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YALE Y-RISE
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Should Low-Income Countries Impose the Same Social Distancing Guidelines as Europe and North America to Halt the Spread of COVID-19?

Zachary Barnett-Howell* Ahmed Mushfiq Mobarak†

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EXECUTIVE SUMMARY

Social distancing has become the primary policy prescription for combating the COVID-19 pandemic, and has been widely adopted in Europe and North America. We combine country-specific economic estimates of the benefits of disease avoidance with an epidemiological model that projects the spread of COVID-19 to analyze whether the benefits of social distancing and suppression varies across rich and poor countries. This modeling exercise yields the following key insights:

1. Populations in rich countries tend to skew older, and COVID-19 mortality effects are therefore predicted to be much larger there than in poor countries, even after accounting for differences in health system capacity.

2. Social distancing measures are predicted to save a large number of lives in high-income countries, to the extent that practically any economic cost of distancing is worth bearing. The economic value generated by equally effective social distancing policies is estimated to be 240 times larger for the United States, or 70 times larger for Germany, compared to the value created in Pakistan or Nigeria. The value of benefits estimated for each country translates to a savings of 59% of US GDP, 85% of German GDP, but only 14% of Bangladesh's GDP or 19% of India's.

3. The much lower estimated benefits of social distancing and social suppression in low-income countries are driven by three critical factors:

   (a) Developing countries have smaller proportions of elderly people to save via social distancing compared to low-fertility rich nations.

   (b) Social distancing saves lives in rich countries by flattening the curve of infections, to reduce pressure on health systems. Delaying infections is not as useful in countries where the limited number of hospital beds and ventilators are already overwhelmed and not accessible to most.

   (c) Social distancing lowers disease risk by limiting people's economic opportunities. Poorer people are naturally less willing to make those economic sacrifices. They place relatively greater value on their livelihood concerns compared to concerns about contracting coronavirus.

Not only are the epidemiological and economic benefits of social distancing much smaller in poorer countries, such policies may also exact a heavy toll on the poorest and most vulnerable. Workers in the informal sector lack the resources and social protections to isolate themselves from others and sacrifice economic opportunities until the virus passes. By limiting their ability to earn a living, social distancing can lead to an increase in hunger, deprivation, and related mortality and morbidity in poor countries. Flattening the epidemiological curve of COVID-19 to buy time until a vaccine can be developed may not be very useful for poor countries if the timeline for vaccine development is too long for social distancing to be maintained.

Poorer countries also have limited capacity to enforce distancing guidelines, and lock-downs may have counterproductive effects if it forces informal sector workers and migrants to reverse-migrate from densely-populated urban areas and spread the disease to remote rural areas of poor countries. It is imperative that the source code for influential epidemiological models (on which the widely-adopted social distancing guidelines are based) are made publicly accessible, so that social scientists can explore the sensitivity of benefit estimates to changes in assumptions about compliance with distancing guidelines or the baseline prevalence of co-morbidities, chronic illnesses or malnutrition that make COVID-19 infections more deadly. Not accounting for co-morbidities, or the greater pollution in poorer countries is an important limitation of these projections. Publicizing code would also allow the research community to quantitatively explore the costs and benefits of alternative harm-reduction measures that better allow poor people to sustain themselves economically while reducing COVID-19 related mortality to the greatest possible extent:

1. Masks and home-made face coverings are comparatively cheap. A universal mask wearing requirement when workers leave their homes is likely feasible for almost all countries to implement.

2. Targeted social isolation of the elderly and other at-risk groups, while permitting productive individuals with lower risk profiles to continue working. Given the prevalence of multi-generational households, this would likely require us to rely on families to make decisions to protect vulnerable members within each household.

3. Improving access to clean water, hand-washing and sanitation, and other policies to decrease the viral load.

4. Widespread social influence and information campaigns to encourage behaviors that slow the spread of disease, but do not undermine economic livelihoods. This could include restrictions on the size of religious and social congregations, or programs to encourage community and religious leaders to endorse safer behaviors and communicate them clearly.

1 INTRODUCTION

The COVID-19 outbreak has generated furious debates about what measures might best contain the spread of the disease and limit mortality. A parallel conversation has emerged about the economic devastation caused by such measures, especially as the virus reaches low-income countries. As social distancing becomes a universal strategy to combat COVID-19, a question emerges: Are the shuttering of the economy for weeks or months and mass unemployment reasonable costs to pay?

