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COVID-19 Risk Assessment among Vulnerable Small Business Owners in El Paso County, Texas

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ABSTRACT

Background: Our objective was to deliver actionable, worksite-specific COVID-19 risk assessments and mitigation strategies tailored to vulnerable workers in one of the highest-risk areas in the US.

Methods: Four trained, bilingual (English/Spanish) Community Health Workers (CHWs) recruited small businesses (i.e., ≤20 employees) across various industries and executed novel on-site infectious disease risk assessment surveys of at least one employer and one employee.

Results: Of 102 participating businesses (95% Hispanic-owned), 96% were characterized as "high risk" or "very high risk" for disease transmission. All businesses reported implementing at least one practice to reduce disease transmission; however, almost half of businesses lacked at least 13 of the 17 controls identified to mitigate risk.

Conclusions: Tailored, culturally sensitive outreach led by CHWs identified and educated businesses on critical hazards, and these methods may be transferable to similar communities.

Keywords: COVID-19; occupational health; risk assessment; health inequities; small business; vulnerable workers

Learning Outcomes:

- Identify critical exposures driving COVID-19 infection risk among small business owners in high-transmission areas
- Differentiate business-initiated transmission control strategies from public health best practices and control strategies

1. INTRODUCTION

Measures for protecting workers from exposure to and infection with SARS-CoV-2 (or "coronavirus"), which causes Coronavirus Disease 2019 (or "COVID-19"), depend on the type of work performed, with particular emphases on the industry sector and occupational category, the potential for interaction with suspected or confirmed COVID-19 cases, and the possibility of contaminated work environments or materials.[1–7] Given the relative novelty of SARS-CoV-2, studies of the occupational risks associated with the virus have tended to focus on occupations at highest risk of transmission and have generally lacked a structured approach to characterizing and mitigating disease transmission as an occupational hazard.[8,9] To date, few U.S. studies have presented systematic methods to identify and prioritize occupational COVID-19 exposures.[5,10] In these studies, researchers have focused on the extent to which job tasks require (1) contact with others, particularly in close physical proximity[5] or (2) exposure to disease and infection as standard work conditions.[10] Several job-exposure matrices have been developed to characterize workplace SARS-CoV-2 risk,[11–16] but detailed approaches that tailor occupational hazard control to specific work settings, job tasks, or work groups[8] are widely lacking. This omission is alarming because the U.S. labor force is segregated by race/ethnicity,[17–19] and racial and ethnic minorities are at increased risk of COVID-19 infection, complications, and death.[20–22] Addressing this science-to-practice gap in the implementation of workplace COVID-19 mitigation strategies is essential for public health.[23]

The goals of the current project were to (1) develop and deploy a tailored, on-site risk profile assessment tool to systematically quantify the SARS-CoV-2 transmission-related risks associated with site- and job-specific attributes, (2) identify and assign pertinent controls to

mitigate the identified occupational risks, and (3) deliver targeted hazard mitigation strategies based on the hierarchy of controls framework to participating businesses.

2. METHODS

2.1. Hazard Classification Tool: Sources of Risk Assessment Elements

Existing U.S. Department of Labor (DOL) and U.S. Occupational Safety and Health Administration (OSHA) resources as well as scientific evidence of differential risk based on indoor or outdoor work settings provided the framework and elements for a tool assessing COVID-19 occupational hazards among the populations of interest.

DOL O*NET Occupational Exposure Descriptors: Sponsored by the DOL, the O*NET database has been summarized in detail elsewhere.[24,25] In brief, O*NET provides detailed worker characteristics and job-related information (e.g., activities, tasks, required knowledge and skills) collected from job incumbents or experts on more than 1,000 occupations,[24,25] with each occupation characterized by more than 275 attributes.[26] Job-related risk of contracting SARS-CoV-2 has been associated primarily with occupations that require either or both contact with others (particularly in close physical proximity) and exposure to disease and infection as standard work conditions[5,10]; within the O*NET database, these attributes are assigned a weighted score from 0 to 100 representing the frequency with which they are experienced, on average, by job title.

