The impact of containment policy and mobility on COVID-19 cases through structural equation model in Chile, Singapore, South Korea and Israel

jun jiao [1, 2], **Leiyu Shi** [3], **Manfei Yang** [1], **Junyan Yang** [1], **Meiheng Liu** [1], **Gang Sun** [Corresp. 1, 3]

[1] Southern Medical University, Guangzhou, Guangdong, China

[2] School of Sociology and Population Studies, Renmin University of China, Beijing, China

[3] The Johns Hopkins University, Baltimore, United States

Corresponding Author: Gang Sun
Email address: sunhoney163@163.com

Objectives: The study aims to understand the impact of containment policy and mobility on COVID-19 cases in Chile, Singapore, South Korea and Israel. To provide experience in epidemic prevention and control. **Methods:** Structural equation modeling (SEM) of Containment policies, mobility, and COVID-19 cases were used to test and analyze the proposed hypotheses. **Results:** Chile, Israel and Singapore adopted containment strategies, focusing on closure measures. South Korea adopted a mitigation strategy with fewer closure measures, focusing on vaccination and severe case management. There was a significant negative relationship among Containment policies, mobility, and COVID-19 cases. **Conclusion:** To control the COVID-19 and slow down the increase of COVID-19 cases, countries can increase the stringency of containment policies when COVID-19 epidemic is more severe. Thus, countries can take measures from the following three aspects: strengthen the risk monitoring, and keep abreast of the COVID-19 risk; adjust closure measures in time and reduce mobility; and strengthen public education on COVID-19 prevention to motivate citizen to consciously adhere to preventive measures.

1 **The impact of containment policy and mobility on COVID-19 cases through structural**

2 **equation model in Chile, Singapore, South Korea and Israel**

4 *Authors: Jun Jiao[1,2], Leiyu Shi[3], Manfei Yang[1], Junyan Yang[1], Meiheng Liu[1], Gang Sun[1,3,*]*

6 1 Department of Health Management, School of Health Management, Southern Medical

7 University, Guangzhou, Guangdong, China

8 2 School of Sociology and Population Studies, Renmin University of China, Beijing, China

9 3 Department of Health Policy and Management, Bloomberg School of Public Health, Johns

10 Hopkins University, Baltimore, Maryland, USA

12 **Corresponding Author: Gang Sun[1,3]*

13 [1] Department of Health Management, School of Health Management, Southern Medical

14 University, Guangzhou, Guangdong, 510515, China

15 [3] Department of Health Policy and Management, Bloomberg School of Public Health, Johns

16 Hopkins University, Baltimore, MD, 21205, USA.

18 *Email address:*

19 sunhoney163@163.com

20 gsun15@jhu.edu

Abstract

Objectives: The study aims to understand the impact of containment policy and mobility on COVID-19 cases in Chile, Singapore, South Korea and Israel. To provide experience in epidemic prevention and control.

Methods: Structural equation modeling (SEM) of Containment policies, mobility, and COVID-19 cases were used to test and analyze the proposed hypotheses.

Results: Chile, Israel and Singapore adopted containment strategies, focusing on closure measures. South Korea adopted a mitigation strategy with fewer closure measures, focusing on vaccination and severe case management. There was a significant negative relationship among Containment policies, mobility, and COVID-19 cases.

Conclusion: To control the COVID-19 and slow down the increase of COVID-19 cases, countries can increase the stringency of containment policies when COVID-19 epidemic is more severe. Thus, countries can take measures from the following three aspects: strengthen the risk monitoring, and keep abreast of the COVID-19 risk; adjust closure measures in time and reduce mobility; and strengthen public education on COVID-19 prevention to motivate citizen to consciously adhere to preventive measures.

Keywords: COVID-19, structural equation modeling, mobility, Containment policies

1 Introduction

COVID-19 still negatively affects normal life. WHO recommends a containment strategy in the first stage of a pandemic, especially by actively tracing and isolating close contacts to prevent their transformation into a chain of transmission, to stop as much transmission as possible, and eventually make the pandemic disappear. As of May 1, 2022, there were 513,52,166 confirmed cases and 6,261,385 deaths worldwide(CDC, 2020).

Chile, Israel, Singapore and South Korea are taking different measures to deal with COVID-19. Chile is a model country in the fight against COVID-19, making full use of big data to aid government decision-making, and of the highest vaccination rates in the world Singapore adopted strict border containment measures in the early stage and initiated a graded diagnosis and treatment policy(Wang et al., 2021b). Singapore used lockdown measures to isolate migrant workers on April 7, 2020(Chen et al., 2021b). South Korea, in the early stages of COVID-19, implemented a containment strategy, escalated public alert levels, and entry control procedures. In response to

57 cluster outbreaks, South Korea implemented a strict lockdown and 14-day quarantine(Chen et al.,

58 2021a). On April 30, 2022, 330,000 per million people in South Korea had been infected(Mathieu

59 et al., 2020). Israel is a superior student of vaccination, being the first country to fully vaccinate,

60 the first to administer vaccine booster shots and the first to prescribe the fourth dose of

61 vaccine(Andrews et al., 2022; Regev-Yochay et al., 2022). During the omicron period, Israel was

62 the first country who declared lockdown("Government extends tourist entry ban for additional

63 week"). But on March 1, 2022, it lifted most of the restrictions on COVID-19, including the

64 "gathering restriction"("Changes to the Green Pass Policy"). All four of these countries have

65 adopted containment policies to some extent in response to COVID-19. At present, there are more

66 descriptive articles on national policies, and more policy summaries on countries with better

67 epidemic control, such as Vietnam and China, and countries with the highest number of confirmed

68 cases, such as the United States, India and Brazil(Tran et al., 2020; Le et al., 2021; Ha et al., 2021).

69 In contrast, quantitative studies on containment policies are limited, with only work modeling the

70 effect of social distancing on containment of COVID-19 transmission.

71 Structural equation model (SEM) is a method to establish, estimate and test the causality model,

72 which can analyze the effect of individual indicators on the whole and the interrelationship

73 between individual indicators(Efron, 2000). In this study, the SEM of containment policies,

74 mobility, and COVID-19 cases was constructed to test and analyze the proposed hypotheses.

75 Specifically, we try to answer one important research question: whether changes in Containment

76 policies could impact COVID-19 cases.

77

78 **2 Research Framework**

79 Containment policies for COVID-19 were first implemented in Wuhan, China on January 23,

80 2020. These policies are collectively known as the Wuhan City containment policy and include

81 home quarantine, strict exit screening measures closure, a shutdown of public transportation, a ban

82 on leaving Wuhan, and other containment policies(Caristia et al., 2020; Kumar, Priya &

83 Srivastava, 2021). Scholars have used a variety of statistical methods and models to analyze the

84 effects of certain periods and geographic closure measures. In studies of early stages of COVID-

85 19, it was shown that conducting a social restriction policy and limiting social distance was

86 effective in reducing COVID-19 cases(Chu et al., 2020; McGrail et al., 2020). Vincenzo Alfano's

87 research estimated the impact of lockdown via feasible generalized least squares fixed effect. Their

88   results show that lockdown is effective in reducing the number of new cases, and it can keep 20

89   days(Alfano & Ercolano, 2020). Hien Lau et al. 's study focused on the lockdown period in Wuhan,

90   during which the increase rate of cases decreased(Lau et al., 2020). These studies suggest that

91   social distancing and lockdowns are effective in reducing COVID-19 cases. However, containment

92   policies also received some different results. Billy J Quilty found that airport screening is unlikely

93   to detect a sufficient proportion of 2019-nCoV infected travelers(Quilty et al., 2020). In addition,

94   some scholars believe that containment policies are not sustainable policies, and long-term use

95   would seriously affect the economy and normal production and life order(Kumar, Priya &

96   Srivastava, 2021). Studies have found that airport screening has had a modest impact on reducing

97   COVID-19 cases, and some containment policies may not be sustainable. What are the effects of

98   containment policies in the face of the long-term epidemic and constant variation of COVID-19?

99   Thus, it was hypothesized that:

100   ***H1: Containment measures are negatively correlated with COVID-19 cases***

101   Mobility is the public's response to the containment policies and the severity of the containment

102   policies. Data of Google Mobility can effectively reflect the implementation of containment

103   policies(Balcan et al., 2009; Charu et al., 2017; Fang, Wang & Yang, 2020; Guo, Deng & Gu,

104   2021). Many countries use movement restrictions as part of epidemic response(Charu et al., 2017).

