Cultural Antecedents of Virus Transmission: Individualism is Associated with Lower Compliance with Social Distancing Rules During the Covid-19 Pandemic

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Abstract

In the context of Covid-19 government-ordered lockdowns, more individualistic people might be less willing to leave their homes to protect their own health, or they might be more willing to go out to relieve their boredom. Using an Australian sample, a pilot study found that people's lay theories were consistent with the latter possibility, that individualism would be associated with a greater willingness to violate lockdown orders. Using a longitudinal dataset containing location records of about 18 million smartphones across the US, Study 1 found that people in more individualistic states were less likely to comply with social distancing rules following lockdown orders. Additional analyses replicated this finding with reference to counties' residential mobility, which is associated with increased individualism. In a longitudinal dataset containing mobility data across 79 countries and regions, Study 2 found that people in more individualistic countries and regions were also less likely to follow social distancing rules. Pre-registered Study 3 replicated these findings at the individual level: people scoring higher on an individualism scale indicated that they had violated social distancing rules more often during the Covid-19 pandemic. Study 4 found that the effect of individualism on violating social distancing rules was mediated by people's selfishness and boredom. Overall, our findings document a cultural antecedent of individuals' socially responsible behavior during a pandemic, and suggest an additional explanation for why the Covid-19 pandemic has been much harder to contain in some parts of the world than in others.

Keywords: Covid-19; individualism; independence; compliance; culture

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One strategy that governments use to fight pandemics is to institute lockdowns, that is, to order all residents working in non-essential jobs to stay in their homes at all times, allowing only residents working in essential jobs involving food and medication to work onsite. Many governments around the world instituted some form of lockdown to mitigate the Covid-19 pandemic. For example, China instituted a two-month lockdown in Wuhan, the first-known city that suffered from the pandemic. The spread of the virus was successfully curbed in this period, probably because a significant proportion of people followed lockdown orders (Kupferschmidt & Cohen, 2020). In contrast, even after a lockdown was instituted in northern Italy for two months, the region continued seeing new cases and deaths (McCann et al., 2020), possibly because a significant proportion of people violated lockdown orders (Tondo, 2020). Similarly, in the New York City metropolitan region, which was heavily affected in the early stages of the pandemic in the US, cases continued increasing despite a lockdown, likely because a significant proportion of people did not follow lockdown orders (Kenton, 2020). In this research, we ask why compliance with lockdowns varies across countries and regions.

Antecedents of Compliance with Social Distancing Rules

Research has identified several factors that underlie people's tendency to follow social distancing rules. With reference to personality traits, people higher on conscientiousness, agreeableness, and openness to experience were more likely to follow social distancing rules (Götz, Gvirtz, et al., 2021; Peters et al., 2020). The findings about conscientiousness and agreeableness would be expected based on definitions of these traits. However, the finding about openness is surprising—one could have expected that people higher on openness would be more willing to violate lockdown orders to explore their altered social surroundings. With reference to cognitive traits, people with higher working memory capacity were more likely to

comply with social distancing rules because they were able to better do a cost-benefit analysis and to conclude that the benefits of social distancing outweigh its costs (Xie et al., 2020).

In addition to these individual-level factors, there are also macro-level factors that influence people's compliance with social distancing rules. For example, with reference to socio-demographic characteristics, residents of counties with higher income and residents of states with higher educational attainment were more likely to follow social distancing rules (Im et al., 2020; Weill et al., 2020). This finding is consistent with the idea that people in richer and more educated regions have more choice in their everyday lives (Snibbe & Markus, 2005; Stephens et al., 2007), and thus are better able to alter their behavior in response to lockdown orders. Moreover, compared to people in states that voted for the Republican presidential candidate in the most recent political election, residents of states who voted for the Democratic presidential candidate were more likely to follow social distancing rules (Im et al., 2020), possibly because the Republican President Donald Trump personally downplayed the severity of the pandemic.

The Predictive Role of Individualism-Collectivism

In this research, we focus on cultural antecedents of compliance with Covid-19 social distancing rules. This work builds on prior research showing that cultural values can shape the spread of infectious diseases (Borg, 2014; Gaygısız et al., 2017). Most of this research has focused on individualism-collectivism, which is one of the most studied values in cross-cultural psychology (Hofstede, 1980; Triandis, 1972). Specifically, "individualists give priority to personal goals over the goals of collectives; collectivists … subordinate their personal goals to the collective goals" (Triandis, 1989, p. 509). A related distinction focuses on individuals' relationships with specific others rather than with groups: people with a more independent self-construal emphasize expressing themselves and influencing others, whereas those with a more interdependent self-construal emphasize attending to others' preferences and needs (Markus & Kitayama, 1991). In independent contexts, actions are supposed to be "freely chosen contingent on one's own preferences, goals, intentions, motives," whereas, in interdependent contexts,

actions are supposed to be "responsive to obligations and expectations of others, roles, situations" (Markus & Kitayama, 2003, p. 7).

The differing construals of the self and agency associated with individualism–collectivism are related to a number of psychological and behavioral outcomes. For example, whereas people from more independent or individualistic cultures tend to view themselves from a first-person perspective—they view the world from their own eyes rather than from the eyes of others—those from more interdependent or collectivistic cultures routinely view themselves from a third-person perspective (Cohen et al., 2007). In the context of lockdown orders during a pandemic, if people take others' or the society's perspective, then they might realize that even if they strongly want to go out, it would be in the community's interest not to do so (as the person might catch an infection outside and bring it home, or transmit their infection to others if they have an asymptomatic infection). In contrast, attending to the self and one's personal goals could mean an increased tendency to act on one's desires to leave one's home (e.g., to have a change of location or to improve one's mood), irrespective of the risks that it might pose to others or society. These arguments lead to the prediction that individualism is associated with a lower tendency to comply with social distancing rules during the Covid-19 pandemic.

However, it is also possible that more individualistic people might follow social distancing rules more closely. Attending to others' interests could be reflected in a greater desire to meet friends and family members to make sure they are doing fine, relieve them of loneliness, and help them if needed, resulting in lower compliance with social distancing rules. Further, more collectivistic people tend to be more responsive to social pressures (e.g., Cialdini et al., 1999), so they might have a harder time refusing the requests of friends and family members to meet up, or of their work supervisor or colleagues to come to work despite lockdown orders. In contrast, attending to one's needs and interests could be reflected in an increased tendency to comply with social distancing rules to ensure one's own safety. Thus, these arguments lead to

the prediction that individualism would be associated with a higher tendency to comply with social distancing rules during the Covid-19 pandemic.

Indeed, extant research has provided mixed evidence about the effect of individualism on people's tendency to follow social distancing rules. On the one hand, research has found that in counties that spent more years on the US frontier, and thus are more likely to emphasize individualism (Kitayama et al., 2006), people were less likely to follow social distancing guidelines (Bazzi et al., 2021). Further, unpublished research has found that in more individualistic countries, people were more willing to violate social distancing rules (Frey et al., 2020; Im & Chen, 2020). Along related lines, people in more individualistic regions were less likely to wear masks (Lu et al., 2021). However, other unpublished research has found that in more individualistic US states, people were more willing to follow social distancing rules (Im et al., 2020).

These inconsistent results about the relationship between region-level individualism and people's tendency to follow social distancing rules may be due to certain limitations of extant research. First, past papers on this topic have each included a single study at one level of analysis (i.e., either county, state, or country-level analysis; e.g., Bazzi et al., 2021; Frey et al., 2020; Huynh, 2020; Im et al., 2020). The mixed findings could arise either from differing indicators of individualism across different studies or from idiosyncratic analytic choices (Silberzahn et al., 2018).

Relatedly, these mixed findings could result from different levels of analyses. Most research in cultural psychology has taken a macro-level approach to individualism-collectivism by comparing individuals across countries varying on individualism-collectivism or independence-interdependence (Hofstede, 1980; Markus & Kitayama, 1991; Triandis, 1989). Researchers have also taken a micro-level approach by studying individuals varying on the value of individualism-collectivism (e.g., Singelis, 1994; Triandis, 1995). However, researchers rarely examine whether effects obtained at the macro-level generalize at the micro-level and

vice-versa (for an exception, see Lee et al., 2000). Some research in cultural psychology suggests that macro-level findings might not generalize at the micro-level and vice-versa. For example, although various indicators of analytic-holistic cognition vary consistently at the macro-level (i.e., East Asians are more holistic and Westerners are more analytic on a wide range of tasks), at the micro-level, various tasks assessing analytic-holistic tendencies are uncorrelated with each other (Na et al., 2010; see also Kitayama et al., 2009). Thus, it is of importance to examine whether the individualism effect holds at multiple levels.

If micro-level individualism is the key construct, then individuals' personal values would be the key driver of their social distancing behavior—more individualistic people violate social distancing rules more often. Any macro-level findings would then be mere aggregates of individual-level phenomena—the key cause is individual values, not regionally prevalent values. Alternatively, suppose macro-level individualism is the key causal construct. In that case, most people might violate (or follow) social distancing rules in more individualistic regions because everyone else is doing so, and because doing so is consistent with the individualistic ethos prevalent in the region. In this case, individual-level values may play little to no role, and therefore, region-level findings would not replicate at the individual level. It is also possible that there are both macro-level and micro-level effects, such that everyone, irrespective of their personal values, violates social distancing rules more in more individualistic (or more collectivistic) regions; and within a given region, more individualistic (or more collectivistic) people violate social distancing rules more. To address some of these complexities, we test the effect of individualism at each level of analysis. However, although our studies rule in a micro-level effect and also document the possibility of a macro-level effect, we were unable to independently assess micro- and macro-level effects in the study.

Third, past research has not explored the mechanisms underlying the relationship between individualism and people's tendency to follow social distancing rules. Given the competing hypotheses outlined above, it is possible that the different mechanisms underlying

individualism may lead to different effects on people's tendency to follow social distancing rules. Thus, exploring the underlying mechanism can help clarify the mixed findings in the literature. In the present research, we focus on four classes of potential mechanisms: concern for self, concern for others, motivation for norm compliance, and optimism about the pandemic. Fourth, past studies suffer from limitations associated with data analysis choices. For instance, Frey et al.'s (2020) results may be subject to the omitted variable bias as they did not control for regional-level characteristics (e.g., economic development, educational attainment, population density). Moreover, the social distancing data in some studies only covered the early stage of the Covid-19 pandemic (e.g., till March 29, 2020 for Huynh, 2020; till April 13, 2020 for Im et al., 2020). These limitations may explain some of the inconsistent findings in the literature.

