Mortality Impact of Chile's Explicit Health Guarantees (GES) Insurance Reform

Felipe Menares*

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Abstract

I analyze the mortality effects of Chile's 2005-2019 Explicit Health Guarantees (GES) insurance reform. GES ensured and guaranteed coverage for specific priority diagnosis, even though were previously covered under the government's universal health care policies. The initial expansion in 2005 covered 25 high-prevalence diagnoses amenable to mortality-averting health care treatment such as heart attacks, hypertension, and diabetes. Subsequent expansions brought the total to 85 newly covered conditions of varying prevalence and amenability to care.

For my analysis, I use all individual death records from 2000 to 2011. First, I categorize the 56 health-related problems covered by the reform during 2005-2007 using the ICD10 cause-of-death codes and compare them to other causes whose insurance coverage did not change. I then analyze deaths in cells defined by cause, year, and age, estimating generalized difference-in-differences models that control for cause, year, and age fixed effects. Preliminary findings suggest that the reform reduced the number of deaths.

Keywords: Mortality, Social Insurance Programs, Program Evaluation

* fmenares@berkeley.edu, Departament of Demography, UC Berkeley.

I. Introduction

This paper contributes to the literature studying to what extent Chile's innovative approach to expanding specialty care access could provide a model for other middle-income countries, as the international community prioritizes cost-effective reforms towards achieving universal health coverage (UHC). In 2015, United Nations member states agreed to work towards worldwide UHC by 2030 following the World Health Organization and others' argument that UHC progress leads to improvements in overall population health. UHC means that all individuals and communities receive the health services they need without suffering financial hardship; this requires implementing specific policies that emphasize care for women, adolescents, and other vulnerable populations (The Lancet. 2019). However, countries have followed different paths to achieve this goal depending on their economic and historical contexts (Reich, M. R. et al., 2016). While there is evidence to suggest that UHC has a positive effect on health status, particularly for poor people, methodological constraints and lack of data have limited the availability of rigorous research on the impact of alternative reforms (Moreno-Serra, R., & Smith, P. C. 2012). Furthermore, analyses have generally focused on the extensive margin of expanding coverage to uninsured populations; and less is known about the population-level health benefits of expanding insurance generosity to include a broader array of more expensive specialty care.

Chile's health system presents a unique opportunity to study evidence related to the UHC initiative and its effects on health outcomes. Chile meets universal coverage criteria, but it is limited and different depending on the health care provision. The GES reform starting in 2005 is a novel effort to expand opportunity, quality, and financial coverage for additional enumerated health-related problems with high mortality and morbidity. Thus, in contrast with previous research, I study a health reform—in a context of high baseline coverage. —- aimed to improve the diagnosis and treatment of high-cost and high-mortality diseases.

Previous work on this Chilean reform shows early success in reducing myocardial infarction mortality (Nazzal et al., 2008). It also suggests that it may have improved access to health care and health status, especially among lower-income Chileans (Frenz et al., 2014). Regarding Latin America, the most comparable region to this Chilean reform, there is some evidence for the impact of health care reforms on mortality (Arroyave, 2013; Parker et al., 2018). However, these studies focus on the early effects of expanding the proportion of the population covered by any health

insurance - in some cases only targeting the old age population - rather than expanding the types of care covered. The most recent work addressing the relationship between health care provision and mortality is on the United States' Affordable Care Act (ACA). Because it is country-specific, it offers little evidence about mortality improvements that reforms in middle-income countries such as Chile may have had (Gruber and Sommers, 2019; Miller et al., 2019; Black et al., 2019; Borschutle and Vogler, 2020; Goldin et al., 2021). However, it provides cutting-edge research design evidence to establish a causal relationship.

This research will update and provide evidence for other middle-income countries already covering most of the population but aiming to move towards more effective universal health care. First, by evaluating high mortality diseases in this reform rather than focusing on just one. Second, by contributing with causal evidence rather than associations to measure and improve health status resulting from this reform.

II. Context

The GES insurance reform ensured and guaranteed coverage for specific priorities, even though were previously covered under the government's universal health care policies. The initial expansion in 2005 covered 25 priority conditions, including high prevalence diagnoses amenable to mortality-averting health care treatment such as heart attacks, hypertension, and diabetes. Subsequent developments in 2006, 2007, 2010, 2013, and 2019 brought the total to 85 newly covered conditions of varying prevalence and amenability to care.

The system guarantees access through a mandatory obligation to public and private insurers for current and future health-related problems. It certifies quality through registered and certified health providers and sets a maximum timeline for the diagnosis, treatment, and follow-up to achieve opportunity. It ensures financial security through limits to contributions, payments, and copayments contingent on users' income. Patients claim benefits by filling out a form with the medical diagnosis confirmed through a public or private health provider. Once verified, they are assigned for treatment into their network; people cannot choose where to get the provision; otherwise, they lose the benefit. Finally, every person has the right to take preventive medicine exams once a year to detect diseases early. Depending on the health-related problem, people may have access to prescriptions for free.

III. Conceptual Framework

I follow a revised version of the Andersen model (Andersen, R. M., & Davidson, P. L. 2007). This model points to the circumstances and environment of healthcare access, including health organization and provider-related factors and community characteristics, in addition to insurance coverage policies that facilitate financial access to care and the system's geographic access to care. The model suggests that the major components of contextual characteristics are divided in the same way as individual characteristics determining access: (1) existing conditions that predispose people to use or not use services even though these conditions are not directly responsible for the use, (2) enabling conditions that facilitate or impede the use of services, and (3) need or conditions that lay people or health care providers recognize as requiring medical treatment.

Therefore, it is essential to distinguish the dimensions of access to care. Andersen identifies six dimensions with its intended improvements: potential, realized, equitable, inequitable, effective, and efficient access. In this regard, GES reform looks to fill the gap between potential and realized access through guaranteed access to a list of health-related problems for all the population, ensuring its effective diagnosis and treatment. Figure 1 establishes the conceptual framework for the GES reform; it relates the contextual and individual characteristics with the health behaviors, through the pathway to health and care, and consequently the relevant health outcomes. Notice that while the Andersen model identifies the contextual and individual characteristics separately, this adaptation mixes both to determine which are related to the predisposing, enabling, and need determinants in the pathway to health and care.

