Study protocol - for registration in ClinicalTrials.gov

Effect of COVID-19 lockdown on alcohol and tobacco use in two Chilean universities: a difference-in-difference analysis

Sponsor: Universidad de La Frontera
Organisation's unique protocol ID: ANID - COVID0282

Principal investigators:
Francisca Román, PhD, Universidad de La Frontera, Temuco, Chile
Paola Haeger, PhD, Universidad Católica del Norte, Coquimbo, Chile

Collaborators:
Sebastián Peña, MD, PhD, Finnish Institute for Health and Welfare, Helsinki, Finland
Camila Salazar, PhD, Universidad de La Frontera, Temuco, Chile
Daniela Palet, MSc, Universidad de La Frontera, Temuco, Chile

Version: 1.0
Version date: October 5, 2021

Effect of COVID-19 lockdown on alcohol use in two Chilean universities: a difference-in-difference analysis

Background

The coronavirus disease 2019 (COVID-19) pandemic has led to substantial societal changes in most high and middle-income countries. This can translate to changes in the volume and patterns of alcohol use, with severe consequences for health and societal wellbeing [1].

The COVID-19 pandemic could potentially affect alcohol and tobacco use in several ways. First, governments have introduced policies to reduce viral transmission, including social distancing policies to restrict people's mobility and exposure to SARS-CoV-2. These have ranged from stay-at-home advice and remote-work guidance to statutory closures of schools and universities, bars and restaurants and restrictions for public gatherings [2, 3]. The most restrictive policies have included lockdowns (with various levels of stringency) and curfews. Such policies have disrupted routines and reshaped social interactions as well as acting as an acute stressful event, which could, in turn, affect alcohol and tobacco use [1, 4-6].

Second, the pandemic could directly impact alcohol and tobacco use through changes in affordability due to the negative economic consequences, reducing people's disposable income and consumption as a result [7]. A SARS-CoV-2 infection could also directly impact tobacco or alcohol use, as the majority of infected individuals have experienced fever, malaise or cough [8]. An estimated 10% of those who had COVID-19 persist with fatigue, dyspnoea, disturbance of smell or taste after 8-24 weeks, which could affect their alcohol use [9]. Persistent COVID-19 symptoms have been reported to be as high as 50% among those who were hospitalized due to COVID-19 [10].

Third, governments have adopted policies that directly influence alcohol and tobacco availability and affordability. Such policies include total ban of tobacco (South Africa)[11] or alcohol sales (e.g. South Africa, India, Thailand, Panama),[12-15] changes in opening hours (as in parts of Chile and Mexico) and even raised alcohol taxes in some States in India [16].

Lockdowns, especially those that include statutory restrictions for people's mobility, have likely the largest potential effect on alcohol and tobacco use. Previous studies reporting the effect of COVID-19 lockdowns on alcohol use have reported a mixed picture, with some studies reporting an increase in high-risk drinking (either volume or heavy episodic drinking),[17-21] volume of alcohol use [22] and frequency of alcohol use [23], while other

studies have reported reductions in alcohol use [24-26]. Mixed changes on tobacco use have also been reported, with a relatively equal proportion of respondents describing an increase or reduction in their use of tobacco [17, 20, 27-30]. Evidence comes primarily from countries in Europe, the United States, Australia, and New Zealand. One common limitation of these studies is that they compare a pre-pandemic with a pandemic period and are thus not able to disentangle the direct effects of the pandemic with those from lockdown and curfew policies.

In this study, we will advance prior knowledge by providing evidence from a country in Latin America, one of the worst-hit regions worldwide. Latin America accounts for 8.4% of the global population, but 20.3% of the total SARS-COV2 cases and 30.2% of the COVID-19 deaths to date [31]. In addition, we will exploit the variation in lockdown policies in two regions in Chile to disentangle the effects of the COVID-19 pandemic with those from a lockdown.

The aim of the study is to examine the effect of a regional lockdown on alcohol use in two university populations in the Araucanía and Coquimbo regions in Chile. We will use a difference-in-difference analysis to obtain causal estimates of these COVID-19 policies.

