NIOSH Risk-Based Model to Resume Field Research and Public Health Service in 2020 During the COVID-19 Pandemic

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In the early months of the COVID-19 pandemic, field research and public health service work conducted by the National Institute for Occupational Safety and Health (NIOSH) was put on hold. During this time, NIOSH developed a risk-based model to resume fieldwork, balancing the public health benefit of such fieldwork with the risks of severe acute respiratory syndrome coronavirus 2 exposure and transmission. We describe our experiences with this model, along with the broader public health significance of the methods used to inform risk management decisions. (*Am J Public Health*. 2022;112(8):1138–1141. https://doi.org/10.2105/AJPH.2022.306882)

AJPH August 2022, Vol 112, No. 8

We developed and implemented travel risk management decision tools to facilitate limited mission-critical fieldwork while protecting field staff and workers during the COVID-19 pandemic because of the real public health risks from delaying critical work conducted by the National Institute for Occupational Safety and Health (NIOSH)—the only federal institute mandated to conduct research and public health service work to prevent work-related injuries and illnesses.

INTERVENTION AND IMPLEMENTATION

An initial travel risk management decision tree (Figure A, available as a supplement to the online version of this article at https://www.ajph.org) considered four major determinants of risk of a NIOSH employee becoming infected with or transmitting severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) while conducting field visits: (1) site conditions and work requirements, (2) level of COVID-19 community spread at the site and surrounding area, (3) mode of transportation and length of stay, and (4) controls in place. The decision tree presented these determinants of risk in the far left column, with descriptors of increasing risk presented from left to right for each category.

We designed the decision tree so that potential risk can stay the same or increase in navigating through the arrows from top to bottom but cannot go from a higher to a lower level of risk between steps. The final risk determination for the field visit is the potential risk level reached at the bottom of the decision tree. Elements of the decision tree were informed in large part by workplace COVID-19 investigations early in the pandemic,[1–3] months before vaccines were available to prevent SARS-CoV-2 infection and serious illness from COVID-19.

In applying the decision tree in the first year of the pandemic, NIOSH investigators were asked to prioritize travel requests supporting only the most critical and time-sensitive research and public health service work. Between October 2020 and July 2021, NIOSH investigators submitted 55 requests for field travel, 51 of which were approved. Three requests were rejected because the potential risk was high and the public health benefit of the activity did not outweigh the potential risk. A fourth request was initially put on hold owing to extremely high levels of community spread but was ultimately approved after community case counts decreased.

PLACE, TIME, AND PERSONS

A group of senior NIOSH leaders convened in April 2020 to develop plans

Step 1. Use this matrix to identify the risk rating for your travel location. https://covid.cdc.gov/covid-data-tracker/#county-view

Percentage of Adult Population Fully Vaccinated at Destination	SARS-CoV-2 Community Transmission *Total new cases per 100 000 persons in the past 7 days*			
	Low Transmission 0.00–9.99	Moderate Transmission 10.00–49.99	Substantial Transmission 50.00–99.99	High Transmission ≥ 100
	Travel Location Risk Rating			
≥ 70%	1	3	6	10
50%–69%	2	5	9	13
40%–49%	4	8	12	15
< 40%	7	11	14	16

Travel decisions should be made in consideration of travel risk level, risk mitigation measures, vaccination status of travelers, and public health benefits of proposed travel. Travel determined to be high risk does not preclude approval but may require additional review.

	Other Risk Factors	Description of Risk Factor Ratings	Risk Rating
Step 2. Use this table to determine risk ratings for other consequential determinants of risks: 1) personal contact and 2) mode of transportation.	Personal Contact[a]	Infrequent and short = 0 Frequent or extended = 2 Frequent and extended = 4	
	Mode of transportation	Vehicle travel 1 occupant = 0 Vehicle travel ≥ 2 occupants = 2 Public transportation = 4	
Step 3. Add your rating from step 1.	Travel location risk rating from risk matrix		
Step 4. Add all numbers to determine your travel risk rating	Travel risk rating		

Step 5. Use this color-coded scale to determine travel risk level.

Travel Risk Rating	Travel Risk Level
1 to 6	Low
7 to 10	Medium
11 to 13	Elevated
≥ 14	High

FIGURE 1— Revised Risk Matrix Framework for Use in Assessing COVID-19 Risk to Investigators and Workers Involved in NIOSH Research and Public Health Service Work: United States, August 2021–March 2022

Note. SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

[a]Specific details on frequency and duration of personal contact must be included on Travel Request Form.

to resume paused research and public health activities at NIOSH research field sites and workplaces throughout the United States.

PURPOSE

We initiated this intervention early in the COVID-19 pandemic in an effort to facilitate and safely conduct high-priority NIOSH occupational health and safety fieldwork.