The answer for the United States and other rich countries is resoundingly yes. Any reasonable valuation of the welfare cost of COVID-19 mortality predicted in epidemiological models makes clear that the cost of *not* intervening in rich countries would be greater than the deepest economic recession imaginable. In other words social distancing interventions and aggressive suppression are overwhelmingly justified in high-income societies.

The purpose of this note is to quantitatively explore whether similar mitigation and suppression strategies are equally justified in low and middle income countries. Are the net benefits of country-wide lock-downs also overwhelmingly positive in poor countries? There are several reasons why our answer may differ from that in the United States or Europe:

Why Optimal Policy Prescriptions may Differ in Poor Countries

- Low fertility in rich countries means that a larger fraction of their population are elderly. Contracting coronavirus is much more dangerous for the elderly, and overall mortality consequences may be smaller in low-income countries which tend to have younger populations.

- The healthcare system capacity (such as the number of hospital beds per capita) varies across countries, and so mortality rates may be larger in poor countries due to inadequate infrastructural support.

- Greater prevalence of chronic health problems and infectious diseases in poor countries, such as malnutrition and tuberculosis, may increase COVID-19 mortality rates.

- Compliance rates with lock-down orders or social distancing guidelines may be lower in countries with weaker enforcement capacity.

- Many more workers in poor countries are self-employed or in the informal sector and depend on daily wages to feed their families. In the absence of strong social protection and insurance, the cost imposed by social (and economic) distancing may be large in terms of immediate deprivation and hunger.

To determine the relative value of suppression strategies in rich versus poor countries, we embed estimates of the country-specific costs of mortality developed by Viscusi and Masterman (2017) into the influential epidemiological model developed by the the Imperial College London COVID-19 Response Team that predicts mortality from the spread of the virus (Ferguson, Laydon, and Nedjati-Gilani et al. 2020; Walker, Whittaker, and Watson et al. 2020). Greenstone and Nigam (2020) adapt this model to assign an economic value to COVID-19 mortality in the United States. They predict that social distancing measures will save 1.76 million lives (both directly, and indirectly by reducing hospital overcrowding), with a total welfare value of 7.9 trillion dollars. Widespread social distancing and stay-at-home orders may create economic hardship in the United States, but this leaves no room for debate about the value of this public health intervention. We conduct a similar exercise for all rich and poor countries to explore whether such a policy prescription applies uniformly, or whether more nuanced thinking, analysis, and strategizing is required in the case of low-income countries.

2 METHODS AND RESULTS

2.1 Mortality

We use predicted mortality from the five policy scenarios in Walker, Whittaker, and Watson et al. (2020):

1. An unmitigated epidemic, where the government takes no action to limit the spread of COVID-19

2. Implementation of mitigation strategies, defined as a 45% reduction in interpersonal contact rates. This includes two specific scenarios

    (a) Population level social distancing

    (b) Population level social distancing plus enhanced distancing of the elderly, where individuals over the age of 70 reduce their social contact rates by 60%

3. Suppression strategies, involving wide-scale *intensive* social distancing, defined as a 75% reduction in interpersonal contact rates. The two specific versions they model:

    (a) Late suppression, triggered at 1.6 deaths per 100,000 people per week

    (b) Early suppression, triggered at at 0.2 deaths per 100,000 people per week

Figure 1 shows the predicted mortality from COVID-19 for a number of countries and regions. Richer regions where the population skews older risk losing more lives in an unmitigated outbreak. Predicted population level mortality rates are just below 0.8% in the United States and other OECD economies.[1] Countries and regions with younger populations, such as Bangladesh and Sub-Saharan Africa, face much lower risk, with the unmitigated spread of COVID-19 leading to predicted mortal-

1. For context, the H1N1 Spanish influenza of 1918 is estimated to have killed between 50 to 100 million people, somewhere between .95% and 5.4% of the world population at the time. The global mortality predicted from the unmitigated spread of COVID-19 is over 135 million. See: Taubenberger and Morens (2006) and Johnson and Mueller (2002).

ity rates of 0.39% and 0.21%, respectively. This is *despite* the comparatively poor health system capacity in poorer countries (proxied by hospital beds per capita) incorporated into the Imperial College model. The right panel of the figure explains why. The proportion of the population that is elderly varies greatly between low-income (3%) and high-income countries (17.4%).

FIGURE 1: What is mortality risk from COVID-19?