OSHA COVID-19 Exposure Risk Designations: During the pandemic period, OSHA developed a hierarchy of occupational exposure risk to SARS-CoV-2 informed by industry

category and contingent on a worker's need to be in close physical proximity to individuals or specimens known or suspected of being infected with SARS-CoV-2.[27] Based on these factors, OSHA classified exposure risk as "very high risk" (high potential for exposure to known or suspected sources of COVID-19 during specific medical, postmortem, or laboratory procedures), "high risk" (high potential for exposure to known or suspected sources of COVID-19), "medium risk"(frequent/close contact with people who may be infected, but who are not known or suspected patients), or "low risk" (minimal contact with people known to be, or suspected of being, infected).[27] OSHA initially (April 2020) limited very high and high exposure risk designations primarily to jobs in healthcare, research, or mortuary professions, which were outside of the scope of this portion of our study.[27] However, as understanding of COVID-19 transmissibility evolved (January 2021), high exposure risk was expanded to include workers with frequent or sustained close contact with coworkers or frequent indoor or poorly ventilated contact with the general public[28,29]; thus, as the understanding of airborne transmission of SARS-CoV-2 transitioned from "likely" to "significant"[30], proper ventilation was identified as part of a larger strategy to protect against the virus.[31] As a result, OSHA incorporated ventilation attributes (e.g., outdoor or well-ventilated spaces, indoor or poorly ventilated spaces) into their occupational hazard recognition hierarchy[28] and their worker protection recommendations.[29,32]

2.2. Hazard Classification Instrument and Controls Matrix Development

A hazard classification instrument was constructed from these O*NET and OSHA resources to assess the probability of occupational exposure among participants, with a focus on job attributes corresponding to contact with or physical proximity to others, routine exposure to infection/disease, and worksite ventilation, including the frequency and duration of exposures.

An occupational controls matrix was developed to outline strategies to limit SARS-CoV-2 transmission risks associated with each hazard. The NIOSH Hierarchy of Controls – which has been described elsewhere[33–36] – was used as a framework to propose occupational controls intended to mitigate the disease transmission risks associated with close physical proximity and pathogen exposure hazards.[33]

2.3. On-Site Assessment of Risk and Delivery of Mitigation Plans

Trained certified Community Health Workers (CHWs or *Promotoras de Salud*) approached small business owners in areas of El Paso, Texas, with dense concentrations of small businesses, which were also predominantly Hispanic communities. Business owners were invited to participate; if the owner was not present, the manager or supervisor was recruited. Following an affirmative response, on-site visits were scheduled, and the assessment tool was administered by a CHW to characterize the unique SARS-CoV-2 transmission risks present in each work setting. Site visits also included a walk-through of the facility, when possible, and lasted approximately 30 to 45 minutes. Data were collected on paper forms, and data entry was executed immediately following the visit by the CHW who administered the survey. Recruitment and data collection occurred over the six-month period from June 23, 2022, to December 22, 2022. Although El Paso County, Texas, reported some of the highest incidence rates in the U.S. in 2020, transmission had declined significantly by 2022,[37] when a surge in cases was reported in the Mexican state bordering El Paso County.[38] Due in part to cross-border movement, transmission in El Paso spiked between May and August 2022 and again in November 2022.[37,39]

Following each site visit, the risk profile tool was scored, and a customized virus mitigation control matrix was populated for each work site. The customized matrix included details of the community transmission level, estimated occupational exposure risk level, and corresponding existing exposures as well as a description of existing or suggested controls. The document was delivered to business owners/managers within 48 hours, at which time the CHWs reviewed the findings and suggestions and addressed questions; these visits lasted 20 minutes, on average.

2.4. Measures

Survey questions were categorized into five primary topics: (1) job tasks, (2) sustained close contact, (3) workplace ventilation, (4) existing workplace precautions, and (5) employment arrangements and socio-demographic measures. Job task questions (e.g., *"How often do your employees perform aerosol-generating procedures on known or suspected COVID-19 patients?"*) captured information on job activities that corresponded to the OSHA exposure risk classification scheme.[27] Questions assessing sustained close contact (e.g., *"Do any of your employees work in frequent or sustained contact with other people, such as co-workers, customers, or the general public?"*), workplace ventilation (e.g., *"When your employees work indoors, how often is the building climate controlled?"*), and existing workplace precautions (e.g., *"Does your workplace currently have COVID-19 guidelines or practices for employees, such as rules about handwashing, masking, distancing, or what to do if you feel sick?"*) were derived from the pertinent OSHA hazard recognition and worker protection guidelines.[28,29,32] Additional questions collected data on the business (e.g., *"Which of the following industries is most similar to the primary type of work performed at this business?"*), workers' employment

arrangements (e.g., "*Which of the following best describes your usual work schedule?"*), and the socio-demographics of the respondent (e.g., *"Do you consider yourself Hispanic or Latino?"*). The employer and employee surveys only differed in terms of phrasing (e.g., *"Do any of your employees work…"* vs. *"Do you work…"*) and the inclusion of an addition question for employees related to their working arrangements.