Overview of Studies

To address the above limitations, the present research uses a multi-method investigation to examine the role of individualism in people's tendency to follow Covid-19 social distancing rules. Given the competing hypotheses outlined above, we first investigate people's lay theories about whether individualism would be associated with more or less compliance with social distancing rules. Unlike scientific theories, lay theories are rarely explicitly articulated but "set up an interpretive frame within which information is processed" (Chiu et al., 1997, p. 19). As lay theories provide people with schema-like knowledge structures that help them process information and make decisions (Levy et al., 2006; Molden & Dweck, 2006), understanding people's lay theories about the role of individualism during the pandemic can help make sense of and predict their behavior.

We then test whether people's lay theories about the role of individualism during the pandemic hold at multi-levels of analysis, including the individual, county, state, and country levels. Further, we examine several potential mechanisms that can explain the effect of individualism on people's tendency to follow social distancing rules. Finally, we address limitations of prior research by controlling for a number of region-level factors, such as economic

development, educational attainment, and population density, and by using data till December 31, 2020. We also conduct analyses using multiple archival datasets assessing actual behavior.

Specifically, we conducted five studies to test our hypotheses using different research designs (experiment, correlational, and longitudinal) and samples from different countries. Using an Australian sample, a pilot study tested people's lay theories about the effect of country-level individualism-collectivism on residents' likelihood of following social distancing rules during a Covid-19 lockdown. In Study 1, we analyzed a longitudinal dataset with records of about 18 million smartphones across the US. We used two different region-level indicators of individualism—a state-level individualism score (Vandello & Cohen, 1999) and county-level residential mobility (Oishi & Kisling, 2009). In Study 2, we analyzed another longitudinal dataset with people's mobility data across 79 countries and regions varying on individualism. Study 3 tested whether Americans who scored higher on individualism reported that they had violated social distancing rules more often during the Covid-19 lockdown in their locality. Finally, Study 4 tested four underlying mechanisms that can explain why more individualistic people are more likely to violate social distancing rules, using data from both the US and the UK.

We report all participants, conditions, and measures. Materials used in the pilot study and Studies 3 and 4, which are not already available in previous publications, are reported in the Supplementary Materials. Survey materials, data, and code related to this article are available on https://osf.io/d3sm7/?view_only=222e0b5abc42468d82f5b7900b28f99e.

Pilot Study: Lay Theories about Individualism and Compliance with Covid-19 Social Distancing Rules

A polit study assessed people's lay theories about whether individualism is associated with following or violating social distancing rules during the Covid-19 pandemic. We presented participants with descriptions of an individualistic country and a collectivistic country, and assessed their expectations about the extent to which people in the two countries would follow social distancing rules during a Covid-19 lockdown.

Method

We pre-registered the methods and analyses of this study at https://osf.io/c2ymu?view_only=4e44ac0162564b06b4ef82a07e52a6c2.

Participants. In a previous study, we identified a correlation coefficient of r = .27 (equivalent to Cohen's d = .56) between individualism and violating social distancing rules. We assumed a slightly smaller effect size of d = .50. A power analysis with d = .50, α = .05 (one-tailed), and power = 80%, indicated that we need to recruit 102 participants. Rounding this number, we posted a survey seeking 100 Australian residents on Prolific (Peer et al., 2017). In response, 77 participants completed the survey (M_{age} = 31.03, SD_{age} = 9.19; 28 women, 48 men, and 1 missing) before it expired. All responses came from unique IP addresses. The study scenario was set in the Solomon Islands, a group of islands close to Australia and Indonesia. We decided to sample participants from Australia because Australians likely know that the Solomon Islands actually exist and are not fictitious, and would be interested in reading about the Solomon Islands' culture. However, we estimated that few Australians have visited the Solomon Islands, so our participants would probably not have any pre-existing assumptions about the culture of the Solomon Islands. More generally, we sought to sample participants from countries other than the US.

Procedure. Participants were presented with a scenario describing the culture of two Pacific island nations close to Australia (i.e., the Solomon Islands and the Marshall Islands). We described one country's culture as individualistic and the other's as collectivistic. Participants were randomly assigned to either the *Solomon Islands-Individualistic Marshall Islands-Collectivistic* condition or the *Solomon Islands-Collectivistic Marshall Islands-Individualistic* condition. The content of the manipulation was based on Triandis and Gelfand's (1998) individualism-collectivism scale. Specifically, in the individualistic culture condition, participants were told that residents of the relevant island prefer to be independent, prefer individual activities over group activities, believe that competition is the law of nature, and try to work

harder to beat others. In the collectivist culture condition, participants were told that residents of the relevant island emphasize the well-being of their friends, enjoy in spending time with others, feel good when they cooperate with others, and believe that it is important to respect the decisions made by the group as a whole (see Supplementary Materials for the detailed scenarios).

After they read the scenario, participants were informed that Covid-19 has spread to both the Solomon Islands and the Marshall Islands, and the two islands have instituted a lockdown—all residents are asked to stay at their home at all times unless they were working in essential industries. We asked participants: "During the lockdown, in which country do you think people will be more likely to (1) follow the lockdown regulations, (2) follow social-distancing guidelines, (3) follow stay-at-home guidelines, and (4) follow the government's orders" (α = .77). Participants were asked to respond on a 11-point scale ranging from "-5 = definitely more likely in the Solomon Islands" to "5 = definitely more likely in the Marshall Islands."

Results

As per the pre-registered analysis plan, we excluded two participants who provided gibberish or irrelevant responses to the open-ended question asking them to describe the culture of each island (see Supplementary Materials for responses that were judged to be gibberish).

An independent-samples *t*-test revealed that participants in the *Solomon Islands-Collectivistic Marshall Islands-Individualistic* condition were more likely to expect people in the Solomon Islands to follow social distancing rules during the Covid-19 pandemic (*M* = -1.14, 95% CI [-1.82, -.40], *SD* = 2.24) than those in the *Solomon Islands-Individualistic Marshall Islands-Collectivistic* condition (*M* = .25, 95% CI [-.54, 1.06], *SD* = 2.55), *t*(73) = 2.51, *p* = .007 (one-tailed, as we pre-registered a directional hypothesis), *d* = .59, 95% CI [.05, 1.12].

Thus, the pilot study found that although competing hypotheses can be made about the effect of individualism on the extent to which people follow Covid-19 social distancing rules, our

participants expected residents of an individualistic culture to be less likely to follow social distancing rules during a Covid-19 lockdown than residents of a collectivistic culture. The subsequent studies tested whether people's lay theory actually pans out with behavioral data at multiple levels of analysis.

Study 1: Region-Level Longitudinal Study Using Mobile-phone Location Data

The goal of this study was to examine whether people's lay theories about the individualism effect hold at the state and county levels using behavioral data. Using location data from US residents' mobile phones, we assessed the extent to which a government-ordered lockdown increased the proportion of residents in a given county who stayed at home in the daytime. The bigger the increase, the more effective the lockdown. We measured region-level individualism in two different ways. First, we used state-level individualism scores provided by Vandello and Cohen (1999), which were constructed based on socio-structural variables (e.g., ratio of divorce rate to marriage rate), behaviors (e.g., proportion of people carpooling), and attitudes (e.g., proportion of people without a religious affiliation).

Second, we used a socio-structural variable—residential mobility—a precursor of individualism (e.g., Oishi, Lun, et al., 2007; Oishi et al., 2012; Oishi & Kisling, 2009). Residential mobility is defined as "the frequency with which individuals change their residence" (Oishi, 2010, p. 6). Individuals who move more frequently place greater importance on their personal selves over their collective selves (Oishi, Lun, et al., 2007). For example, people living in metropolitan cities, where residential mobility is relatively higher, considered their personal self as more important than those living in regional cities, where residential mobility is relatively lower (Kashima et al., 2004). As people in individualistic cultures place greater importance on their personal self than on their collective self (Triandis et al., 1988), residential mobility serves as an antecedent of individualism (Oishi et al., 2012). Indeed, extensive research has found that in regions with higher residential mobility, people are more individualistic (Oishi, 2010). We thus

used county-level residential mobility as another indicator of individualism. Thus, we sought to test our hypothesis using two different region-level indicators of individualism.

Method

Independent variables. For the first indicator of individualism, we obtained the state-level collectivism index from Vandello and Cohen (1999) and then multiplied it by -1 to obtain a state-level individualism index. The second indicator was residential mobility. Following Oishi, Rothman, et al. (2007) and McCann (2015), we computed county-level residential mobility by dividing the number of residents who lived in a different dwelling in a different micropolitan or metropolitan one year ago, by the total population in the county. We obtained this data from the 2016 American Community Survey's 5-year estimate at the census block group level (U.S. Census Bureau, 2016). We aggregated the block-level data into county level to calculate residential mobility. Higher residential mobility represents higher individualism. The correlation between Vandello and Cohen's (1999) individualism score and residential mobility is 0.099 ($p < 0.001$). For ease of interpretation, we normalized all independent variables to a mean of 0 and a standard deviation of 1.

Dependent variable. To measure the extent to which people followed social distancing rules, we used data provided by SafeGraph Inc (SafeGraph, 2020).[1] The dataset contains location information of millions of US residents who are representative of the 77% of US residents who use smartphones (Chen & Rohla, 2018). We analyzed all data from January 1 to December 31, 2020. The dataset contained location records of about 18 million smartphones, with an average of 6,000 smartphones in each county. Participants used one of many smartphone apps and provided their opt-in consent to the app to collect their location data. The data is anonymous and is aggregated at the level of *census block groups*. Based on a

[1] Data publicly available here: https://www.safegraph.com/covid-19-data-consortium

smartphone's geolocation throughout the day, SafeGraph coded the overall traveling pattern for all devices in each census block group on a given date.

Our analysis was at the level of dates nested within counties. To measure the extent to which people followed social distancing rules, we constructed several measures. The first measure was the median number of minutes devices were found at home among all devices on a given date in a given county ("HomeDwellTime"). Specifically, for each device, SafeGraph summed the number of minutes the device was found at home across the day to get the total number of at-home minutes. Then SafeGraph calculated the median number of at-home minutes among all devices within a given county. The second measure was the percentage of smartphones that were completely at home on a given date in a given county (i.e., we divided the number of smartphones that spent the whole day at home by the total number of smartphones; "%StayHome"). SafeGraph marks device holders as working (part-time or full-time) when the device is found at a location other than home for more than 3 hours. Therefore, for robustness check, we also computed our dependent variable by dividing the number of smartphones that were completely at home by the number of smartphones belonging to individuals not working that day ("%StayHome(NonWork)"). We used a fourth measure—the median percentage of time devices were found at home on a given date in a given county ("PercHome"). Specifically, for each device, SafeGraph divided the number of minutes the device was observed at home by the number of minutes the device was observed at all places to calculate the percentage of time the device was found at home. Then SafeGraph took the median percentage of time devices were found at home across all observed devices within a given county. The correlations between HomeDwellTime and %StayHome, between HomeDwellTime and %StayHome(NonWork), between HomeDwellTime and PercHome, between %StayHome and %StayHome(NonWork), between %StayHome and PercHome, and between %StayHome(NonWork) and PercHome are 0.232 ($p < .001$), 0.207 ($p < .001$), 0.636 ($p < .001$), 0.965 ($p < .001$), 0.721 ($p < .001$), and 0.638 ($p < .001$), respectively.