2.2 Assumptions Driving the Mortality Predictions

The prediction of significantly lower incidence of COVID-19 deaths in poor countries is largely based on the younger average age of their population. The model accounts for the fact that poor countries have fewer hospital beds and lower ICU capacity and will be entirely unable to meet peak demand. The lower marginal benefits of implementing suppression policies in poor countries arises from the fact that by the time suppression is triggered (at a specific death rate), the model predicts that COVID-19 will have already spread significantly, overwhelming countries with low healthcare capacity. Older people in low-income countries are also more likely to become infected by COVID-19 as they have higher contact with other individuals inside and outside the household, but the large demographic differences between rich and poor countries outweighs this factor.

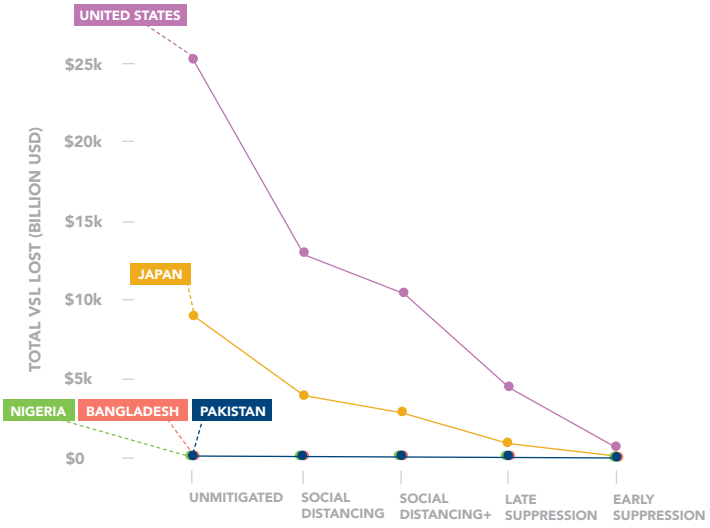
The model, however, does not account for the higher burden of infectious diseases and chronic illness in low-income countries, particularly in children, basing its estimate of healthcare demand and overall mortality on data from China. This could lead to an under-estimate of mortality in low-income countries (Walker, Whittaker, and Watson et al. 2020). On the other hand, the model presumes equally effective implementation of mitigation or suppression policies in poor and rich countries. Recent experience in India with the large and slow exodus of migrant workers from cities following lock-down suggests that suppression policies imperfectly implemented in low-capacity settings may have counter-productive effects on containing COVID-19.

2.3 Differences in the Economic Value of Interventions in Rich and Poor Countries

The COVID-19 mitigation strategies considered in our model are all based on reducing contact rates. However, lower contact comes at the cost of reduced economic activity and lower earnings. We measure the economic value of avoided mortality from mitigation policies in each country using Viscusi and Masterman (2017)'s country-specific value of statistical life (VSL) estimates. The VSL computation is based how people in different countries trade off the risk of harm from disease versus foregone economic reward. An important advantage of using VSL to value the relative benefits of COVID mitigation across countries is that reducing COVID mortality via distancing or suppression necessitates some economic sacrifices. Rich and poor countries would naturally evaluate those tradeoffs differently, depending on how urgent the economic needs of their population are. That exact same tradeoff forms the basis of country-specific VSL estimates, so applying those estimates to value the relative benefits of social distancing seems very appropriate.

Figure 2 displays the estimated dollar value of total losses from deaths under each intervention scenario when the Viscusi and Masterman (2017) VSL estimates are embedded in the Imperial College mortality predictions.

FIGURE 2: What is the total VSL lost for each country?



The cost of leaving COVID-19 uncontrolled in the United States is unambiguously large. This is due to higher predicted mortality rates in the United States relative to other countries and the higher base VSL. In comparison to U.S. losses, the dollar costs of uncontrolled COVID-19 in large countries such as Pakistan or Nigeria look minuscule. The more relevant question to devise country- specific policy is the one answered in Figure 3: What is the total cost of COVID-19 mortality in the country relative to that country's own GDP?

FIGURE 3: What is the relative VSL lost for each country?

Although the numbers are closer together in this scale, without mitigation policies COVID-19 still imposes a large welfare cost above 130% of GDP in rich countries like the United States and Japan. In contrast, due to the lower predicted mortality rate, the losses in India, Bangladesh, Pakistan, Nigeria, Nepal in the unmitigated scenario are about 50-60% of their own (lower) annual GDP.

