

An Example Outline for Applying the *Total–Harm–Minimization* Framework for Developing a Return–to–the–Workforce Policy

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The challenge of reintroducing workers to the workforce before an effective COVID–19 vaccine is available is complex scientifically, economically, and from a policy perspective. Modeling this quantitatively involves hundreds of assumptions about the economy, the progression of the COVID–19 virus through populations (including how this progression may be impacted by various interventions such as social distancing), and then further assumptions about how these two sets of processes – epidemiology and economics – interact with each other. Such a rich problem could take years to research and frame. Given the risks of COVID–19 to public health and the very consequential and hard to reverse decisions that might be based on such models, it is difficult to recommend basing public health policies on either complex models driven by the current sparse and noisy data, on the one hand, or on simplified models, that abstract away important detail, on the other.

Five–Step Risk Management–Based Approach (see Figure 1)

- Step 1 Compile background information (mostly from existing data)*
- Step 2 Rank population of asymptomatic individuals for testing*
- Step 3 Conduct targeted antibody testing for workers with high potential to return due to possible conferred immunity*
- Step 4 Determine return to work policy*
- Step 5 Given sub–population cleared to return, implement workforce return policy*

Policy makers and citizens cannot afford to wait for the ideal conditions and information to emerge over time. Neither should they lightly undertake implementing public health policy based on models that may be sophisticated but hard to validate, or on models that may be dominated by oversimplifications. However, given the magnitude of the health and economic issues affecting millions of citizens, leaders cannot simply wait idly, but must urgently take decisions and implement plans on the time scale of weeks rather than waiting idly over months or years.

In recognition of these challenges, the approach presented here takes a different, **risk management**, perspective:

- We accept as given the current uncertainty about the science and impact on economics, on the one hand, and the paucity of reliable data on the other.
- Rather than attempting to reduce the error rates and uncertainty of models, which is very difficult at present, we focus instead on managing the risk of the policies, by considering options that reduce the policy dependence on models and unavailable data.
- We focus on strategies that state and local governments can adopt to develop policies using existing staff and resources that are already available.

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Note to reader: This material is CONFIDENTIAL. While we believe that the concepts outlined in this note provide a useful framing for this problem, the details of their implementation and execution are beyond the scope of this work and, in some cases, beyond the current working group's detailed knowledge. As such, this is not intended as a recommendation or policy proposal.

The authors of this paper, introduced (in a [companion paper](#)) a risk-management framework for developing return-to-the-workforce policies that recognizes the current limitations of quantitative models and data.

The *Total-Harm-Minimization* framework encourages prioritizing those sectors and businesses that are most crucial to the rebooting and operation of the economy and then identifying the workers who may most safely return to work, thereby maximizing the impact on the economy of early-returners to the workforce. To mitigate risk, policies can start returning employees to the workforce by starting with the lowest risk individuals in the most impactful areas.

In this companion document we present an example outline showing the framework in somewhat more detail in order to demonstrate how policymakers might apply it to structure policy development.

The *Total-Harm-Minimization* framework does incorporate several basic assumptions about conferred immunity, the efficacy of antibody tests and the current state of medical and scientific research on COVID-19. These are listed in the next section. Information about some of these is still being actively debated by members of the scientific community

All assumptions should be evaluated carefully as part of any policy design, and should be reviewed regularly if policies are implemented.

The framework involves five steps, as outlined below and in Figure 1. For a fuller discussion of the rationale for this structure, as well as of the motivation for the risk-management focus of framework, see, [A *Total-Harm-Minimization* Framework for Developing Expedient and Low-Risk Return-to-the-Workforce Policies During the COVID-19 Pandemic](#).