105   Jose Maria Martin Moreno et al. studied the relationship among vaccinations, mobility, and

106   COVID-19 transmission. The study highlights the significance of mobility in realizing the

107   effectiveness of COVID-19 vaccines(Guo, Deng & Gu, 2021). Chenjing Fan's study believed that

108   migration may be the primary reason for the long-distance transmission of the disease, and

109   proposed containment policies(Fan et al., 2020). The level of containment measures varies from

110   country and period, with mandatory containment measures restricting access to people. And

111   population movements may be exacerbated when containment policies are not in place or when

112   there is a panic effect on the population about the virus(Huang et al., 2020; Fang, Wang & Yang,

113   2020; Jiao et al., 2022a). In this paper, we study whether containment policies are related to

114   mobility and how containment policies affect mobility. Thus, the following was hypothesized:

115   ***H2: Containment policies are negatively correlated with Mobility***

116   In infectious diseases, mobility is strongly correlated with epidemic transmission(Viboud et al.,

117   2006; Balcan et al., 2009). When people move, they take contagious diseases with them and spread

118   them. And since COVID-19 is spread through respiratory droplets and indirect contact, the

119 reduction of mobility and contact reduction can reduce the effective reproduction rate (R_t) and

120 control the disease epidemic. The achievement of $R_t<1$ is necessary to stop the spread of infectious

121 diseases(Yang et al., 2020; Noland, 2021). In most studies, mobility is mostly used as a moderating

122 variable(Quilty et al., 2020; Alfano & Ercolano, 2020; Guo, Deng & Gu, 2021). Through

123 modeling, Jayson S. Jia et al. found that mobility had a greater impact on COVID-19 spread in

124 Hubei province, but a weaker impact outside Hubei Province(Jia et al., 2020). In addition, mobility

125 is considered to be an important factor leading to long-distance infection and prone to cluster

126 outbreaks, which is also an important factor to be paid attention to in the long-term response to

127 COVID-19(Chen et al., 2020; Chinazzi et al., 2020). Thus, the following was hypothesized:

128 ***H3: Mobility is positively correlated with COVID-19 cases***

129 Figure 1 represents the research framework of this study. The novelty of this study is not only the

130 systematic analysis of COVID-19 Containment policies, but also conducted an empirical study on

131 the relationship among containment policies, mobility, and COVID-19 cases by constructing SEM

132

133 Figure 1 Research framework

134

135 **3 Methods**

136 **3.1 Variables and Sources**

137 There are 3 parts of data in the study including containment policies, mobility, and COVID-19

138 cases in Chile, Singapore, South Korea and Israel.

139 Data on containment policies from Oxford COVID-19 Government Response Tracker

140 (https://github.com/OxCGRT/covid-policy-tracker). All containment policies were used including

141 8 categories: school closing, workplace closing, cancel public events, restrictions on gathering

142 size, closed public transport, stay-at-home requirement, restrictions on internal movement, and

143 international travel controls and assigns a value of 0-5 according to their severity.

144 These Community Mobility Reports aimed to provide insights into what changed in response to

145 policies aimed at combating COVID-19. The mobility data at the country level wais collected from

146 Community Mobility Reports provided by Google(https://ourworldindata.org/covid-google-

147 mobility-trends), which uses anonymized data provided by apps such as Google Maps, the

148 company has produced a regularly updated dataset that shows how peoples' movements have

149 changed throughout the pandemic. And reports population mobility data for 6 locations: retail and

150 recreation, grocery and pharmacy, residential, transit stations, parks, and workplaces. In this work,

151 we consider all place categories provided, and mobility has changed compared to baseline days

152 (the median value for the 5 weeks from January 3 to February 6, 2020), and we collected 730

153 population mobility data for every four countries.

154 Data on COVID-19 cases are from Our World in Data (https://ourworldindata.org/coronavirus).

155 Thus, we collected data on containment policies, mobility, and COVID-19 cases in Chile,

156 Singapore, South Korea and Israel from May 1, 2020, to April 30, 2022. Then, we took a set of

157 data every six days. In the end, a total of 488 sets of data were obtained.

158

159 **3.2 Structural Equation Modeling**

160 SEM was used to measure the causal relationships between latent variable constructs. It was run

161 by using AMOS 24. This study considered using SEM in constructing a model of the impact of

162 Containment policies – Mobility - COVID-19 cases.

163 Firstly, according to the relevant theories and literature, the theoretical hypothesis and model of

164 containment policies - mobility - COVID-19 cases in the COVID-19 were initially constructed.

165 Secondly, we analyzed the data and carried out empirical research to analyze and verify the

166 theoretical model and research hypothesis. Finally, the containment policies - mobility - COVID-

167 19 cases are concluded.

168

169 **4 Results**

170 **4.1 National trend of COVID-19 pandemic**

171 In this part, this study describes the trends of containment policies, mobility and COVID-19 cases,

172 which can quickly discover the point and degree of change based on time and clearly understand

173 the differences in the four countries.

174 As shown in Figure 2, overall, Trends of containment policies in four countries show an overall

175 decline and phase fluctuations, which is generally consistent with the timing of SARS-CoV-2

176 variants in countries. And the total data in Chile is higher than in three other countries, especially

177 in the early period of COVID-19. Chile closed public places and workplaces for a long time,

178 canceling events, limiting transportation, keep closing schools until sanitary conditions allow a

179 gradual return. Singapore's trend is relatively smooth. The changes in containment policies are

180 small and return to the original state after a phased increase. Workplace closing and international

181   travel controls overall remained generally unchanged. In the beginning, South Korea's containment
182   policies were at a low level, and only school closing and international travel control measures were
183   taken. And public transport has never been shut down. South Korea only retained international
184   travel controls after April 18, 2022. Israel's trend fluctuates greatly, showing a trend of rapid rise
185   and fall. The policy changes come from three policy changes: cancel public events, stay at home
186   requirements, and internal mobility restrictions.

187   As shown in Figure 3, T1 to T6 are mobility data of places in retail and recreation, grocery and
188   pharmacy, residential, transit stations, parks, and workplaces. For T1-retail and recreation, most
189   of the time, all four countries were below the baseline, showing an overall upward trend. But Chile
190   in December 2021 and South Korea in June and December 2021 are above the baseline. For T2-
191   grocery and pharmacy, there are many differences among four countries. For T3-residential, Chile,
192   Singapore and the early period of Israel were higher than baseline, and in others has no obvious
193   change compared with baseline. For T4-transit stations, others are below the baseline, except for
194   Chile which is above the baseline after October 2021. For T5-parks, there are two trends. In Chile
195   and Singapore, the trend of T5 is lower than baseline. However, in South Korea and Israel, trends
196   are wild fluctuation and great higher than baseline, especially in South Korea. And the trend of
197   T6-workplaces is similar to T4.

198   As shown in Figure 4, the rank of total cases in South Korea, Israel, Chile, and Singapore. For total
199   cases per million people, Chile is 185,226.106 cases per million people, Singapore is 218,800.43
200   cases per million people, South Korea is 336,723.26 cases per million people, Israel is 438,715.32
201   cases per million people.

202
203   Figure 2 Trend of containment policies
204
205

206   Figure 3 Trend of mobility in Chile, Singapore, South Korea, and Israel (compared to baseline
207   days -the median value for the 5 weeks from January 3 to February 6, 2020)
208

209   Figure 4 Total cases of COVID-19
210

211   **4.2 Structural Equation Modeling**

212   SEM is a method of latent variable analysis that offers a high degree of flexibility in terms of
213   modeling methods for applied research questions(Hall & Clark, 2023). SEM was used to research

214 to understand the complex relationship of containment policies, mobility and COVID-19 related

215 factors and to assist in formulating effective containment policies to promote policy and practice.

216 In this study, the Person correlation analysis was used to examine the relationship between latent

217 variables used within the research scope, and the results were presented in Table 1. A significant

218 correlation was observed among the three (P<0.001). There was a negative correlation between

219 containment policies and mobility (r = -0.662, P=0.00<0.001) and cumulative COVID-19 cases (r

220 = -0.276, P=0.00<0.001). There was a positive correlation between mobility and COVID-19 cases

221 (r = 0.176, P=0.00<0.001). The two variables that were found to have a higher relationship level

222 than other variables in the study were containment policies related to mobility. The relationship

223 between these two variables was seen to be a positive correlation and moderate correlation (r = -

224 0.662, P=0.00<0.001). Furthermore, the weakest positive relationship between the variables was

225 found between mobility and cumulative COVID-19 cases (r = 0.176, P=0.00<0.001).

226

227   Table 1 Correlation values between scales.

228
229 And then, the initial SEM is tested. As shown in Figure 5, the results ($\chi2$/SD=24.76, GFI=064,

230 AGFI=0.53, NFI=0.64, RMSEA=0.22, CFI=0.65) did not meet the standard and the model should

231 be corrected.

232

233   Figure 5 Initial SEM model in this study
234

235 In correcting the SEM, we tested the measurement models. After model modification, mobility

236 and COVID-19 cases retained 3 factors respectively, which was exact identification, while

237 containment policies retained 4 factors, which showed excellent fitting levels (χ^2/SD=1.78,

238 GFI=0.99, AGFI=0.98, NFI=0.99, RMSEA=0.04, CFI=0.99)(Iacobucci, 2010).

239 In this stage, the impact of containment policies, mobility, and cumulative COVID-19 cases was

240 investigated through SEM. Whether or not the measurement models were validated was then

241 analyzed with Chi-square , χ^2/SD, GFI, AGFI, NFI, RMSEA, and CFI fit indices.