Methods

Study design

The study is a controlled before-and-after study of COVID-19 policies in two Chilean regions. We will report the results in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [32].

Participants

The study population are university communities from two regions in Chile (Coquimbo, northern Chile, and Araucanía, southern Chile). These university communities include undergraduate and postgraduate students, full-time and part-time academics, leadership positions, administrative staff and service personnel. Eligibility criteria include (1) those with study rights either at the undergraduate and postgraduate levels by July 27, 2020; or (2) workers with a full-time or part-time contract with the University, including academics and assistant personnel, (3) with an email registered in the Human Resource Office of each university.

Intervention

We will examine the effect of lockdown in the context of the COVID-19 pandemic. During the study period, the Chilean Ministry of Health established a five-step process for social distancing measures. These ranged from full lockdown (step 1) to almost no restrictions (step 5). Even under full lockdown, citizens were able to obtain permits for essential activities (e.g., buying food or going to the doctor). These permits had a maximum of two per week and were obtained in a virtual station of the Chilean Police Force (Carabineros de Chile). Table S1 describes the five phases in detail. Table S2 describes the different types of permits people were allowed to use. It must be noted that, due to the COVID-19 pandemic, the Chilean government issued a night curfew with a total prohibition to leave home between 22.00 and 05.00 for the whole country from March 22, 2020, to date. Table 1 includes the specific policies implemented in both regions at the time of each data collection period.

Comparator

The comparator is the absence of lockdown at a given time. During most of the study period, the whole country had in place restrictions for public gatherings, school closures and advice for remote work. Both universities instructed remote work from March 16, 2020, which continued during the whole study period.

Covariates

We will adjust for covariates that are not influenced by the intervention but correlate with the outcome to increase the statistical power. These covariates include sex, age, educational level, living arrangements, existing medical conditions, and type of relationship with the university (i.e., student, academic or service personnel). We will categorise education into four categories: complete secondary education, incomplete undergraduate education, complete undergraduate education, and postgraduate education degree. We will categorise living arrangements into living alone or not. Existing medical conditions will be categorised into a dichotomous variable on whether the participants reported any of the following: high blood pressure; diabetes; cardiac problems (cardiac insufficiency, myocardial infarction, or others; respiratory conditions (asthma, respiratory insufficiency; depression; anxiety; other mental health problem; cancer (any malignancy including leukaemia or lymphoma; and fibromyalgia). We will categorise the type of relationship into three categories: student, service or administration personnel, and academic or leadership position.

Outcomes

We will examine three primary outcomes: weekly grams of alcohol use, heavy episodic drinking (HED) and number of cigarettes smoked per day. Weekly grams of alcohol use were measured at baseline with a question of how many drinks of beer (in portions of 330 cc), wine and similar (chicha and pipeño, two types of unfiltered wines, in portions of 140 cc) and spirits (pisco, rum, whisky, tequila, vodka, gin or other strong liquors) in a typical week. We asked the same questions for a pre-pandemic period and a during-the-pandemic period. The follow-up at waves 2 to 6 included a similar question but for each day of the week ("how many drinks did you have each day of the week").

We will convert the number of drinks into grams by multiplying the volume of each beverage by the density of alcohol (0.789). We will consider a standard drink of 15.8 grams based on the results of the Chilean National Health Survey 2009-2011, which had a standardized protocol to assess standard drinks in Chile. This data is available for all waves. Waves 0, 1, 5 and 6 include separate questions for beer, wine, and spirits.

We will measure HED with a question on how often the respondent drank 5 or more drinks on a single occasion (considering a 1-month period). The options were never, once, twice, 3 to 5 times, 6 to 9 times and 10 or more. We will convert this information into a continuous variable. We will convert the options 3-5 and 6-9 times to their arithmetic midpoint (4 and 7.5, respectively). We will convert the 10 or more option into the lower boundary (i.e., 10). This data is available for waves 0, 1, 4, 5 and 6.

We will measure the number of daily cigarettes smoked per day with a question on how many cigarettes has the participant smoked on average during the past week. We will convert this information into a continuous variable. This data is available for all waves.

