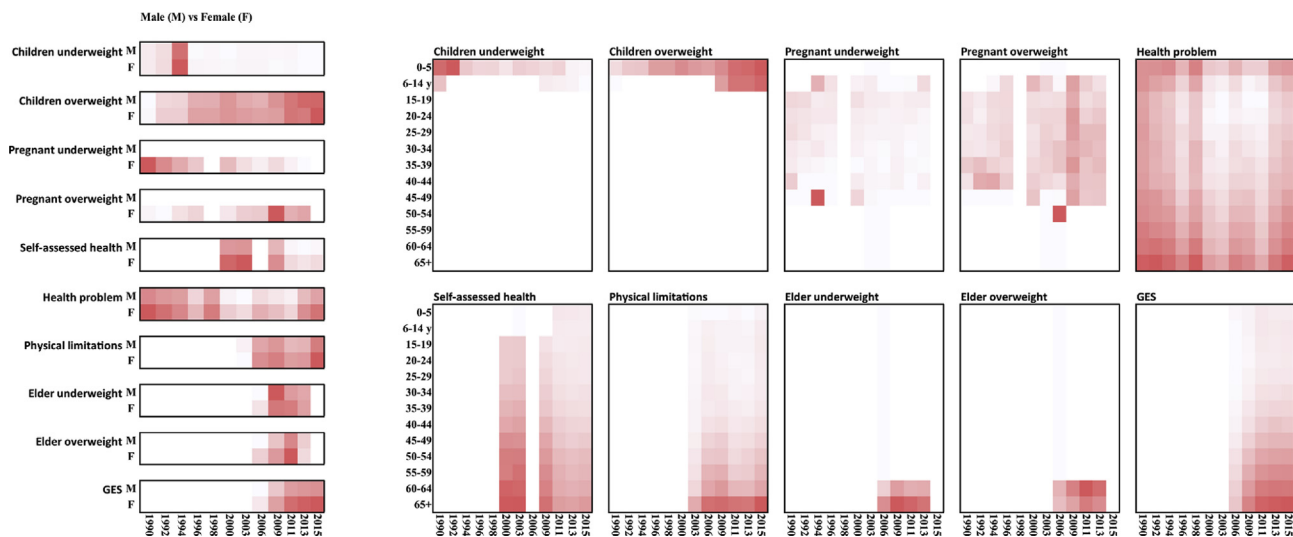

Fig. 2 − Male vs female and age assessment of health outcomes (1990−2015). The color intensity represents a relative scale of correlation for each variable (darker = higher correlation). GES = Regime of Explicit Health Guarantees. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)
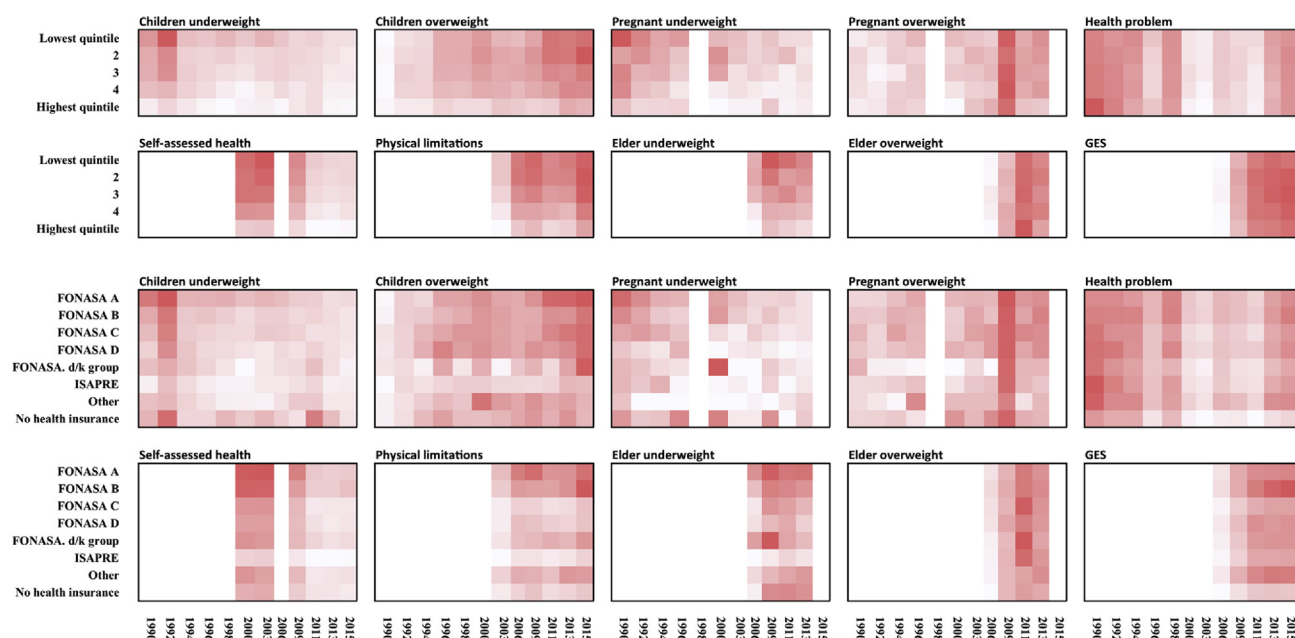
Fig. 3 — Public insurance programs (FONASA A-D) vs Private insurance users (ISAPRE), and total income (represented by quintiles) assessment of health outcomes (1990−2015). The color intensity represents a relative scale of correlation for each variable (darker = higher correlation). GES = Regime of Explicit Health Guarantees. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