Other variables. Following Allcott, Boxell, Conway, Gentzkow, et al. (2020) and Alexander and Karger (2021), we integrated county-level stay-at-home orders with state-level policies to form a county-level policy stringency index. Specifically, we obtained information about county-level stay-at-home orders from the National Association of Counties (NACo).[2] We obtained the composite state-level policy stringency index from Oxford Covid-19 Government Response Tracker (OxCGRT; Hale et al., 2020), which equaled the sum of the closure and containment policy stringency on eight dimensions (i.e., school closure, workplace closure, public event cancellation, gathering restriction, public transport closure, stay-at-home requirements, internal movement restriction, and international travel controls).[3] For the 148 counties that issued stay-at-home orders earlier than the state did, we coded a *stay-at-home order* dummy variable as 1 after the county-level policy came into effect but before the state-level policy came into effect. For this period, we created a composite county-level policy stringency index for these 148 counties, which equaled the stay-at-home order dummy plus seven other policy stringency indices (i.e., school closure, workplace closure, public event cancellation, gathering restriction, public transport closure, internal movement restriction, and international travel controls) coded by OxCGRT. For all other periods for these 148 counties and the remaining counties, in which a state-level policy was in effect, the county-level policy stringency index equaled the composite state-level policy stringency index calculated by OxCGRT. For ease of interpretation, we normalized this variable to a mean of 0 and a standard deviation of 1.

We controlled the natural logarithm of one plus the new Covid-19 deaths in that county on that date in our analyses. These variables were obtained from data provided by The New York Times (Smith et al., 2020).[4] We included number of new deaths as a control variable

[2] The data are publicly available at https://ce.naco.org/?dset=COVID-19&ind=Emergency%20Declaration%20Types
[3] The data are publicly available at https://github.com/OxCGRT/USA-covid-policy
[4] The data is publicly available at https://github.com/nytimes/covid-19-data

because the greater the number of new deaths in a county, the more people in that county would be expected to stay at their homes (Ding et al., 2020; Ru et al., 2020). Following Allcott, Boxell, Conway, Ferguson, et al., (2020), if the number of new deaths in a given county on a given date was missing, we assumed that there were no confirmed new deaths in the county on that date. Therefore, we replaced missing number of deaths with 0.[5]

We also included a number of county-level control variables: median income, percentage of individuals with a Bachelor's degree or higher, percentage of individuals who identify as non-white, population density, percentage of individuals who are over 65 years old, and percentage of residents who voted for Donald Trump in the 2016 US presidential election. We included these socio-demographic variables because they have been found to be correlated with individualism (Kemmelmeier, 2003; Snibbe & Markus, 2005; Vandello & Cohen, 1999). In addition, we controlled for median income because people in higher-income countries and higher-income localities in the US comply more with the Covid-19 lockdown orders (Maire, 2020; Weill et al., 2020). We controlled for educational attainment because better-educated people are more likely to follow social distancing rules (Zhao et al., 2020). We controlled for the proportion of people from ethnic minorities because certain minority groups are disproportionately represented in essential jobs, such as healthcare, grocery stores, and public transportation (U.S. Bureau of Labor Statistics, 2019), which might require them to report to work even under a lockdown. We controlled for total population and population density because the spread of SARS-CoV-2 relies on human-to-human contact, and more people and higher population density leads to higher contact rates (Hu et al., 2013), and might thus reduce people's tendency to violate social distancing rules. We controlled for the percentage of the population over 65 years old because older people are more likely to become severely ill from Covid-19 and thus might be more likely to follow social distancing rules. We controlled for the

[5] The missing observations are all on dates before the first Covid-19 death was reported in the relevant county.

percentage of voters who voted for Donald Trump because at the beginning of the Covid-19 pandemic because President Trump downplayed the risks of Covid-19, which would likely reduce Trump voters' compliance with social distancing rules (Allcott, Boxell, Conway, Gentzkow, et al., 2020; Gollwitzer et al., 2020; Painter & Qiu, 2021).

We obtained data on median income from 2016 American Community Survery's 5-year estimate at the county level (U.S. Census Bureau, 2016). We obtained data on educational level (i.e. number of people with different levels of educational attainment), ethnicity (i.e. number of people of different races), total population, total land, and age distribution (i.e. number of people in different age groups) from the 2016 American Community Survey's 5-year estimate at the census group level. Data at the census group level were aggregated into the county level using county FIPS codes. The data on voting patterns in the 2016 US presidential elections was obtained from the MIT Election Data and Science Lab (2018).[6] All our measures are summarized in Table 1.

Table 1
Measures

Variable	Description	Source
HomeDwellTime	Median number of minutes devices were found at home across all devices in a county on a day.	SafeGraph Inc.
%StayHome	Number of devices that were found completely at home divided by total number of devices in a county on a day.	SafeGraph Inc.
%StayHome (NonWork)	Number of devices that were found completely at home divided by the number of devices without working patterns (e.g., part-time or full-time) in a county on a day.	SafeGraph Inc.
PrecHome	The median percentage of time devices were found at home in a county on a day.	SafeGraph Inc.
Policy Str	County-level stringency index of the pandemic containment policies.	OxCGRT & National Association of Counties (NACo)
Individualism	State-level collectivism index times (reverse-scored).	Vandello and Cohen (1999)
Mobility	Percentage of residents in a county who lived in a different dwelling in a different micropolitan or metropolitan one year ago.	U.S. Census Bureau
MedianIncome	Median household income.	U.S. Census Bureau
%HighEduc	Percentage of people (above 25 years old) who have received a bachelor's degree or above.	U.S. Census Bureau

[6] Available at https://electionlab.mit.edu/data.

%Minority	Percentage of people who are non-White.	U.S. Census Bureau
PopuDensity	Number of people per unit of area.	U.S. Census Bureau
Population	Total population.	U.S. Census Bureau
%Over65	Percentage of people who are 65 years old or older.	U.S. Census Bureau
%Trump	Percentage of people who voted for Donald Trump in the 2016 U.S. presidential election.	U.S. Census Bureau
Ln(1+NewDeaths)	Natural logarithm of one plus the new Covid-19 deaths in a county on a day.	The New York Times

Analyses

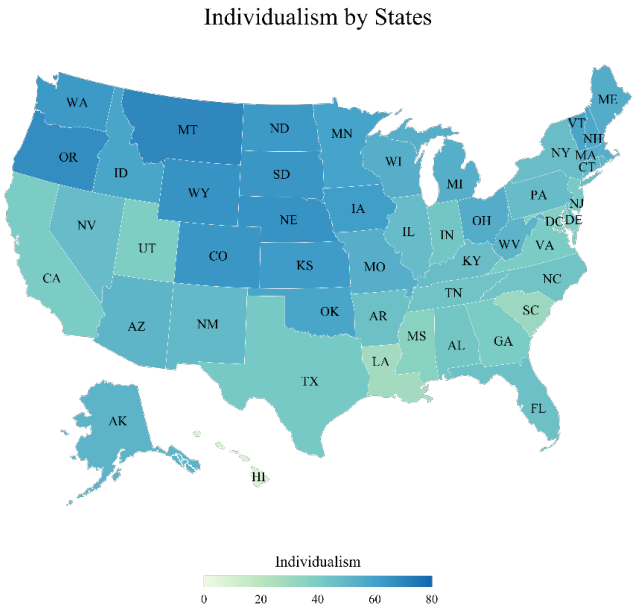
Figure 1 depicts the map of Vandello and Cohen's (1999) individualism score across the 50 US states, and the average time away from home (24*60 minutes - *HomeDwellTime*) across the 50 states on May 31, 2020. States shaded in a lighter color (indicating higher collectivism) have higher average *HomeDwellTime.*[7]

To test our hypothesis, we analyzed the data using the difference-in-difference approach (Bertrand et al., 2004). As a quasi-experimental design, this approach utilizes the staggered adoption of containment and closure policies across counties. This approach can help to tease out the effects of unobserved but fixed omitted variables (Angrist & Pischke, 2008). Our analyses were conducted at the County × Date level, with the following regression model:

$$HomeDwellTime_{i,t} = \alpha + \beta_1 \times PolicyStr_{i,t} + \beta_2 \times Individualism_i \times PolicyStr_{i,t} + \beta_3 \times Controls_i \times PolicyStr_{i,t} + Ln(1 + NewDeaths)_{i,t} + r_i + d_t + \varepsilon_{i,t}$$

In this formula, i represents each county; t represents each day from January 1 to December 31, 2020; $HomeDwellTime_{i,t}$ is the median number of minutes devices are found at

[7] We are grateful for the suggestion on the visual comparison from an anonymous reviewer.



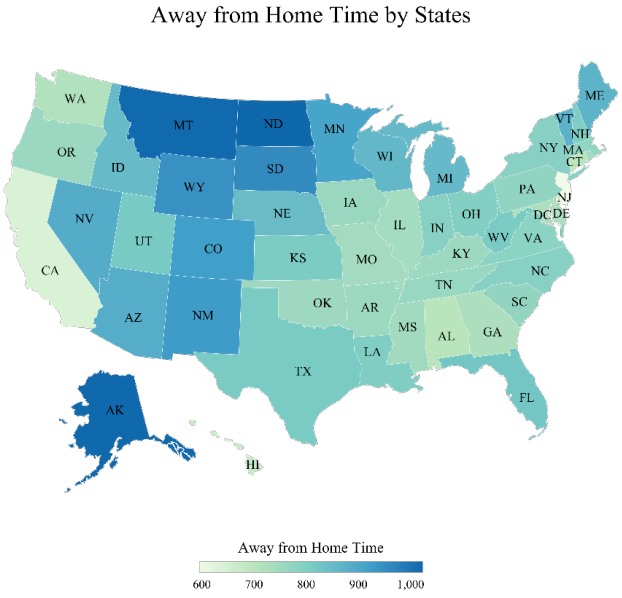


Figure 1. Individualism and Time Away from Home Across the United States

home for all devices in county i on date t; $PolicyStr_{i,t}$ is the standardized policy stringency index from OxCGRT and NACo; $Individualism$ is the individualism indicator measured in one of two different ways; $Controls$ are the socio-demographic characteristics of each county; $Ln(1 + NewDeaths)_{i,t}$ is the natural logarithm of one plus the number of new Covid-19 deaths in county i on date t; r_i represents the county-level fixed effects; and d_t represents the date-level fixed effects.

