

Indemnifying Precaution: Economic Insights for Regulation of a Highly- Infectious Disease

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Abstract

Economic insights are powerful for understanding the challenge of managing a highly infectious disease, such as COVID-19, through behavioral precautions including social distancing. One problem is a form of moral hazard, which arises when some individuals face less personal risk of harm or bear greater personal costs of taking precautions. Without legal intervention, some individuals will see socially-risky behaviors as personally less costly than socially-beneficial behaviors, a balance which makes those beneficial behaviors unsustainable. For insights, we review health insurance moral hazard, agricultural infectious disease policy, and deterrence theory, but find that classic enforcement strategies of punishing non-compliant people are stymied. One mechanism is for policymakers to indemnify individuals for losses associated with taking those social-desirable behaviors to reduce the spread. We develop a coherent approach for doing so, based on conditional cash payments and precommitments by citizens, which may also be reinforced by social norms.

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1. Introduction

In the medium-term time horizon until a vaccine is developed, and perhaps thereafter, management of the COVID-19 pandemic will largely depend on broad behavioral changes at the population level. Under a strategy of social distancing, lockdown, or quarantine, individuals are directed or suggested to exercise precautions including staying home, closing businesses, wearing masks, and avoiding physical proximity to other persons.² Presymptomatic patients are a reservoir for spread, but such precautions depend on them believing that spread is both important and preventable.³ Individuals have inherent incentives to undertake such measures, because they are self-protective, reducing the chance of the actor herself becoming infected and suffering. Accordingly, policymakers can expect a substantial degree of voluntary compliance, as long as the public receives, and believes, accurate information about the risk. That is, regrettably, a non-trivial assumption, but that problem is not our focus here.⁴

Notwithstanding the self-protective effects of these measures, micro-economic analysis suggests a likely market failure, due to heterogeneity in the population. Part of the heterogeneity is biological -- some individuals (e.g., younger persons and women) appear less likely to suffer harm from infection, while other individuals (e.g., older persons, men, and those with other medical conditions) face greater risk of harm if infected.⁵ The costs of precaution are also heterogeneous. For individuals who would otherwise be actively building careers or businesses, searching for romantic partners, or providing for dependents including children -- the costs of staying at home are much more substantial, compared to others who are already retired from work, settled with spouses and partners, and no longer have dependents.⁶ Certainly, the consequences of loss of life are more dire for the younger as they have more years of life to lose. However, younger people tend to discount the future more heavily than older individuals and may not place much value on the additional years of life at risk.⁷

² Stanley M. Lemon et al., Forum on Microbial Threats, Inst. of Med., Ethical and Legal Considerations in Mitigating Pandemic Disease: Workshop Summary (2007), <https://www.ncbi.nlm.nih.gov/books/NBK54163/>.

³ Zhanwei Du et al., *Serial Interval of COVID-19 Among Publicly Reported Confirmed Cases*, 26 Emerging Infectious Diseases (forthcoming June 2020), https://wwwnc.cdc.gov/eid/article/26/6/20-0357_article#r1.

⁴ Glenn Kessler, Meg Kelly & Sarah Cahlan, *Tracking Trump's False or Misleading Coronavirus Claims*, Wash. Post (March 14, 2020), www.washingtonpost.com/politics/2020/03/14/tracking-trumps-false-or-misleading-coronavirus-claims/.

⁵ Ctrs. for Disease Control, Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19): United States, February 12–March 16, 2020 (2020), <https://www.cdc.gov/mmwr/volumes/69/wr/mm6912e2.htm>; Chris Mooney, Sarah Kaplan & Brady Dennis, *All Across the United States, the Coronavirus Is Killing More Men Than Women, Data Show*, Wash. Post (Apr. 4, 2020, 1:36 PM), <https://www.washingtonpost.com/health/2020/04/04/coronavirus-men/>.

⁶ Zunyou Wu & Jennifer M. McGoogan, *Characteristics of and Important Lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72,314 Cases from the Chinese Center for Disease Control and Prevention*, 323 J. Am. Med. Ass'n 1239 (2020).

⁷ John T Warner & Saul Pleeter, *The Personal Discount Rate: Evidence from Military Downsizing Programs*, 91 American Economic Review 33–53 (2001).

Perhaps most important, the greatest risk to individuals in this younger group, particularly teenagers, is the loss of the social interactions through school, sports, and other activities that are essential to combat depression, among other risk factors for health.⁸ Suicide and suicide attempts in younger individuals dwarf the magnitude of risk from COVID-19, which makes the pandemic precautions particularly burdensome for this population, even if yielding spillover benefits for everybody else.⁹ Perilously, young people are starting to venture into “COVID-19 parties” organized so that people can mingle with infected people to get the illness “out of the way” and carry on with life.¹⁰

In rough terms, for the age gradient in particular, these observations suggest a stark misalignment of incentives -- younger persons personally receive the fewest benefits from precautions, but suffer the greatest costs of taking them. On the margin, some individuals will see the personal costs of taking a precaution to be greater than the personal benefits. The heterogeneity in the population suggests a classic market failure, known in the law-and-economics literature as an “externality.”¹¹ Those who do not comply with precautions disproportionately impose the costs of noncompliance on others, who are more likely to suffer from infection.

Similarly, for seasonal flu where vaccination is a primary precaution, the rate of vaccination in the 18-49 age bracket has not in recent years exceeded 35%, which is just over half the rate of older adults.¹² In a recent survey, young millennials were the least well informed about influenza, and the most likely to believe anti-vaccine rhetoric.¹³ Accordingly for COVID-19, we can expect that for those who can get infected without bearing healthcare costs, suffering, or unemployment, precautions may seem unnecessary. This is especially true given that persons have private information about their preventive measures, but may not possess information about whether or not they are infected.