overweight showed a tendency to get closer to the equality line. Table 3 presents the complete information for 2015 with two additional scenarios that represent a higher aversion to health inequality and achievement indexes for child nutrition, self-assessed health, health problems, GES conditions, and physical limitations when applying the concentration index weighting (0.0255, 0.1708, 0.1659, 0.2264, 0.2518, and 0.0960 respectively). When comparing to the standard health of the population, we found that the negativity of the concentration index (such as in the case of child underweight) is over-weighting the higher prevalence of the poorest. As a result, the achievement index of 0.0255 indicates worst health than the average health (i.e. 0.0218). This means that since aversion to inequality is increased, the greater weight assigned to the first

quintiles makes average health deteriorate (i.e. underweight children). Similar interpretation can be drawn from the other health outcomes, except for 'GES condition' and 'health problem', in which richer individuals suffered more from a GES condition or a health problem, and higher aversion to inequality makes their achievement index improve. Please refer to Online Resource 3 for a complete description of the results.

The concentration curves for most of the health conditions lay above the 45° line of equality, which confirmed that these health conditions were more prevalent among the poor. By contrast, the concentration curve for 'health problem' and 'GES condition' were very close to the 45° line of equality, which indicated very little association between these

Table 2 — Standard concentration index for selected outcome variables.						
Year	Children underweight	Children overweight	Self-assessed health	Health problems	GES condition	Physical limitations
1990	−0.1853	0.0232	NI	0.0388	NI	NI
1992	−0.2236	−0.0014	NI	0.0207	NI	NI
1994	−0.1138	−0.0233	NI	−0.0261	NI	NI
1996	0.3090	−0.2864	NI	−0.0077	NI	NI
1998	−0.3180	−0.0679	NI	−0.0135	NI	NI
2000	−0.2762	−0.0963	NI	−0.0180	NI	NI
2003	−0.2520	−0.0170	−0.1498	−0.0313	NI	−0.1565
2006	−0.1960	−0.0156	NI	−0.0153	−0.0092	−0.1238
2009	−0.0933	−0.0540	−0.1397	−0.0073	−0.0225	−0.1254
2011	−0.0615	−0.1164	−0.1363	−0.0425	−0.0101	−0.1350
2013	−0.1672	−0.0608	−0.1268	−0.0252	−0.0234	−0.1429
2015	−0.1708	−0.0827	−0.0929	−0.0014	0.0045	−0.0807
CASEN, Chilean National Socio-economic Survey; GES, Regime of Explicit Health Guarantees; NI, no information collected by the CASEN survey.						