Each workplace hazard captured on the survey was associated with a specific risk and risk level, which informed the risk assessment provided to the business. Responses associated with the job task, sustained close contact, and workplace ventilation questions were mapped to a risk matrix developed from OSHA's hazard recognition and risk classification scheme for worker exposure to SARS-CoV-2[28]; this project's CHWs were trained on utilizing the matrix – which was constructed for this purpose – to assign estimated risk categories to each business based on their survey responses. Information on existing workplace precautions was employed to acknowledge controls currently in place and/or to suggest controls for the business' consideration. Guidelines and best practices from the CDC/NIOSH,[34] OSHA,[29,32,40] EPA,[31] existing literature,[6,8] professional associations,[30] and team-member expertise[41–44] informed the controls targeting each surveyed hazard. Controls were categorized to address three primary hazards: sustained close contact, workplace ventilation, and workplace precautions.

2.5. Statistical Analyses

Data from each business' employer survey and remediation plan were merged to create a business-level data set. Descriptive and bivariate analyses were executed to characterize participating businesses by their characteristics (e.g., industry), SARS-CoV-2 hazards (e.g.,

frequency of contact with customers) and mitigation practices at the time of the survey (e.g., requiring hand washing), and suggested controls (e.g., reducing crowding in busy areas).

Correlations between the existing controls were assessed across the three hazard categories (i.e., sustained close contact, workplace ventilation, workplace precautions). The total number of existing controls was summed within each category, and those totals were compared across categories by calculating a series of Pearson's correlation coefficients. Additional measures of correlation were calculated (Spearman's, Kendall's τ, Somers' *d*) to indicate if the sample size, range of values, or distributional shapes were producing spurious results.

Analyses were conducted using Stata/MP-Parallel software (version 15.1; Stata Corp, College Station, TX), with statistical significance defined as □<0.05. This project was deemed exempt from institutional review board or ethics committee review because this effort comprised one portion of a training grant and did not comprise human subjects research.[45]

3. RESULTS

One hundred and four businesses agreed to participate and provided data; however, two businesses provided incomplete information and were removed from the analysis, yielding an analytical sample of 102 businesses (n = 102). The majority of responding managers/owners self-identified as White (79.4%) and Hispanic (95.0%), and they were relatively evenly split in terms of gender (male: 44.1%) and across the age spectrum. More than 60% reported having been in their current position for more than three years, and one-quarter were salaried (25.5%). Three-quarters of surveys were conducted in Spanish (76.5%).

The hospitality (e.g., restaurants, bakeries, chauffeured limousine rental), retail (e.g., florists, boutiques, appliance centers, grocers), personal services (e.g., hair salons/barbers, dry cleaners, tanning salons), and automotive-related (e.g., mechanics, tire sales, trailer repair) industries comprised 87% of businesses surveyed (Table 1), with most employees working standard daytime schedules (74.5%). Although more than half of business reported that their employees "never" work overtime (58.8%), almost one in five indicated that employees work overtime "every day or almost every day" (17.6%).

Of 102 participating businesses, only one (1.0%) reported employees performing very high risk tasks (e.g., exposure to aerosol-generating procedures, collecting or handling specimens), but almost all businesses reported employees performing high risk tasks (Table 2). Working in frequent or sustained contact with other people was the most frequently reported high risk exposure (97.0%). Additionally, approximately two-thirds (67.0%) indicated their employees generally work moderately (i.e., arm's length) or very closely (i.e., almost touching or touching) with others, and almost nine out of ten reported that their employees interact with both coworkers and customers/clients in close physical proximity (i.e., 6 feet [or 2 meters] apart) every day, though the number of these interactions varied widely. Most work was performed at the primary business location (92.9%), which was typically indoors (70.4%) and climate controlled (89.2%).

In terms of workplace COVID-19 transmission control practices, sixty-six percent of employers encouraged employee COVID-19 vaccination; an additional 16% required it. Of the 61% of employers reporting workplace COVID-19 guidelines, almost one-third (30.2%) had not

documented them. All businesses reported implementing at least one practice to reduce disease transmission, typically requiring employee hand washing/sanitizing (85.3%) or reporting symptoms of illness (84.3%); no other practices (e.g., social distancing, masking) were in place at more than about one-quarter of businesses. Among those who requested additional information on reducing workplace transmission, 28% wanted to learn more about the vaccines and 19% were interested in evidence on the efficacy of masking.