242 In the testing of the final model, the paths between the variables and the model were found to be

243 significant at the 0.001 level. The fit indices of the hypothetical model were calculated as $\chi2$/SD =

244 9.26. Moreover, it was determined to have acceptable values of GFI = 0.91, AGFI = 0.84, NFI =

245 0.92, RMSEA = 0.13, and CFI = 0.93. These values reveal that the fit indices of the model can be

246 considered both good and within the acceptable range. The final SEM model is presented in Figure
247 6.

248

249 Figure 6 Final SEM model in this study

250

251 Moreover, Table 2 presents the variance values, standard error, P, and standardized regression
252 coefficients explained in the model regarding direct affection. After correction, all paths pass the
253 significance test.

254

255 Table 2 Revised model path analysis results

256

257 The standardized regression coefficient between containment policies and mobility was found to
258 be -0.84. This value indicates that there is a negative correlation between them. Moreover,
259 containment policies are a strong influence factor on mobility. This result confirms the first
260 hypothesis of the study (H1: Containment measures are negatively correlated with COVID-19
261 cases). The standardized regression coefficient between mobility and COVID-19 cases was found
262 to be -0.29, which is a weak negative correlation. In other words, the regression weight for mobility
263 in the prediction of COVID-19 cases is at the 0.01 level. This result is inconsistent with the third
264 hypothesis of the study (H3: Mobility is positively correlated with COVID-19 cases). The
265 standardized regression coefficient between containment policies and COVID-19 cases was found
266 to be -0.45. This result indicated that there was a moderate negative correlation between
267 containment policies and COVID-19 cases found. This result confirms the second hypothesis of
268 the study (H2: Containment policies are negatively correlated with Mobility).

269

270 **5 Discussion**

271 This study investigated the containment policies, mobility, and COVID-19 cases in Chile,
272 Singapore, South Korea and Israel in response to COVID-19, to provide experience and lessons
273 learned for studying the impact of containment policies on mobility and COVID-19, and for better
274 response to COVID-19. Chile, Israel and Singapore adopted containment strategies, which aim to
275 prevent spread of infections and prefer social intervention measures to block epidemics spread(Jiao
276 et al., 2022b). Chile strictly managed population management and border closures. Israel focused
277 on entry control, and Singapore adopted a regular blockade. In contrast, South Korea adopted a

278   mitigation strategy, which aims to reduce the pandemic impact. And it consistently refrained from

279   a large-scale closure policy and focused on vaccines and severe cases.

280   In addition, SEM of containment policies, mobility, and COVID-19 cases was used to test and

281   analyze the proposed hypotheses. In COVID-19, containment policies, mobility, and COVID-19

282   cases were significantly and negatively related to each other. This paper discusses the three

283   previously proposed hypotheses and provides targeted recommendations for responding to

284   COVID-19.

285   **5.1 National Containment policies, mobility, and COVID-19 cases**

286   In response to COVID-19, four countries have adopted different containment policies. As the

287   Community Mobility Reports write on their home page: these Community Mobility Reports aimed

288   to provide insights into what mobility changed in response to policies aimed at combating COVID-

289   19. COVID-19 spreads between humans through respiratory droplets produced when an infected

290   person coughs or sneezes(Pathania et al., 2021). Population concentrations speed up COVID-19

291   spreading and are leading to more cases. Mobility reflects the extent to which people are

292   implementing policies and is reflected in COVID-19 case data. In this study, Chile, Israel and

293   Singapore adopted containment strategies, focusing on the effect of lockdown measures and social

294   restriction policies, which used lockdown to block epidemic spread. South Korea has adopted a

295   mitigation strategy that focuses less on lockdown and more on vaccination and severe case

296   management.

297   In the early stages of COVID-19, Chile attached importance to containment policies and focused

298   on population management and border closing. At the height of the COVID-19 epidemic, home

299   quarantine was mandatory when Chile announced into "national disaster- a state of the nation in

300   difficult times". In the global push for vaccination, Chile has seized the opportunity to accelerate

301   vaccination far faster than any other country in the Americas(Castillo, Villalobos Dintrans &

302   Maddaleno, 2021; "WHO Coronavirus (COVID-19) Dashboard"). However, since Chile began

303   mass vaccination in February 2021, mobility and COVID-19 cases have increased. For these

304   reasons, some academics suggested that the rapid and effective vaccination campaign gave the

305   Chilean government and people a false sense of security, lifting closure measures too early and

306   causing too many people to traveling(N, P & R, 2021; Taylor, 2021).

307   Like Chile, Israel is a vaccination star(Andrews et al., 2022). Israel is very sensitive to the use of

308   containment policies, that is, policies are very variable and change with COVID-19. Israel has also

309   seen the biggest change in blockade policy among the four countries. Among the containment

310   policies, Israel has focused on entry control measures. Since Israel is a small country, most arrivals

311   go through its only international airport, making entry control measures easier to

312   implement(Goldberg et al., 2021). Due to the rapid change of containment policies, Israel used

313   Traffic Light Model to show the epidemic level in the region, so that the public could learn about

314   it in time. The index of Traffic Light Model is updated once every two weeks. The index is

315   calculated by weighing the number of new cases, the percentage of positive test results, and

316   infection rate. There are four scales, green, yellow, orange and red, with the strict rising in that

317   order("Local Councils Traffic Light Model").

318   However, the Israel epidemic began to increase rapidly in 2022. On March 1, 2022, Israel

319   announced the full opening of its borders, leading to an increase in COVID-19 cases. "After more

320   than two years of COVID-19, it is time to return to a more normal reality - living with this virus

321   and taking the appropriate steps to protect public health." Israeli Prime Minister Bennett said in a

322   statement that according to "all the data, the epidemic is steadily declining.("'Time has come to

323   return to normal reality, to live with the virus' | ערוץ 7")"

324   Singapore responded quickly in early stages of COVID-19, and focused on containment policies,

325   preventing imported cases through a strict border policy(Tan et al., 2021). All these restricting

326   policies curb mobility. After the outbreak phase, Singapore's containment policies were basically

327   unchanged. Trend of containment policies is much lower than those of the other three countries.

328   Their mobility is largely below the baseline, except for residential. Why Singapore containment

329   policies have not changed much compared to the other countries? Because even though Singapore

330   does not implement strict containment policies, mobility did not surge rapidly but steadily and

331   slowly increased. This is closely related to the awareness of health education and a clear

332   understanding of COVID-19 in Singapore. For Singapore, it's appropriate to the regular lockdown

333   measures(Wang et al., 2021b).

334   South Korea implemented a mitigation strategy in response to COVID-19. There was not any

335   large-scale lockdown in South Korea. For containment policies, South Korea mainly maintained

336   school closing and international travel controls. In the early stages of COVID-19, South Korea

337   launched a massive campaign to raise public awareness; through extensive and rapid testing; only

338   severe cases admitted and kept a low-level COVID-19 cases. The turning point of COVID-19 in

339   South Korea came in 2022. The omicron epidemic came as South Korea relaxed quarantine

340 measures, easing border controls and pushing home quarantine policies. Polls in South Korea show
341 that –majority support easing them, and there were gatherings for people infected with COVID-
342 19. South Korea was facing multiple pressures such as a severe shortage of medical resources,
343 public response and an economic downturn. In this case, South Korea has further eased
344 containment policies, and the daily COVID-19 cases became the highest in the world.
345

346 **5.2 SEM model of Containment policies, mobility, and COVID-19 cases**
347 Through the testing and revision of the model, the study found that there was a significant negative
348 relationship among containment policies, mobility, and COVID-19 cases. In addition, the model
349 shows that mobility and COVID-19 cases contradict the hypothesis.
350 The results of the final SEM model are explained here. In the final SEM model, containment
351 policies retain school closing, workplace closing, close public transport, and stay-at-home
352 requirement: all of the four factors are policies to limit outgoings. In mobility, the three factors of
353 the data of retail and recreation, grocery and pharmacy, and parks were retained, showing different
354 trends in the four countries. COVID-19 cases retain the three factors of total cases, new cases, and
355 new cases per million people, which not only retain the overall case indicators but also pay
356 attention to changing trends and national population data.
357

358 **Containment policies and COVID-19 cases**
359 The results of this study point out that, there is a strong negative correlation between containment
360 policies and COVID-19 cases. That is, COVID-19 cases decrease as the severity of containment
361 policies increases. In response to the sudden COVID-19, many countries began to implement travel
362 restrictions and border prevention and control policies, which are also effective ways to reduce
363 COVID-19 cases entering the country(Quilty et al., 2020; Pham et al., 2021). Among containment
364 policies included in the final model, the effect of the stay-at-home requirement (C6) on
365 containment policies was the most significant, with factor loading reaching 0.93 under
366 normalization.
367 The stay-at-home requirement policy includes curfew, home isolation, banned for unessential
368 activities, etc., which is also the most changed policy among containment policies of the four
369 countries. Its audience is all citizens, which is also one of the important policies that require whole
370 citizen, such as India's time-limited curfews, and China's silent management(Paital, Das & Parida,

371 2020; Wang et al., 2021a). The school closing, workplace closing and close public transport
372 policies are all closed policies targeted at specific regions, which only as temporary measures to
373 reduce virus transmission from confined spaces. However, COVID-19 is still in a long-term trend,
374 and prolonged containment policies harm social and economic development(Atim et al., 2021).
375 Even so, we cannot deny the effect of containment policies on controlling COVID-19. Under such
376 circumstances, the country should take appropriate containment policies following the trend of
377 COVID-19, and implement relaxed containment policies that are easy to implement when COVID-
378 19 enters into the normal period, so that COVID-19 prevention and control and economic
379 development should be carried out simultaneously. This requires real-time monitoring and analysis
380 of COVID-19 situation at home and abroad, and timely adjustment of the severity of policies.