How can governments effectively regulate this situation in the complex environment of an infectious disease, like COVID-19? We make the non-trivial assumption that governments can promulgate policies about what activities may be optimal at a given point in time (i.e., whether to return to work), but we focus on mechanisms of compliance, recognizing that many micro-level decisions are difficult for the government to monitor, much less enforce.

From a normative perspective, the goals are clear: to minimize the net harm to aggregate social welfare caused by the pandemic, accounting for both the public health losses (mortality and morbidity, and the costs of treating or suffering with the same) and the economic losses

⁸ Adolescents are paying a high price for Covid-19 prevention, <https://www.statnews.com/2020/04/27/adolescents-young-adults-paying-high-price-covid-19-prevention/>

⁹ See Suicide, <https://www.nimh.nih.gov/health/statistics/suicide.shtml> (suicide is the second leading cause of death for individuals 10-34 years of age).

¹⁰ Mike Baker, *A New Source of Coronavirus Spread: ‘Covid-19 Parties’*, NYTimes, may 6, 2020.

¹¹ See, e.g., W. Kip Viscusi, *Fatal Tradeoffs: Public and Private Responsibilities for Risk* (1995).

¹² Flu Vaccination Coverage, United States, 2018–19 Influenza Season | FluVaxView | Seasonal Influenza (Flu), <https://www.cdc.gov/flu/fluview/coverage-1819estimates.htm>

¹³ Survey Reveals Common Misconceptions About Flu, Vaccination, <https://www.aafp.org/news/health-of-the-public/20200122flusurvey.html>

associated with taking precautions (lost wages and forgone consumption of welfare-enhancing goods and services). We generally assume, for the sake of argument, that certain levels of specific precautions are worthwhile from this social utility perspective. Yet, for the reasons just stated, the costs and benefits of taking those precautions are poorly distributed. We do not offer a normative theory of optimal distribution, but rather a behavioral one: how to align the costs and benefits of precautions so that the precautions will be sustainably undertaken.

One mechanism to address that problem is for policymakers to indemnify individuals for losses associated with taking those social-desirable behaviors to reduce the spread. We discuss a coherent mechanism for encouraging the taking of costly precautions, which may also be reinforced by social norms.

2. Insights From Health Insurance Moral Hazard

The concept of “moral hazard” is that individuals are more likely to take risky or costly behaviors when those costs are borne by others.¹⁴ In health policy, most of the focus on moral hazard has been in the design of health insurance policy, using deductibles and copays, to insure that once ill or injured, a patient does not wastefully consume healthcare.¹⁵ That form of moral hazard is sometimes distinguished as “secondary,” or *ex post*, after the illness arises. Notwithstanding an overwhelming emphasis in health policy, the literature suggests that *ex post* moral hazard is a relatively small driver of healthcare consumption for several reasons, including patients’ lack of agency in making many of their own healthcare choices in practice.¹⁶ Accordingly in the COVID-19 infectious disease context, where underconsumption is a greater risk than overconsumption, Congress provided that tests be covered without cost-exposures and insurance companies have largely covered associated treatments.¹⁷

In contrast, “primary”, or *ex ante*, moral hazard applies where individuals who have healthcare costs largely externalized to the insurance pool may undertake risky behaviors (e.g., smoking or skydiving) increasing chances of having an injury or illness in the first place.¹⁸ For health insurance design, primary moral hazard may have a relatively small effect on risk-taking behavior, since individuals personally suffer many of the other risks associated with illness or injury (including pain, suffering, lost work, chance of death).¹⁹ These other costs are likely more salient to a person selecting a risky behavior than is the fact that some of the healthcare costs will be insured.

¹⁴ Mark V. Pauly, *The Economics of Moral Hazard*, 52 Am. Econ. Rev. 531 (1968).

¹⁵ See generally Christopher T. Robertson, *Exposed: Why Our Health Insurance Is Incomplete and What Can Be Done About It* (2019).

¹⁶ See e.g., Andrew Mulcahy et al., *Insurance Coverage of Emergency Care for Young Adults Under Health Reform*, 368 New Eng. J. Med. 2105 (2013).

¹⁷ Families First Coronavirus Response Act, Pub. L. No. 116-127, 134 Stat. 178 (2020); *Health Insurance Providers Respond to Coronavirus (COVID-19)*, Am.’s Health Ins. Plans (April 13, 2020), <https://www.ahip.org/health-insurance-providers-respond-to-coronavirus-covid-19/>

¹⁸ See e.g., Luare B. De Preux, *Anticipatory Ex Ante Moral Hazard and the Effect of Medicare on Prevention*, 20 Health Econ. 1056, 1056–72 (2011).

¹⁹ Univ. of Cal., *Health Insurance Increases Preventive Care, Not Risky Behaviors*, Sci. Daily (Nov. 26, 2013), <https://www.sciencedaily.com/releases/2013/11/131126155912.htm>.

For the policy of managing infectious disease, primary moral hazard is likely to be a more important driver of behavior where the chance of suffering any disutility whatsoever is heterogeneous. In this case, although the risk does not approach zero, it is as if relative youth provides partial indemnity insurance against not only the healthcare costs, but also the pain, suffering, lost work, and chance of death that are associated with COVID-19 infection.