IV. Research questions and hypotheses

This research aims to answer the following question: Does the provision of targeted health care reforms that guarantee access and coverage for specific conditions reduce mortality?

A. Death administrative records

The primary mortality dataset I will use for this research is the individual-level deaths registry from the death certificates provided by the Department of Health Statistics and Information for 1997 – 2017; our primary analyses of the 2005-07 expansions will use just the years 2000-2011. This dataset includes each individual's cause of death, year of birth, sex, educational attainment,

residence, and place of death (home or health care facility). It also includes health care facility location, urban or rural, and medical attention (yes or no) of each death in the country.

B. ICD10 codes and GES health-related problems

The GES plan established clinical guidelines with detailed procedures for detection, diagnosis, treatment, and follow-up for the health conditions covered by the plan. In addition, the administrative records provide a comprehensive list of the ICD10 codes treated under the 85 health-related problems covered by the reform. Therefore, we can classify each health-related problem using the ICD 10 codes to evaluate the impact of the reform on those potentially preventable deaths given effective and timely health care.

V. Research design and methods

The implementation of the reform allows for a natural experiment or a quasi-experimental research design. Leveraging the timing of the inclusion of a group of diseases covered by the reform, I implement a difference-in-differences estimation procedure that compares mortality in covered and not covered diseases before and after the GES reform. Therefore, the study analyzes a change in policy that results in variation in health insurance coverage that is unrelated to unobservable characteristics that also determine health so that the causal effect of insurance on health can be isolated. The primary identification assumption is that in the absence of the reform, the trend in my outcome of interest (mortality) of these two groups of diseases (covered and not covered) would have evolved similarly, meaning that differences would have been constant between them. Thus, the implicit identifying assumptions are: (1) fixed characteristics within diseases (not change over time) (2) time trends for deaths are the same for covered and not covered disease. These assumptions are usually known as the common or parallel) trends assumption in the program evaluation literature. I assess the plausibility of the parallel trends assumption using event studies around the time a new disease is covered.

VI. Poisson Estimation

In each wave, the reform targeted a group of diseases that covered specific groups of ages, such as newborns, children below 15, and adults above 65. For instance, all cancers were covered for ages below 15 as part of the first wave. Because we only observe deaths and do not observe how many

individuals suffered from each disease, we do not have denominators for constructing disease-specific death rates.

In the absence of a denominator for the mortality rate, we use death counts by cause (within age and year cells) as our outcome of interest. Deaths are bounded as non-negative values; thus, our dependent variables have restricted support. One approach to analyzing deaths would be to use the log of deaths as a dependent variable, but this requires ad hoc solutions for cells with zero deaths; thus, we use count data models, fitting a Poisson model for counts as a function of covariates using a log link.

For this purpose, we compute cells of death counts by ICD10 code[1], age-group[2] , and year, where treated units are identified through the ICD10 codes and ages covered by each health-related problem. The parameter of interest then captures the weighted average of log risk or log rate ratio comparing the log risk or log rate when GES covered diseases and when they were not.

To investigate the effect of GES reform on mortality, we use a set of difference-in-differences (DiD) specifications: (i) a "simple DiD" specification, which assumes a one-time change in mortality; (ii) an "event-study" or "leads- and-lags" model, which allows for a separate treatment effect in each year, both before and after the reform, and thus lets us assess whether pre-treatment trends are parallel.

Treatment is recorded in event time relative to the year in which each disease was included in the GES expansions. All models use ICD10-age group-level data, diseases and year fixed effects (FE), standard errors clustered at the level of treatment (ICD10-age group level), and data from 2000 through 2011. This analysis studies the effect of the first three waves: 2005, 2006, and 2007[3]. The last three waves were implemented in 2010, 2013, and 2019, and in total represent 12% of the deaths in the period studied, so we decided not to use them as controls yet to be treated. The period and waves studied allow us to have a 5-year moving window around each expansion.

The general specification we estimate is the following DiD regression Equation (1):

[1] ICD10 codes aggregated to 3 digits (e.g. X99)
[2] We create 22 five-year age groups, except for newborns, ages 1 to 4, and an open-ended interval for deaths above 100.
[3] Detailed tables with each of the health-related problems and age groups covered can be found in Table A 1

$$log(y_{dt}) = \alpha_d + \gamma_t + \beta GES_{dt} + \epsilon_{dt}, \qquad (1)$$

Where y_{dt} is one of our outcomes of interest, associated with an ICD10 code and age-group d at time t. GES_{dt} is an indicator that equals one from the first time a disease is included in GES and onwards (note that in this setting, the control group consists of never-included diagnostics); α_d represent diseases fixed effects that control for unobservables specific to the diseases and γ_t are time-fixed effects accounting for unobservable shocks specific to a period.

Turning to examine the dynamic effects of GES. We will use a leads-and-lags model in event time, with the first expansion year set to zero, following Equation (2):

$$log(y_{dt}) = \alpha_d + \gamma_t + \sum_{k=\underline{C}}^{-2} \beta_k D_{dt}^k + \sum_{k=0}^{\bar{C}} \beta_k D_{dt}^k + \epsilon_{dt}\ , \qquad (2)$$

where $D_{dt}^k = 1[t = GES_d + k]$, and GES_d is the timing of inclusion of diagnostic d. D_{dt}^k is a dummy variable indicating that diagnostic d was included in GES, k periods ago (or will be included k periods ahead for negative values of k). Therefore, the β_k coefficients can be interpreted as the population average treatment effect of GES on y_{dt} for each k period, relative to the date before the inclusion of d in GES. We normalize the coefficients such that $\beta_{k=-1} = 0$.

VII. **Preliminary Results**

We present full-sample results in this section. We first present summary statistics, followed by an univariate analyses, dynamics and then results from DiD.