Table 3 – Health inequality, unstandardized year 2015.

	Children underweight	Children overweight	Self-assessed health	Health problems	GES condition	Physical limitations
Quintiles of income per equivalent adult						
Lowest quintile	0.0304	0.1701	0.1725	0.2223	0.2308	0.0969
2	0.0220	0.1942	0.1752	0.2326	0.2646	0.1025
3	0.0226	0.1581	0.1605	0.2270	0.2698	0.0987
4	0.0168	0.1404	0.1488	0.2254	0.2604	0.0834
Highest quintile	0.0098	0.1011	0.1023	0.2232	0.2390	0.0630
Total	0.0218	0.1577	0.1518	0.2261	0.2529	0.0889
Standard concentration index	−0.1708	−0.0827	−0.0929	−0.0014	0.0045	−0.0807
Conc. index with inequality−aversion parameter = 3	−0.2466	−0.0981	−0.1184	0.0004	0.0220	−0.0985
Conc. index with inequality−aversion parameter = 4	−0.2914	−0.0974	−0.1272	0.0035	0.0394	−0.0993
Standard achievement index	0.0255	0.1708	0.1659	0.2264	0.2518	0.0960
Achievement index with inequality −aversion parameter = 3	0.0272	0.1732	0.1698	0.2260	0.2473	0.0976
Achievement index with inequality −aversion parameter = 4	0.0282	0.1731	0.1711	0.2253	0.2429	0.0977
GES, Regime of Explicit Health Guarantees.						

conditions and income, and reinforced what was observed in the correlation analysis (Fig. 4). Please refer to Online Resource 4 for a complete description of the concentration curves of health outcomes from 1990 to 2015.

Gender and age were used as standardizing variables for the decomposition of the concentration index. The results for the last year studied (i.e. 2015) showed that child underweight was slightly more concentrated among the poor because of age (CI: concentration index) (CI: −0.002), while self-assessed health, health problems, and GES conditions were slightly more concentrated among the poor because of gender (CI: −0.001, −0.002, −0.002, respectively). Conversely, self-assessed health, health problems, GES conditions, and physical limitations were slightly more concentrated among the rich because of age (CI: 0.050, 0.015, 0.057, 0.064), and no effect was observed in child underweight, physical limitation for gender (CI: 0). The total contribution of age and gender to income-related inequality in these six health outcomes (Table 4) was −0.002, 0, 0.048, 0.013, 0.055, and 0.064, respectively. Negative contributions meant that child underweight, for example, was correlated with age only, and they showed a pro-poor distribution, while positive contributions showed a pro-rich distribution.

When wealth index, insurance, and place of residence were used as control variables the inequality because of the control variables was CI: −0.162, −0.080, −0.134, −0.014, −0.048, and −0.139, for the selected health outcomes, respectively (Table 4). Total inequality for this subset of health outcomes was CI: −0.171, −0.083, −0.093, −0.001, 0.004, and −0.081. The related inequity for our control variables was −0.158, −0.081, −0.142, −0.014, −0.050, and −0.145, respectively. Negative values indicated that inequity favored the rich. All the information about the decomposition of the concentration index is available in Online Resource 5.