Procedures

We collected the data using an online survey sent by email to all eligible participants. Data were collected from July 27 to August 13 (wave 0 and 1), August 15 to August 25 (wave 2), September 7 to September 22 (wave 3), October 5 to October 16 (wave 4), November 9 to November 20 (wave 5), December 9 to December 21 (wave 6) and April 5 to April 23 (wave 7). In all waves, we used an online survey tool (QuestionPro) which creates a database automatically. We did not allow participants to leave questions blank, but participants could stop answering at any moment. We used the following protocol to remind participants to answer the questionnaire: After sending the survey, we sent a reminder every three days: twice via email, then to those who had provided a mobile phone number, we sent the survey

two more times via text messaging. No incentive was provided in exchange for their participation in any of the study waves. The first round of data collection included questions regarding the period before the COVID-19 pandemic (wave 0) and during the pandemic (wave 1).

Sample size calculation

Prior to the beginning of the study, we calculated a sample size of 1046 participants to detect a small effect size (0.2), with a statistical power of 0.95, alpha of 0.05 and a factor of 2 to take into account the impact of attrition.

Ethical approval

The Scientific Ethics Committee from the Universidad de la Frontera and Universidad Católica del Norte approved the study in accordance with Law 20.120 (2006). We obtained electronic written consent from all participants.

Statistical analysis

We will exploit the variation in lockdown policies in the two regions to measure the effect of lockdown on alcohol use. For this purpose, we will use a difference-in-difference (DiD) design to compare the effect of lockdown in multiple treatment periods. DiD is a quasi-experimental approach that allows using longitudinal data to obtain causal effects in the absence of randomization [33]. DiD is a well-established method in public health research and was first used by John Snow in his seminal study on the transmission of cholera in 1855 [34].

The canonical DiD consists of two time periods and two groups. One computes the difference in the mean outcomes of the treatment and control group after the treatment and subtract the difference that existed before treatment had any effect [35].

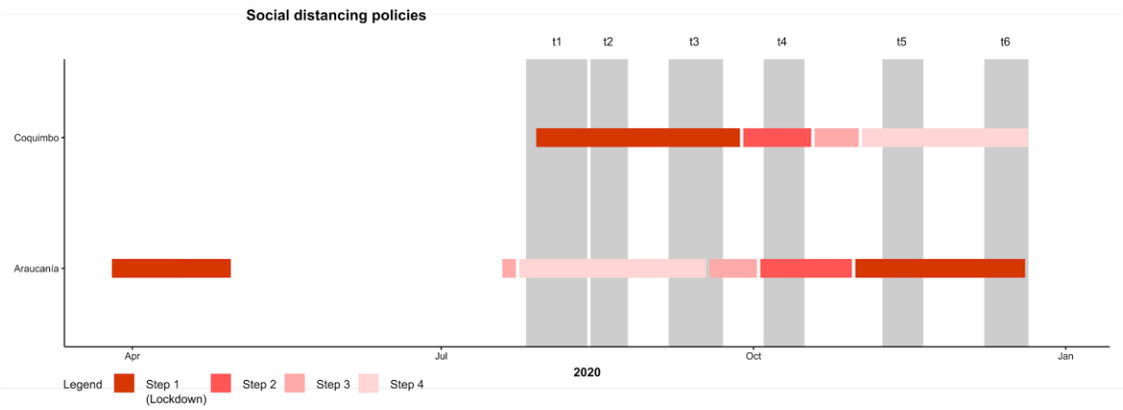
$$\delta_{DD} = (\underline{Y}_{posttreat} - \underline{Y}_{pretreat}) - (\underline{Y}_{postcontrol} - \underline{Y}_{precontrol})$$

The key identifying assumption is that, in the absence of treatment, the average outcomes would have followed parallel paths over time [33].

As depicted in Figure 1, our case is more complex, as there are multiple time periods (seven in total) and two groups that are both treated and not-treated in different time periods. For τperiods and a particular time period denoted by t where t=1,..., τ, $t_0$represents the baseline measurement captured retrospectively at t_1. In time periods t_1, $t_2$and t_3, the Coquimbo group

is exposed to lockdown while the Araucanía group is exposed to less restrictive social distancing policies. At $t_4$both groups are exposed to step 2 social distancing policies and at $t_5$and t_6; this situation reverses, and Araucanía is exposed to lockdown and Coquimbo moves to less restrictive social policies. Treatment intensity Dhas values ranging from 5 (step 1) to 1 (step 5) (see Table S2 for details).