EVALUATION AND ADVERSE EFFECTS

Although somewhat complex and difficult to navigate, the model presented in Figure A facilitated the continuation of limited mission-critical occupational health and safety research relatively early in the pandemic. The evaluation of our risk decision tree included consideration of easier access to frequently updated data, increased knowledge regarding the effectiveness of various control measures, and, importantly, the widespread availability of effective vaccines. We subsequently replaced the risk decision tree with a relatively simple risk matrix framework (Figure 1) that was finalized in August 2021. This model integrates county-level data on SARS-CoV-2 transmission with percentage of adult population fully vaccinated, two important determinants of risk of transmission, infection, and illness,[4] and characterizes varying levels of both metrics in terms of a travel location risk rating. The model also considers information on personal contact and mode of transportation in estimating a travel risk level. This model is intended to serve as an initial "snapshot" of potential risk, with final decisions made after considering travel risk level, travelers' vaccination status, specific details on the nature and extent of personal contact, control measures in place, and public health benefits of the proposed travel.

We determined the vast majority of approved travel during the first year of the pandemic (45 of 55 requests) to be medium or elevated risk. For example, two research engineers were able to travel together in a car for four hours to conduct maintenance on a seismic monitoring station, which is critical in conducting safety research on the impacts of seismic events in the mining industry.

Additionally, a few requests for travel determined to be high risk with extensive COVID-19 transmission were approved (3 of 55) that we deemed to involve an urgent public health need. In one such case, two investigators traveled to a worksite to investigate a suspected relationship between workers performing welding operations and serious illness involving novel bacteria.

No adverse effects (e.g., reported COVID-19 illness or SARS-CoV-2 infection) were observed. We cannot discount the possibility that the absence of adverse effects is attributable at least in part to a small sample size or lack of data.

SUSTAINABILITY

The process we have used for estimating risk can easily be adapted by other organizations, and alternative metrics can easily be substituted with the current approach if found to be more reliable for informing and managing risk. The risk matrix we developed is just one tool that can be used in a larger risk assessment process. The matrix does not attempt to estimate the probability of an outcome; however, the effectiveness of a simple and sensible approach to risk management in work settings has significant advantages over more complex models, as described elsewhere.[5–7]

The models NIOSH developed and used have limitations. The complexity of the initial risk decision tree made it difficult to navigate but also may have provided users with an unwarranted sense of confidence in the overall estimate of risk. Furthermore, the simplified risk matrix did not explicitly include some important risk factors (e.g., contact duration, personal risk factors for developing severe illness), and the cut points dividing potential levels of risk for each metric in both models were based largely on convenience rather than an in-depth analysis. Nonetheless, many components of our risk matrix are reflected in the Centers for Disease Control and Prevention's recently updated guidance related to COVID-19 community levels,[8] notably the use of a simple model that integrates a limited number of reliable COVID-19–related metrics to inform decision making.

PUBLIC HEALTH SIGNIFICANCE

The work described had a direct impact on the health and safety of US workers, as it facilitated the continued work of NIOSH soon after the start of the COVID-19 pandemic. Our flexible approach may be adopted and modified by those who are charged with managing risk in their organizations, and it acknowledges that rules and regulations cannot always account for all risk for all sites at all times. Organizations and their employees benefit by developing and clearly communicating mitigation strategies in anticipation of changing risk to minimize potential disruptions to employees and work processes. This may include, as appropriate, categories of risk with an a priori layered approach for control measures at each risk level to increase transparency. In other words, it is clear what mitigation measures will be put in place if the level of risk increases and what controls may be lifted if risk decreases. If executed and documented properly, the approach also creates an ability to track and evaluate what metrics and measures of control work best under varying conditions, which can lead to more consistent implementation strategies and communications across locations. AJPH

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PUBLICATION INFORMATION

Full Citation: Johns DO, Yeoman KM, Harney JM, Howard J, Poplin GS. NIOSH risk-based model to resume field research and public health service in 2020 during the COVID-19 pandemic. *Am J Public Health*. 2022;112(8):1138–1141.

Acceptance Date: April 5, 2022.

DOI: https://doi.org/10.2105/AJPH.2022.306882

CONTRIBUTORS

D. O. Johns led the writing. D. O. Johns and J. M. Harney designed the travel guidance and risk management decision tree. J. Howard oversaw the implementation of the intervention. G. S. Poplin led the design of the risk matrix with input from D. O. Johns and clinical direction from K. M. Yeoman. All authors contributed to the writing of the article.

ACKNOWLEDGMENTS

The work described was conducted and funded as part of each of the authors' employment with the Centers for Disease Control and Prevention (CDC).

We gratefully acknowledge Wilhelmina Hartsfield for her contributions in developing the travel guidance and Kelley Durst and Margaret Kitt for reviewing all travel requests.

Note. The findings and conclusions presented are those of the authors and do not necessarily represent the official position of the National Institute for Occupational Safety and Health, CDC.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

Institutional review board approval was not required as the work described did not involve human participants.

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