A. Summary statistics

We can observe from Table 1 that almost 80% of deaths occurred in the period of study are concentrated among diseases of the circulatory system, neoplasms, respiratory system, injuries, and digestive systems. This aligns with the reform expansions on the first three waves, aiming to decrease deaths in diseases with higher mortality. We can see that only 30% of the causes of deaths from the group of diseases of the circulatory system were not included in the first three years of expansion. The 2005 expansion covered almost 42% of the causes of deaths under the health-related problems associated with Chronic Kidney Diseases, Myocardial Infarction (Heart attack),

Heart Conduction System, and Arterial hypertension for adults. For 2005 and 2006, these are covered under Ischemic Strokes and Aneurysm, respectively.

Neoplasms and diseases of the respiratory system followed a similar pattern, being covered mainly by the health-related problems associated with specific cancers. For the respiratory system, these were covered primarily by Chronic obstructive pulmonary disease and Pneumonia in adults above 65. Finally, an interesting case is the deaths classified under injuries, which started to be covered in 2007, where the health-related problems associated are mostly polytraumatized.

Table 2 presents some descriptives regarding the age structure of our period of analysis. We see that almost 75% of deaths occurred between 50 and 89. We also see the usual pattern of increasing deaths with age, peaking in the 80-84 age group to start decreasing. The reform covers around 50% of the causes of deaths within each age group; most of them were covered by the first expansion. For the 2007 distribution, there is an interesting pattern. The number of deaths covered decreases with age, which is in line with most deaths coming from polytraumatized health-related problems.

Finally, Table 3 shows the resulting statistics from our cells before the estimation, where we have many of them with 0 deaths, some with a maximum of 995 for a given year, age group, and cause of death at three digits. Therefore, this helps us understand the magnitude of the coefficients we will find, capturing a weighted average of the proportionate change between covered cells relative to those not covered, controlling for age-group, causes of deaths, and time using the fixed effect model. In turn, we would expect that our coefficient is negative, leading to a decrease in the number of deaths of the diseases covered after the reform, compared to what would have been the number of deaths without the reform.

B. Univariate Graphical Evidence

Figure 2 displays trends in normalized deaths for the first three waves plus the non-covered group for the full-time study period (2000-2011). First, there are differences in the proportional change of deaths across the groups. However, these are smaller between our main comparison groups—the Covered Diseases vs. Non-Covered Disease, showing some evidence of parallel pre-treatment trends. Second, Figure 2 shows a divergence across the groups after the reform, showing evidence of negative effects of the covered group of diseases vs. the non-covered. More specifically, over

2005-2011, deaths increased proportionally more in the non-covered than the covered groups. However, between 2003 and 2004, all deaths were declining, leveling off a year before the reform.

We hope that some of the differences observed before the reform started are absorbed by the regression FE, and any DiD analysis will be credible. If the parallel trend assumption holds, we expect to compare the pre-treatment average difference in deaths for non-covered versus a covered group of diseases to a similar post-treatment average difference—as a simple DiD regression does— resulting in the GES reform having a negative effect in reducing deaths. In line with what we see from Figure 2, proportionate deaths in these groups diverge principally during the post-treatment period.

Finally, note that the large increases in deaths in uncovered causes observed after 2005 are driven mainly by an aging population, as shown in Figure 3 and Figure A 2. The crude death rate declined until 2000, when it increased again, jumping from 5.13 to 5.5 deaths per 1000, between 2000 and 2011. At the same time, the mortality rate is constantly decreasing until 2017, going from 130.11 to 126.87 deaths per 1000, between 2000 to 2011.

C. Leads-and-Lags Results

We turn next to leads-and-lags graphs, using Equation (2):. Figure 4 provides annual point estimates and 95% CIs over 2000-2011 among the full sample. Again, we find some evidence consistent with our parallel trends assumption, with relative mortality not improving in covered diseases before the inclusion for each of the expansions. However, after the reform, the result negatively affects mortality after two years of expansion.

We can also see that the point estimate increases and stabilizes after three years. Additionally, the standard errors naturally get larger as the sample size decreases further away from 0. For instance, diseases included in 2007 only have four years post-period until 2011, being diseases expended in 2005 only considering six years post period.

D. DiD Regression Results.

We next turn to regression analysis. Table 4 shows results from DiD regressions, following Equation (1), diseases, and year FE. We present stratified results for females and males since some

diseases were only covered for a specific sex. However, there are no significant differences between the sex-stratified results and together.

In Table 4, in regressions with fixed effects, we find a statistically significant 5.9% post-expansion fall in mortality. Therefore, the log of the risk when diseases go from being uncovered to covered decreases 5.9%. Alternatively, we can say that the proportionate change in deaths decreased 5.9% once conditions started to be covered. However, this coefficient is a weighted average across all the diseases-year so that we can compute the number of deaths averted due to the reform.