Figure 1. Social distancing policies in Coquimbo and Araucanía for the study period



In this setting, we will use a generalized difference-in-difference that allows for multiple treatment periods and several treatment intensities [36, 37]. The regression of a DiD model can be expressed in more general terms as

(1) $$Y_{ist} = \alpha + \delta_{DD} TREAT_{st} + \theta X_{ist} + \beta_i + \gamma_t + e_{ist}$$

where $Y_{ist}$is the outcome for an individual s at time t and $i$is the region (Coquimbo or Araucanía), δ_{DD} is the coefficient of interest of a treatment intensity variable, X_{ist} is a vector of control variables (e.g. age, sex), β_i is a region fixed effect, and γ_t is a set of time fixed effects. The identifying assumption, in this case, relies on a common trend assumption that both treatment groups would develop equally over time under at least one of the treatments. It assumes effect homogeneity conditional on observables X_{ist}.

An alternative to adjustment by control variables would be to use propensity score matching (PSM). Recent analyses Daw and Hartfield (2018) suggest that using PSM could increase bias due to regression to the mean when treatment assignment occurs at the population level. In this context, the difference between treatment groups is stable and unmatched analysis is unbiased. Matching on the preperiod level introduces regression to the mean bias [38]. For this reason, we chose to adjust for control variables and not to use PSM.

There is an ongoing debate about DiD when groups of units receive treatment at different times or different treatment intensities.[39, 40] Researchers are concerned this fixed effect regression provides greater weights to treatments with similar before and after treatment periods and uses treated units as controls.[39] This is unlikely to affect our study, as it has only two treated groups and thus no variation in treatment timing. Nonetheless, we will use the Callaway-Sant'Anna method (CS method) in sensitivity analyses. The method was built to handle staggered treatment adoption designs.[40] To accommodate this, we will divide the analysis into two sections ($t_0$versus t_1, $t_2$and t_3) and ($t_0$versus $t_5$and t_6).

The estimation will be done using linear mixed effects models. These models take into account the correlated nature of the data (repeated measures of the same individuals) and provide mathematically equivalent estimates than fixed effects linear regression. However, an additional advantage of linear mixed effects models is that they allow to vary the number of observations within each participant, handling missing data more efficiently than other analytical approaches [41].

Statistical Software

We will use R (current version 3.6.3) for all analyses. We will use the *lme4* function to run the DiD model and the *did* package for the Callaway-Sant'Anna method.