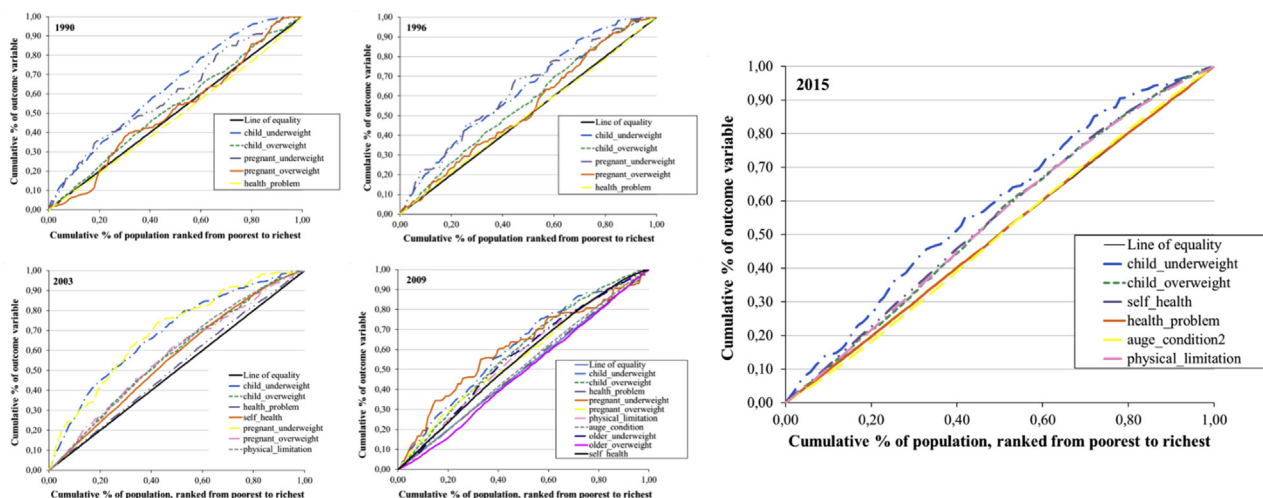Age made a positive contribution to 'self-assessed health', reporting a health problem, having a GES condition

Fig. 4 – Concentration curves for selected years.

**Table 4 − Decomposition of the concentration index for health outcomes, linear model year 2015.**

	Children underweight	Children overweight	Self-assessed health	Health problems	GES condition	Physical limitations
Standardizing (demographic) variables						
Respondents current age	−0.002	0.000	0.050	0.015	0.057	0.064
Gender	0.000	0.000	−0.001	−0.002	−0.002	0.000
Subtotal	−0.002	0.000	0.048	0.013	0.055	0.064
Control variables						
Urban	0.006	−0.002	0.001	0.004	0.001	0.002
Metropolitan region	0.016	0.000	0.010	−0.002	0.001	0.005
Insurance	0.000	0.001	0.000	0.000	0.000	0.000
Wealth_index = poor	0.016	−0.007	0.010	0.000	0.002	0.009
Wealth_index = middle	−0.013	−0.002	0.000	0.000	0.000	0.000
Wealth_index = rich	−0.054	−0.014	−0.034	−0.005	−0.013	−0.039
Wealth_index = richest	−0.132	−0.056	−0.121	−0.011	−0.038	−0.116
Subtotal	−0.162	−0.080	−0.134	−0.014	−0.048	−0.139
Residual: regression error	0.004	−0.001	−0.008	0.000	−0.002	−0.005
Residual: missing data	−0.011	−0.002	0.001	0.000	0.000	0.000
Inequality (total)	−0.171	−0.083	−0.093	−0.001	0.004	−0.081
Inequity/unjustified inequality	−0.158	−0.081	−0.142	−0.014	−0.050	−0.145

GES, Regime of Explicit Health Guarantees.

and a physical limitation (Table 4). Thus, indicating that these conditions were more frequent among richer individuals. On the other hand, gender made a small contribution. The poor income quintile made a positive contribution to the concentration index for child underweight, self-assessed health, and physical limitations, implying that being in the poorest quintile makes these outcomes more frequent. The middle quintile made the concentration index more pro-rich for child underweight and overweight. The rich and richest quintiles made a negative contribution to the concentration index for all the health outcomes in the analysis. Therefore, these health outcomes were more frequent among poor individuals (i.e. individuals in the higher income quintiles are healthier than those in the lower quintiles).