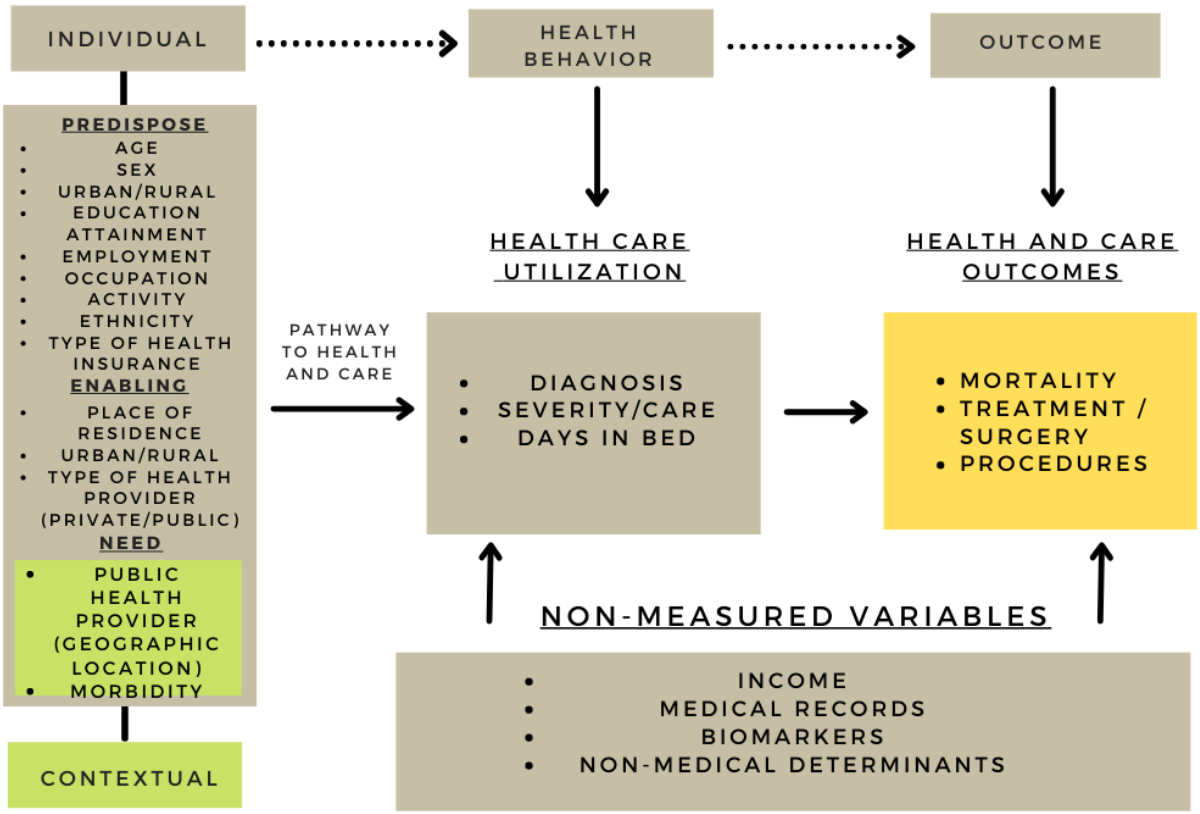
For instance, if we scale the 42,504 number of deaths in 2011 for the covered group of diseases, by the exponent of our coefficient, we get 45,114 deaths that would have been if there were no reform. So, as a result, there is a difference of approximately 2,700 [4,155, 1,116] deaths averted.

VIII. Discussion

Additional models need to be tested to improve our understanding of the results found. It is crucial to study the impact of the reform for a group of deaths amenable to health care, which are intrinsically related to the scope of the reform. Additionally, robustness checks must be assessed, such as placebo tests for non-covered diseases and age groups. Now, results by age group are included in Table A 2 and Figure A 3 with similar conclusions.

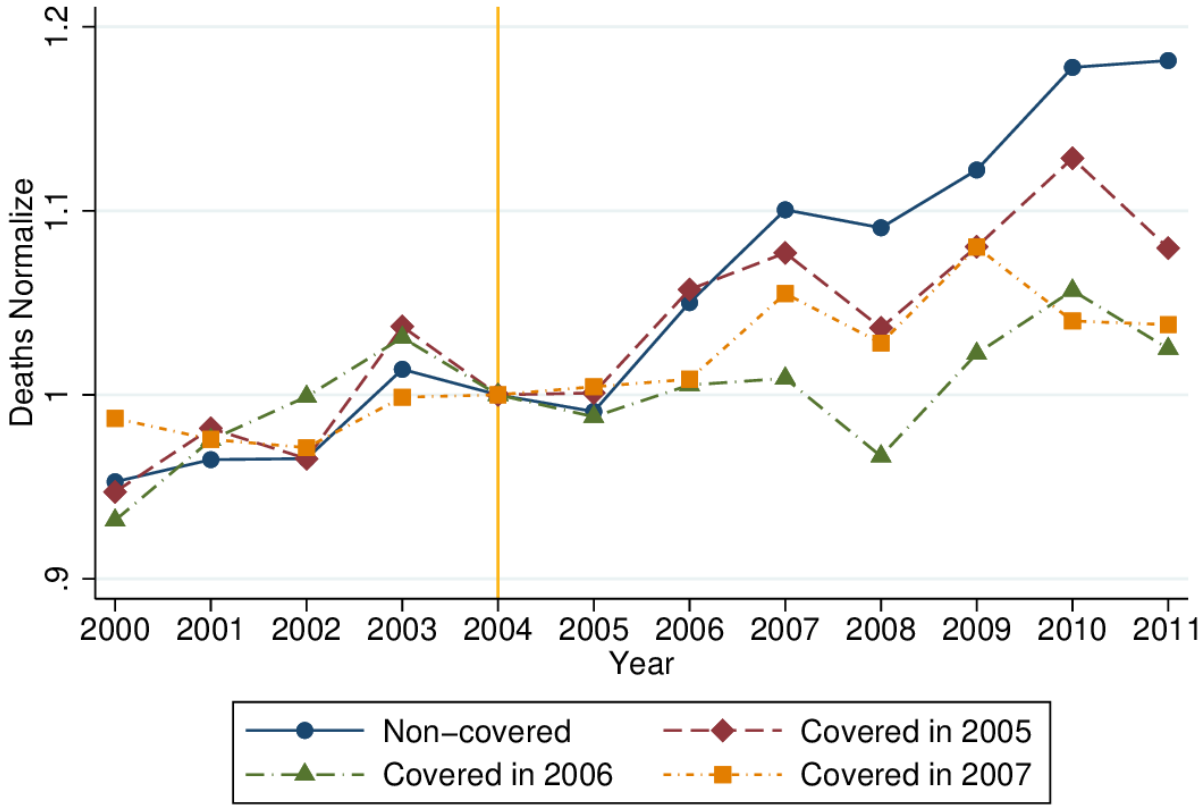
Finally, the assessment of the impacts of the reform can be extended using the available data on the universe of hospital discharges. This data allows us to pivot the results found here with the mechanisms involved by analyzing the impact of the reform on surgery rates in covered versus non-covered diseases.

Figure 1: The GES Reform: Conceptual Framework.