Traditional health insurance policy has conceived healthcare as a cost when a risk materializes, but healthcare is often itself a precaution against a greater future risk. Baicker and colleagues have coined the term “behavioral hazard” to refer to the phenomenon of people declining to consume worthwhile healthcare.²⁰ This body of research in the health insurance domain demonstrates the more general phenomenon of how policy may strike the wrong balance, for example, if actors are biased away from optimal precaution-taking decisions, because the immediate costs of care (e.g., co-payments for insulin) seem more salient than the longer-term costs (e.g., treating neuropathy for uncontrolled diabetes).²¹ Of course, that problem is exacerbated if the costs of precaution are so high that individuals simply cannot afford to take them, even if they would prefer to do so.²² Accordingly, the Affordable Care Act now requires coverage of certain preventive services without cost-exposure at all -- indemnifying the cost of precaution -- an approach that may improve welfare and reduce spending overall.²³

3. Insights from Agricultural Infectious Disease Moral Hazard

In the recent past, few global diseases in human health have been comparable to COVID-19 with respect to the simultaneous level of transmissibility and pathogenicity. Yet policymakers are not “flying blind.” In other infectious disease contexts, moral hazard and risk-seeking behavior have been confirmed empirically.

For example, in the United Kingdom, policymakers have struggled to manage an outbreak of bovine tuberculosis.²⁴ The primary policy mechanism is a surveillance program, where agricultural agents visit farms and test animals for the disease. If it is discovered, the animal is killed, and the farm is put on a disease restricted status (like a quarantine or lockdown) for sixty days.²⁵ The farmers are able to take various costly precautions (e.g., maintaining fences, disinfecting trailers) to reduce the risk of infection. One might suppose that the risks of having beef purchasers reject

²⁰ Katherine Baicker, Sendhil Mullainathan & Joshua Schwartzstein, *Behavioral Hazard in Health Insurance*, 130 Q. J. Econ., 1623–67 (Nov. 2015).

²¹ J. Frank Wharam et al., *Diabetes Outpatient Care and Acute Complications Before and After High-Deductible Insurance Enrollment: A Natural Experiment for Translation in Diabetes (NEXT-D) Study*. 177 J. Am. Med. Ass’n Internal Med. 358, 358–68 (2017).

²² John A. Nyman, *The Theory of Demand for Health Insurance* (2003).

²³ Susan H. Busch et al., *Effects of a Cost-Sharing Exemption on Use of Preventive Services at One Large Employer*, 25 Health Affairs 1529, 1529–36 (2006).

²⁴ *Bovine TB Strategy Review: Summary and Conclusions*, Dep’t for Env’t Food & Rural Aff., <https://www.gov.uk/government/publications/a-strategy-for-achieving-bovine-tuberculosis-free-status-for-england-2018-review/bovine-tb-strategy-review-summary-and-conclusions> (last updated Mar. 5, 2020).

²⁵ *Actions Once TB Is Suspected or Confirmed*, TB Hub, <https://tbhub.co.uk/advice-during-a-tb-breakdown/actions-once-tb-is-suspected-or-confirmed/> (last visited Apr. 12, 2020).

infected meat, of having an infected animal discovered and slaughtered, and having the farm put on lockdown would be sufficient to induce optimal rates of precaution-taking.

However, the policy also includes a provision to indemnify the farmer for the loss of the infected animal that must be destroyed by law. Forthcoming empirical work shows that higher levels of indemnity may lead to higher rates of infection likely because farmers take fewer precautions when facing larger indemnities.²⁶ In this case, the government has in part exacerbated the moral hazard problem, by paying an indemnity which lowers the farmer's risk exposure, reducing the inherent incentive he would otherwise have to keep his cattle healthy. This indemnity is similar to the young, female, otherwise healthy human in the age of COVID-19, who may be less likely to suffer adverse effects of infection, and thus has reduced inherent incentives to take precautions.

As in human health, a farm experiencing a disease breakdown generates a negative externality for its neighbors through spatial disease transmission. By taking steps to minimize the likelihood of a breakdown on her own farm, the farmer also reduces the likelihood of infection for her neighbors. The indemnity payment relieves the farm of a portion of the costs of contracting the disease and, by doing so, reduces the incentive to invest in on-farm biosecurity. Consequently, not only do high indemnity rates lead to higher rates of disease, directly, by disincentivizing precautionary steps, the spatial feedback effect runs the risk of generating further infections in the surrounding area.²⁷ Again, the example of animal disease management echoes the human experience.

4. Political, Legal, and Practical Limits to Optimal Deterrence

In the agricultural settings, the unfortunate policy of indemnifying farmers against the costs of their failing to take precautions may reflect a constitutional, legal or political limit to governmental enforcement. The payment of an indemnity may reflect a political bargain, allowing a relatively intrusive regulatory mechanism, such as mandatory testing, to be agreeable to the agricultural lobby, if accompanied by a payment from the treasury to offset some of the costs thereof.²⁸ Similarly, under the United States Constitution's due process clause, the government must generally compensate individuals for "takings" of their property.²⁹ Moreover, under international commercial agreements, businesses may enjoy a remedy against excessive regulatory interventions that cause economic injury.³⁰

More generally, the United States Constitution limits the powers of the state and federal governments to restrict certain liberties, but the Supreme Court has generally upheld reasonable

²⁶ See K. Aleks Schaefer, Daniel P. Scheitrum & Steven van Winden, *Cruel to be Kind: Moral Hazard in British Animal Disease Management* (on file with the authors).

²⁷ *Id.*

²⁸ Vincent H. Smith & Barry K. Goodwin, Crop Insurance, Moral Hazard, and Agricultural Chemical Use, 78 *Am. J. Agric. Econ.* 428 (1996).

²⁹ U.S. Constitution, amend V.

³⁰ Award on Jurisdiction, *Can. Cattlemen for Fair Trade v. United States*, N. Am. Free Trade Agreement Arbitration, <https://www.italaw.com/sites/default/files/case-documents/ita0114.pdf>.

public health interventions, especially in times of emergency.³¹ In the 1905 case of *Jacobson v. Massachusetts*, for example, the Supreme Court upheld a local Massachusetts law requiring smallpox vaccination.³² The courts have, however, struck down public health enforcement actions that were motivated by racial animus, or which were not appropriately tailored to the risks at hand.³³

Nonetheless, the government has broad powers in this domain.³⁴ Accordingly, to enforce orders for social distancing, or staying at home in particular, some governmental actors made strict orders backed by the coercive power of the state. On April 5, for example, police officers throughout the state of California began issuing citations for those who refused to close businesses or maintain social distance on beaches.³⁵ If these sorts of citations, or more severe sanctions such as imprisonment, have a deterrent effect, they may solve the collective action problem.