Of participating businesses, 96% were characterized as high or very high risk of disease transmission, which was primarily due to frequent or close contact with customers in hospitality, retail, and personal services. Of the 17 controls identified to mitigate risk factors, almost half of businesses lacked 13 or more (Table 3). Controls to minimize sustained close contact and improve worksite ventilation were the most frequently absent and, thus, more often suggested by CHWs than controls related to worksite precautions. Only two controls were in place in more than half of participating businesses: having handwashing facilities and/or hand sanitizer available to employees and customers (76.5%) and encouraging or requiring employees to follow guidelines or practices to reduce the spread of illness (72.5%). Three additional controls were present in almost half: reducing crowding and bottlenecks in busy areas (46.5%), providing shift flexibility options (e.g., staggering start/end times and/or break times) (45.9%), and encouraging or requiring vaccination (43.6%).

A series of Pearson's pairwise correlations were run to assess the relationship among the three types of controls: contact, ventilation, and workplace precautions (Table 4). There was a strong positive correlation between the number of ventilation and contact controls, r(100) =

0.748, $p < 0.0001$, with ventilation controls explaining 56% of the variation in contact controls. In addition, there was a small positive correlation between the number of ventilation controls and workplace precautions, $r(100) = 0.252$, $p = 0.011$; ventilation controls explained approximately 6% of the variation in workplace precautions. Given the relatively small sample size, limited range of values, and inconsistent evidence of bivariate normality, Spearman's and Kendall's τ rank correlation coefficients as well as Somers' *d* statistics were calculated for all pairs of the three general controls, with equivalent results (not shown).

4. DISCUSSION

The COVID-19 pandemic exacerbated existing inequalities in occupational health among minority communities. The disproportionate risk of COVID-19 severity and mortality among vulnerable populations lends urgency to the development of targeted approaches to limit occupational transmission risk, given that workplace mitigation strategies may be beyond the control of many frontline workers. Studies of the work-related risks associated with COVID-19 across occupations and industries and accompanying mitigation strategies – especially in small businesses – remain limited. This paper outlines methods to deliver actionable, worksite-specific training in COVID-19 mitigation strategies tailored to small businesses in a high-risk, predominantly Hispanic community. To our knowledge, this is the first outreach effort focused on a public health program that involved partnering with CHWs to provide on-site respiratory disease risk assessments to small businesses and tailored remediation plans incorporating CDC, DOL, and OSHA guidelines and recommendations.

This project over-sampled Hispanic businesses in El Paso, Texas, in order to better understand workplace infectious disease prevention practices among this vulnerable population. Approximately 95% of participants identified as Hispanic and 76% preferred communicating in Spanish, which were almost 10% higher than the same measures of the general population of El Paso (83% and 65.5%, respectively).[46] Studies have found minority populations over-represented in lower paying jobs that were considered "essential" during the pandemic (e.g., hair care, retail, automotive repair)[47]; similarly, more than three-fourths of this project's participating businesses were in the hospitality, retail or service industries. Consistent with other studies that have assessed COVID-19 risk among minority populations,[47–50] we found that workers of almost all participating businesses (96%) were at high or very high risk for transmission, due primarily to the frequency or duration of contact with others required by their jobs.

This project's findings suggest that all participating small businesses had instituted at least one workplace guideline or practice to prevent SARS-CoV-2 transmission, but fewer than one-third had documented them. Concerningly, the majority of participating businesses reported relying on less effective hazard management strategies, such as administrative controls and/or the use of personal or community protective equipment (e.g., face masks, gloves), than on more effective hazard control methods, such as engineering controls. The three prevention practices most frequently required by participating businesses were handwashing, reporting of symptom onset, and social distancing; the former two comprised administrative controls, and the latter one was typically implemented as an administrative control, though some businesses utilized engineering controls to support the practice. In fact, engineering controls targeted at reducing SARS-CoV-2 transmission, such as ventilation management or physical barriers that minimized

exposures associated with frequent and/or long-duration interpersonal contact,[32,40,51,52] were the least likely to be present and, thus, were most frequently recommended by the CHWs.