Example outline for developing a “return-to-the-workforce” policy

Assumptions

1. COVID-19 and the workforce: A large number of individuals have already been exposed to COVID-19 and survived.^a
 - (a) a large percentage of Americans will ultimately contract COVID-19.
 - (b) “80%” (see footnote) of those infected will have had no or only mild symptoms.
 - (c) “15–19.5%” (see footnote) of those infected will have become ill but their condition will ultimately resolve.
2. Conferred immunity: Individuals who have already been exposed and survived COVID-19 are the most likely to conferred immunity and cannot be carriers of COVID-19 and cannot infect others even if exposed to COVID-19.
 - **This assumption must be confirmed.** To the extent confirmed immunity in the population is much less than 100%, calculations get more complicated and trade-off analysis may be required.
 - There is an antibody test available to determine conferred immunity status.
There is open debate on this point: See, e.g.,
Le Page, M. (2020) “[Will a home antibody test for covid-19 really be a game changer?](#)” , but also
WHO (2020) “[Immunity passports](#)” in the context of COVID-19 .
3. Absence of confirmed immunity: Individuals who have not been confirmed to be immune to COVID-19, and have not been vaccinated (when vaccine is available) can still become infected, be carriers of COVID-19, infect others, and themselves become ill.
 - Workforce participants who are otherwise asymptomatic may still be infected and contagious.
 - It is currently difficult/complex to assess the cost of false negative test results if non-immune individuals are erroneously returned to the workforce.
4. Impact on work of Self-Isolation: Varies by employee role and firm activities.
 - (a) Knowledge work
 - (i) Many individuals may continue to productively work remotely for an extended period.
 - (i) Many firms engaged primarily in knowledge work may continue to operate in a remote, distributed fashion, subject to telecommunications and computing infrastructure availability.
 - (i) Knowledge-work activities are often amenable to asynchronous execution.
 - (b) Contact work
 - (i) Many individuals cannot productively work remotely for an extended period.
 - (i) Many firms engaged primarily in traditional work cannot continue to operate effectively from remote locations.
 - (i) Traditional-work activities must often be done synchronously.
 - (c) Individuals who do not engage primarily in knowledge-work roles are at higher risk of unemployment if not returned to the workforce in the medium term.

^aEstimates given here are informal. Without testing a random sample of individuals, which is strongly indicated (see Step 1), it is difficult to determine the incidence, morbidity and mortality rates. For purposes of examples, we use numbers that have been reported as “typical” but unverified.