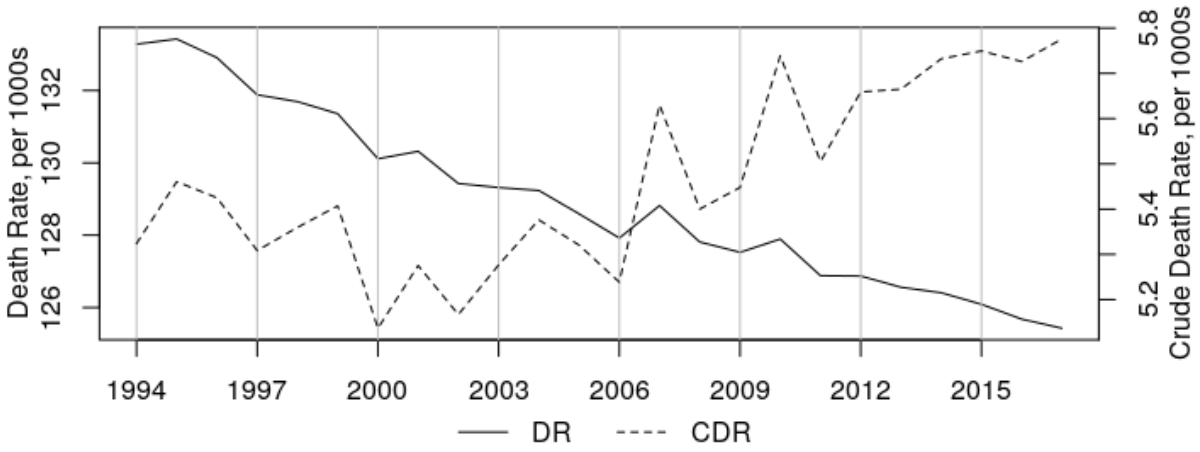
Source: Own construction based on Andersen revised model (Andersen, R. M., & Davidson, P. L. (2007)).

Figure 2: Time Trends in Deaths



Source: Author's construction based on Chilean deaths administrative records.

Figure 3: Death and Crude Death Rates



Source: Author's construction based on HMD data.

Figure 4: Effect of the GES expansions on deaths

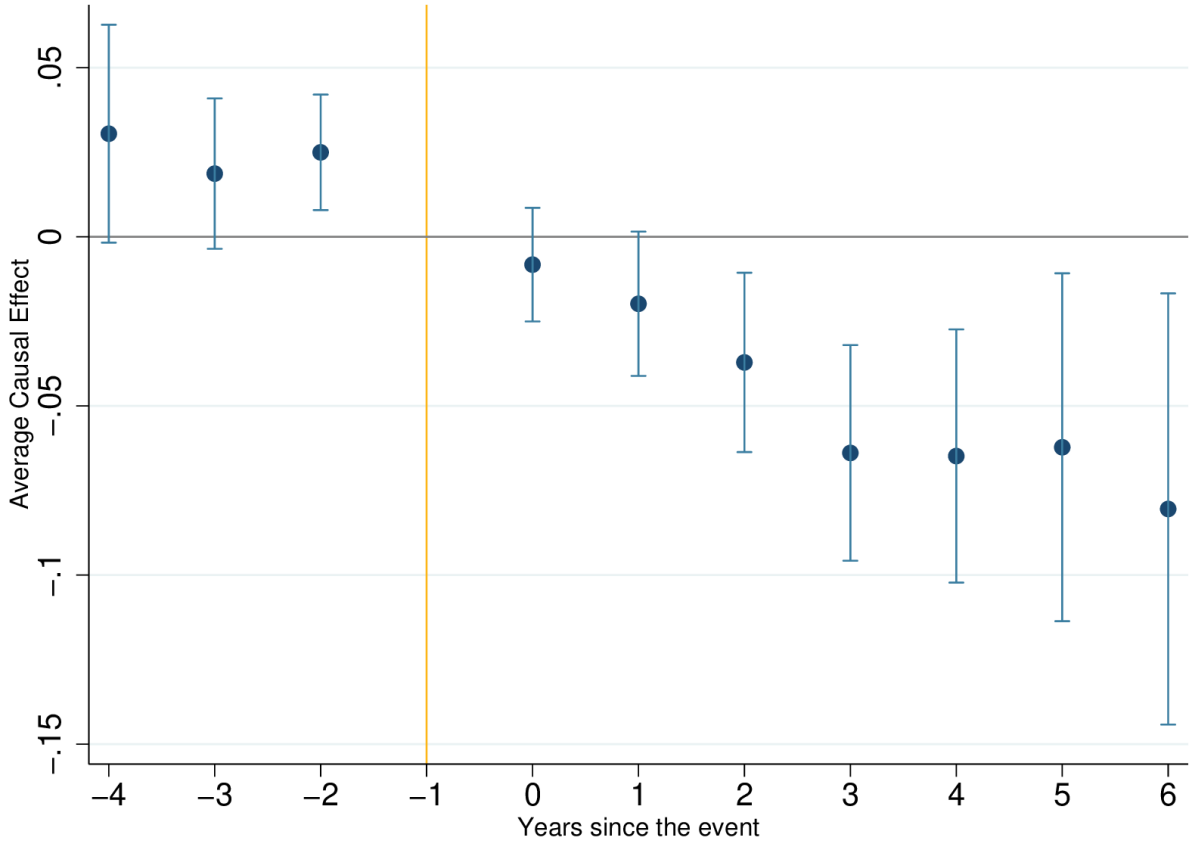


Table 1: Deaths according to the ICD10 classification between 2000-2011

	All deaths		Deaths never covered		Deaths covered by year of expansion					
					2005		2006		2007	
ICD10 Chapters	N	Col. %	N	%	N	%	N	%	N	%
Diseases of the circulatory system	288817	31.04	99050	34.30	120064	41.57	41950	14.52	27753	9.61
Neoplasms	191798	20.61	87250	45.49	32134	16.75	58835	30.68	13579	7.08
Diseases of the respiratory system	99337	10.68	30903	31.11	35266	35.50	33168	33.39	0	0.00
Injury, poisoning and certain other consequences of external causes	93723	10.07	34690	37.01	0	0.00	0	0.00	59033	62.99
Diseases of the digestive system	76351	8.21	76243	99.86	0	0.00	100	0.13	8	0.01
Endocrine, nutritional and metabolic diseases	50204	5.40	10342	20.60	39647	78.97	0	0.00	215	0.43
Diseases of the genitourinary system	30337	3.26	17361	57.23	12213	40.26	763	2.52	0	0.00
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	29859	3.21	29859	100.00	0	0.00	0	0.00	0	0.00
Certain infectious and parasitic diseases	21474	2.31	16161	75.26	5306	24.71	0	0.00	7	0.03
Congenital malformations, deformations and chromosomal abnormalities	11060	1.19	6865	62.07	3820	34.54	375	3.39	0	0.00
Certain conditions originating in the perinatal period	10138	1.09	4058	40.03	4520	44.58	1560	15.39	0	0.00
Diseases of the nervous system	9669	1.04	9485	98.10	178	1.84	6	0.06	0	0.00