References

1. Rehm J., Kilian C., Ferreira-Borges C., Jernigan D., Monteiro M., Parry C. D. H. et al. Alcohol use in times of the COVID 19: Implications for monitoring and policy, Drug and Alcohol Review 2020: 39: 301-304.
2. Flaxman S., Mishra S., Gandy A., Unwin H. J. T., Mellan T. A., Coupland H. et al. Estimating the effects of non-pharmaceutical interventions on COVID-19 in Europe, Nature 2020: 584: 257-261.
3. Islam N., Sharp S. J., Chowell G., Shabnam S., Kawachi I., Lacey B. et al. Physical distancing interventions and incidence of coronavirus disease 2019: natural experiment in 149 countries, BMJ 2020: 370: m2743.
4. Giovenco D. P., Spillane T. E., Maggi R. M., Lee E. Y., Philbin M. M. Multi-level drivers of tobacco use and purchasing behaviors during COVID-19 "lockdown": A qualitative study in the United States, Int J Drug Policy 2021: 94: 103175.
5. Jacob L., Smith L., Armstrong N. C., Yakkundi A., Barnett Y., Butler L. et al. Alcohol use and mental health during COVID-19 lockdown: A cross-sectional study in a sample of UK adults, Drug and alcohol dependence 2021: 219: 108488-108488.
6. Keyes K. M., Hatzenbuehler M. L., Grant B. F., Hasin D. S. Stress and alcohol: Epidemiologic evidence, Alcohol Research: Current Reviews 2012: 34: 391-400.
7. De Goeij M. C. M., Suhrcke M., Toffolutti V., Van De Mheen D., Schoenmakers T. M., Kunst A. E. How economic crises affect alcohol consumption and alcohol-related health problems: A realist systematic review, Social Science & Medicine 2015: 131: 131-146.
8. Grant M. C., Geoghegan L., Arbyn M., Mohammed Z., Mcguinness L., Clarke E. L. et al. The prevalence of symptoms in 24,410 adults infected by the novel coronavirus (SARS-CoV-2; COVID-19): A systematic review and meta-analysis of 148 studies from 9 countries, PloS one 2020: 15: e0234765-e0234765.
9. Stavem K., Ghanima W., Olsen M. K., Gilboe H. M., Einvik G. Persistent symptoms 1.5–6 months after COVID-19 in non-hospitalised subjects: a population-based cohort study, Thorax 2020: thoraxjnl-2020-216377.
10. Huang C., Huang L., Wang Y., Li X., Ren L., Gu X. et al. 6-month consequences of COVID-19 in patients discharged from hospital: a cohort study, The Lancet 2021: 397: 220-232.
11. Filby S., Van Der Zee K., Van Walbeek C. The temporary ban on tobacco sales in South Africa: lessons for endgame strategies, Tob Control 2021.
12. Matzopoulos R., Walls H., Cook S., London L. South Africa's COVID-19 Alcohol Sales Ban: The Potential for Better Policy-Making, Int J Health Policy Manag 2020.
13. Ghosh A., Choudhury S., Basu A., Mahintamani T., Sharma K., Pillai R. R. et al. Extended lockdown and India's alcohol policy: a qualitative analysis of newspaper articles, The International journal on drug policy 2020: 85: 102940-102940.
14. Singh S., Sharma P., Balhara Y. P. S. The impact of nationwide alcohol ban during the COVID-19 lockdown on alcohol use-related internet searches and behaviour in India: An infodemiology study, Drug and Alcohol Review 2021: 40: 196-200.
15. Thanthong-Knight S. Bangkok Bans Alcohol Sales in Attempt to Stop Spread of Coronavirus. Time; 2020.
16. Miglani S., Verma N. India's Delhi imposes 70% 'corona tax' on alcohol to deter large crowds. Reuters; 2020.
17. Jackson S. E., Garnett C., Shahab L., Oldham M., Brown J. Association of the COVID-19 lockdown with smoking, drinking and attempts to quit in England: an analysis of 2019-20 data, Addiction 2021: 116: 1233-1244.
18. Winkler P., Formanek T., Mlada K., Kagstrom A., Mohrova Z., Mohr P. et al. Increase in prevalence of current mental disorders in the context of COVID-19: analysis of repeated nationwide cross-sectional surveys, Epidemiology and Psychiatric Sciences 2020: 29: e173.