However deterrence theory suggests that to be effective, enforcement has to find the optimal mix between detecting non-compliance and then sanctioning it once found.³⁶ For a rational actor, the risk of suffering the sanction is the product of these two variables. Although it may be relatively easy for the police to detect and enforce against business operators and beach goers, it will be much more difficult to detect individuals who meet to have sex, for example. Similarly the war on illicit drugs has been stymied by such difficulties of detection.³⁷ Whether such black markets can be kept small enough to keep infection rates at manageable levels, is a key question.

In this case, deterrence is also stymied by the realities of an infectious disease, such as COVID-19. Law enforcement typically employs escalating consequences for violations with the threat of fines and other sanctions with imprisonment being the ultimate consequence short of death. Yet, fines may affect communities that have already been hit hard by the pandemic and are generally hard to enforce, when individuals have little or no funds to pay (a problem known as “judgment

³¹ Rebecca L. Haffajee & Michelle M. Mello, *Thinking Globally, Acting Locally—The U.S. Response to Covid-19*, *New Eng. J. Med.*, Apr. 2020, at 1, www.nejm.org/doi/full/10.1056/NEJMp2006740#.Xo9F0JdWHpY.twitter.

³² *Jacobson v. Massachusetts*, 197 U.S. 11 (1905)

³³ *Jew Ho v. Williamson*, 103 F.10 (C.C.N.D. Cal., 1900).

³⁴ Wendy E. Parmet & Michael S. Sinha, *Covid-19—The Law and Limits of Quarantine*, *New Eng. J. Med.*, Apr. 2020, <https://www.nejm.org/doi/full/10.1056/NEJMp2004211>.

³⁵ *Police Across California Issue Citations for Violations of Stay at Home Order*, NBC Bay Area (Apr. 5, 2020), <https://www.nbcbayarea.com/news/local/san-francisco/police-across-ca-issue-citations-for-violations-of-stay-at-home-order/2267942/>.

³⁶ See generally, Becker, G. S. *Crime and Punishment: An Economic Approach*, 76 *J. Pol. Econ.* 169 (1968). But see Hope Corman & H. Naci Mocan, *A Time-Series Analysis of Crime, Deterrence, and Drug Abuse in New York City*, 90 *Am. Econ. Rev.* 584 (2000) (“[A]fter 30 years of empirical research there is no consensus on the impact of police and arrests on criminal activity.”)

³⁷ See generally David M. Kennedy, *Deterrence and Crime Prevention: Reconsidering the Prospect of Sanction* (2009).

proofing").³⁸ Indeed, the power to fine is ultimately backed by the power to imprison those who refuse to pay.³⁹

Moreover, prisoners are particularly vulnerable to COVID-19 due to overcrowding, poor ventilation, unsanitary facilities, and poor access to health-care services.⁴⁰ Prisons easily become epicenters of disease, threatening the health and safety of the inmates as well as the surrounding community.⁴¹ Accordingly, on March 26, 2020, the Attorney General of the U.S. instructed the Federal Bureau of Prisons to transfer some eligible inmates from prisons to home confinement.⁴² Some prisoners have reportedly even tried to get themselves infected, as a basis for then getting early release.⁴³

Thus, governments are hamstrung in how they are able to enforce compliance with social distancing and quarantine requirements. Fines are regressive and imprisoning an individual violating quarantine guidelines would be counterproductive as they could introduce the disease into a particularly vulnerable population where the chance of spread is high. Governors and law enforcement agencies have dramatically reduced arrests.⁴⁴ By May 2020, some local governments were already refusing to enforce 'stay-at-home' orders for political, ideological or other reasons.⁴⁵ Hence, governments will have to look beyond the threat of fines and imprisonment to compel compliance with precautionary measures.

³⁸ See, Brandon D.L. Marshall and Abdullah Shihpar, *We Can't Police Our Way Out of a Pandemic*, NYTimes, Apr. 27, 2020 <https://www.nytimes.com/2020/04/27/opinion/coronavirus-police.html>. See generally, Martin H. Pritikin, "Fine-Labor: The Symbiosis Between Monetary and Work Sanctions." *U. Colo. L. Rev.* 81 (2010): 343 (describing practical drawbacks of both monetary sanctions and incarceration)..

³⁹ See generally Derek A. Westen, "Fines, imprisonment, and the poor: Thirty dollars or thirty days." *Calif. L. Rev.* 57 (1969): 778.

⁴⁰ Stuart A. Kinner et al., *Prisons and Custodial Settings Are Part of a Comprehensive Response to COVID-19*, 5 *Lancet Pub. Health* e188 (2020), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7103922/>.

⁴¹ *Id.*

⁴² William Barr, Dep't of Justice, Memorandum on Prioritization of Home Confinement as Appropriate in Response to COVID-19 Pandemic (Mar. 26, 2020), https://www.bop.gov/coronavirus/docs/bop_memo_home_confinement.pdf.