Health utilization

The concentration curves for health utilization did not show considerable changes during the time analyzed (1990−2015) (Fig. 5). Please refer to Online Resource 6 for a complete description of the results. The concentration curves corresponding to the number of preventive healthcare services and emergency visits all lay above the 45° line. This meant that poorer households received more preventive healthcare services and emergency visits than the richer (Fig. 5). The concentration curve related to number of medical visits has become very close to the equality line. The concentration curves for number of specialty visits, number of hospitalizations, number of X-ray exams, and number of dental visits, all lay below the equality line, indicating that richer households benefited much more from this healthcare services (Fig. 5).
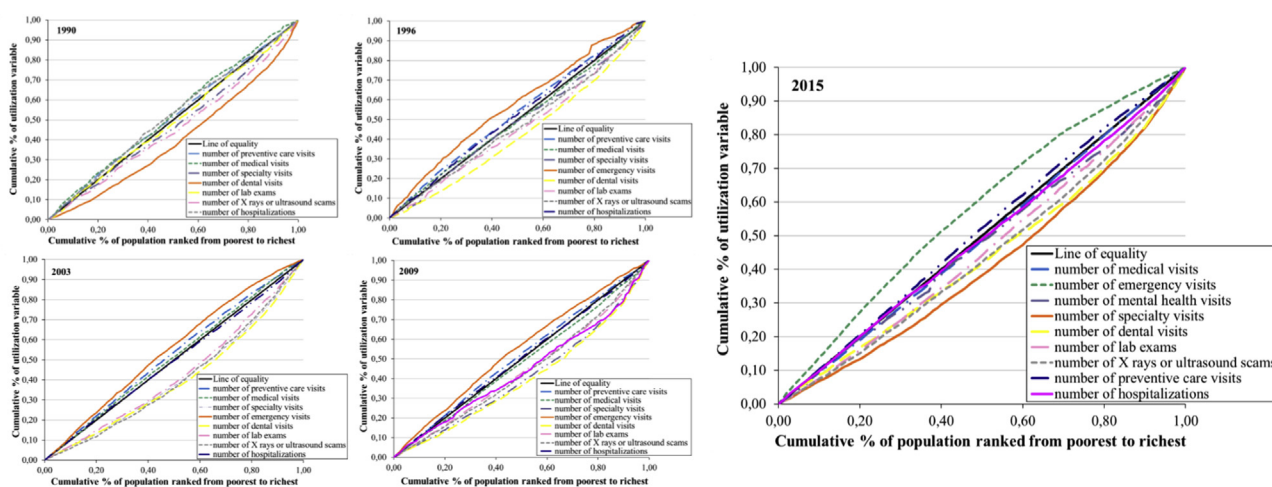
Fig. 5 − Concentration curves of utilization year 1990−2015.

The evolution of utilization of healthcare services by year suggested that there was an increase in the use of all type of healthcare services, except dental care visits in which a decrease in the utilization of services over the years was observed (Fig. 6). This may be explained by the relative high costs of dental services, most of the time not covered by health insurance systems. See detail in Online Resource 7.

Discussion

The Chilean Ministry of Health has historically been committed to maternal and child health and has implemented nutrition policies and programs that have been widely accepted as successful in the rehabilitation of malnourished children and mothers.[23] Furthermore, according to studies, stunting has been practically eliminated in the country.[24,25] However, our findings suggest that some additional efforts are required specially for children, pregnant, and older with lower income level. Nevertheless, what is notable today is the increase in overweight and obesity problems with high risks for chronic diseases.[26–28] This showed the need to modify the nutrition programs and education of the population emphasizing the importance of prevention programs and healthier lifestyles.

Our results indicated that the concentration of people suffering from a health problem or a GES condition were similar in the poorest and richest households. Furthermore, the concentration indexes for health outcomes suggested that the allocation of income makes the distribution of health conditions pro-poor. However, the opposite was observed for age among richer individuals, where the probability of health problems increased with age. To some extent, this finding contradicts the theory that income and wealth support better health (i.e. richest people can afford the resources that protect and improve their health). However, advancing age is also associated with a higher risk of getting age-related diseases such as Alzheimer's, heart disease, stroke, diabetes, and cancer, which do not depend on just income level, but also on diet and other lifestyle characteristics. Additionally, we based our results on answers from the CASEN survey, and studies have found that people with lower income are less likely than their more socially advantaged counterparts to agree that they have a higher risk of ill health and to acknowledge a social gradient in health.[29]

When examining the concentration curves for utilization of healthcare services, we found that the use of dental visits, laboratory exams, specialty visits, and hospitalizations were concentrated on the richest households. According to our results, their use has been increasing over the time (except for dental visits). This highlighted the importance of strong preventive programs, especially given the rise in prevalence of chronic diseases among the Chilean population.[30] Social preventive programs are essential for promoting healthy behaviors and preventing the complications of chronic diseases, i.e. reducing the utilization of other healthcare services.