We included county-level fixed effects to account for the dozens of ways in which counties differ from each other but are not captured by our control variables. No matter how many county-level variables we control for, there is always the possibility that some relevant variables are omitted (Imbens & Wooldridge, 2009). Thus, including county-level fixed effects is a conservative strategy that accounts for all other variables that differ across counties (Bertrand & Mullainathan, 2003). We included date-level fixed effects to account for the effects of date-specific events (e.g., national policy announcements, the weather) that varied across dates, and thus could have impacted the dependent variables. In our analyses, we clustered standard errors at the county level to account for within-county correlation in the dependent variable.

Our model accounts for the main effect of county-level individualism in the analysis—however, this effect is absorbed in the county-level fixed effects and thus not represented as a separate coefficient. We used the difference-in-difference analytic method, which was implemented with the STATA command *reghdfe* developed by Correia (2017). Specifically, we included the county-level fixed effects and date-level fixed effects in the regressions for the county × date panel data in this study. Including the county-level fixed effects is equivalent to including an indicator/dummy variable for each county. Since individualism is a state-level measure and does not change across time, the main effect of individualism is absorbed by the county-level fixed effects. Given estimating coefficients using the regression analysis may suffer from the omitted variable bias (Imbens & Wooldridge, 2009), using the fixed-effect model can

help mitigate this problem. When testing the fixed-effect model using the difference-in-difference analytic method, STATA automatically drops the main effects due to their collinearity with the fixed effects while retaining the interaction effects. For these reasons, the main effect of individualism is absent from our table.

Results

State-level individualism score and following social distancing rules. Table 2 reports the results based on containment policy stringency and Vandello and Cohen's (1999) individualism index. Model 1 reports the results for the median number of minutes devices are found at home for all devices in each county on a given date. The coefficient of *PolicyStr* in Model 1 is 3.783 ($p < 0.001$), indicating that people spent more time at home when the containment policies are more stringent. The coefficient of the interaction between *Individualism* and *Policy Str* in Model 1 is -6.586 ($p < 0.001$). The negative sign indicates that people in counties with higher individualism were less likely to follow social distancing rules to stay home. Models 2 and 3 examine the percentage of devices that were found at home during the entire day. Model 2 reports the results including all residents. The effects are qualitatively the same when we exclude residents who went to work on a given day and thus might be classified as essential workers (Model 3). As a robustness check, Model 4 examines the median percentage of time devices were found at home, and once again, the coefficient of the interaction between $Individualism$ and $Policy\ Str$ is still negative and significant.

In Models 2 and 3, the coefficients of *PolicyStr* are 0.890 ($p < 0.001$) and 0.991 ($p < 0.001$), respectively. These results indicate that more residents spent their whole day at home when the containment policies were more stringent. However, the effect is small—a one standard deviation increase in *PolicyStr* only leads to a 0.890 percentage point increase in the percentage of residents staying at home for the whole day. This small effect is consistent with findings from recent research (Allcott, Boxell, Conway, Gentzkow, et al., 2020; Chiou & Tucker, 2020; Painter & Qiu, 2021). One explanation is that our conservative approach of including

county and date dummy variables extracted a large amount of variance that could potentially have been associated with shelter-in-place orders. These dummy variables would not have reduced the effect size if shelter-in-place orders were randomly distributed over counties and dates, but in reality, the orders were instead relatively smoothly distributed over space and time.

We also included interaction terms between county-level socio-demographic characteristics and the $Policy\ Str$ as control variables. In Model 2, the interaction coefficient between $MedianIncome$ and $Policy\ Str$ is 0.496 ($p < 0.001$), indicating that people in wealthier counties were more likely to follow social distancing rules. The coefficient of the interaction between $\%HighEduc$ and $Policy\ Str$ is 0.267 ($p < 0.001$), indicating that people in counties with a higher proportion of residents with a Bachelor's degree or higher were more likely to follow the closure policies. The coefficient of the interaction between $\%Minority$ and $Policy\ Str$ is -0.365 ($p < 0.001$), indicating that people in counties with a higher proportion of non-white residents were less likely to follow social distancing rules. The coefficient of the interaction between $PopuDensity$ and $Policy\ Str$ is 0.038 ($p = 0.34$), indicating that people in counties with higher population density were non-significantly more likely to follow social distancing rules. The coefficient of the interaction between $\%Over65$ and $Policy\ Str$ is -0.196 ($p < 0.001$), indicating that people in counties with a higher percentage of people above 65 years old were less likely to follow social distancing rules. The coefficient of the interaction between $\%Trump$ and $Policy\ Str$ is -0.503 ($p < 0.001$), indicating that people in counties with a higher proportion of Trump voters were less likely to follow social distancing rules. Our results held even after controlling for the big five personality traits (please see Panel A of Table A2 in the Supplementary Materials). For brevity, regression results without control variables are included in the Supplementary Materials.

Residential mobility. Table 3 presents the results with county-level residential mobility as an indicator of individualism. The coefficients of the interaction term between $Mobility$ and

$Policy\ Stringency$ are negative, indicating that people in counties with higher residential mobility (i.e., with higher individualism) were less likely to follow social distancing rules. Our results still held after controlling for the big five personality traits (please see Panel B of Table A2 in the Supplementary Materials).

Discussion

Study 1 found that in more individualistic US states, Covid-19 lockdowns led to a smaller increase in the proportion of people staying home the whole day. Similarly, in counties with higher residential mobility, which is associated with greater individualism, lockdowns led to a smaller increase in the proportion of people staying home the whole day. This finding is consistent with that of Salvador et al. (2020), who found that the greater a country's relational mobility, the faster its growth rate of Covid-19 in the country. Given that more independent countries have higher relational mobility (Schug et al., 2010), our findings converge with Salvador et al. (2020). Regression results without control variables are included in the Supplementary Materials.

Our findings held even after controlling for county-level severity of Covid-19 (i.e., the number of new Covid-19 deaths in each county on each date). An examination of the control variables indicated that counties with a higher median income, higher education attainment, fewer people over 65 years of age, and fewer people who voted for President Trump in 2016 exhibited a bigger increase in the proportion of people staying home following a lockdown.

Table 2
Vandello and Cohen (1999)'s Individualism and Compliance with Social Distancing Rules

Variables	Model 1 *HomeDwell Time*	Model 2 *%StayHome*	Model 3 *%StayHome (NonWork)*	Model 4 *PercHome*
Policy Str	3.783***	0.890***	0.991***	0.925***
	(3.35)	(17.91)	(18.75)	(11.22)
Individualism × *Policy Str*	-6.586***	-0.256***	-0.293***	-0.202***
	(-15.83)	(-11.35)	(-12.25)	(-5.83)
MedianIncome × *Policy Str*	5.813***	0.496***	0.423***	0.579***
	(9.51)	(17.50)	(15.11)	(12.34)
%HighEduc × *Policy Str*	-1.465*	0.267***	0.312***	-0.021

	(-2.36)	(8.56)	(9.83)	(-0.47)
%Minority × Policy Str	-1.401*	-0.365***	-0.349***	-0.385***
	(-2.50)	(-11.74)	(-10.91)	(-7.16)
PopuDensity × Policy Str	0.075	0.038	0.028	0.006
	(0.16)	(0.95)	(0.79)	(0.23)
Population × Policy Str	2.358***	0.176**	0.177**	0.084**
	(3.49)	(3.08)	(3.28)	(2.96)
%Over65 × Policy Str	-2.015***	-0.196***	-0.184***	-0.159***
	(-4.62)	(-9.15)	(-8.00)	(-4.58)
%Trump × Policy Str	-4.356***	-0.503***	-0.537***	-0.511***
	(-8.12)	(-18.24)	(-18.59)	(-13.50)
Ln(1+NewDeaths)	3.586***	0.632***	0.610***	0.456***
	(4.46)	(16.37)	(15.89)	(13.75)
Constant	629.837***	27.007***	31.170***	76.892***
	(6,103.65)	(5,360.04)	(6,102.19)	(12,720.04)
County FE	YES	YES	YES	YES
Date FE	YES	YES	YES	YES
Observations	1,136,038	1,136,038	1,136,038	1,136,038
Adj. R-squared	0.778	0.783	0.702	0.706

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$. *T*-statistics are reported in parentheses. FE stands for fixed effects.

Table 3
Residential Mobility and Compliance with Social Distancing Rules

Variables	Model 1 *HomeDwell Time*	Model 2 *%StayHome*	Model 3 *%StayHome (NonWork)*	Model 4 *PercHome*
Policy Str	-1.013	0.229***	0.326***	0.474***
	(-0.70)	(3.30)	(4.48)	(5.26)
Mobility × Policy Str	-2.998***	-0.097*	-0.084*	-0.184***
	(-3.40)	(-2.50)	(-2.04)	(-4.41)
MedianIncome × Policy Str	9.504***	0.603***	0.553***	0.659***
	(15.95)	(20.19)	(16.85)	(16.94)
%HighEduc × Policy Str	-2.759***	0.215***	0.222***	-0.041
	(-4.26)	(5.68)	(5.27)	(-0.95)
%Minority × Policy Str	2.560***	-0.205***	-0.156***	-0.279***
	(4.04)	(-5.98)	(-4.18)	(-7.01)
PopuDensity × Policy Str	0.100	0.022	0.013	0.004
	(0.25)	(0.75)	(0.53)	(0.17)
Population × Policy Str	1.605***	0.115**	0.124**	0.045**
	(3.59)	(2.99)	(3.23)	(2.78)
%Over65 × Policy Str	-1.678**	-0.133***	-0.087*	-0.181***
	(-2.67)	(-4.07)	(-2.54)	(-4.58)
%Trump × Policy Str	-3.313***	-0.540***	-0.577***	-0.495***
	(-4.86)	(-14.41)	(-14.21)	(-12.62)
Ln(1+NewDeaths)	6.367***	0.579***	0.561***	0.418***
	(7.82)	(13.04)	(12.65)	(11.24)
Constant	673.835***	28.281***	32.411***	79.206***
	(3,759.97)	(2,797.82)	(3,196.99)	(8,234.08)

County FE	YES	YES	YES	YES
Date FE	YES	YES	YES	YES
Observations	423,874	423,874	423,874	423,874
Adj. R-squared	0.837	0.871	0.831	0.823

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$. *T*-statistics are reported in parentheses. FE stands for fixed effects.