381

382 **Containment policies and mobility**

383 There is a moderate negative correlation between containment policies and mobility, that is,
384 mobility decreases with the increase in the severity of containment policies. Meanwhile,
385 containment policies are useful in government response to COVID-19 and people are highly
386 compliant. In the early stage of COVID-19, when the pathogenicity, transmission, mortality, and
387 characteristics of virus are not clear, there was a certain fear of COVID-19, and people tended to
388 obey the policy and reduce mobility. And the poor are more vulnerable to COVID-19(Papageorge
389 et al., 2021; Wang et al., 2021c). In addition, migration may be the primary reason for the long-
390 distance transmission of the disease(Fan et al., 2020). Mobility reflects the influence of the stay-
391 at-home requirement policy through T3-Residential. The residential mobility in Chile and
392 Singapore are both above the baseline, which shows that they implement strict stay-at-home
393 requirement policies.

394 Strong containment policies can effectively reduce mobility. Research by Matan Yechezkel also
395 points out that in Israel closure policies have had a marked effect on mobility, especially the
396 elderly(Yechezkel et al., 2021). And people's perceptions of epidemic risk also play a role in their
397 response behavior. The more people perceive a higher epidemic risk, the more they tend to take
398 protective measures. When some countries began to downplay COVID-19 in 2021, reduce the
399 stringency of containment policies, and accelerate the resumption of work and production, the
400 population's perception of the epidemic risk began to shift. Response behaviors showed by
401 mobility have also changed, as evidenced by increased mobility in public places. And also, a long-

402 term containment policy would generate a backlash(Famiglietti & Leibovici, 2022; Reis et al.,
403 2022). The government should strictly review the publicity of COVID-19 and policies, and
404 enhance public education, which enable the citizen to consciously implement the containment
405 policy and reduce mobility[5].

406

Mobility and COVID-19 cases

408 There was a weak negative correlation between mobility and COVID-19 cases, that is the number
409 of COVID-19 cases decreased with increased mobility. This is contrary to our hypothesis H3. Yun
410 Li's study suggests that mobility may not always directly affect COVID-19 trends(Li et al., 2021).
411 For this reason, this study identifies a significant change in mobility of some countries after 2021.
412 In South Korea and Israel, park mobility figures remain high and much higher than at-home
413 mobility. Stepping into the omicron epidemic, the proportion of asymptomatic infections
414 increases, and combined with the immune escape nature of the omicron variant, it is difficult to
415 detect the virus with a single nucleic acid test(Kannan, Shaik Syed Ali & Sheeza, 2021; Bruel et
416 al., 2022). The population perceives itself to be asymptomatic and delays or even does not seek
417 medical care, which may lack case data but is exacerbated by population mobility. In addition, in
418 the person correlation test, mobility and COVID-19 cases were positively correlated. In the person
419 correlation, the data on mobility included data from public places and also from residential;
420 however, the SEM screened 3 factors. We believe this may be the reason for the contradictory
421 paths of person correlation and the SEM.

422 In this study, SEM was used to quantitatively analyze containment policies, mobility and COVID-
423 19 cases in four countries, Chile, Singapore, South Korea and Israel. The changes during Omicron
424 are clearly explained and analyzed. However, there are still some deficiencies in this study. As
425 COVID-19 is changing all the time, containment policies and population mobility during omicron
426 were affected before, so the description of this part is insufficient. Another limitation is
427 containment policies in the study present different characteristics in transmission speed and
428 variations in pathogenicity were poorly considered. In future research, we will pay more attention
429 to the policy evolution and influencing factors.

430

6 Conclusion

432 The study used the SEM to analyze the impact of containment policy and mobility on COVID-19

433 cases in Chile, Singapore, South Korea and Israel. Chile, Israel and Singapore adopted containment

434 strategies, focusing on the effect of containment policies. South Korea adopted a mitigation

435 strategy that focuses less on containment policies and more on vaccination and severe case

436 management. In COVID-19, there is a significant negative relationship among containment

437 policies, mobility, and COVID-19 cases.

438 This study was conducted for controlling COVID-19 and slow down the increase of COVID-19

439 cases, countries can increase the stringency of containment policies when COVID-19 epidemic is

440 more severe. Thus, countries can take measures from the following three aspects: firstly,

441 strengthen the risk monitoring, such as establishing an international epidemic surveillance

442 network; secondly, keep abreast of the COVID-19 risk, adjust closure measures in time and reduce

443 mobility, which can do this by setting up decision trees; thirdly, strengthen public education on

444 COVID-19 prevention to motivate citizen to consciously adhere to preventive measures by social

445 speeches and television advertisements. These policies are fundamental to the management of

446 COVID-19. Management of containment policies, mobility reduction and prediction are needed to

447 address similar future challenges.

448

449 ***Ethics of Approval and Consent to Participate:*** This study did not involve ethical issues.

450 ***Patient and Public Involvement statement:*** No patient and public were involved in this analysis.

451 ***Consent for Publication:*** Not applicable.

452 ***Availability of data and material:*** The datasets analyzed during the current study are available in

453 Oxford COVID-19 Government Response Tracker (https://github.com/OxCGRT/covid-policy-

454 tracker), Google (https://ourworldindata.org/covid-google-mobility-trends), Our World in Data

455 (https://ourworldindata.org/coronavirus).

456 ***Competing Interests:*** The authors have no conflicts of interest to declare.

457 ***Funding:*** The authors gratefully acknowledge the financial supports by the Natural Science

458 Foundation of Guangdong Province in 2022: Construction and application of COVID-19 control

459 model PSR-SOR-Haddon in Guangdong Province (No. 2022A1515011112).

460 ***Authorship contributions:*** JJ and GS conceived the paper. MY, JY, and ML collected the data. JJ

461 drafted the manuscript. LS and MY revised the manuscript. GS contributed to the critical revision

462 of the manuscript for important intellectual content and approved the final version of the

463 manuscript. All authors have read and approved the final manuscript. JJ and GS are the study

464   guarantors.

465

466   **Reference**

467   Alfano V, Ercolano S. 2020. The Efficacy of Lockdown Against COVID-19: A Cross-Country Panel Analysis.

468   *Applied Health Economics and Health Policy* 18:509–517. DOI: 10.1007/s40258-020-00596-3.

469   Andrews N, Stowe J, Kirsebom F, Toffa S, Rickeard T, Gallagher E, Gower C, Kall M, Groves N, O'Connell

470   A-M, Simons D, Blomquist PB, Zaidi A, Nash S, Iwani Binti Abdul Aziz N, Thelwall S, Dabrera G,

471   Myers R, Amirthalingam G, Gharbia S, Barrett JC, Elson R, Ladhani SN, Ferguson N, Zambon M,

472   Campbell CNJ, Brown K, Hopkins S, Chand M, Ramsay M, Lopez Bernal J. 2022. Covid-19 Vaccine

473   Effectiveness against the Omicron (B.1.1.529) Variant. *The New England Journal of Medicine*. DOI:

474   10.1056/NEJMoa2119451.

475   Atim MG, Kajogoo VD, Amare D, Said B, Geleta M, Muchie Y, Tesfahunei HA, Assefa DG, Manyazewal T.

476   2021. COVID-19 and Health Sector Development Plans in Africa: The Impact on Maternal and Child

477   Health Outcomes in Uganda. *Risk Management and Healthcare Policy* 14:4353–4360. DOI:

478   10.2147/RMHP.S328004.

479   Balcan D, Colizza V, Gonçalves B, Hu H, Ramasco JJ, Vespignani A. 2009. Multiscale mobility networks and

480   the spatial spreading of infectious diseases. *Proceedings of the National Academy of Sciences*

481   106:21484–21489. DOI: 10.1073/pnas.0906910106.

482   Bruel T, Hadjadj J, Maes P, Planas D, Seve A, Staropoli I, Guivel-Benhassine F, Porrot F, Bolland W-H, Nguyen

483   Y, Casadevall M, Charre C, Péré H, Veyer D, Prot M, Baidaliuk A, Cuypers L, Planchais C, Mouquet

484   H, Baele G, Mouthon L, Hocqueloux L, Simon-Loriere E, André E, Terrier B, Prazuck T, Schwartz O.

485   2022. Serum neutralization of SARS-CoV-2 Omicron sublineages BA.1 and BA.2 in patients receiving

486   monoclonal antibodies. *Nature Medicine*. DOI: 10.1038/s41591-022-01792-5.