19. Daly M., Robinson E. High-Risk Drinking in Midlife Before Versus During the COVID-19 Crisis: Longitudinal Evidence From the United Kingdom, Am J Prev Med 2021: 60: 294-297.
20. Niedzwiedz C. L., Green M. J., Benzeval M., Campbell D., Craig P., Demou E. et al. Mental health and health behaviours before and during the initial phase of the COVID-19 lockdown: longitudinal analyses of the UK Household Longitudinal Study, J Epidemiol Community Health 2021: 75: 224-231.
21. Rossow I., Bye E. K., Moan I. S., Kilian C., Bramness J. G. Changes in Alcohol Consumption during the COVID-19 Pandemic—Small Change in Total Consumption, but Increase in Proportion of Heavy Drinkers, International Journal of Environmental Research and Public Health 2021: 18: 4231.
22. Vanderbruggen N., Matthys F., Van Laere S., Zeeuws D., Santermans L., Van Den Ameele S. et al. Self-Reported Alcohol, Tobacco, and Cannabis Use during COVID-19 Lockdown Measures: Results from a Web-Based Survey, Eur Addict Res 2020: 26: 309-315.
23. Nordeck C. D., Riehm K. E., Smail E. J., Holingue C., Kane J. C., Johnson R. M. et al. Changes in drinking days among US adults during the COVID-19 pandemic, Addiction: n/a.
24. Glowacz F., Schmits E. Psychological distress during the COVID-19 lockdown: The young adults most at risk, Psychiatry Research 2020: 293: 113486.
25. Callinan S., Smit K., Mojica-Perez Y., D'aquino S., Moore D., Kuntsche E. Shifts in alcohol consumption during the COVID-19 pandemic: early indications from Australia, Addiction 2021: 116: 1381-1388.
26. Clare P. J., Aiken A., Yuen W. S., Upton E., Kypri K., Degenhardt L. et al. Alcohol use among young Australian adults in May–June 2020 during the COVID-19 pandemic: a prospective cohort study, Addiction: n/a.
27. Bartlett L., Brady J. J. R., Farrow M., Kim S., Bindoff A., Fair H. et al. Change in modifiable dementia risk factors during COVID-19 lockdown: The experience of over 50s in Tasmania, Australia, Alzheimers Dement (N Y) 2021: 7: e12169.
28. Bar-Zeev Y., Shauly M., Lee H., Neumark Y. Changes in Smoking Behaviour and Home-Smoking Rules during the Initial COVID-19 Lockdown Period in Israel, Int J Environ Res Public Health 2021: 18.
29. Gonzalez M., Epperson A. E., Halpern-Felsher B., Halliday D. M., Song A. V. Smokers Are More Likely to Smoke More after the COVID-19 California Lockdown Order, Int J Environ Res Public Health 2021: 18.
30. Guignard R., Andler R., Quatremère G., Pasquereau A., Du Roscoät E., Arwidson P. et al. Changes in smoking and alcohol consumption during COVID-19-related lockdown: A cross-sectional study in France, Eur J Public Health 2021.
31. Dong E., Du H., Gardner L. An interactive web-based dashboard to track COVID-19 in real time, Lancet Infectious Diseases 2020: 20: 533 - 534.
32. Vandenbroucke J. P., Von Elm E., Altman D. G., Gøtzsche P. C., Mulrow C. D., Pocock S. J. et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): Explanation and Elaboration, PLoS Med 2007: 4: e297.
33. Wing C., Simon K., Bello-Gomez R. A. Designing Difference in Difference Studies: Best Practices for Public Health Policy Research, Annual Review of Public Health 2018: 39: 453-469.
34. Coleman T. Causality in the Time of Cholera: John Snow As a Prototype for Causal Inference. 2018. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3262234 (accessed March 3, 2021)
35. Angrist J., Pischke J. Mastering metrics: the path from cause to effect New Jersey, United States: Princeton University Press; 2015.
36. Hansen C. B. Generalized least squares inference in panel and multilevel models with serial correlation and fixed effects, Journal of Econometrics 2007: 140: 670-694.

37. Imbens G. W., Wooldridge J. M. Recent Developments in the Econometrics of Program Evaluation, Journal of Economic Literature 2009: 47: 5-86.
38. Daw J. R., Hatfield L. A. Matching in Difference-in-Differences: between a Rock and a Hard Place, Health Services Research 2018: 53: 4111-4117.
39. Goodman-Bacon A. Difference-in-differences with variation in treatment timing, Journal of Econometrics 2021.
40. Callaway B., Sant'anna P. H. C. Difference-in-Differences with multiple time periods, Journal of Econometrics 2020.
41. O'connell N., Dai L., Jiang Y., Speiser J., Ward R., Wei W. et al. Methods for Analysis of Pre-Post Data in Clinical Research: A Comparison of Five Common Methods, Journal of Biometrics & Biostatistics 2017: 8.