Study 2: Country-Level Longitudinal Study Using Cross-Country Google Mobility Data

Study 2 sought to replicate Study 1's findings at the country level by analyzing Google mobility data across 79 countries and regions. We examined whether people in individualistic countries were less likely to follow social distancing rules. We measured country/region-level individualism using Hofstede's scores (Hofstede, 1980). We measured people's tendency to violate or follow social distancing rules by calculating the number of times they visited parks (e.g., local parks, national parks, public beaches, marinas, and public gardens), grocery stores (e.g., grocery markets, food warehouses, and pharmacies), retail & recreation locations (e.g., restaurants, cafes, shopping centers, theme parks, museums, libraries, and movie theaters), and workplaces, compared to residential places.

The inclusion of multiple dependent measures helps assess the specificity of the effect of individualism. The findings from our Study 1 suggest that people in more independent counties would be less willing to follow social distancing rules, and would thus be less likely to be found at residential places, and more likely to visit other places that are open, such as parks and grocery stores. However, during much of the pandemic, workplaces, and retail and recreation businesses were either fully closed or open under limited capacity. More generally, the stronger the lockdown policy in place, the more likely that people could not voluntarily choose to visit these places. Our theorizing states that more individualistic people are more likely to voluntarily go out to places that were actually open during the pandemic, so individualism should be unrelated to people's mobility to workplaces, and retail and recreation locations. In case individualism predicts people's mobility to workplaces, and retail and recreation locations, then the findings would suggest that the effect of individualism could be spurious.

Method

Independent variable. We obtained country-level individualism scores from Geert Hofstede's website (https://geerthofstede.com/). This data has been widely used in previous studies (e.g., Chui et al., 2010; Han et al., 2010; Hofstede, 1980). For ease of interpretation, we normalized the independent variable to a mean of 0 and a standard deviation of 1.

Dependent variable. To measure the extent to which people followed social distancing rules, we used cross-country mobility data from Google.[8] The Google mobility dataset covers 135 countries and regions around the world. This dataset provides how people's frequency of visits to various places (e.g., grocery stores, pharmacies, parks, restaurants, workplaces, and places of residence) changed compared to a baseline period (i.e., January 3 to February 6, 2020). During the baseline period, very few countries and regions had adopted lockdown or social distancing policies. The Google mobility dataset covers mobility data from February 15 onwards. Similar to Study 1, we used data till December 31, 2020. During this period, most countries had some form of a lockdown as many countries were severely affected by the Covid-19 pandemic. For each country on each day, Google calculated the number of visits on each day of the week compared to the median number of visits on the same day of the week during the baseline period. For example, the mobility data on May 1 (Friday) would reflect the number of visits on May 1 minus the median value of the number of visits on January 3 (Friday), January 10 (Friday), January 17 (Friday), January 24 (Friday), and January 31 (Friday).

Similar to Study 1, we analyzed the data with dates nested within countries. We constructed five dependent variables. We calculated residents' mobility pattern using the number of visits to "Parks" (e.g., local parks, national parks, public beaches, marinas, and public gardens), "Grocery & Pharmacy" (e.g., grocery markets, food warehouses, and pharmacies), "Retail & Recreation" (e.g., restaurants, cafes, shopping centers, theme parks, museums,

[8] https://www.google.com/covid19/mobility/

libraries, and movie theaters), and “Workplace.” The higher the mobility to "Parks," "Grocery & Pharmacy," "Retail & Recreation," and "Workplace,” the higher probability people are violating social distancing rules. The higher the mobility to “Residential Places,” the lower the probability people are violating social distancing rules.

Other variables. As the definition of stay-at-home orders could vary across countries, we included the stringency of each country’s lockdown orders as a key variable in our model. The policy stringency index measured the overall stringency of governments’ measures to contain Covid-19. We obtained this data directly from Oxford Covid-19 Government Response Tracker (OxCGRT; Hale et al., 2020)[9]. OxCGRT collected information on common policy measures that governments took to contain the Covid-19 pandemic, such as closing school, closing non-essential workplaces, closing public transport, canceling public events, putting restrictions on gatherings, instituting stay-at-home requirements, restricting internal movement, and restricting international travel. We also controlled for the natural logarithm of one plus the number of Covid-19 new deaths in the country on each date, as provided by OxCGRT.

We included a number of country-level control variables: GDP per capita, median age, total population, population density, and life expectancy. We obtained the data on GDP per capita, total population, and population density from World Bank (2018).[10] We obtained the data on median age of the country’s population from Department of Economics and Social Affairs in United Nations (2020).[11] We obtained the life expectancy data from Worldometer (2020).[12] We included GDP per capita because in wealthier countries, people might be more responsive to government orders (Giuliano, 2005). We included the population density and total population for the same reasons as in Study 1. We included life expectancy as a proxy for the robustness of a country’s health system (Evans et al., 2001); people might be more likely to violate social

[9] https://covidtracker.bsg.ox.ac.uk/.
[10] https://data.worldbank.org/
[11] https://population.un.org/
[12] https://www.worldometers.info/demographics/life-expectancy/

distancing policies if confident about their country's health system. We included median age because young people are more likely to violate social distancing rules (Berg et al., 2020). We did not include country-level tightness scores as a covariate because Gelfand et al.'s (2011) scores are only available for 33 countries. All our measures are summarized in Table 4.

After merging variables from the above datasets, we had data from OxCGRT, Google mobility, and Hofstede for 79 countries and regions. Therefore, we focus on these 79 countries and regions in our following analyses.

Table 4
Measures

Variable	Description	Source
Parks	Mobility to parks (e.g., local parks, national parks) on a given day compared to mobility to parks in the baseline period.	Google Mobility
Grocery & Pharmacy	Mobility to grocery & pharmacy (e.g., grocery markets, food warehouses) on a given day compared to mobility to grocery & pharmacy in the baseline period.	Google Mobility
Residential Places	Mobility to residential places on a given day compared to mobility to residential places in the baseline period.	Google Mobility
Retail & Recreation	Mobility to retail & recreation (e.g., restaurants, cafes, shopping centers) on a given day compared to mobility to retail & recreation in the baseline period.	Google Mobility
Workplace	Mobility to workplaces on a given day compared to mobility to workplaces in the baseline period.	Google Mobility
Policy Str	Country-level stringency index of pandemic containment policies.	OxCGRT
Individualism	Country-level individualism score.	Hofstede's website
GDP Per Capita	GDP of a country divided by its population.	World Bank
PopuDensity	Number of people per unit of area.	World Bank
Population	Total population.	World Bank
Life Expectancy	The number of years an individual in a country is expected to live since their birth.	Worldometer
Median Age	Median age of the population in a country.	United Nations
Ln(1+NewDeaths)	Natural logarithm of one plus the new Covid-19 deaths in a country on a day.	OxCGRT

Analyses

As in Study 1, we tested whether the effects of stringency of government containment policies on people's mobility to parks, grocery and pharmacy, retail and recreation places, workplace, and residential places become weaker in countries that are higher in individualism. Our analyses were conducted at the Country × Date level, with the following regression model:

$$ParkMobility_{i,t} = \alpha + \beta_1 \times PolicyStr_{i,t} + \beta_2 \times Individualism_i \times PolicyStr_{i,t}$$

$$+\beta_3 \times Controls_i \times PolicyStr_{i,t} + Ln(1 + NewDeaths)_{i,t} + r_i + d_t + \varepsilon_{i,t}$$

In this formula, i represents each country/region; t represents each day from February 15 to December 31, 2020; $ParkMobility_{i,t}$ is the changes in mobility to parks on date t compared to the baseline period for country i; $PolicyStr_{i,t}$ is the policy stringency index for the government containment measures for country i on date t; $Individualism_i$ is the individualism score of country i; $Controls_i$ are the socio-demographic characteristics of country i; $Ln(1 + NewDeaths)_{i,t}$ is the natural logarithm of one plus the number of new Covid-19 deaths in country i on date t; r_i represents the country-level fixed effects; and d_t represents the date-level fixed effects.

As in Study 1, we included country-level fixed effects and date-level fixed effects. The main effects of individualism and of the control variables are absorbed by the country-level fixed effects. We clustered standard errors at the country level to account for within-country correlation in the dependent variable.

Results

Individualism and Google Mobility. Table 5 reports the results for the cross-country analysis. The coefficients on $Policy\ Str$ in Models 1, 2, and 3 are -18.253, -7.404, and 4.644 (all *p*'s < 0.001). However, the coefficients on $Policy\ Str$ in Models 4 and 5 are nonsignificant. The negative sign in Model 1 and Model 2, and positive sign in Model 3 indicate that, when more stringent containment policies were implemented, people visited parks, and grocery and

pharmacy stores less, and were more likely to be found at residential places. Moreover, the coefficients on the interaction between $Individualism$ and $Policy\ Str$ in Model 1, Model 2, and Model 3 are 4.428 ($p < 0.01$), 1.634 ($p < 0.01$), and -0.681 ($p < 0.05$). This positive sign in Model 1 and Model 2 and the negative sign in Model 3 indicate that people in more individualistic countries were more likely to visits parks as well as grocery and pharmacy stores, and were less likely to stay at residential places. In terms of magnitude, a one standard deviation increase in individualism led to a 24.26% (4.428/18.253) decrease in the effect of government containment measures. In other words, the effect of government containment policies is 24.26% weaker in countries that are one standard deviation higher in individualism scores. Thus, Study 2 conceptually replicated the findings of Study 1 at the country level. For brevity, regression results on country-level individualism without control variables are included in the Supplementary Materials.

Discussion

Study 2 replicated the key finding of Study 1 at the country-level: Covid-19 lockdown orders led to a decrease in the proportion of people visiting parks or grocery and pharmacy stores and an increase in the likelihood of being found at residential places. However, people in more individualistic countries left their home more frequently by visiting public parks or grocery and pharmacy stores despite social distancing rules. In Study 2, we found no relationship between individualism and people's mobility to workplaces and to retail and recreation places. One explanation is that during times of stringent social distancing policies, these places were likely fully closed or opened at limited capacities, and thus people had less discretion in whether they could visit workplaces and retail and recreation locations. It is also possible that by December 2020, some work and retail locations had opened up, and even before then, there was probably a high degree of variability in the extent to which lockdown orders were enforced. Thus, people in more individualistic countries could have visited these places but decided not to do so. Perhaps people in these countries were not necessarily motivated to hurt their fellow

citizens by going to high-risk places that could worsen the spread of Covid-19 (e.g., work and retail, which are typically indoor places), but were motivated to exercise their individual freedoms by going to outdoor places (e.g., parks) where they could meet people even if it meant violating official lockdown orders.