The use of emergency visits and preventive visits were highly concentrated among poor individuals, and its use had also increased in 1990–2015. Medical visits were more equally distributed among income groups, and their use has increased over the years of analysis. These patterns can be explained by current Chilean mixed healthcare system. According to the latest CASEN survey, 78% of the population is covered by the public insurance system, and just 15% of the population is covered by the private insurance system.[21] In general, the richest individuals covered by private insurance systems have
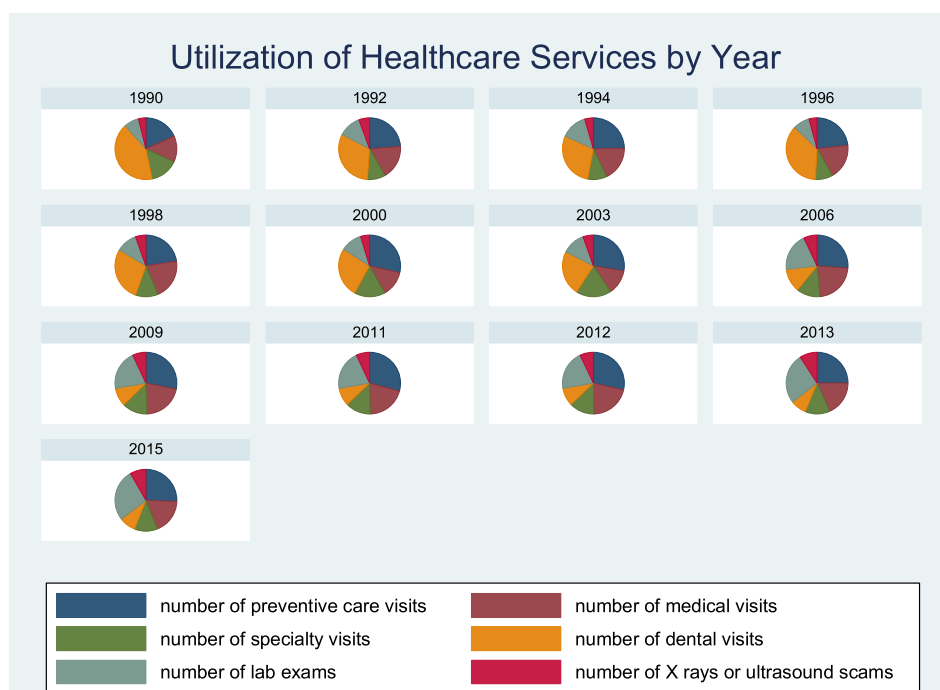

Fig. 6 — Utilization of healthcare services by year.

better access to healthcare services, infrastructure, and specialists. Additionally, dental visits and laboratory exams demand a higher amount of out-of-pocket payment and increases of emergency visits could be a consequence of the long waiting times for a specialist in the public sector; many C5 patients (least urgent or least acute patients) attend directly to the emergency services.[31] These findings are also in line with what was described by Vasquez et al., who reported about income-related inequalities in health and healthcare utilization in Chile.[17]

The last reform significantly altered the Chilean health system by introducing a single supplemental benefit plan for both the publicly insured and the privately insured tied to social security, in which the quality in healthcare provision and delivery was highly emphasized. Even though we observed a positive trend in the increase of medical service use, no significant impact on improving equity in health after the implementation of the new health reform was observed. However, the reform is still underway, and we might observe its effects in the future.