The second important lesson from Figure 3 is that moving from a policy of doing nothing to imposing social distancing yields a very large welfare improvement in rich countries: Equivalent to 59% of U.S. GDP. However, the same policy of social distancing increases estimated welfare in Bangladesh by only 14% of its own lower GDP. Imposing more suppressive policies in the United States yield additional increases in welfare equivalent to 43% of its GDP, while moving from social distancing to suppression in Bangladesh only increases welfare by an additional 19% of its own (lower) GDP. The relative gains of more stringent policy measures against COVID-19 are shown in Table 1 for countries at varying income levels.

TABLE 1: Marginal Value of Increasing COVID-19 Interventions (total VSL/GDP)

	UPPER INCOME			UPPER-MIDDLE INCOME		LOWER-MIDDLE INCOME		
STRATEGY	JAPAN	UK	US	BRAZIL	INDONESIA	S AFRICA	BANGLADESH	NIGERIA
UNMITIGATED	-	-	-	-	-	-	-	-
SOCIAL DISTANCING	103	81	62	42	23	21	16	13
SOCIAL DISTANCING+	21	17	13	9	6	6	4	4
LATE SUPPRESSION	42	33	30	22	18	10	16	8
EARLY SUPPRESSION	16	28	19	13	16	22	12	21

2.3.1 Limitations of using VSL to Value Mortality Reduction

One concern with using the VSL to estimate welfare loss from COVID-19, is that income levels play a significant role in determining individual willingness to accept compensation for increased risks. That people in poor countries accept greater risks for lower compensation, leading to a lower estimate of their VSL, may be due to necessity rather than choice. Moreover, the VSL is estimated using very small changes in the relative risk of dying, on the order of 1:10,000. The different COVID-19 mitigation scenarios under consideration shift estimated mortality rates more drastically: two to three orders of magnitude larger. For example, moving from no mitigation to social distancing in Bangladesh reduces average risk by 1:1,000, and moving from social distancing to late suppression reduces average risk by a similar amount. It is unclear whether it is appropriate to extrapolate the VSL, estimated from small increases in relative risk, to the much larger risks from COVID-19. Our estimates of the value of each strategy are likely to underestimate the welfare losses to COVID-19 in countries with older populations, where the change in relative risk under strategy is the largest.

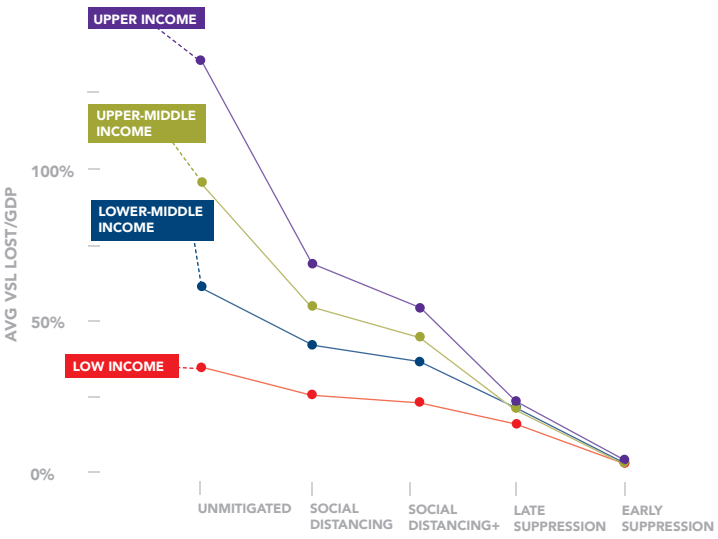
Why are the gains from social distancing smaller in poorer countries?

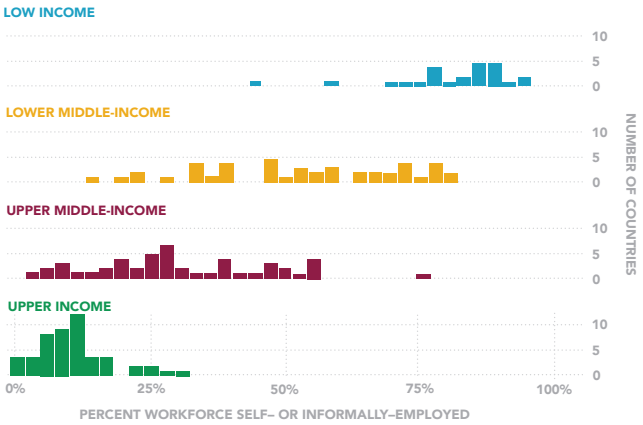
Underlying the relatively modest benefit estimates from mitigation and suppression policies in poorer countries are three critical factors. First, in poor countries there are fewer old people to who can benefit from targeted distancing. Further, the elderly often reside with younger family members, so contact rates can only be reduced within limits. Second, the relatively low hospital and ICU capacity at baseline in poorer countries means that flattening the mortality curve is unlikely to prevent hospitals from being overwhelmed. Third, the opportunity cost of social distancing is larger in poorer countries, and the VSL is therefore lower. Simply put, rich people can more easily meet their basic needs while social distancing, while a poor person may need to prioritize income-generating opportunities to put food on their family's table.