A Five Step Framework

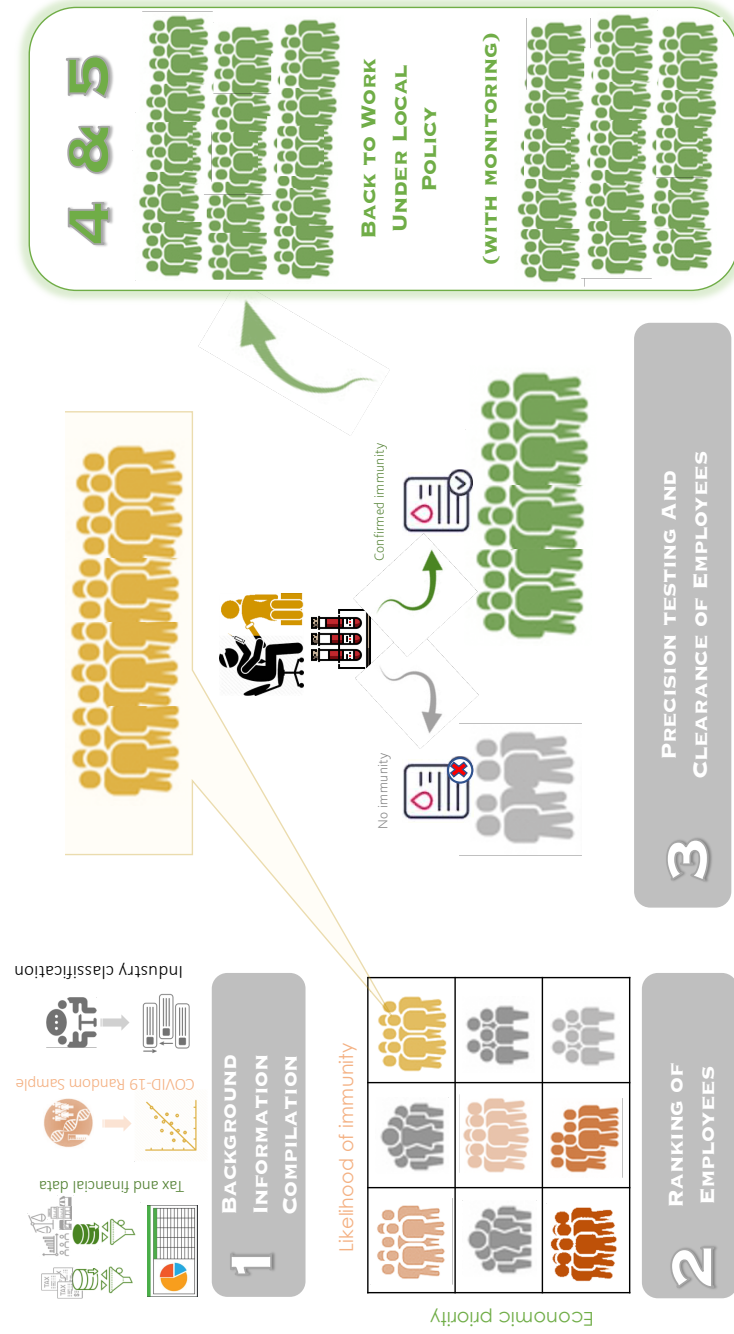


Figure 1: Conceptual schematic of policy development framework

Step 1: Compile background information on (a) COVID-19 incidence, recovery and mortality; and (b) economic and demographic profiles of employers. Step 2: Rank population of asymptomatic individuals for testing based on likelihood of having confirmed immunity/low susceptibility and economic impact of re-turn to workforce. Step 3: Conduct targeted testing for COVID-19 antibodies (not virus) based on ranking in Step 2. Step 4: Formulate policy based on results of testing, including roll-back plan and monitoring protocol for returned workers. Step 5: Implement policy in staged fashion with monitoring.

1. Compile background information (mostly from existing data)

- (a) Compile information on economic triage (qualitatively, using tax records, Dun and Bradstreet data, etc.)
 - (i) By sector to determine, (e.g.) ...
 - Which segments have largest numbers of employees
 - Which segments have largest numbers of customers
 - Which segments have highest liquidity
 - Which segments are concentrated in a few providers
 - Which segments make largest contributions to economic production
 - (ii) By business to determine, (e.g.) ...
 - Which firms have largest numbers of employees
 - Which firms have largest numbers of customers
 - Which firms have lowest liquidity (and are thus have increased risk of default in the short term)
 - Demographics of firms (if possible)
- (b) Conduct an abbreviated (likely qualitative) classification of segments based on...
 - (i) The degree to which a job function/firm's activities (e.g.) ...
 - Are largely knowledge-based (and can thus be continued remotely)
 - Can be conducted in a modular fashion
 - Have unusual demographic distributions (if possible)
 - Outputs are part of critical infrastructure
 - Activities are critical to managing direct and indirect health impacts of COVID-19
 - (ii) The degree and scale to which outputs of the business are critical for downstream critical businesses
 - (iii) Note that initial work the distribution of job functions, etc. is available in some cases (see: Figure 3)
See, e.g., Dingel, J. and B Neiman (2020), ["How Many Jobs Can be Done at Home?"](#)
- (c) Compile information/prediction of base rates, mortality rates, susceptibility and confirmed immunity (e.g., virus and antibody tests of a random sample of 1,000 – 10,000 persons). For example,
 - (i) Test: both for active virus and for antibodies
 - (ii) Record: test results and various phenotypical and demographic info, as well as current medications
 - (iii) As sampling will likely be biased for a variety of reasons, all analyses should be adjusted for selection bias; so information on non-reports should be detailed as carefully as possible.

2. Rank population of asymptomatic individuals for testing

- (a) Develop an objective function (likely heuristic) for the economic importance/criticality of sectors and business that minimizes false negative risk and maximizes economic/infrastructure benefit.
- (b) For sub-populations for which information from (1) and (2) are reliable enough triage using a grid 2a x 2b.
- (c) Prioritize individuals and segments that maximize utility:
 - (i) Focus on those segments/job descriptions/businesses for which (e.g.)
 - Remote work is inefficient/impossible
 - There are expected to be a large number of employees with confirmed immunity or who have been exposed and are unlikely to become ill or become carriers
 - There is higher modularity and/or a high proportion of the workforce which is likely to meet reentry criteria
 - (ii) e.g., consider targeting areas where economic activity has been particularly constrained due to COVID-19.
 - (iii) e.g., consider areas where the outbreak of COVID-19 has peaked, as rates of immunity may be expected to be higher.
 - (iv) e.g., consider sectors/firms/individuals that are liquidity constrained and thus at highest risk of bankruptcy in the short term.