⁴³ Timothy Bella, *Inmates tried to infect themselves with the coronavirus to get early release, Los Angeles County sheriff says*, Washington Post (May 12, 2020), <https://www.washingtonpost.com/nation/2020/05/12/inmates-coronavirus-infect-los-angeles/>

⁴⁴ Tess Riski, *Portland Police Will Not Take Misdemeanor Arrests to Jail During the COVID-10 Outbreak, to Avoid Overcrowding*, Willamette Week (Mar. 20, 2020), <https://www.wweek.com/news/2020/03/20/ppb-will-not-take-misdemeanor-arrests-to-jail-during-covid-19-outbreak-to-avoid-overcrowding/>; Matthew Fultz, *Northam Encourages Police to Avoid Arrests, Imprisonment in Wake of COVID-19 Virus*, WTVR News Richmond (Mar. 19, 2020, 11:58 PM), <https://www.wtvr.com/news/local-news/northam-encourages-police-to-avoid-arrests-imprisonment-in-wake-of-covid-19-virus>; Ron Wilkins, *Coronavirus: Officers Make Fewer Arrests During COVID-19 Emergency*, Lafayette J. & Courier (Mar. 29, 2020, 5:06 PM), <https://www.jconline.com/story/news/crime/2020/03/29/police-make-fewer-arrests-lafayette-area-response-covid-19/2920809001/>.

⁴⁵ See e.g., Aris Folley, *Two Arizona sheriffs say they won't enforce governor's stay-at-home order*, The Hill, May 3, 2020 <https://thehill.com/homenews/state-watch/495896-two-arizona-sheriffs-say-they-wont-enforce-governors-stay-at-home-order>

These difficulties may explain why, in March and April 2020, the United States saw private actors merely encouraging people to take precautions, and even some governmental actors, such as state governors, who had the power to exercise the coercive role of the state, declined to do so, in favor of mere exhortation and encouragement.⁴⁶ The literature on ‘private ordering’ and the broader literature on social norms, together suggest that individuals may provide socially desirable behaviors, even when it is not compelled to do so under strict rationality.⁴⁷ Economics literature suggests the possibility of repeated interactions with individuals and the threat of social retaliation may be sufficient to establish and uphold social norms (i.e., “don’t burn bridges”).⁴⁸ For instance, adherence to government recommendations to social distance may be achieved simply through the universal fear of loss of status or reputations if one is discovered to disregard recommended behavior. In Hong Kong and elsewhere internet users shamed people they believed had flouted lockdown orders, traveled or socialized recklessly during the pandemic.⁴⁹

Vendors may also voluntarily embrace precautions to burnish their own reputations for safety. For COVID-19, government directives were initially crude -- just a binary decision to allow businesses to remain open (if essential) versus mandate closure (if not). Yet, the market responded innovatively: in some “essential” stores, there were no limits on the number of shoppers in the store, no systematic disinfection of carts or baskets or checkout counters, no masks or other protective equipment of store personnel and the like. Conversely, some stores voluntarily created waiting lines outside the store, with tape demarcating 6 foot intervals, allowing entry into the store only with exit of another shopper, thoughtful distancing of carts from other shoppers on check-out, a designated position for the customer while items are scanned, and more. Stores may have enacted voluntary precautions in hopes of boosting business by being seen as a safe place to shop, reducing liability exposure in the event of infected employees, or simply to minimize the chance of disease spread for safety reasons. Eventually, governments may catch up to prescribing the sort of granular policies for managing COVID-19 as they have, for example, for handling food-borne illness in foods.⁵⁰

Yet, reputational sanctions tend to work best when used against members within identifiable groups, such as a close-knit religious or ethnic community, but can cut against compliance of

⁴⁶ See e.g., Judy Woodruff, Laura Santhanam & Alison Thoet, What Dr. Fauci Wants You to Know About Face Masks and Staying Home as Virus Spreads, PBS (Apr. 3, 2020, 6:50 PM), <https://www.pbs.org/newshour/show/what-dr-fauci-wants-you-to-know-about-face-masks-and-staying-home-as-virus-spreads#transcript> (National Institute for Allergies and Infectious Diseases Director Anthony Fauci interviewed: “Q. But when lives are at stake, why aren't command measures requiring people to do this appropriate now? A. . . . That generally is not the way things operate in the relationship between the federal government and the states.”).

⁴⁷ Robert C. Ellikson, *Order Without Law: How Neighbors Settle Disputes* (1994); Oliver E. Williamson, *Credible Commitments: Using Hostages to Support Exchange*, 73 *Am. Econ. Rev.* 519 (1983); Eric Posner, *Laws and Social Norms* (2002).

⁴⁸ Michihiro Kandori, *Social Norms and Community Enforcement*, 59 *Rev. Econ. Stud.* 63 (1992).

⁴⁹ Liza Lin, *Coronavirus Rule Breakers Draw Public Ire Online*, *WSJ*, Mar. 28, 2020.

⁵⁰ See e.g., *Ariz. Rev. Stat. tit. 9, ch. 8, § 1-101.10 et seq.* <https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/food-safety-environmental-services/az-food-code.pdf>.

formal rules.⁵¹ In communities in which government authority conflicts with strong social norms or fear of loss of status or reputations, governmental orders can also be harder to enforce. It has been reported that an important factor contributing to the outbreak in South Korea included mistrust by a close knit community.⁵²

5. Potential Solutions

Economic and behavioral insights are powerful for understanding the problems inherent in managing a highly infectious disease, but what do they recommend as solutions? The overarching principle is to make it easier (i.e., less costly) for individuals to take reasonable precautions than to not take reasonable precautions.

In this essay, we are primarily focused on regulatory mechanisms prior to a vaccine becoming available. However, the American experience with vaccine mandates is illustrative of our economic and behavioral analysis so far. Consider a parent's choice about whether to vaccinate her child prior to COVID-19. Her state may nominally require vaccination unless an exemption applies, but an indifferent or harried parent may find it easier to scribble her name on an exemption form rather than go to the hassle of finding a pediatrician, making an appointment, and securing the vaccination. Indeed, scholars have found that vaccination rates vary substantially depending on the procedure required to invoke such an exemption.⁵³ For example, in 2011 Washington State implemented a requirement that parents have a counseling session with a physician prior to securing such an exemption, and exemption rates went down by 40%.⁵⁴ In addition to any information delivered, these requirements function as behavioral speedbumps for the parent, with the inconvenience (i.e., non-monetary cost) serving to ration the scarce resource of non-vaccinated parents.⁵⁵ In this way, the precaution is made less costly than not taking the precaution.