2.4 Differences in the Costs of Interventions in Rich and Poor Countries

Beyond the much smaller benefits of COVID-19 mitigation in poorer countries, workers in such countries are also more vulnerable to the disruption of the economy. They are more likely to rely on a daily cash wage, their work is hands-on and cannot be done while social distancing. Figure 4 shows the distribution of the percentage of workers either self- or informally-employed. Such workers do not always appear in government and bureaucratic records. So even if a social insurance policy were implemented in these countries, it is uncertain how quickly such people could be located, if at all, to deliver relief benefits to them.

FIGURE 4: Estimated Value of COVID-19 Intervention by Income Group





The social distancing and suppression interventions pioneered in Wuhan, China, and now in place throughout Europe and parts of the United States, rely on government support systems. Many workers throughout Europe still receive their salaries, and U.S. taxpayers will receive a stimulus check. By contrast, efforts by the Indian government to impose a lockdown appear to have had significant negative consequences for the most vulnerable members of its population. Interviews with workers from the informal sector tell a story of impending poverty, evictions, and hunger, as their incomes and work opportunities have been curtailed. Migrant laborers in India's largest cities, now without access to employment, are without food or shelter. Many are in the process of literally walking back to their homes, with deaths along the journey already being reported. These mortality consequences cannot be ignored when devising public policy strategies to contain COVID-19.[2]

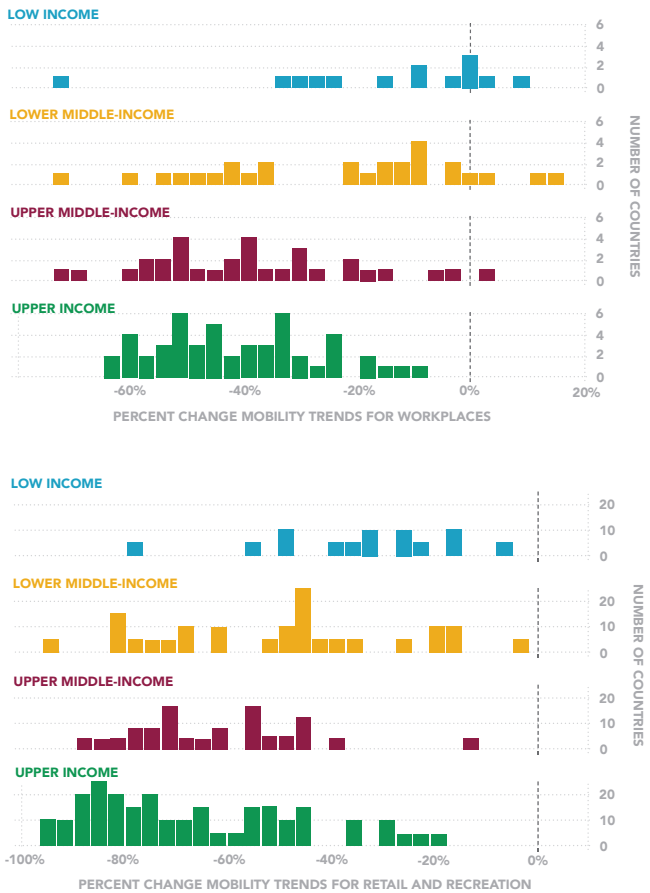
3 SUMMARY OF LESSONS

The COVID-19 pandemic represents a serious threat in every country. A policy response is necessary, but the benefits to each policy must be carefully weighed against the economic cost and risks imposed on that society. The most widely-cited model of COVID-19 transmission and mortality shows that we should expect fewer deaths in poor countries, and that social distancing policies in these countries produce smaller benefits. Much of this result is based on differences in the age distribution across countries, because our present understanding is that COVID-19 mortality risk increases dramatically with age. It is uncertain whether this relationship will remain robust in poorer countries where younger people have higher rates of chronic illness and endemic disease. Yet even permitting an overestimate of deaths in rich countries and an underestimate in poor countries, the differences in imputed welfare benefit remain vast. Given the deeper concerns about the risks that economic shutdowns pose on the most vulnerable members of low-income societies (Saleh and Cash 2020), it remains unclear whether the value of mitigation and suppression policies in poor countries outweighs the uncertain economic costs.