3. Conduct targeted antibody testing campaign for workers with high potential to return

- (a) Use triage ranking (2c) to target individuals and industries.
- (b) Consider pooled testing to economize on scarce tests (if possible):
 - (i) Compute optimal pool size.
See, e.g., Bilder, C. R. and J.M. Tebbs, (2012). [“Pooled testing procedures for screening high volume clinical specimens in heterogeneous populations.”](#) for an overview.
 - (ii) Determine whether multiple tests are required given costs, error rate of test.
 - (iii) Determine optimal cutoff or variable cutoff, depending on Type I error rate of tests
e.g., see, e.g., Stein, R.M., (2005). [“The relationship between default prediction and lending profits: Integrating ROC analysis and loan pricing”](#) for details of using rankings or models to determine greenlight cut-offs and an example from economics.

4. Determine return to work policy

- (a) Develop roll-back plan for individuals or groups of individuals who are returned to workforce but, due to testing error or other reasons subsequently recontract COVID-19. (This should contemplate the need to quarantine individuals and their coworkers if needed.)
- (b) Develop returned-employee monitoring protocol to ensure quick response to false negative results. This could include
 - Daily temperature checks of all returning employees.
 - Frequent (pooled) testing of all returning employees using the COVID-19 virus diagnostic (rather than the antibody diagnostic), particularly while the determination regarding the totality of conferred immunity is being researched.

5. Given sub-population cleared to return, implement work-force return policy

- Consider staging in segments with one full COVID-19 incubation cycle between successive stages.
- Consider staging segments to minimize concentrations of returning workers in geographic locations (to facilitate rollback if needed and to minimize opportunities for transmission).

Workforce triage and clearance

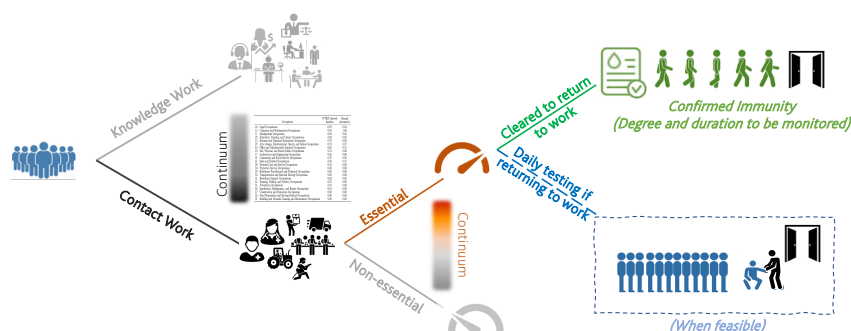


Figure 2: Triage, prioritization and monitoring of employee return-to-the-workforce policies

	Occupation	O*NET-derived baseline	Manual alternative
23	Legal Occupations	0.97	0.84
15	Computer and Mathematical Occupations	0.95	1.00
11	Management Occupations	0.84	0.84
25	Education, Training, and Library Occupations	0.82	0.85
13	Business and Financial Operations Occupations	0.78	0.92
27	Arts, Design, Entertainment, Sports, and Media Occupations	0.73	0.57
43	Office and Administrative Support Occupations	0.65	0.51
19	Life, Physical, and Social Science Occupations	0.51	0.36
17	Architecture and Engineering Occupations	0.50	0.88
21	Community and Social Service Occupations	0.37	0.50
41	Sales and Related Occupations	0.28	0.21
39	Personal Care and Service Occupations	0.18	0.00
33	Protective Service Occupations	0.06	0.00
29	Healthcare Practitioners and Technical Occupations	0.05	0.06
53	Transportation and Material Moving Occupations	0.03	0.00
31	Healthcare Support Occupations	0.02	0.00
45	Farming, Fishing, and Forestry Occupations	0.01	0.00
51	Production Occupations	0.01	0.00
49	Installation, Maintenance, and Repair Occupations	0.01	0.00
47	Construction and Extraction Occupations	0.00	0.00
35	Food Preparation and Serving Related Occupations	0.00	0.00
37	Building and Grounds Cleaning and Maintenance Occupations	0.00	0.00

Figure 3: Ranking of jobs by degree to which work may be done remotely (*from Dingel and Neiman, 2020*)

This table orders major occupations by the degree to which the occupations may be performed remotely from home. (See: Dingel, J. and B Neiman (2020), "[How Many Jobs Can be Done at Home?](#)", Table 3 for details.)