For the nonsignificant results of some of our covariates, we have two explanations. First, controlling multiple predictors in the same model may weaken the effect of a given variable. For example, if we only included GDP per capita in the regression, then GDP per capita significantly predicted the mobility to grocery stores and workplaces. However, if we included both GDP per capita and individualism in the regression, then GDP per capita was no longer statistically significant. Also, if we only included population density in the regression, then population density significantly predicted mobility to parks and residential places. However, if we include both population density and individualism in the regression, the effect of population density became weaker. These results seem to suggest that cultural variables have higher explanatory power than demographic variables. Second, we clustered the standard error at the country level when calculating the *p*-values of the coefficients. We did so because there are strong within country correlations among the mobility variables (Abadie et al., 2017). Clustering the standard error is a conservative method, and explain why some of our covariates were nonsignificant.

Table 5
Cross-Country Individualism and Google Mobility

Variables	Model 1 *Parks*	Model 2 *Grocery & Pharmacy*	Model 3 *Residential Places*	Model 4 *Retail & Recreation*	Model 5 *Workplace*
Policy Str	-18.253***	-7.404***	4.644***	-12.678***	-7.131***
	(-7.41)	(-7.71)	(14.52)	(-13.26)	(-9.28)
Individualism × *Policy Str*	4.428**	1.634**	-0.681*	1.034	0.401
	(2.95)	(2.73)	(-2.59)	(1.49)	(0.72)
GDP Per Capita× *Policy Str*	1.464	0.875	0.105	0.535	0.317
	(0.70)	(1.17)	(0.42)	(0.72)	(0.58)
PopuDensity × *Policy Str*	-1.594	0.722	0.673	-0.575	-0.926
	(-1.64)	(1.65)	(1.85)	(-1.09)	(-1.33)
Population × *Policy Str*	-0.105	-0.165	-0.050	-0.381	-0.072
	(-0.19)	(-0.92)	(-0.48)	(-1.53)	(-0.50)

Life Expectancy × PolicyStr	-1.286	-1.524	0.603	-2.191*	-1.626
	(-0.54)	(-1.41)	(1.22)	(-2.10)	(-1.74)
Median Age × Policy Str	-0.138	0.260	-0.397	-0.586	0.223
	(-0.08)	(0.31)	(-1.10)	(-0.67)	(0.32)
Ln(1+NewDeaths)	-7.425***	-0.530	0.911***	-2.643***	-1.059***
	(-7.52)	(-1.19)	(6.34)	(-6.06)	(-3.53)
Constant	17.831***	-5.921***	8.384***	-21.109***	-21.470***
	(9.53)	(-7.30)	(31.81)	(-26.29)	(-38.84)
Country FE	YES	YES	YES	YES	YES
Date FE	YES	YES	YES	YES	YES
Observations	25,130	25,251	25,256	25,257	25,255
Adj. R-squared	0.672	0.608	0.816	0.800	0.701

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$. *T*-statistics are reported in parentheses. FE stands for fixed effects.

Study 3: Pre-registered Correlational Replication at the Individual Level

Although the findings of Studies 1 and 2 were consistent with our hypotheses, both studies used macro-level, not individual-level, measures of individualism (region-level in Study 1, and country-level in Study 2). Although we controlled for a number of region-level and country-level variables, it is always possible that some key variables correlated with individualism were left out. The goal of Study 3 was to provide a conceptual replication of Study 1's and Study 2's key findings by conducting a correlational study at the individual level. We recruited participants who had lived under a Covid-19 lockdown and measured their personal degree of individualism. We then tested whether more individualistic people reported that they had violated social distancing rules more often during the Covid-19 lockdown in their community.

Method

We pre-registered the methods and analyses of this study at https://osf.io/6mjd4?view_only=b40d0787bd8a4364be182538142d3a77.

Participants. In a previous study using a similar design, we found an effect size in the predicted direction with $r = .27$. A power analysis with $r = .27$, $\alpha = .05$ (one-tailed), and power = 80% indicated that we need to recruit 81 participants. Given that we had an exclusion (see below), we posted a survey seeking 100 US residents on Amazon's Mechanical Turk. Using a

prescreen, we only allowed prospective participants who had stayed at least a week under a Covid-19 lockdown, but did not have to work onsite during this time (i.e., did not work in essential services) to proceed with the survey. In response, 97 participants completed the survey (M_{age} = 40.78, SD_{age} = 14.26; 55 women, 42 men; 72.2% obtained bachelor's degree or below, 27.8% obtained master's degree or above; 27.8% were lower-middle-class or below, 72.2% were middle class or above; 75.3% European, 10.3% African, 5.2% Latin American, 3.1% Native American, 7.2% East Asian, 3.1% South-east Asian, 3.1% South Asian, 1% Middle Eastern, and 2.1% other). All participants had unique IP addresses.

Procedure. We measured participants' individualism using the 8-item scale developed by Triandis and Gelfand (1998). Participants were asked to respond to sample items such as "I rely on myself most of the time; I rarely rely on others" on a 7-point scale ranging from "strongly disagree" to "strongly agree." We measured the extent to which participants had violated social distancing rules during the Covid-19 lockdown in their community using a 6-item scale developed for this study. We asked participants to "Think about the time when you were living under a lockdown, that is, when people were prohibited from leaving their home except for essential items (e.g., food and medicine)." They were then asked to respond to items including: (a) "During the lockdown, how often did you leave your home to relieve your boredom," (b) "During the lockdown, how often did you physically meet your friends or significant other who were not living with you," (c) "During the lockdown, how often did you go out in places where there were many other people around," (d) "During the lockdown, how often did you visit parks, beaches, or other outdoor areas that were closed," (e) "During the lockdown, how often did you loiter around in public places," and (f) "During the lockdown, how often did you go to supermarkets to buy non-essential items" on a 7-point scale ranging from "never" to "multiple times a day." Higher scores on this measure indicated that participants had violated social distancing rules more often during the lockdown in their locality. We measured people's political orientation using three items, each measured on a 7-point bipolar scale: "Please indicate your

political orientation: strongly liberal—strongly conservative; strongly left—strongly right"; strongly Democrat—strongly Republican." Finally, we asked participants an open-ended question: "Please summarize the main point of the statements that you responded to in the above survey."

Results

As per the pre-registered analysis plan, we excluded eight participants who provided gibberish or irrelevant responses to the open-ended question asking them to summarize the main point of the measures that they responded to (see Supplementary Materials for the responses that were judged to be gibberish).

As shown in Table 6, we found that more individualistic people reported that they had violated social distancing rules more often, r = .269, 95% CI [.055, .432], p = .005 (one-tailed, as we pre-registered a directional hypothesis). We further conducted regression analyses while controlling for political orientation. As shown in Model 2 of Table 7, the relationship between individualism and violating social distancing rules remained significant, B = .271, 95% CI [.035, .507], p = .013 (one-tailed, as we pre-registered a directional hypothesis), β = .242.

Table 6
Descriptive Statistics and Correlations

Variables	*M*	*SD*	1	2	3
1. Political orientation	3.94	1.56	(.93)		
2. Individualism	4.86	.77	.23*	(.74)	
3. Violating social distancing rules	1.89	.87	.17	.27*	(.91)

N = 89. Reliability coefficients are displayed on the diagonal in parentheses.
*p < .05, **p < .01, ***p < .001 (two-tailed).

Table 7
Regression Results with Violating Social Distancing Rules as the Dependent Variable

Variables	Model 1		Model 2	
	B	*SE*	*B*	*SE*
Intercept	1.51*** [1.01, 2.00]	.25	.31 [-.84, 1.46]	.58
Political orientation	.10 [-.02, .21]	.06	.07 [-.05, .18]	.06
Individualism			.27* [.04, .51]	.12
ΔR^2	.03		.06*	

N = 89. *p < .05, **p < .01, ***p < .001 (two-tailed).

Discussion

Study 3 provided support for our key hypothesis at the individual level: more individualistic people reported that they had violated social distancing rules more often when they were living under a Covid-19 lockdown. Individuals' political orientation was not associated with their tendency to follow social distancing rules.

Study 4: Examining Underlying Mechanisms

A key question then arises: Why are more individualistic people less likely to follow social distancing rules? In Study 4, we examined a number of potential mechanisms that can explain the relationship between individualism and the extent to which people followed social distancing rules during Covid-19 lockdowns. Specifically, we investigated four different underlying mechanisms: concern for self, concern for others, compliance with norms, and optimism.

First, individualism is associated with a greater focus on one's own self-interest and a greater concern for oneself (Triandis, 1995). In the context of Covid-19, increased concern for one's interests means going outside whenever one desires, even if it means violating shelter-in-place guidelines and leaving their home just for a change of scenery whenever they feel bored. Thus, more individualistic people might be less likely to follow social distancing rules because they are more concerned about their own interests.

Second, in addition to being more self-interested, more individualistic people care less about others' needs and interests (Triandis, 1988). Although a greater emphasis on self-interest and a reduced emphasis on others' interests often go hand in hand, the two are experimentally dissociable (e.g., De Dreu & Nauta, 2009; van Lange et al., 1997). People from more individualistic cultures are not only more focused on their self-interest but also less concerned about others' interests (Pearson & Stephan, 1998). In the context of Covid-19, reduced concern for others' interests means going outside even if it means putting others at risk (e.g., infecting others, in case one has an asymptomatic infection; or getting infected outside and bringing the

infection home, thereby putting others in one's household at risk). Thus, more individualistic people might be less likely to follow social distancing rules because they are less concerned about others' interests.

Third, people high in individualism are more strongly guided by their personal preferences and thus are less likely to conform to social norms (Cialdini et al., 1999; Savani et al., 2008). For example, even when people's personal values were similar across cultures, social norms influenced people's decisions less in an individualistic culture than in a collectivistic culture (Savani et al., 2015). In the context of Covid-19, social norms call for following social distancing rules because that is what a majority of other people are doing. Thus, more individualistic people might be less likely to follow social distancing rules because they do not like to comply with social norms.

Finally, in more individualistic cultures, people are more optimistic (Chang, 1996). For example, Americans think that they are more likely to personally encounter good outcomes than other people, but this difference is smaller with Japanese participants (Rose et al., 2008). In the context of Covid-19, optimism can translate into the belief that the risk of catching a Covid-19 infection is low, that the consequences of catching Covid-19 are not as bad, and that the pandemic would be arrested shortly. Thus, more individualistic people might be less likely to follow social distancing rules because they are more optimistic about Covid-19.