2. See: Abi-Habib and Yasir (2020a, 2020b), BBC (2020), and Tewari (2020). Abi-Habib and Yasir (2020b) quote one migrant laborer saying: "You fear the disease, living on the streets. But I fear hunger more, not corona." Another migrant construction worker is quoted saying "I earn 600 rupees every day and I have five people to feed. We will run out of food in a few days. I know the risk of coronavirus, but I can't see my children hungry" (BBC 2020).

We know that workers in low-income countries are younger and likely less susceptible to COVID-19. We know that workers are also more vulnerable to economic disruption, and may be unable to adhere to lockdown orders. Mobility data in Figure 5 already shows adherence to social distancing policies in high income countries, while mobility trends for workplaces and retail shops in lowerincome countries have seen much less change.[3] Various government and non-governmental organizations are currently playing an important role to avert outright starvation during the pandemic by providing free meals, food supplies, and fuel to poor households. Supply chains within countries have been disrupted by lockdown measures, making it increasingly difficult to deliver food (Purohit 2020). Ray and Subramanian (2020) suggest permitting people under the age of 40 to work during lockdown as a way of mitigating the economic costs to COVID-19 suppression. Indeed, the recent example of India demonstrates our concern about the capacity of states to enforce suppression strategies, and where imperfect compliance may lead to an increase in transmission to other vulnerable populations (Agrawal 2020). Ravallion (2020) highlights the tradeoff inherent to COVID-19 mitigation strategies between the risks of the disease, and the deprivation and hunger that will result from prolonged economic disruption. Once the source code for the Imperial College model is made available, social scientists can explore the sensitivity of benefit estimates to changes in assumptions about compliance with distancing guidelines, enforcement capacity, and other behavioral adjustments.

FIGURE 5: How have mobility trends already changed?



4 POLICY DISCUSSION

The social distancing policies implemented in European countries and the United States may well be entirely applicable to other parts of the world. However, our analysis suggests that benefits to social distancing are a lot smaller in poorer countries. Furthermore, there is ample evidence that economic costs of distancing – especially the burden on the poor – are a lot higher. A serious assessment is therefore urgently required to determine what other measures could effectively preserve lives while minimizing losses in aggregate welfare. The model presented here can be extended to explore quantitatively the benefits of alternative policies, including harm-reduction measures that allow people in low income countries to minimize their risk from COVID-19 while preserving their ability to put food on the table:

1. Masks and home-made face coverings are comparatively cheap.[4] A universal mask wearing requirement when workers leave their homes is likely feasible for almost all countries to implement.

2. Targeted social isolation of the elderly and other at-risk groups, while permitting productive individuals with lower risk profiles to continue working.[5] This would likely require us to rely on families to make intra-household allocations that protect vulnerable members within each household.

3. Improving access to clean water, hand-washing and sanitation, and other policies to decrease the viral load.[6]

4. Widespread social influence and information campaigns to encourage behaviors that slow the spread of disease, but do not undermine economic livelihoods. This could include restrictions on the size of religious and social congregations, or programs to encourage community and religious leaders to endorse safer behaviors and communicate them clearly.

If widespread social distancing must be pursued, then efforts must be made to get food, fuel, and cash into the hands of the people most at risk of hunger and deprivation. This is especially challenging in countries without well-developed social protection infrastructure. It is important for governments, private and humanitarian sectors, mobile phone operators and technology companies to experiment with innovative solutions such as sending cash transfers via mobile phones.

3. Data taken from Google Community Mobility reports issued on March 29, 2020 (Community Mobility Reports 2020).
4. Abaluck et al. 2020.
5. Ray and Subramanian 2020; *COVID-19 control in low-income settings and displaced populations: what can realistically be done?* 2020; Favas 2020.
6. Glassman, Chalkidou, and Sullivan 2020; Rabinowitz and Bartman 2020.

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* Yale University and Y-RISE. Contact: zachary.barnett-howell@yale.edu

† Yale University, Y-RISE, NBER, CEPR and IGC. Contact: ahmed.mobarak@yale.edu