Supplementary Appendix

Table S1. Components of the step-by-step mobility restrictions for the COVID-19 pandemic in Chile during the study period

Phase	Curfew (22.00-05.00)	Lockdown	Schools	Restaurants and bars	Gyms	Public gatherings	Cinemas, theatres and similar	Closed spaces	Local mobility	Mobility permits	Older adults
Step 1	Yes	Yes	Remote education for preschool, elementary and higher schools	Closed, only take away allowed	Closed	Forbidden	Closed	Customer service restricted to no more than 1 person per 10 square meters	Passenger cruises forbidden. All buses must have a list of passengers for travelling times longer than 2 hours. Forbids travel to second residence.[1]	Allowed	Lockdown for residents in elderly care. Closure of day centers for older adults and meetings of "Clubes de Adultos Mayores"
Step 2	Yes	Yes, only Saturdays, Sundays and bank holidays	Remote education for preschool, elementary and higher schools	Open at 25% of their maximum capacity, maximum time two hours, only in open spaces	Sports activities for maximum 10 people in open spaces. Gyms closed	Public events allowed for a maximum of 10 people in a closed space and 20 people in an open space.	Closed	Customer service restricted to no more than 1 person per 10 square meters	Passenger cruises forbidden. All buses must have a list of passengers for travelling times longer than 2 hours. Forbids travel to second residence.[1]	Allowed	Lockdown for residents in elderly care. Closure of day centers for older adults and meetings of "Clubes de Adultos Mayores"

Step 3	Yes	No	Allowed after permission from Regional Secretary of Education	Open at 25% of their maximum capacity, maximum time two hours, only in open spaces	Sports activities for maximum 25 people in open spaces and 5 people in closed spaces, including gyms	"Oficios, ritos, seminarios and ceremonias" allowed for a maximum of 25 people in a closed space and 50 people in an open space.	Closed	Customer service restricted to no more than 1 person per 10 square meters	Allows travel to second place of residence	Allowed	Lockdown for residents in elderly care. Closure of day centers for older adults and meetings of "Clubes de Adultos Mayores"
Step 4	Yes	No	Allowed after permission from Regional Secretary of Education	Open at 50% of their maximum capacity	Sports activities for maximum 50 people in open spaces and 10 people in closed spaces, including gyms	"Oficios, ritos, seminarios and ceremonias" allowed for a maximum of 50 people in a closed space and 100 people in an open space.	Open at 50% of maximum capacity	Customer service restricted to no more than 1 person per 5 square meters	Allows travel to second place of residence	Allowed	Lockdown for residents in elderly care. Closure of day centers for older adults and meetings of "Clubes de Adultos Mayores"
Step 5	Yes	No	Allowed after permission from Regional Secretary of Education	Open at 75% of maximum capacity	Sports activities for maximum 100 people in open spaces and 20 people in closed spaces, including gyms	"Oficios, ritos, seminarios and ceremonias" allowed for a maximum of 100 people in a closed space and 200 people in an open space.	Open at 75% of maximum capacity	Customer service restricted to no more than 1 person per 5 square meters	Allows travel to second place of residence	Allowed	Visits to elderly care centers are allowed. Day centers for older adults open

1. Except people older than 65 years old and with chronic conditions. They are allowed to move but must remain in quarantine.
Data based on Resolución Exenta 591 from the Chilean Ministry of Health, July 23, 2020

Table S2. Mobility permits during step 1 (lockdown) in Chile during the study period

Permit	**Duration**
Appointment in a health care centre	3 hours
Shopping for essential goods (food, medications, etc)	3 hours
Going out for a person with autistic spectrum disorder or any other cognitive disability	2 hours, no weekly limit
Walking dogs and other pets, two blocks around the place of residence	30 minutes
Payment of household expenses or collecting pensions or State subsidies	3 hours
Attending funerals of direct relatives	5 hours[1]
Collecting textbooks, school food or technological devices for school purposes	5 hours
Attending a court appointment	No limit
Take food or other essential products to older adults	2 hours
Take food or other essential products to prison inmates	3 hours
Transport children or adolescents between parents or caretakers' residences	2 hours
Visits to people with disabilities that are hospitalized	3 hours
Weddings or civil unions, including a maximum of 5 companions	4 hours
Donate blood	4 hours
Taking care of older adults and people with disabilities	No limit
Other important and urgent matters authorized in person by the Chilean Police Force	Depend

1. If the funeral is in the same region, 24 hours if it's in a different region than the one of residence