Mental, Behavioral and Neurodevelopmental disorders	4903	0.53	4420	90.15	410	8.36	54	1.10	19	0.39
Diseases of the musculoskeletal system and connective tissue	4842	0.52	3012	62.21	155	3.20	0	0.00	1675	34.59
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	4288	0.46	4234	98.74	16	0.37	38	0.89	0	0.00
Diseases of the skin and subcutaneous tissue	3048	0.33	3048	100.00	0	0.00	0	0.00	0	0.00
Pregnancy, childbirth and the puerperium	534	0.06	528	98.88	5	0.94	0	0.00	1	0.19
Diseases of the ear and mastoid process	51	0.01	51	100.00	0	0.00	0	0.00	0	0.00
Diseases of the eye and adnexa	12	0.00	12	100.00	0	0.00	0	0.00	0	0.00
Total	930445	100	437572	47.03	253734	27.27	136849	14.71	102290	10.99

Source: Author's construction based on Chilean deaths administrative records.

Table 2: Deaths by age group between 2000-2011

	All deaths		Deaths never covered		Deaths covered by year of expansion					
					2005		2006		2007	
Age group	N	Col. %	N	%	N	%	N	%	N	%
0-14	34040	3.66	17716	52.04	11555	33.95	2077	6.10	2692	7.91
15-49	122079	13.12	58360	47.81	19592	16.05	6035	4.94	38092	31.20
50-54	40552	4.36	21058	51.93	9231	22.76	3245	8.00	7018	17.31
55-59	51071	5.49	26392	51.68	12492	24.46	5126	10.04	7061	13.83
60-64	65405	7.03	32944	50.37	16581	25.35	8293	12.68	7587	11.60
65-69	81353	8.74	38432	47.24	22463	27.61	12664	15.57	7794	9.58
70-74	101483	10.91	46204	45.53	28706	28.29	18541	18.27	8032	7.91
75-79	119477	12.84	53510	44.79	34536	28.91	23323	19.52	8108	6.79
80-84	122300	13.14	54899	44.89	36136	29.55	24117	19.72	7148	5.84
85-89	102495	11.02	46391	45.26	31980	31.20	19104	18.64	5020	4.90
90-94	63365	6.81	28807	45.46	21154	33.38	10640	16.79	2764	4.36
95-99	22528	2.42	10676	47.39	7779	34.53	3227	14.32	846	3.76
100+	4297	0.46	2183	50.80	1529	35.58	457	10.64	128	2.98
Total	930445	100.00	437572	47.03	253734	27.27	136849	14.71	102290	10.99

Source: Author's construction based on Chilean deaths administrative records.

Table 3: Summary statistics of the cells

	All deaths	Non-covered	Covered		
			2005	2006	2007
Min	0	0	0	0	0
P75	0	0	1	5	1
Mean	3	2	12	29	3
Max	995	510	995	650	276
Total	930445	437572	253734	136849	102290

Source: Author's construction based on Chilean deaths administrative records

Table 4: Impact of the GES Reform on Mortality, Difference and Difference Estimates

	(1) All	(2) Females	(3) Males
PostGES	-0.0596***	-0.0603**	-0.0589***
	(0.01718)	(0.02032)	(0.01743)
Constant	4.3060***	3.6466***	3.7884***
	(0.00491)	(0.00586)	(0.00495)
Diseases FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Ps. R-squared	0.930	0.896	0.904
N. of cells	127668	100944	104124

Standard errors in parentheses
Poisson regression models with cluster standard errors at the treatment level
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

IX. Appendix

Table A 1: Group of diseases covered by each wave

Health Related Problem				
2005	No.	Mean	SD	%
Myocardial Infarction (Heart attack)	69975	132.53	254	27.58
Arterial hypertension (15+ years old)	38157	44.16	77.18	15.04
Pneumonias in older adults (65+ years old)	34042	44.33	136.36	13.42
Chronic Kidney Disease	29899	18.32	45.92	11.78
Diabetes mellitus, types 2	22464	21.27	64.34	8.85
Breast cancer (15+ years old)	14330	22.11	42.36	5.65
Heart Conduction System >=15	11930	9.21	18.21	4.70
Cervicouterine cancer	7703	14.59	24.08	3.04
Lymphoma (15+ years old)	7221	4.18	12.23	2.85
HIV/AIDS	5198	3.94	7.55	2.05
Prematurity	4520	2.14	18.1	1.78
Congenital heart disease (15- years old)	2949	8.78	18.57	1.16
All childhood cancers (15- years old)	1693	0.38	1.49	0.67
Acute respiratory infections (5- years old)	1332	2.92	11.32	0.52
Testicular cancer (15+ years old)	1178	5.45	6.15	0.46
Psychosis (severe psychiatric disorders)	410	0.52	1.36	0.16
Spinal Dysraphism	324	0.24	0.95	0.13
Epilepsy (between 1 and 15 years old)	158	2.19	2.38	0.06
Hip replacement (65+ years old)	137	1.43	1.7	0.05
Cleft lip/palate	81	0.06	0.45	0.03
Scoliosis (25- years old)	22	0.15	0.43	0.01
Primary brain tumors (15+ years old)	10	0.05	0.21	0.00
Total	253733	11.52	58.55	100.00