487   Caristia S, Ferranti M, Skrami E, Raffetti E, Pierannunzio D, Palladino R, Carle F, Saracci R, Badaloni C,

488   Barone-Adesi F, Belleudi V, Ancona C, AIE working group on the evaluation of the effectiveness of

489   lockdowns. 2020. Effect of national and local lockdowns on the control of COVID-19 pandemic: a rapid

490   review. *Epidemiologia E Prevenzione* 44:60–68. DOI: 10.19191/EP20.5-6.S2.104.

491   Castillo C, Villalobos Dintrans P, Maddaleno M. 2021. The successful COVID-19 vaccine rollout in Chile:

492   Factors and challenges. *Vaccine: X* 9:100114. DOI: 10.1016/j.jvacx.2021.100114.

493   CDC. 2020. COVID Data Tracker. *Available at https://covid.cdc.gov/covid-data-tracker* (accessed April 25,

494   2023).

495   Changes to the Green Pass Policy. *Available at https://www.gov.il/en/Departments/news/04022022-02* (accessed

496   April 25, 2023).

497   Charu V, Zeger S, Gog J, Bjørnstad ON, Kissler S, Simonsen L, Grenfell BT, Viboud C. 2017. Human mobility

498   and the spatial transmission of influenza in the United States. *PLoS Computational Biology*

499   13:e1005382. DOI: 10.1371/journal.pcbi.1005382.

500   Chen H, Shi L, Zhang Y, Wang X, Sun G. 2021a. Policy Disparities in Response to COVID-19 between China

501   and South Korea: *Journal of Epidemiology and Global Health* 11:246. DOI:

502   10.2991/jegh.k.210322.001.

503   Chen H, Shi L, Zhang Y, Wang X, Sun G. 2021b. A cross-country core strategy comparison in China, Japan,

504   Singapore and South Korea during the early COVID-19 pandemic. *Globalization and Health* 17:22.

505   DOI: 10.1186/s12992-021-00672-w.

506   Chen S, Yang J, Yang W, Wang C, Bärnighausen T. 2020. COVID-19 control in China during mass population

507   movements at New Year. *Lancet (London, England)* 395:764–766. DOI: 10.1016/S0140-

508   6736(20)30421-9.

509   Chinazzi M, Davis JT, Ajelli M, Gioannini C, Litvinova M, Merler S, Pastore y Piontti A, Mu K, Rossi L, Sun

510   K, Viboud C, Xiong X, Yu H, Halloran ME, Longini IM, Vespignani A. 2020. The effect of travel

511   restrictions on the spread of the 2019 novel coronavirus (COVID-19) outbreak. *Science (New York,*

512   *N.y.)* 368:395–400. DOI: 10.1126/science.aba9757.

513   Chu DK, Akl EA, Duda S, Solo K, Yaacoub S, Schünemann HJ. 2020. Physical distancing, face masks, and eye

514   protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic

515   review and meta-analysis. *Lancet (London, England)* 395:1973–1987. DOI: 10.1016/S0140-

516   6736(20)31142-9.

517   Efron B. 2000. The Bootstrap and Modern Statistics. *Journal of the American Statistical Association* 95:1293–

518   1296. DOI: 10.1080/01621459.2000.10474333.

519   Famiglietti M, Leibovici F. 2022. The impact of health and economic policies on the spread of COVID-19 and

520   economic activity. *European Economic Review* 144:104087. DOI: 10.1016/j.euroecorev.2022.104087.

521   Fan C, Cai T, Gai Z, Wu Y. 2020. The Relationship between the Migrant Population's Migration Network and

522   the Risk of COVID-19 Transmission in China—Empirical Analysis and Prediction in Prefecture-Level

523   Cities. *International Journal of Environmental Research and Public Health* 17:2630. DOI:

524   10.3390/ijerph17082630.

525   Fang H, Wang L, Yang Y. 2020. Human mobility restrictions and the spread of the Novel Coronavirus (2019-

526   nCoV) in China. *Journal of Public Economics* 191:104272. DOI: 10.1016/j.jpubeco.2020.104272.

527   Goldberg Y, Mandel M, Bar-On YM, Bodenheimer O, Freedman L, Haas EJ, Milo R, Alroy-Preis S, Ash N,

528   Huppert A. 2021. Waning Immunity after the BNT162b2 Vaccine in Israel. *The New England Journal*

529   *of Medicine*:NEJMoa2114228. DOI: 10.1056/NEJMoa2114228.

530   Government   extends   tourist   entry   ban   for   additional   week.   *Available   at*

531   *https://www.timesofisrael.com/liveblog_entry/government-extends-tourist-entry-ban-for-additional-*

532   *week/* (accessed April 25, 2023).

533   Guo J, Deng C, Gu F. 2021. Vaccinations, Mobility and COVID-19 Transmission. *International Journal of*

534   *Environmental Research and Public Health* 19:97. DOI: 10.3390/ijerph19010097.

535   Ha BTT, Quang LN, Thanh PQ, Duc DM, Mirzoev T, Bui TMA. 2021. Community engagement in the

536   prevention and control of COVID-19: Insights from Vietnam. *PLOS ONE* 16:e0254432. DOI:

537   10.1371/journal.pone.0254432.

538   Hall GJ, Clark KN. 2023. Demystifying longitudinal data analyses using structural equation models in school

539   psychology. *Journal of School Psychology* 98:181–205. DOI: 10.1016/j.jsp.2023.03.003.

540   Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z, Yu T, Xia J, Wei Y, Wu

541   W, Xie X, Yin W, Li H, Liu M, Xiao Y, Gao H, Guo L, Xie J, Wang G, Jiang R, Gao Z, Jin Q, Wang

542   J, Cao B. 2020. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China.

543   *Lancet (London, England)* 395:497–506. DOI: 10.1016/S0140-6736(20)30183-5.

544   Iacobucci D. 2010. Structural equations modeling: Fit Indices, sample size, and advanced topics. *Journal of*

545   *Consumer Psychology* 20:90–98. DOI: 10.1016/j.jcps.2009.09.003.

546   Jia JS, Lu X, Yuan Y, Xu G, Jia J, Christakis NA. 2020. Population flow drives spatio-temporal distribution of

547   COVID-19 in China. *Nature* 582:389–394. DOI: 10.1038/s41586-020-2284-y.

548   Jiao J, Shi L, Zhang Y, Chen H, Wang X, Yang M, Yang J, Liu M, Sun G. 2022a. Core policies disparity response

549   to COVID-19 among BRICS countries. *International Journal for Equity in Health* 21. DOI:

550   10.1186/s12939-021-01614-z.

551   Jiao J, Shi L, Zhang Y, Chen H, Wang X, Yang M, Yang J, Liu M, Sun G. 2022b. Core policies disparity

552   response to COVID-19 among BRICS countries. *International Journal for Equity in Health* 21:9. DOI:

553   10.1186/s12939-021-01614-z.

554   Kannan S, Shaik Syed Ali P, Sheeza A. 2021. Omicron (B.1.1.529) - variant of concern - molecular profile and

555   epidemiology: a mini review. *European Review for Medical and Pharmacological Sciences* 25:8019–

556   8022. DOI: 10.26355/eurrev_202112_27653.

557   Kumar A, Priya B, Srivastava SK. 2021. Response to the COVID-19: Understanding implications of government

558   lockdown policies. *Journal of Policy Modeling* 43:76–94. DOI: 10.1016/j.jpolmod.2020.09.001.

559   Lau H, Khosrawipour V, Kocbach P, Mikolajczyk A, Schubert J, Bania J, Khosrawipour T. 2020. The positive

560   impact of lockdown in Wuhan on containing the COVID-19 outbreak in China. *Journal of Travel*

561   *Medicine* 27:taaa037. DOI: 10.1093/jtm/taaa037.

562   Le T-AT, Vodden K, Wu J, Atiwesh G. 2021. Policy Responses to the COVID-19 Pandemic in Vietnam.

563   *International Journal of Environmental Research and Public Health* 18. DOI: 10.3390/ijerph18020559.

564   Li Y, Li M, Rice M, Zhang H, Sha D, Li M, Su Y, Yang C. 2021. The Impact of Policy Measures on Human

565   Mobility, COVID-19 Cases, and Mortality in the US: A Spatiotemporal Perspective. *International*

566   *Journal of Environmental Research and Public Health* 18:996. DOI: 10.3390/ijerph18030996.

567   Local Councils Traffic Light Model. *Available at https://corona.health.gov.il/en/ramzor/* (accessed April 25,

568   2023).

569   Mathieu E, Ritchie H, Rodés-Guirao L, Appel C, Giattino C, Hasell J, Macdonald B, Dattani S, Beltekian D,

570   Ortiz-Ospina E, Roser M. 2020. Coronavirus Pandemic (COVID-19). *Our World in Data*.

571   McGrail DJ, Dai J, McAndrews KM, Kalluri R. 2020. Enacting national social distancing policies corresponds

572   with dramatic reduction in COVID19 infection rates. *PLoS ONE* 15:e0236619. DOI:

573   10.1371/journal.pone.0236619.