For COVID-19, when a vaccine is available, it may begin as a scarce resource to be rationed across many people desiring it, but once it achieves a certain saturation, there will likely remain a minority of persons who resist vaccination, unless properly incentivized. The United States has generally focused only on childhood vaccinations, but strategies for incentivizing adults will then

⁵¹ See Toni Massaro, *Shame, Culture, and American Criminal Law*, 89 Mich. L. Rev. 1880 (1991).

⁵² S. Nathan Park, *Cults and Conservatives Spread Coronavirus in South Korea*, Foreign Pol'y (Feb. 27, 2020, 10:45 AM), <https://foreignpolicy.com/2020/02/27/coronavirus-south-korea-cults-conservatives-china/>.

⁵³ *Id.*

⁵⁴ Saad B. Omar et al., *Exemptions from Mandatory Immunization After Legally Mandated Parental Counseling*, Pediatrics, January 2018, at 1, <https://doi.org/10.1542/peds.2017-2364>. See also *Senate Bill 276 and Senate Bill 714: Vaccinations and Medical Exemptions Questions and Answers*, Cal. Health & Hum. Servs. (Sept. 9, 2019), <https://www.chhs.ca.gov/blog/2019/09/09/senate-bill-276-and-senate-bill-714-vaccinations-and-medical-exemptions-questions-and-answers/> (A 2019 California law allows the health department to report physicians to the medical board if they issue too many such exemptions.)

⁵⁵ Nir Eyal, Paul L. Romain & Christopher Robertson, *Can Rationing Through Inconvenience Be Ethical?*, 48 Hastings Ctr. Rep. 10 (2018).

be required as well. For example, participating in some valuable but risky activities, such as airline travel, could be conditioned on vaccine compliance.⁵⁶

Returning to our focus on the pre-vaccine era, in order to diminish the negative impact on the economy and citizens' finances, some governments are considering issuing "immunity certificates" to individuals who have recovered from the disease and are presumed to be immune from re-infection as well as unable to spread disease.⁵⁷ These individuals with immunity certificates would then be able to re-enter society and resume their employment as well as patronize businesses and continue participating in the economy. Assuming that fundamental questions regarding immunity can be answered affirmatively by medical science, and that a technological solution can be employed to ensure validity over counterfeiting concerns, such a policy could then receive support in judicial review, as discriminating against those with and without immunity, not unlike the way extant and potential policies discriminate against those who are unvaccinated.⁵⁸

Still, this sort of certificate policy could backfire, especially as it creates an incentive to contract the disease -- a "get-out-of-jail-free" card, creating a risk of community spread, prior to the hypothesized benefit of immunity being secured. Intentionally seeking out disease like in the form of "COVID-19 parties" has precedents in the form of "chicken pox parties" in order to obtain immunity as a young child as well as the concept of "gift giving," the intentional transmission of HIV.⁵⁹ Unless the infection is secured in controlled conditions (e.g., exposure followed by two weeks of quarantine), the net effects may be negative overall.

This analysis suggests that the immunity certificates policy could exacerbate the same moral hazard problem, which already discourages some people from taking reasonable precautions. This problem may be overstated, to the extent that individuals are already actively flouting stay-at-home orders, immunity certificates may do little to alter their private risk calculus towards less precaution.

Thus, the primary concern is the population on the margin, who otherwise would have abided by shelter-in-place and social distancing, but due to immunity certificates, will be tipped toward reckless behavior. Those who are extremely financially insecure, those who perceive themselves to not be at risk of serious adverse consequences of the disease, or those who believe contracting COVID-19 is inevitable have an incentive to eschew precautionary measures and seek out the

⁵⁶ Christopher T. Robertson, "Vaccines and Airline Travel: A Federal Role to Protect the Public Health." *American journal of law & medicine* 42, no. 2-3 (2016): 543-571.

⁵⁷ Henry T. Greely, *Covid-19 "Immunity Certificates": Practical and Ethical Conundrums*, Stat Reports (Apr. 10, 2020), <https://www.statnews.com/2020/04/10/immunity-certificates-covid-19-practical-ethical-conundrums/>.

⁵⁸ See Robertson supra note ____.

⁵⁹ Chickenpox Transmission, Ctrs. for Disease Control & Prevention, <https://www.cdc.gov/chickenpox/about/transmission.html> (last updated Dec. 31, 2018); Hugh Klein, *Generating, Stealthing, and Gift Giving: The Intentional Transmission of HIV by HIV-Positive Men to Their HIV-Negative Sex Partners*, 2 *Health Psychol. Res.* 64 (2014), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4768590/>.

disease in order to shorten the length of time they are out of work. This problem reinforces the more fundamental need, discussed below, to further indemnify individuals who are taking precautions, including through substantial increase in unemployment compensation, as already beginning in the CARES Act (discussed below).

Speaking more broadly, while the immunity card solution allows identification of individuals who are no longer disease-susceptible, it fails to solve the primary imperfect information problem - identifying who is contagious. Expanded testing capacity and faster tests would allow for more direct targeting of the moral hazard problem. Improved testing would dramatically reduce the need for population-wide “shelter in place” strategies. Under this scenario, quarantine restrictions could be limited only to individuals that test positive and their contacts.