Health Related Problem

2006	No.	Mean	SD	%
Ischemic stroke (15+ years old)	41956	64.75	133.08	30.66
Stomach cancer	37748	78.64	149.64	27.58
Chronic obstructive pulmonary disease	33158	21.26	79.76	24.23
Prostate cancer (15+ years old)	19308	89.39	123.02	14.11
Respiratory distress in new-born	1935	26.88	32.36	1.41
Cholecystostomy (between 35 to 49 years old)	1742	12.1	19.1	1.27
Benign hypertrophy of the prostate	900	1.7	4.15	0.66
Depression (15+ years old)	54	0.13	0.38	0.04
Hemophilia	38	0.07	0.31	0.03
Bronchial Asthma (15- years old)	10	0.21	0.46	0.01
Total	136849	29.39	92.3	100.00

Health Related Problem

2007	No.	Mean	SD	%
Polytrauma with or without medullary lesion	54623	2.41	11.7	53.40
Aneurysms	27753	35.04	59.57	27.13
Primary brain tumors (15+ years old)	6922	4.58	9.19	6.77
Leukemia (15+ years old)	6657	6.16	8.05	6.51
Major burns	3520	1.33	2.71	3.44
Rheumatoid arthritis	1628	1.23	3.6	1.59
Dental emergencies	897	1.17	2.5	0.88
Cystic fibrosis	215	0.81	1.06	0.21
Hernia of the nucleus	42	0.08	0.3	0.04
Alcohol/drug dependence (20- years old)	19	0.05	0.37	0.02
Tooth loss in older adults (60+ years old)	7	0.06	0.28	0.01
Osteoarthritis (Hip and Knee) (55+ years old)	5	0.02	0.13	0.00
Delivery care with analgesia	1	0	0.06	0.00
Eye trauma	1	0	0.06	0.00
Total	102290	3.11	14.61	100.00

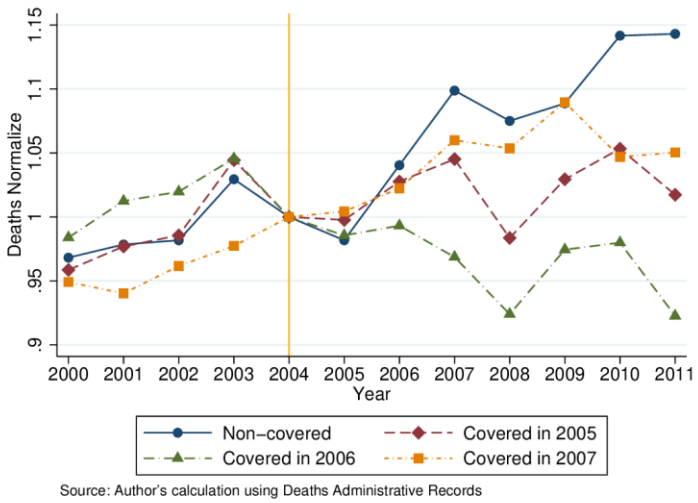
Table A 2: DiD results for different age groups.

	(1) Age group 50 to 79	(2) Age group 50 to 89	(3) Age group 50 to 99
PostGES	-0.0718**	-0.0687**	-0.0557**
	(0.02306)	(0.02110)	(0.02051)
Constant	4.4644***	4.6177***	4.5797***
	(0.00642)	(0.00611)	(0.00604)
Diseases FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Ps. R-squared	0.937	0.943	0.942
N. of cells	43560	58032	68472

Standard errors in parentheses
Poisson regression models with cluster standard errors at the treatment level
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

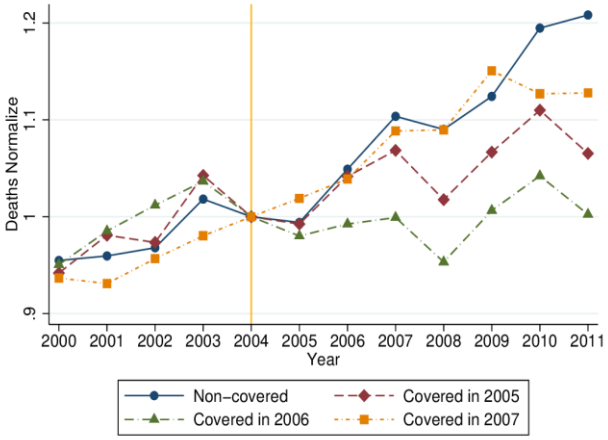
Figure A 1: Normalized deaths by age group

A. Age 50 to 79



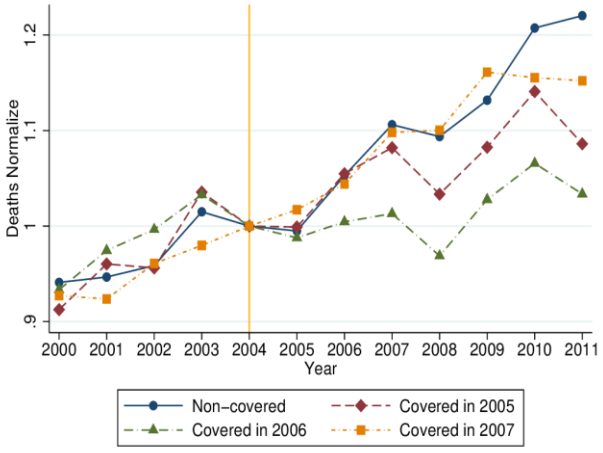
Source: Author's calculation using Deaths Administrative Records