574   N, P, R. 2021. Chile Sees New Wave Of COVID-19 Infections Despite Rapid Vaccine Distribution. *NPR*.

575   Noland RB. 2021. Mobility and the effective reproduction rate of COVID-19. *Journal of Transport & Health*
576   20:101016. DOI: 10.1016/j.jth.2021.101016.

577   Paital B, Das K, Parida SK. 2020. Inter nation social lockdown versus medical care against COVID-19, a mild
578   environmental insight with special reference to India. *The Science of the Total Environment*
579   728:138914. DOI: 10.1016/j.scitotenv.2020.138914.

580   Papageorge NW, Zahn MV, Belot M, van den Broek-Altenburg E, Choi S, Jamison JC, Tripodi E. 2021. Socio-
581   demographic factors associated with self-protecting behavior during the Covid-19 pandemic. *Journal*
582   *of Population Economics* 34:691–738. DOI: 10.1007/s00148-020-00818-x.

583   Pathania AS, Prathipati P, Abdul BA, Chava S, Katta SS, Gupta SC, Gangula PR, Pandey MK, Durden DL,
584   Byrareddy SN, Challagundla KB. 2021. COVID-19 and Cancer Comorbidity: Therapeutic
585   Opportunities and Challenges. *Theranostics* 11:731–753. DOI: 10.7150/thno.51471.

586   Pham QD, Stuart RM, Nguyen TV, Luong QC, Tran QD, Pham TQ, Phan LT, Dang TQ, Tran DN, Do HT,
587   Mistry D, Klein DJ, Abeysuriya RG, Oron AP, Kerr CC. 2021. Estimating and mitigating the risk of
588   COVID-19 epidemic rebound associated with reopening of international borders in Vietnam: a
589   modelling study. *The Lancet. Global Health*. DOI: 10.1016/S2214-109X(21)00103-0.

590   Quilty BJ, Clifford S, Group2 C nCoV working, Flasche S, Eggo RM. 2020. Effectiveness of airport screening
591   at detecting travellers infected with novel coronavirus (2019-nCoV). *Eurosurveillance* 25:2000080.
592   DOI: 10.2807/1560-7917.ES.2020.25.5.2000080.

593   Regev-Yochay G, Gonen T, Gilboa M, Mandelboim M, Indenbaum V, Amit S, Meltzer L, Asraf K, Cohen C,
594   Fluss R, Biber A, Nemet I, Kliker L, Joseph G, Doolman R, Mendelson E, Freedman LS, Harats D,
595   Kreiss Y, Lustig Y. 2022. Efficacy of a Fourth Dose of Covid-19 mRNA Vaccine against Omicron.
596   *New England Journal of Medicine* 386:1377–1380. DOI: 10.1056/NEJMc2202542.

597   Reis J, Buguet A, Román GC, Spencer PS. 2022. The COVID-19 pandemic, an environmental neurology
598   perspective. *Revue Neurologique* 178:499–511. DOI: 10.1016/j.neurol.2022.02.455.

599   Tan JB, Cook MJ, Logan P, Rozanova L, Wilder-Smith A. 2021. Singapore's Pandemic Preparedness: An
600   Overview of the First Wave of COVID-19. *International Journal of Environmental Research and Public*

601   *Health* 18:252. DOI: 10.3390/ijerph18010252.

602   Taylor L. 2021. Covid-19: Spike in cases in Chile is blamed on people mixing after first vaccine shot. *BMJ*

603   373:n1023. DOI: 10.1136/bmj.n1023.

604   "Time has come to return to normal reality, to live with the virus" | ערוץ 7. *Available at*

605   *https://www.israelnationalnews.com/news/322604 (accessed April 27, 2023).*

606   Tran TPT, Le TH, Nguyen TNP, Hoang VM. 2020. Rapid response to the COVID-19 pandemic: Vietnam

607   government's experience and preliminary success. *Journal of Global Health* 10:020502. DOI:

608   10.7189/jogh.10.020502.

609   Viboud C, Bjørnstad ON, Smith DL, Simonsen L, Miller MA, Grenfell BT. 2006. Synchrony, Waves, and Spatial

610   Hierarchies in the Spread of Influenza. *Science* 312:447–451. DOI: 10.1126/science.1125237.

611   Wang X, Shi L, Zhang Y, Chen H, Sun G. 2021a. Coping with COVID-19: Core Elements of Lockdown Wuhan

612   City Policy. *Journal of Health Care for the Poor and Underserved* 32:373–385. DOI:

613   10.1353/hpu.2021.0029.

614   Wang X, Shi L, Zhang Y, Chen H, Sun G. 2021b. Policy disparities in fighting COVID-19 among Japan, Italy,

615   Singapore and China. *International Journal for Equity in Health* 20:33. DOI: 10.1186/s12939-020-

616   01374-2.

617   Wang K, Wong ELY, Ho KF, Cheung AWL, Chan EYY, Wong SYS, Yeoh EK. 2021c. Unequal availability of

618   workplace policy for prevention of coronavirus disease 2019 across occupations and its relationship

619   with personal protection behaviours: a cross-sectional survey. *International Journal for Equity in Health*

620   20:200. DOI: 10.1186/s12939-021-01527-x.

621   WHO Coronavirus (COVID-19) Dashboard. *Available at https://covid19.who.int (accessed June 17, 2022).*

622   Yang C, Ma QY, Zheng YH, Yang YX. 2020. Transmission routes of 2019-novel coronavirus (2019-nCoV).

623   *Zhonghua Yu Fang Yi Xue Za Zhi [Chinese Journal of Preventive Medicine]* 54:374–377. DOI:

624   10.3760/cma.j.cn112150-20200216-0016.

625   Yechezkel M, Weiss A, Rejwan I, Shahmoon E, Ben-Gal S, Yamin D. 2021. Human mobility and poverty as

626   key drivers of COVID-19 transmission and control. *BMC public health* 21:596. DOI: 10.1186/s12889-

627   021-10561-x.