To test whether our findings hold across different countries, Study 4 collected data from the US and UK. Importantly, these two countries have some of the highest numbers of confirmed Covid-19 cases in the world. Moreover, in addition to controlling for individuals' political orientation, we also controlled for people's degree of physical activity before Covid-19, as more physically active people might be more likely to violate social distancing rules.

Method

Participants. A power analysis with $r = .27$ (from Study 4), $\alpha = .05$ (one-tailed), and power = 80% indicated that we need to recruit 81 participants. However, as we were testing a

number of potential mediators in this study, we decided on a sample size of 200 participants per country. We posted surveys seeking 200 US residents on Amazon's Mechanical Turk and 400 UK residents on Prolific. We sought to recruit more UK residents because Prolific did not allow us to kick out participants who failed to pass the prescreen question. As in Study 3, only prospective participants who had stayed at least a week under a Covid-19 lockdown but did not have to go to work during this time (i.e., did not work in essential services) were allowed to participate in our study. In response, 199 Americans and 274 British completed the survey. All responses came from unique IP addresses. None of the Americans but 25 British provided gibberish or irrelevant responses to an open-ended question asking them to summarize the main point of the measures that they responded to. They were thus excluded (see Supplementary Materials for the responses that were judged to be gibberish or irrelevant).

The final sample consisted of 199 Americans (M_{age} = 43.01, SD_{age} = 12.48, 1 missing; 103 women, 94 men, 2 other; 81.4% obtained bachelor's degree or below, 18.6% obtained master's degree or above; 44.2% were lower-middle class or below, 55.8% were middle class or above; 80.4% European, 9.5% African, 4.5% Latin American, 2.5% Native American, 6.5% East Asian, 0.5% South-east Asian, 1% South Asian, and 0.5% other) and 249 British (M_{age} = 40.63, SD_{age} = 14.23, 5 missing; 182 women, 67 men; 79.4% obtained bachelor's degree or below, 20.6% obtained master's degree or above; 58.2% were lower-middle class or below, 41.8% were middle class or above; 85.1% European, 2.8% African, 0.8% Latin American, 2% East Asian, 1.2% South-east Asian, 4.8% South Asian, 1.2% Middle Eastern, and 2.4% other).

Procedure. We measured participants' individualism and the extent to which they had violated social distancing rules during the Covid-19 lockdown[13] using the same measures used

[13] The only difference between Study 3 and Study 4 regarding the measure of violating social distancing rules is the instructions. In Study 3, we instructed participants, "Think about the time when you were living under a lockdown, that is, when people were prohibited from leaving their home except for essential items (e.g., food and medicine)." In Study 4, we instructed participants, "Think about the time when you were living under a lockdown. We want to learn about how often you left home for reasons other than purchasing essential items (food and medicines) and getting exercise."

in Study 3. Table 8 displays the list of mediator measures. Specifically, concern for self was operationalized by measures of selfishness, desire for freedom, and boredom during lockdown, concern for others was operationalized by measures of sympathy and prosocial motivation, compliance with norms was operationalized by measures of compliance with social norm and compliance with government order, and optimism was operationalized by measures of optimism toward Covid-19 and perceived vulnerability of catching Covid-19. All items of all newly created measures are available in the Supplementary Materials.

Table 8
Mediator Measures

Mechanism	Measure	Scale	Sample Item	Scale Point
Concern for self	Selfishness	Raine and Uh's (2019) 8-item scale	I'm not too concerned about what is best for society in general.	7-point scale: "strongly disagree" to "strongly agree"
	Desire for freedom	Rokeach's (1973) 4-item scale	I prefer no restrictions placed on me.	7-point scale: "strongly disagree" to "strongly agree"
	Boredom	Newly developed 3-item scale	How bored did you feel during the lockdown.	7-point: "not at all" to "extremely"
Concern for others	Sympathy	Batson et al.'s (1995) 4-item scale	I tend to feel sympathetic toward others.	7-point scale: "strongly disagree" to "strongly agree"
	Prosocial motivation	Grant's (2008) 4-item scale	I care about benefiting others.	7-point scale: "strongly disagree" to "strongly agree"
Compliance with norms	Compliance with social norm	Bizer et al.'s (2014) 6-item scale	I always do my best to follow society's rules.	7-point scale: "strongly disagree" to "strongly agree"
	Compliance with government order	Newly developed 3-item scale	To what extent do you think people should follow the government's regulations.	7-point scale: "not at all" to "to an extremely large extent"
Optimism	Optimism	Scheier and Carver's (1985) 8-item scale	I am optimistic about the future of the Covid-19 pandemic.	7-point scale: "strongly disagree" to "strongly agree"
	Perceived vulnerability of catching Covid-19	Newly developed 4-item scale	There is a low likelihood that I will get infected with Covid-19.	7-point scale: "not at all" to "to an extremely large extent"

For political orientation, we used the same 3-item scale as in Study 3 for the US sample. However, we removed the item, "Please indicate your political orientation" (7-point scale:

"Strongly Democrat" to "Strongly Republican"), for the UK sample because this item did not make sense in UK. We measured the extent to which participants were physically active before Covid-19 by asking participants to respond to the question "Overall, how often did you exercise outside of your home before Covid-19" on a 7-point scale ranging from "never" to "multiple times a day."

Results

We merged the US and UK samples to conduct analyses. As shown in Table 9, we found that more individualistic people were more likely to violate social distancing rules (*r* = .178, 95% CI [.089, .265], $p < .001$).[14] Next, we regressed the extent to which participants violated social distancing rules during Covid-19 on their individualism, political orientation, and physical activity before Covid-19. As shown in Model 2 of Table 10, more individualistic people reported that they had violated social distancing rules more often even after including these covariates (*B* = .18, 95% CI [.085, .273], $p < .001$, $\beta = .17$).

Upon examining the correlation table, we found that, as expected, more individualistic people were more selfish, had a greater desire for freedom, experienced more boredom, and perceived greater vulnerability to Covid-19. Contrary to our expectations, individualism was uncorrelated with sympathy, prosocial motivation, motivation to comply with social norms and government orders, and optimism. Among the mediators that are significantly correlated with individualism, only selfishness and boredom were significantly correlated with people's tendency to violate social distancing rules in the expected direction. Thus, selfishness and boredom can potentially explain the relationship between individualism and people's tendency to violate social distancing rules.

[14] We tested whether culture (0 = US, 1= UK) interacts with individualism to influence people's tendency to violate social distancing rules. We found that culture did not moderate the effect of individualism on people's tendency to violate social distancing rules (*B* = -.02, 95% CI [-.210, .171], $p = .843$, $\beta = -.01$). Therefore, it is justifiable to merge the US and UK samples to test our hypotheses.

To examine whether selfishness and boredom mediated the effect of individualism on people's tendency to violate social distancing rules, we used Hayes' (2013) PROCESS macro for SPSS with 5000 bootstrapped iterations. We used Model 4 to test multiple mediators. We found that both selfishness (indirect effect = .047, 95% CI = [.017, .089]) and boredom (indirect effect = .022, 95% CI = [.004, .046]) mediated the effect of individualism on people's violating social distancing rules.

Discussion

Study 4 replicated the key finding of Study 3—more individualistic people were more likely to report violating social distancing rules during Covid-19 lockdowns. Further, this study identified an underlying mechanism—concern for self—that explained this relationship. Specifically, more individualistic people were more selfish and experienced more boredom and thus were more likely to violate social distancing rules.

Table 9

Descriptive Statistics and Correlations

Variables	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Physically active before Covid-19	3.83	1.59													
2. Political orientation	3.43	1.56	.03												
3. Individualism	4.76	.82	-.02	.11*	(.71)										
4. Selfishness	3.18	1.06	.02	.18***	.20***	(.83)									
5.Desire for freedom	5.64	.96	-.02	-.09†	.44***	.03	(.78)								
6. Boredom	3.66	1.76	-.09†	.02	.19***	.12*	.17***	(.89)							
7. Sympathy	5.55	1.12	-.00	-.18***	-.05	-.58***	.13**	-.04	(.93)						
8.Prosocial motivation	5.73	1.02	.02	-.17***	.02	-.58***	.16**	.03	.72***	(.92)					
9. Compliance with social norm	4.69	1.19	.09†	.28***	.05	-.03	-.12*	.10*	.10*	.12*	(.90)				
10. Compliance with government order	5.48	1.29	.07	.03	-.05	-.10*	-.13**	.00	.12*	.13**	.53***	(.95)			
11. Optimism	4.57	1.23	.13**	.05	-.02	-.23***	.05	-.26***	.22***	.20***	.03	.09†	(.89)		
12. Perceived vulnerability of catching Covid-19	3.18	1.58	.02	.12*	.14**	.20***	.02	.11*	-.14**	-.10*	-.03	-.12*	.14**	(.87)	
13.Violating social distancing rules	1.86	.85	.18***	.13**	.18***	.29***	.06	.14**	-.16**	-.11*	-.13**	-.27***	.01	.16**	(.77)

N = 448. Reliability coefficients are displayed on the diagonal in parentheses.

†*p* < .10, **p* < .05, ***p* < .01, ****p* < .001 (two-tailed).

Table 10
Regression Results with Violating Social Distancing Rules as the Dependent Variable

Variable	Model 1		Model 2	
	B	*SE*	*B*	*SE*
Intercept	1.26*** [1.00, 1.52]	.13	.44† [-.07, .94]	.26
Physically active before Covid-19	.09*** [.05, .14]	.03	.10*** [.05, .15]	.02
Political orientation	.07** [.02, .12]	.03	.06* [.01, .11]	.03
Individualism			.18*** [.09, .27]	.05
ΔR^2	.05***		.03***	

Note. N = 448. $^{\dagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$ (two-tailed).

General Discussion

The current research identified a dark side of individualism—a lower willingness to follow social distancing rules amid a pandemic. A pilot study identified people's lay theories about the effect of individualism, specifically, that people expect residents of individualistic cultures to follow social distancing rules less. Then using a combination of longitudinal and correlational study designs, we examined whether people's lay theories about the individualism effect hold at the country, region and individual levels. Specifically, Study 1 found that in US states that are higher in individualism, residents were less likely to follow social distancing rules, as indicated by the physical location of their cellphone throughout the day. Further, in counties with higher residential mobility, which is associated with individualism, residents were less likely to follow social distancing rules. This finding held even after we controlled for all possible county-level differences using county fixed effects, and all specific date-level events using date fixed effects.