This strategy imposes the economic costs of contagion on precisely the right individuals -- those that are contagious. And unlike the immunity card strategy, it does not create a perverse incentive to become infected, but rather imposes the costs of quarantine on those who become infected. Note that such an analysis need not suggest that all individuals who become infected are in some way at “fault” for having become infected (though some may have been, if they failed to take reasonable precautions to avoid infection). Once infected due to any cause, in economics jargon, the infected individuals generate a negative externality; and, thus, they are the appropriate population to be isolated.⁶⁰ Regardless of the source of infection, it may then be unreasonable for such a person to engage in activities which risk harm to others. We also emphasize below that the individuals under targeted quarantine could be compensated for the private costs of quarantine through private or public insurance programs.

A test-and-quarantine strategy would allow the economy - susceptible and immune individuals alike - to resume normal life while actively and effectively mitigating the spread of the disease. Of course, this targeted quarantine strategy still requires compliance with guidelines to stay at home on the part of the COVID-19-positive individuals. Compliance may be achieved more easily in this scenario as subjects of quarantine will know the restrictions are temporary. Additionally, because those quarantined have tested positive or come in contact with a positive case, they will face more severe social pressure to avoid contact with others.

However, unless widespread testing could be implemented and made mandatory (at least conditional on certain risky behaviors), other imperfections in the healthcare system confound this strategy. If tests were not mandatory, symptomatic individuals could simply avoid testing so as not to be detected as a positive case and removed from employment. For instance, those who are financially insecure and without any sick-leave program that would provide compensation during the quarantine period would have incentive to avoid the test to prevent loss of income.

For COVID-19 across all these particular policy tactics, the fundamental mechanism must be to reduce the costs associated with individuals taking precautions, so that the net individual cost of

⁶⁰ See William Vickrey, *Automobile Accidents, Tort Law, Externalities, and Insurance: An Economist's Critique* 33 *Law & Contemp. Probs.* 464 (1968) (explaining why fault is unnecessary for regulation).

precaution is lower than not taking the precaution. The most costly form of precaution is to stay home from work. One obvious solution is to effectively indemnify persons who lose income due to lost work. Prior to the COVID-19 crisis this was a weakness of U.S. policy, compared to other industrialized countries, who tend to have robust provisions for paid sick leave and unemployment insurance. For people who actually lose their jobs, unemployment insurance in the United States pays for up to twenty-six weeks, and is even then capped to cover only a portion of prior income.⁶¹ In one study, those receiving unemployment insurance only recouped half of their lost wages on average.⁶²

The \$2 trillion package passed by Congress in mid-March, provides a one-time payment at about \$2,400 plus \$500 per child for most families (and less or none for others).⁶³ It is worthwhile that these payments went to both workers and non-workers, because even non-workers face substantial disutilities in complying with social distancing protocols.

But for workers at least, the payments are far from sufficient to indemnify the costs of precaution: the median American family would need about \$5,000, to compensate for a single lost month of work.⁶⁴ Additionally, the U.S. has increased weekly unemployment benefits by \$600.⁶⁵ Even with the increased weekly payment for the unemployed, the benefit may end in the near future and it does not scale with income to the detriment of those living in high cost-of-living areas.⁶⁶ This suggests that non-compliance will remain a very substantial problem (not to mention the substantial disutility suffered by those under the current income shock, and the larger economic effects due to contraction).

Of course, with broader public spending on income replacement and broader compensation for taking precautions, someone must pay those costs. Since younger persons today may be disproportionately taking precautions for the sake of protecting older persons (as we suggest in the introduction), it may not be sensible to use deficit financing, where younger persons would ultimately bear those costs. But we set aside the point of intergenerational justice.

Behaviorally, it may be more sensible to distribute the burdens across current taxpayers more rationally. Current U.S. tax policy is relatively flat, unlike the wartime era of the 1940s, when

⁶¹ Chad Stone & William Chen, *Introduction to Unemployment Insurance*, Ctr. on Budget & Pol'y Priorities, <https://www.cbpp.org/research/introduction-to-unemployment-insurance> (last updated July 30, 2014).

⁶² *Id.*

⁶³ Susan Davis, Claudia Grisales & Kelsey Snell, *Senate Passes \$2 Trillion Coronavirus Relief Package*, NPR (Mar. 25, 2020, 8:21 AM), <https://www.npr.org/2020/03/25/818881845/senate-reaches-historic-deal-on-2t-coronavirus-economic-rescue-package>.

⁶⁴ See Cong. Budget Office, *Average Household Income, by Income Source and Income Group, 1979 to 2014*, <http://cbo.gov/about/products/major-recurring-reports>.

⁶⁵ Tami Luhby, *Extra \$600 unemployment benefits will start flowing as early as this week for a lucky few*, CNN (April 10, 2020), <https://www.cnn.com/2020/04/07/politics/unemployment-benefits-cares-act-covid-pandemic/index.html>.

⁶⁶ Greg Iacurci, *Unemployment benefits will be reduced after July 31*, CNBC (May 4, 2020), <https://www.cnbc.com/2020/05/04/unemployment-benefits-will-be-reduced-after-july-31.html>.

marginal tax rates went as high as 94% for the highest-income earners.⁶⁷ We cannot here make a comprehensive case for the optimal tax policy, recognizing complications like tax avoidance.⁶⁸ However, it remains true that wealthier individuals suffer less disutility for each dollar expropriated through taxation, compared to poorer individuals who suffer greater deprivations on the margin.⁶⁹ This “diminishing marginal utility” of money (as its known in the economics literature) suggests a substantial opportunity to reallocate the costs of precaution to minimize the disutility. Most importantly, this special pandemic situation inverts some of the classic arguments against progressive taxation as undermining incentives to work.⁷⁰ Here, the rush to get back to work may impose more social costs (in terms of infections) than social benefits (in terms of economic productivity).