628

Figure 1

Figure 1 Research framework

Figure 1 Research framework
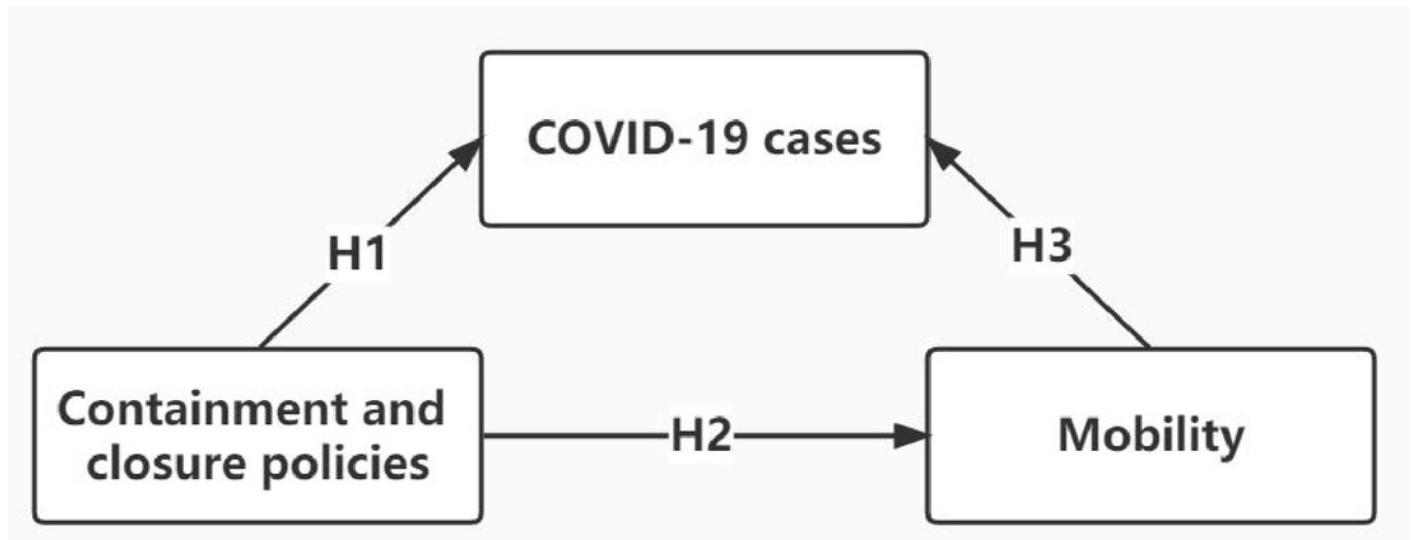
Figure 2

Figure 2 Trend of containment policies

Figure 2 Trend of containment policies
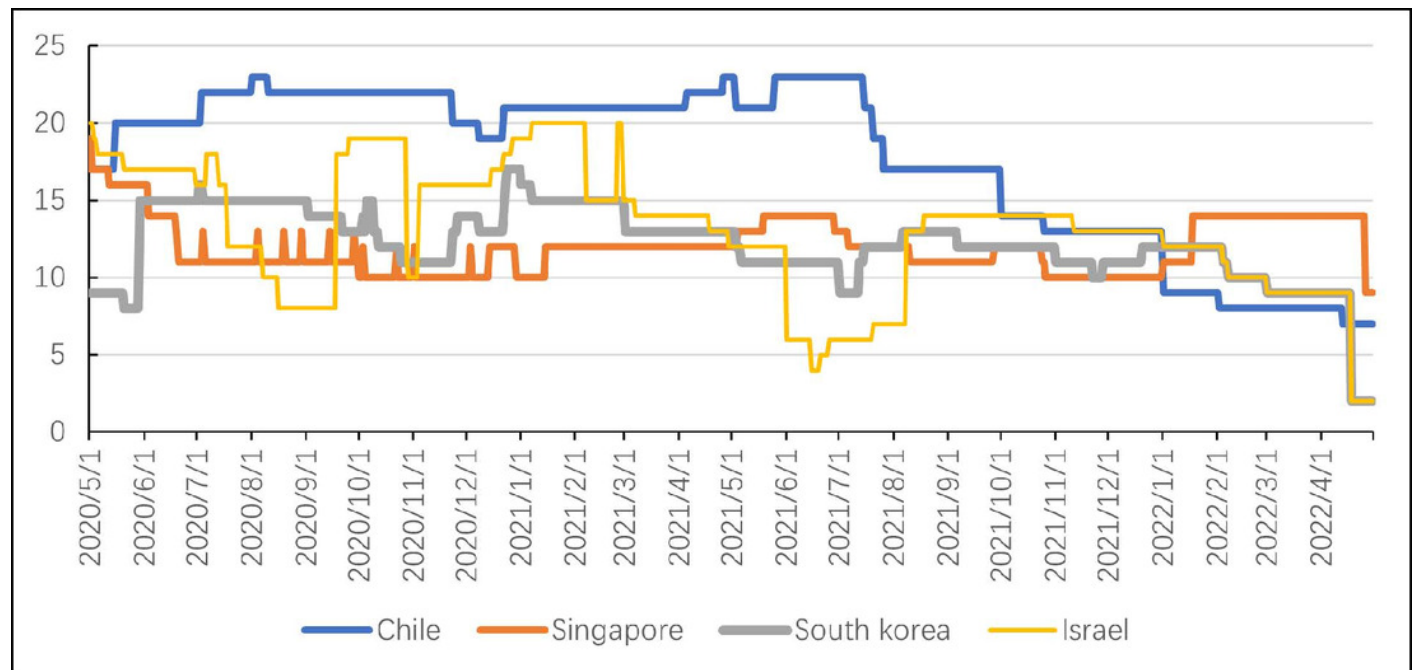
Figure 3

Figure 3 Trend of mobility in Chile, Singapore, South Korea, and Israel (compared to baseline days -the median value for the 5 weeks from January 3 to February 6, 2020)

图3 智利、新加坡、韩国和以色列的流动性趋势（与基线天数相比，5月3日至6日，2020年<>至<>的中值）。
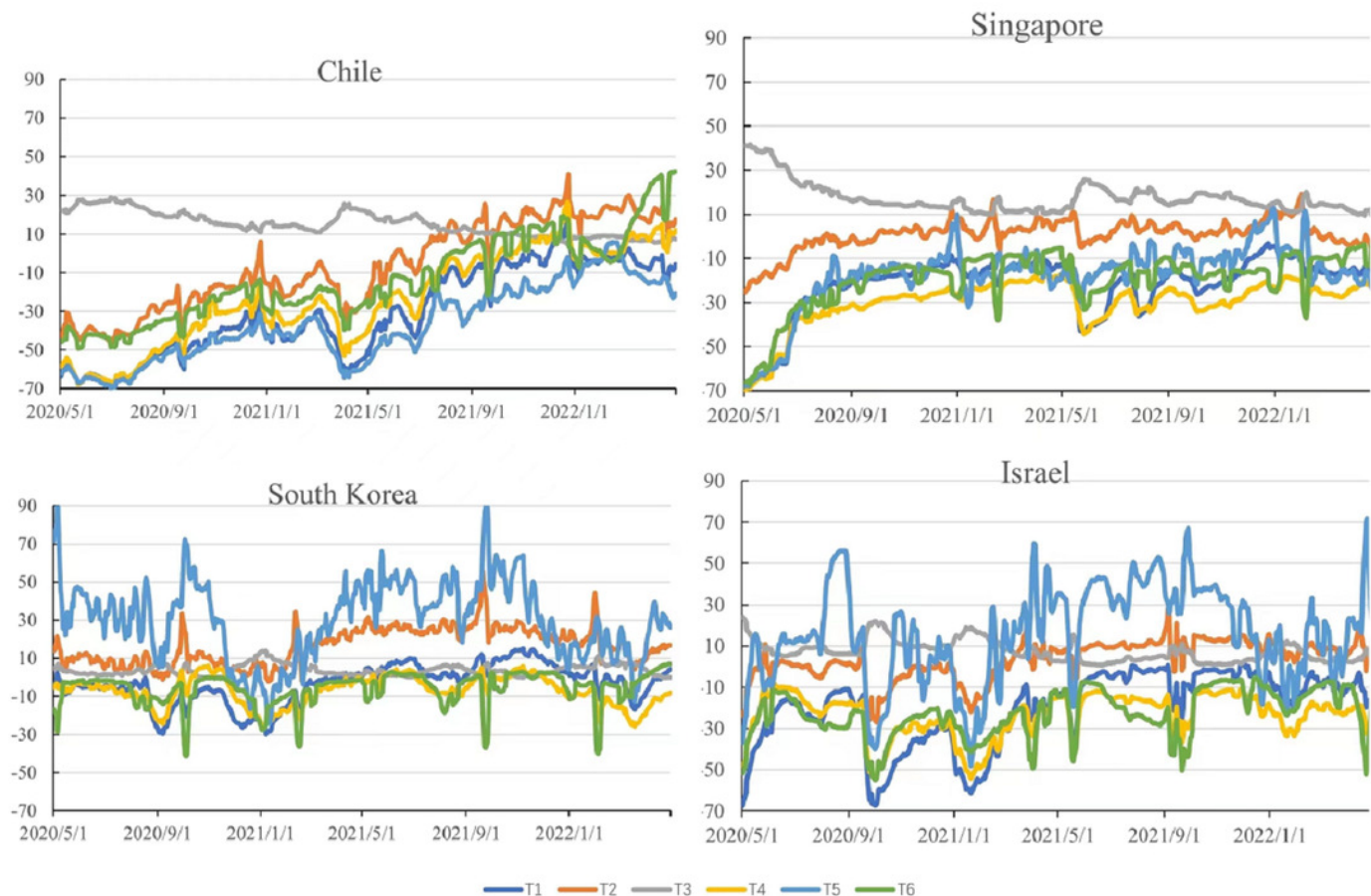
Figure 4

Figure 4 Total cases of COVID-19

Figure 4 Total cases of COVID-19
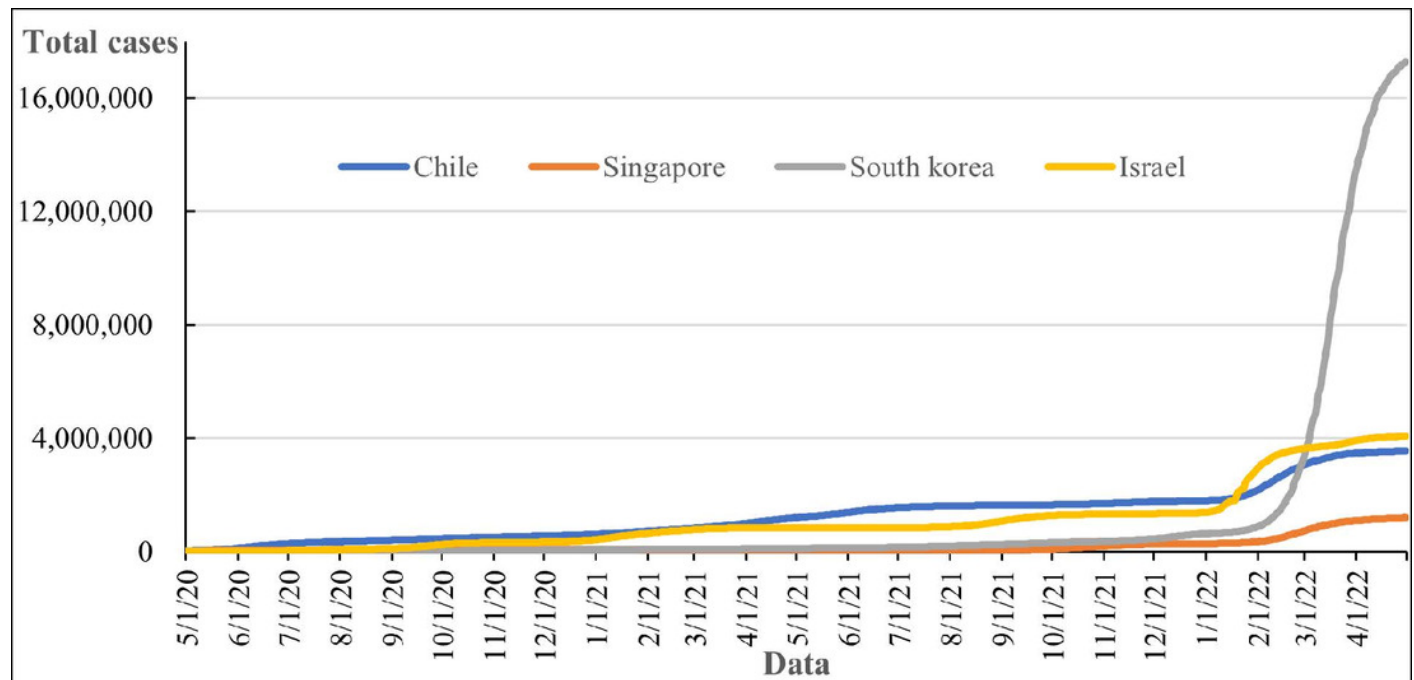
Figure 5