Study 2 conceptually replicated the above findings across 79 countries and regions. We found that in more individualistic countries and regions, people left their home more frequently despite social distancing rules, as indicated by increased mobility to public parks and grocery and pharmacy stores, and decreased tendency to stay at the residential places. However, as expected, there was no relationship between individualism and mobility to workplaces and retail and recreation locations, which were largely closed during stringent Covid-19 restrictions. Our

findings held even after controlling for all possible country-level differences using country fixed effects and all specific date-level events using date fixed effects. Study 3 replicated these findings at the individual level: Americans who scored higher on individualism stated that they had violated social distancing rules more often during lockdowns in their community. Study 4 found that the relationship between individualism and violating social distancing rules was explained by selfishness and boredom: more individualistic people were more selfish and experienced more boredom, and therefore were more likely to violate social distancing rules.

Theoretical Implications

Our research makes a number of theoretical contributions. First, we contribute to the literature on predictors of people's compliance with social distancing rules by examining individualism-collectivism as an important cultural predictor. Extant research is exclusively based on single studies conducted at the region-level and has obtained mixed findings (Bazzi et al., 2021; Frey et al., 2020; Im & Chen, 2020). We enrich this line of research by providing converging evidence for the idea that individualism is associated with lower compliance with social distancing rules at the individual, county, state, and region levels. We further find that people even hold the lay theory that in more individualistic cultures, people would be less likely to follow social distancing rules. Importantly, our findings indicate that individualism has similar effects at both the micro-level and the macro-level. It is possible that the macro-level findings from Studies 1 and 2 are entirely driven by individuals' personal values, not by cultural values. However, as we did not have data on the values of individual mobile phone users in Studies 1 and 2, we cannot assess whether individual and cultural values both played a role. Nevertheless, our findings are consistent with the general idea that cultural values can play an important role in containing the spread of infectious diseases (Borg, 2014; Gaygısız et al., 2017).

Second, our research contributes to the literature by examining four mechanisms that might explain the relationship between individualism and people's tendency to follow social

distancing rules: concern for the self, concern for others, compliance with norms, and optimism. Our results substantiated the self-concern mechanism. Specifically, we found that more individualistic people were more selfish and experienced more boredom, and therefore, were more likely to violate social distancing rules. By identifying selfishness and boredom as potential underlying mechanisms that explained the effect of individualism on people's violating social distancing rules, our research provides a more nuanced understanding of why individualism impacts people's tendency to follow social distancing rules.

Third, our research contributes to the individualism-collectivism literature by highlighting the utility of the individualism-collectivism construct. Numerous researchers have criticized this construct, arguing that it is often theorized but not empirically documented (Matsumoto, 1999), does not reliably differ across cultures (Oyserman et al., 2002), does not explain cultural differences in behavior (Yamagishi et al., 2008; Zou et al., 2009), does not capture the complexities of culture (Kitayama, 2002), and romanticizes certain cultures (Liu et al., 2019). We find that individualism-collectivism predicts an important behavior in a crisis at both the macro-level and the micro-level, which suggests that the construct is still societally relevant.

Finally, the findings of the present research complement past research documenting that the threat of infectious diseases leads cultures to become more collectivistic (Murray & Schaller, 2012). For example, cultures that faced a greater threat from pathogens in their history score higher on collectivism (Fincher et al., 2008), and people in such cultures are more likely to conform to the majority and prioritize obedience (Murray et al., 2011). The current research suggests that this relationship might be bidirectional, such that people in more collectivistic cultures are more likely to take actions that can slow the spread of novel pathogens.

Practical Implications

Our research has important practical implications. We found that people residing in more individualistic countries, states, and counties were more likely to violate social distancing rules, which could accelerate the spread of the virus and thus pose a threat to public health.

Policymakers can thus use regions' individualism score as a risk factor for increased virus transmission, and seek to target these regions with pandemic-containment measures. To motivate residents of individualistic regions, and people high on individualism, to follow the social distancing rules, policymakers can frame social distancing rule in terms of the benefit they bring to the individual, not to society as a whole. This framing might be more effective given that individualistic people care more about their own self-interests, as verified by our final study.

Limitations and Future Research Directions

Consistent with Ding et al. (2020), our Study 1 found that people in counties with a higher percentage of people above 65 years old were less likely to follow social distancing rules. This finding is counterintuitive because older adults are more likely to catch Covid-19 (Saadat et al., 2020), and therefore, should be more likely to follow social distancing rules. However, neither past research nor our studies examined the actual behaviors of individuals, let alone those of individual older adults. It is possible that individual older adults are less likely to follow social distancing rules, in which case public agencies might seek to address older adults' needs so that they do not need to leave their homes as often. Alternatively, it is possible that in counties with a bigger proportion of people above the age of 65, older adults still follow social distancing rules, but younger people in these counties might need to move around more to serve the older adults (e.g., to take care of their health, food, and other needs). More broadly, counties with a high proportion of older adults (e.g., retirement communities) might include a different composition of middle-aged or younger adults than other counties, which could have resulted in our counterintuitive finding. Future research can investigate this surprising finding in greater detail.

We employed Vandello and Cohen's (1999) index to measure state-level individualism. Although this index has been widely used in recent research on state-level values (e.g., Harrington & Gelfand, 2014), it was developed two decades ago, so it may not capture the current state of individualism-collectivism across the US states. Additionally, due to the

heterogeneity of cultures within states (e.g., the rural versus urban divide), different counties within the same state likely vary on individualism. However, these limitations work against our hypotheses by reducing the likelihood of finding an association between individualism and people's tendency to violate social distancing rules. We hope future research would develop new state-level and county-level measures of individualism, which would allow researchers to assess whether our findings can be replicated using improved and more fine-grained indices.

Our studies tested the effect of individualism on people's tendency to violate social distancing rules at multiple levels of analyses. Although we obtained similar findings at both the macro-level and the micro-level, we cannot rule out the possibility that the macro-level effect of individualism that we found was due to the impact of aggregated micro-level individualism. To test whether macro-level individualism has incremental effect on individuals' compliance with social distancing rules above and beyond micro-level individualism, future research needs to conduct a multi-level study in which both macro-level and micro-level individualism are measured and tested. For example, in Studies 1 and 2, if we had measures of individuals' personal level of individualism, then we could test whether country-, state-, and county-level individualism predicted compliance with social distancing rules above and beyond people's personal-level individualism.

In addition to examining the effect of individualism, we also tested for any effect of cultural tightness in our supplementary analyses. Given that people in tighter cultures are more likely to follow social norms and orders from authority figures (Gelfand et al., 2011), we expected that people higher in tightness or living in tighter states would be more likely to follow social distancing rules. Nevertheless, we found mixed results in two studies. In Study 1, people in tighter states were more likely to follow social distancing rules when our dependent variable was the median number of minutes devices were found at home or the median percentage of time devices were found at home. However, the effect reversed when the dependent variable either included or excluded residents who went to work on a given day (see Supplementary

Materials). In Study 3, people higher in tightness reported following social distancing rules more when we controlled for their individualism; however, this effect reversed once we removed individualism from the model (see Supplementary Materials). Future research can investigate these inconsistent findings regarding tightness in greater detail. More generally, the findings indicate that tightness is not the only construct that predicts whether people will follow the rules and orders. In the present case, individualism seems to be a more consistent predictor. Our research suggests that future research on tightness needs to assess whether tightness predicts people's tendency to follow the rules, norms, and orders above and beyond individualism-collectivism.

Although we found that people in more individualistic countries and regions are more likely to violate social distancing rules, we did not specifically focus on the downstream consequences of this violation, such as higher mortality rates. Follow-up analysis showed that in the country-level study (Study 2), there was a positive correlation between individualism and the number of Covid-19 deaths in 2020 (r = .26, p = .018). However, in the region-level study (Study 1), the correlation was negative (r = -.24, p = .096). These inconsistent results might be due to the correlational nature of our data and analyses, as mortality rates are influenced by a large number of other factors (e.g., proportion of older adults in the population and population density). Other research did not find any relationship between country-level individualism and mortality (Gelfand et al., 2021). We encourage future research to examine the relationship between individualism and mortality rates in greater depth.

Although our pilot study found that participants have a lay theory that more individualistic people are more likely to violate social distancing rules during the Covid-19 pandemic, we only tested this lay theory in an Australian sample. Given past research on cultural differences in people’s lay theories (e.g., Morris et al., 2001; Savani & Job, 2017), future research can examine whether these findings would generalize to other cultures.

The effect sizes observed in some of our studies, particularly the archival studies 1 and 2, are small. One explanation is that our macro-level measures of individualism in these studies are noisy. For example, in Study 1, we used a measure of state-level individualism collected over 20 years ago, and a measure of county-level residential mobility, which is an indirect measure of individualism. In Study 2, we used a measure of country-level individualism collected over 40 years ago. As cultures change over time (Varnum & Grossman, 2017), these measures might be somewhat out of date. Additionally, these measures were noisy to begin with. Yet, the small effect sizes are consistent with findings of previous research examining the effect of cultural factors on people's tendency to violate social distancing rules (Bazzi et al., 2021). As pointed out by Prentice and Miller (1992), small effect sizes can be practically meaningful if they affect a large number of individuals. Indeed, "some small effects may also have direct real-world consequences" (Götz, Gosling, et al., 2021, p. 2). Given that the Covid-19 pandemic is still raging across the world and may affect the world in the predictable future, we believe that our study can have important practical implications despite the small (but statistically significant) effect sizes. Additionally, we found stronger effects in which we directly measured participants' individualism, r = .18 - .27 in Studies 3 and 4, despite the fact that both the independent variable and the dependent variable were measured with error in these studies.

Finally, while the SafeGraph dataset used in Study 1 provides more granular data at the census block level, we conducted our analyses at the county-level. This more macro-level analysis may miss out on variation at the census block-level. However, about 20% of the census block groups in the SafeGraph dataset have fewer than 40 devices, which may not be representative of the census block and thus have a high degree of error variance. Therefore, in line with other research using the SafeGraph social distancing data (e.g., Chiou & Tucker, 2020; Ding et al. 2020; Painter & Qiu, 2021), we aggregated the data at the county-level. However, future research can conduct more granular analyses at the census block level.

Conclusion

Overall, the present research indicates that cultural values have implications for consequential behaviors even during once-in-a-century events, such as a worldwide pandemic. Our findings suggest that everything else being equal, more individualistic people, more individualistic regions, and more individualistic countries are likely to have a harder time combatting pandemics because fewer people are likely to follow government orders. It is possible that America's greater individualism explains why the US had a much harder time quelling the Covid-19 pandemic than other similarly developed countries in Europe and East Asia. More generally, given patterns of increasing individualism around the world (Greenfield, 2013; Grossmann & Varnum, 2015; Hamamura, 2012; Santos et al., 2017), the current findings suggest that everything else being equal, the world might have a more difficult time quelling pandemics in the future.

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