In this way, government payments to those who are complying with social distance or quarantine protocols are designed to indemnify them against the costs of taking those pro-social precautions. Of course there is a risk of mismatch -- people receiving the payments who are nonetheless not complying with distancing/quarantine guidelines.

To make the bargain more explicit, the payments could be made conditional on agreeing to comply with stay-at-home or social distancing orders. Given the extensive literature on the deep evolutionary basis of reciprocity for human behavior, we hypothesize (subject to testing) that such an explicit promise to comply as a reciprocal condition of accepting funds (a “carrot” strategy) may have behavioral advantages over other (“stick”) forms of enforcement, such as fines or imprisonment.⁷¹

Our point is not about the cost of non-compliance (assume equal probability of detection and an equal-size penalty), and we are not suggesting a differential framing according to prospect theory

⁶⁷ *Federal Individual Tax Rates History, Nominal Dollars, 1913–2013*, Tax Found. (Oct. 17, 2013), <https://taxfoundation.org/us-federal-individual-income-tax-rates-history-1913-2013-nominal-and-inflation-adjusted-brackets/>.

⁶⁸ See generally, Joel Slemrod and Shlomo Yitzhaki. "Tax avoidance, evasion, and administration." In *Handbook of public economics*, vol. 3, pp. 1423-1470. Elsevier, 2002.

⁶⁹ See generally Joseph Bankman & Thomas Griffith, *Social Welfare and the Rate Structure: A New Look at Progressive Taxation*, 75 Cal. L. Rev. 1905 (1987) (arguing that the diminishing marginal utility of money makes it efficient to take more from higher-paid individuals); see also Leo P. Martinez, “To Lay and Collect Taxes”: *The Constitutional Case for Progressive Taxation*, 18 Yale L. & Pol’y Rev. 111, 117 (1999) (surveying the rationales and arguing for constitutionality).

⁷⁰ See generally, Philippe Choné and Guy Laroque. "Optimal incentives for labor force participation." *Journal of Public Economics* 89, no. 2-3 (2005): 395-425; Peter Diamond and Emmanuel Saez, *The case for a progressive tax: from basic research to policy recommendations*, *Journal of Economic Perspectives* 25, no. 4 (2011): 165-90.

⁷¹ See generally, Martin A. Nowak, *Five Rules for the Evolution of Cooperation*, 314 *Science* 1560, 1563 (2006) (“Perhaps the most remarkable aspect of evolution is its ability to generate cooperation in a competitive world. Thus, we might add ‘natural cooperation’ as a third fundamental principle of evolution beside mutation and natural selection.”); Bolton, Gary E., and Axel Ockenfels. "ERC: A theory of equity, reciprocity, and competition." *American economic review* 90, no. 1 (2000): 166-193 (developing a theory to explain a wide range of economic lab findings).

(in both cases it may be framed as a loss conditional on noncompliance, rather than a gain).⁷² Rather, asking individuals to explicitly commit to compliance as a condition of accepting payment reinforces a social norm of compliance.⁷³ Moreover, the breaking of the promise creates a cognitive dissonance, which itself may be experienced as a disutility.⁷⁴ The explicit promise and size of these payments are likely to make them more effective than the sorts of small fines, which may have perverse effects.⁷⁵

In addition to self-policing by people feeling motivated to keep their own promises, compliance may be buttressed by other members of the public shaming those who do not comply or even reporting them to authorities, since they represent not only a hypothetical risk for infection but also expropriation of public funds. In this way, the noncompliance can also be connected to standard law-enforcement mechanisms, where an individual convicted of violating a legitimate order suffers revocation of the payment as a penalty, with full due process protections of course. Even with such a standard (rational) deterrence theory, the explicit promise to forfeit the funds upon noncompliance may make that risk seem more salient to the citizen and thus increase compliance.

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Overall, these economic and behavioral principles suggest that to manage a pandemic prior to dissemination of a vaccine, policymakers should use conditional payments to encourage compliance with social distancing, stay-at-home, and quarantine directives. The key is to make compliance easier and cheaper than noncompliance, especially for those that would otherwise feel the greatest compulsion to not comply.

⁷² See Amos Tversky and Daniel Kahneman. "Prospect theory: An analysis of decision under risk." *Econometrica* 47, no. 2 (1979): 263-291.

⁷³ See generally, Jennifer L. Matjasko, John H. Cawley, Madeleine M. Baker-Goering, and David V. Yokum. "Applying behavioral economics to public health policy: illustrative examples and promising directions." *American journal of preventive medicine* 50, no. 5 (2016): S13-S19 (discussing social norms and commitment devices); Tess Wilkinson-Ryan, "Legal promise and psychological contract." *Wake Forest L. Rev.* 47 (2012): 843 (discussing compliance with agreed promises).

⁷⁴ Thomas Baumgartner, Urs Fischbacher, Anja Feierabend, Kai Lutz, and Ernst Fehr. "The neural circuitry of a broken promise." *Neuron* 64, no. 5 (2009): 756-770 ("the breaking of the promise is associated with increased activation in the DLPFC, ACC, and amygdala, suggesting that the dishonest act involves an emotional conflict due to the suppression of the honest response"); Christoph Vanberg, "Why do people keep their promises? An experimental test of two explanations 1." *Econometrica* 76, no. 6 (2008): 1467-1480("Numerous psychological and economic experiments have shown that the exchange of promises greatly enhances cooperative behavior in experimental games. ... [New data finds] that people have a preference for promise keeping.")

⁷⁵ Chung-cheng Lin and C. C. Yang. "Fine enough or don't fine at all." *Journal of Economic Behavior & Organization* 59, no. 2 (2006): 195-213. See also Uri Gneezy and Aldo Rustichini. "A fine is a price." *The Journal of Legal Studies* 29, no. 1 (2000): 1-17 (the now-classic study).