Limitations

The limitations of this study are related to the use of secondary data. There was a longer than usual self-reported recall period of 1 year or 6 months for most of the questions related to health care in the CASEN survey, which may have increased recall bias. Also, we are aware that estimates of healthcare use can suffer from the same recall bias. We also recognize that self-report bias might exist for variables such as service utilization and income. Individuals tend to underreport their income, which may lead to underestimation of inequalities across income groups. However, service utilization can either be under or overreported; therefore, the present analysis may be biased, but it is uncertain of the direction. In addition, we studied healthcare equity based on a household survey that collects information regarding the frequency of use of different healthcare services and health outcomes; however, a more specific survey is required to assess the different constructs involved in measuring accessibility to healthcare services, which it represents the next step in this research.

Policy implications

The relevance of this study relies on the need for more continuous, routine, and systematic assessments of equity in health over time, as a tool to understand the impact and implications of policies implemented in the healthcare system. We provide evidence on the impact of 'GES conditions' and their transversal nature among income levels and geographical regions. Even though the current reform is still underway and we may notice its long-term effects later, there is still a space for improvement to prevent barriers of access (e.g. shortage of healthcare professionals, waiting times, elevated cost, preference for self-diagnosis, among others) that are still faced by the Chilean population. There is still work that needs to be done to move toward universal health care.

Author statements

Ethics approval

Not applicable. This study does not require ethics approval. There is no direct human subject involvement in this study. Consent from the patient is not required, as this study reports an analysis of secondary population group data from the CASEN survey. No individual or his/her information can be identified.

Competing interest

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

Availability of data and material

In this manuscript we are reporting data from the CASEN survey that is publicly accessible in http://observatorio.ministeriodesarrollosocial.gob.cl/index.php by the Government of Chile.

Authors contribution

A.N.M. principal investigator developed the original research idea and questions, obtained the data for this study, conducted data analysis, interpreted the results, and wrote the manuscript. C.A.M. contributed with data interpretation (figures and tables) and writing the manuscript. C.C. contributed to the original research idea and questions and contributed to the writing and revisions of the manuscript.

REFERENCES

1. Wagstaff A, Van Doorslaer E, Watanabe N. On decomposing the causes of health sector inequalities with an application to malnutrition inequalities in Vietnam. *J Econom* 2003;**112**:207–23.
2. Whitehead M. The concept and principles of equity and health. *Int J Health Serv* 1992;**22**:429–45.
3. Wagstaff A, Van Doorslaer E. Equity in health care finance and delivery. *Handb Econom* 2000;**17**:1803–62.

4. Commission on Social Determinants of Health. *Closing the gap in a generation: health equity through action on the social determinants of health. Final report of the commission on social determinants of health.* Geneva: World Health Organization; 2008.

5. Monteiro L, Pellegrino A, Solar O, Rígoli F, Malagon de Salazar L, Castell-Florit P, Gomes K, Swift T, Bravo F, Atun R. Social determinants of health, universal health coverage, and sustainable development:case studies from Latin American countries. *The Lancet* 2015;**385**:1343—51.

6. Vega J. Enfermo de Pobre. Las Inequidades sociales y la salud en Chile. *Revista Universitaria* 2001;**73**:43—56.

7. Missoni E, Solimano G. *Towards universal health coverage: the Chilean experience. World Health Report.* 2010. Background paper 4; 2010.

8. MINSAL 2019. *Diseño e Implementación de una Metodología de Evaluación, Seguimiento y Acompañamiento de la Reforma de la Salud de Chile.* http://www.paho.org/chi/images/PDFs/resumenejecutivo.pdf?ua=1, 2019. [Accessed 21 May 2019].

9. Infante A, de Paraje G. Reforma de Salud: Garantías Exigibles como Derecho Ciudadano. In: Larrañaga O, Contreras D, editors. *Las Nuevas Políticas de Protección Social en Chile.* Santiago de Chile, Chile: Uqbar Editores; 2010. p. 77—118.