B. Age 50 to 89



Source: Author's calculation using Deaths Administrative Records

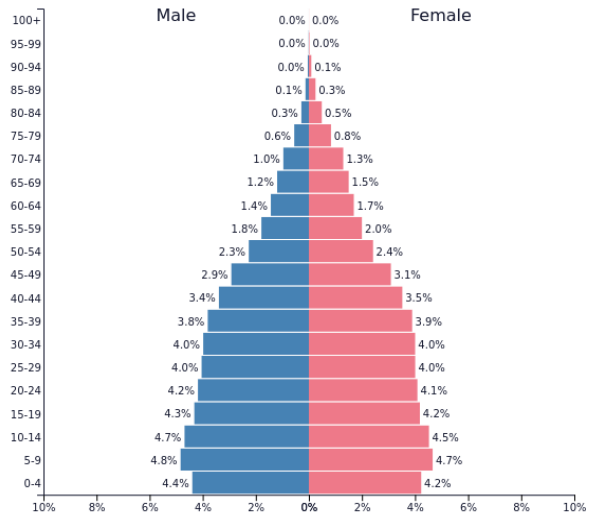
C. Age 50 to 99



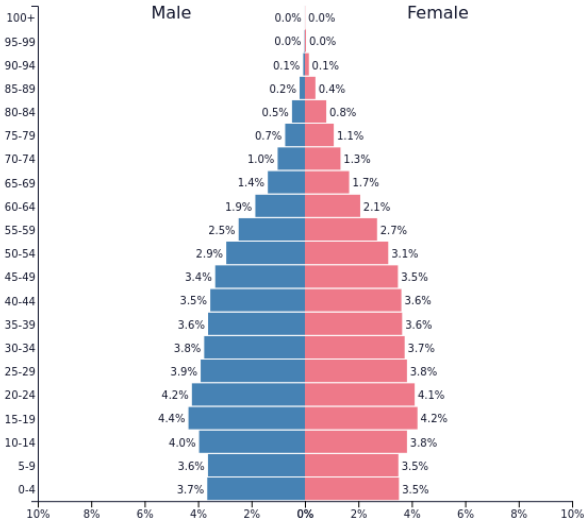
Source: Author's calculation using Deaths Administrative Records

Figure A 2: Population Pyramids

A. 2000, Pop: 15,32,350

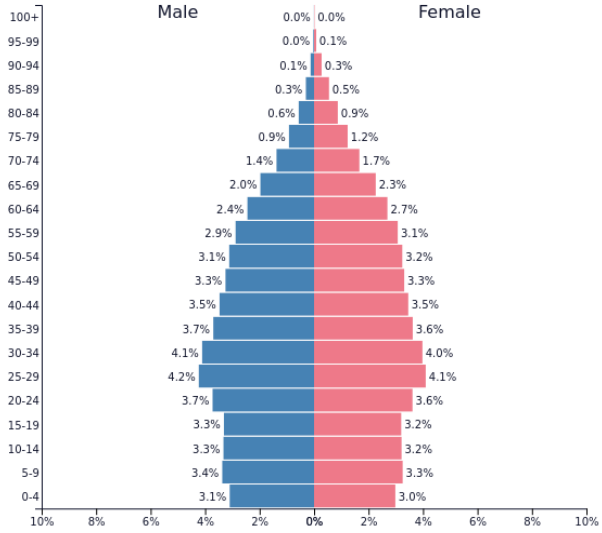


B. 2010, Pop: 17,062,531



Source: Pyramids.net

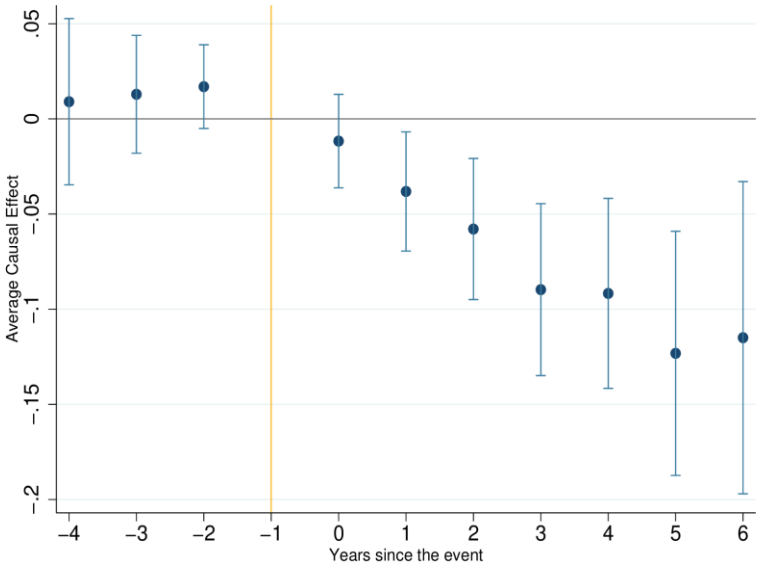
C. 2020, Pop 19,611,208



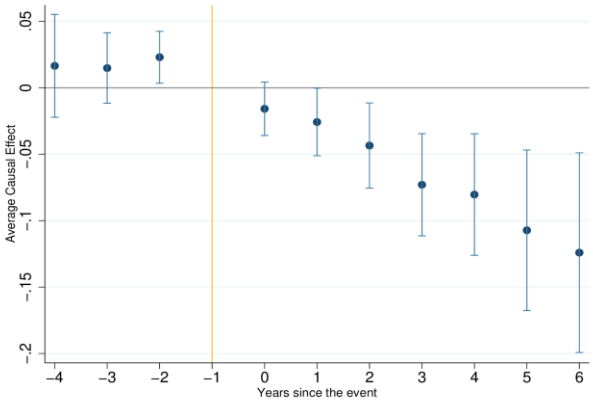
Source: Pyramids.net

Figure A 3: Effect of the GES expansions on deaths by age group

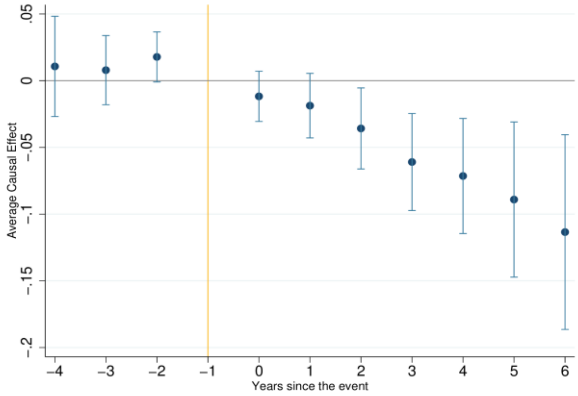
A. Age 50 to 79



B. Age 50 to 89



C. Age 50 to 99



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