Figure 5 Initial SEM model in this study
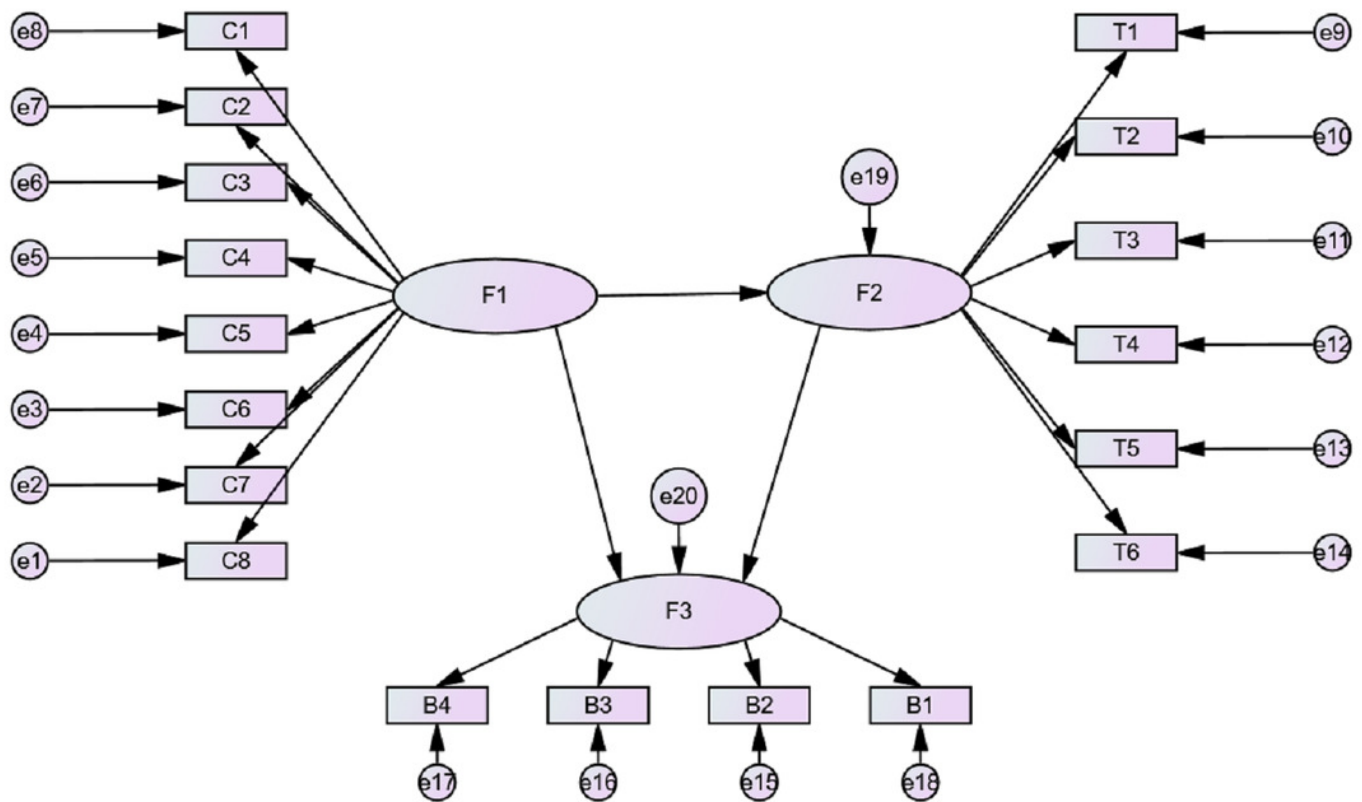
Figure 6

Figure 6 Final SEM model in this study
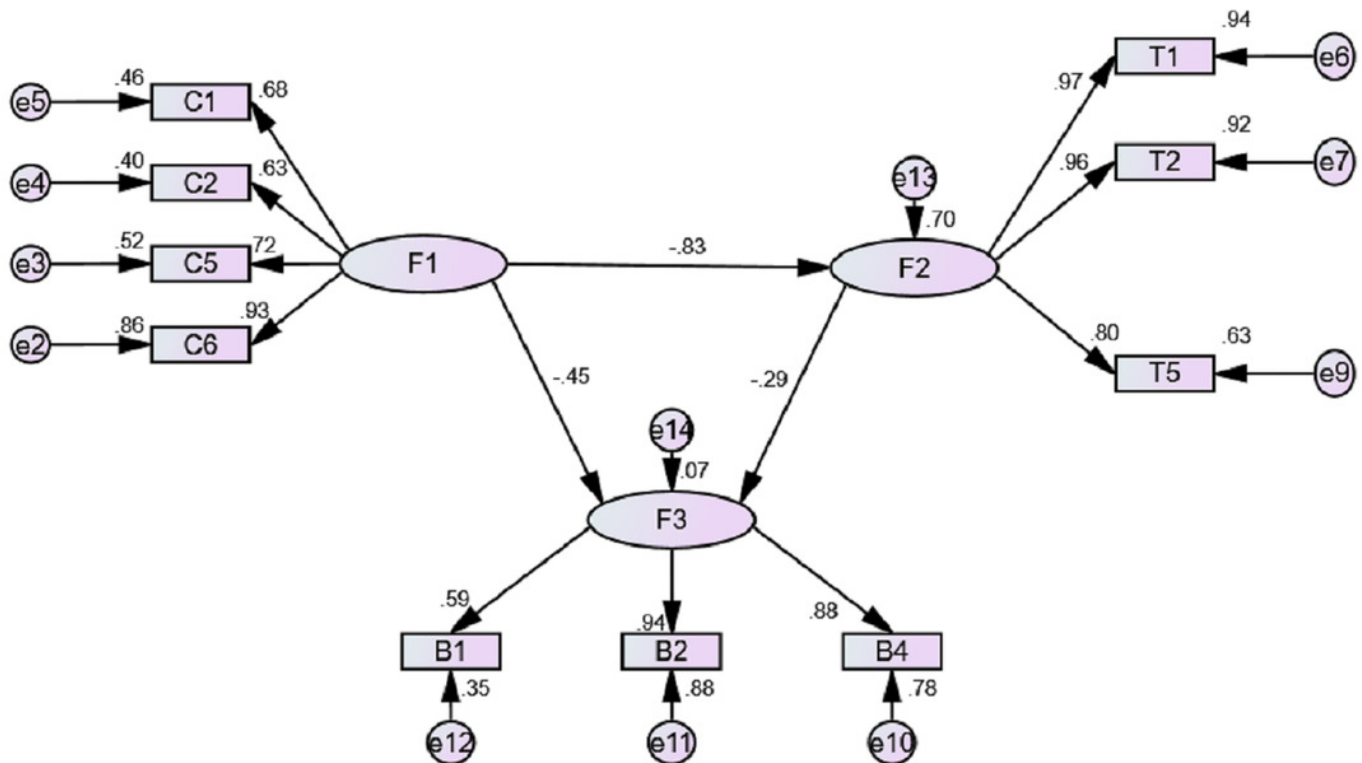
Table 1 Correlation values between scales.

Table 1 Correlation values between scales.

1   Table 1 Correlation values between scales.

Scale	Containment policies	Mobility	COVID-19 cases
Containment policies	1	-0.66**	-0.28**
Mobility		1	0.18**
COVID-19 cases			1

2   ***P< 0.001

Table 2 Revised model path analysis results

Table 2 Revised model path analysis results

1   Table 1 Revised model path analysis results

Path		Unstd.	Std.	S.E.	P
F2	F1	-25.49	-0.84	1.60	***
F3	F2	-17696.80	-0.29	6248.70	0.005
F3	F1	-831755.49	-0.45	203669.52	***
F1	C1	1	0.68	0.09	***
	C2	0.76	0.63	0.05	***
	C5	0.71	0.72	0.06	***
	C6	1.56	0.93		
F2	T1	1	0.97		
	T2	0.81	0.96	0.02	***
	T5	1.40	0.80	0.05	***
F3	B1	1	0.60		
	B2	0.04	0.94	0.01	***
	B4	0.01	0.88	0.00	***

2   ***$P < 0.001$