10. Gobierno de Chile. http://www.gobiernodechile.cl, 2009. [Accessed 31 May 2009].

11. FONASA: Tramos y copagos. https://www.fonasa.cl/sites/fonasa/beneficiarios/informacion-general/tramos, 2017. [Accessed 23 January 2017].

12. Superintendencia de Salud. http://www.supersalud.gob.cl/portal/w3-channel.html, 2015. [Accessed 15 December 2015].

13. ISAPRE. http://www.isapresdechile.cl, 2011. [Accessed 5 August 2011].

14. Kongstvedt PR. *Essentials of managed care.* Jones & Bartlett Learning; 2007.

15. Zerda A, Velásquez G, Tobar F, Vargas J. *Health insurance systems and access to medicines - case studies from: Argentina, Chile, Colombia, Costa Rica.* Guatemala and the United States of America. D.C.: PAHO; 2002.

16. Jadue L, Marín F. *Determinantes Sociales de la Salud en Chile: En la Perspectiva de la Equidad.* Santiago de Chile: Policy Institute of Epidemiology and Public Health; 2005.

17. Vásquez F, Paraje G, Estay M. Income-related inequality in health and health care utilization in Chile, 2000-2009. *Rev Panam Salud Públic* 2013;**33**:98—106.

18. Frenz P, Delgado I, Kaufman J, Harper S. Achieving effective universal health coverage with equity: evidence from Chile. *Health Policy Plan* 2014;**29**(6):717—31.

19. Núñez A, Chi C. Equity in health care utilization in Chile. *Int J Equity Health* 2013;**12**:58.

20. Núñez A, Chi C. Equity in out-of-pocket payment in Chile. *Rev Saude Publica* 2017;**51**:44.

21. Encuesta Casen. http://observatorio.ministeriodesarrollosocial.gob.cl/index.php, 2019. [Accessed 24 January 2019].

22. ADePT Software Platform. menuPK:7108381~pagePK:64168176~piPK:64168140~theSitePK:7108360,00.html, http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTPROGRAMS/EXTADEPT/0, 2017. [Accessed 9 August 2017].

23. Bossert TJ, Leisewitz T. Innovation and change in the Chilean health system. *N Engl J Med* 2016;**374**(1):1—5.

24. Athala E, Amigo H, Bustos P. Does Chile's nutritional situation constitute a double burden? *Am J Clin Nutr* 2013;**100**(6):1623S—7S.

25. Mardones F, Passi A, Rosso P, Rozowski J, Torres-Robles R, Cantwell J, Olagnero Gm, Fernández X. Nutrition and health of women in Chile. *Annal Nutr Food Sci* 2017;**1**(2):1007.

26. Kain J, Galvan M, Taibo M, Corvalan C, Lera L, Uauy R. Evolution of the nutritional status of Chilean children from preschool to school age: anthropometric results according to the source of the data. *Arch Latinoam Nutrition* 2010;**60**:155—9.

27. Amigo H, Bustos P, Erazo M, Cumsille P, Silva C. Determinant factors of excess of weight in school children: a multilevel study. *Rev Med Chile* 2007;**135**:1510—8.

28. Ratner R, Sabal J, Hernandez P, Romero D, Atalah E. Nutritional status and lifestyles of workers from two regions in Chile. *Rev Med Chile* 2008;**136**:1406—14.

29. Macintyre S, McKay L, Ellaway A. Are rich people or poor people more likely to be ill? Lay perceptions, by social class and neighbourhood, of inequalities in health. *Soc Sci Med* 2005;**60**(2):313—7.

30. OECD Reviews of Public Health. *Chile: a healthier tomorrow. Assessment and recommendation.* https://www.oecd.org/health/health-systems/OECD-Reviews-of-Public-Health-Chile-Assessment-and-recommendations.pdf, 2019. [Accessed 23 May 2019].

31. Núñez A, Neriz L, Mateo R, Ramis F, Ramaprasad A. Emergency departments key performance indicators: a unified framework and its practice. *Int J Health Plan Manag* 2018;**33**(4):915—33.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2019.08.017.