Ventilation management was a complex issue for participants, as many reported that they did not have access to the climate control and/or ventilation systems at their worksites because they leased their workspaces and were unable to modify the heating, ventilation, and air conditioning system and/or had little to no input into or oversight of its maintenance or settings. Our finding that business leaders who implemented greater numbers of ventilation controls were more likely to implement greater numbers of worksite precautions and sustained close contact controls suggests that these businesses saw a benefit in incorporating multiple infection control approaches; this pattern may also reflect that greater authority over the implementation of controls, in general, results in a larger number of controls being utilized. Although ventilation controls may have been less obvious to and less burdensome on employees and customers than other controls implemented by business owners/managers (e.g., handwashing, masking, distancing), many participating employers expressed a desire for their employees and customers to be actively engaged in reducing transmission risk, which may explain, in part, why these businesses employed multiple strategies.

This project's findings should be considered in light of its limitations. First, participants were comprised of a purposive sample of small businesses recruited by CHWs in predominantly Hispanic communities. Although this approach may limit the generalizability of some findings, this strategy was effective in reaching the intended vulnerable worker population, and the study sample was not intended to be representative of all small businesses in El Paso. When small

business owners were not available to complete the survey, the risk assessments were completed by managers or supervisors, who may not have had full knowledge of the business operations or disease transmission strategies; additionally, the job title of each respondent (i.e., owner vs. manager vs. supervisor) was not captured, which prohibited analyses of differences between these groups. Data were self-reported, and it is possible that respondents may have felt obligated to report certain preventative measures that were not in place or implemented, thereby introducing social desirability bias into this analysis.

COVID-19 has posed an unprecedented challenge for occupational health, but it won't be the last infectious event to strike workplaces. Numerous jobs require direct contact with or close physical proximity to the general public; many of these jobs entail numerous such contacts each day.[2] Future public health interventions could apply this methodology to provide worksite specific and culturally appropriate respiratory disease risk assessments and mitigation plans to small businesses in other communities, larger businesses, or businesses in more varied industries. This innovative approach to deliver OSHA-guided COVID-19 risk assessment and mitigation to small businesses provides a framework for engaging CHWs as partners with small businesses in vulnerable communities to promote worker, customer, and community health and better protect those populations from respiratory disease transmission.

REFERENCES

1. Koh D. Occupational risks for COVID-19 infection. *Occup Med (Lond)*. 2020;70(1):3-5. doi:10.1093/occmed/kqaa036
2. Burdorf A, Porru F, Rugulies R. The COVID-19 (Coronavirus) pandemic: consequences for occupational health. *Scandinavian Journal of Work, Environment & Health*. 2020;46(3):229-230. doi:10.5271/sjweh.3893
3. McClure ES, Vasudevan P, Bailey Z, Patel S, Robinson WR. Racial capitalism within public health—How occupational settings drive COVID-19 disparities. *American Journal of Epidemiology*. 2020;189(11):1244-1253. doi:10.1093/aje/kwaa126
4. Chirico F, Magnavita N. COVID-19 infection in Italy: An occupational injury. *SAMJ: South African Medical Journal*. 2020;110(6):0-0. doi:10.7196/SAMJ.2020.v110i6.14855
5. Hawkins D. Differential occupational risk for COVID-19 and other infection exposure according to race and ethnicity. *Am J Ind Med*. Published online June 15, 2020. doi:10.1002/ajim.23145
6. Michaels D, Wagner GR. Occupational Safety and Health Administration (OSHA) and worker safety during the COVID-19 pandemic. *JAMA*. 2020;324(14):1389-1390. doi:10.1001/jama.2020.16343
7. Lewandowski P. *Occupational Exposure to Contagion and the Spread of Covid-19 in Europe*. Social Science Research Network; 2020. Accessed December 14, 2020. https://papers.ssrn.com/abstract=3596694
8. Granados J, Ceballos M, Amariles P. Proposed individual risk score for educational institutions utilizing risk of morbidity/mortality by SARS-CoV-2, occupational exposure,

and type of transportation. *Journal of Occupational and Environmental Medicine*. 2020;62(12):e770. doi:10.1097/JOM.0000000000002032

9. Eyre DW, Lumley SF, O'Donnell D, et al. Differential occupational risks to healthcare workers from SARS-CoV-2 observed during a prospective observational study. Lipsitch M, Davenport MP, Torok ME, eds. *eLife*. 2020;9:e60675. doi:10.7554/eLife.60675
10. Baker MG, Peckham TK, Seixas NS. Estimating the burden of United States workers exposed to infection or disease: A key factor in containing risk of COVID-19 infection. *PLoS One*. 2020;15(4). doi:10.1371/journal.pone.0232452
11. Hengel KMO, Burdorf A, Pronk A, et al. Exposure to a SARS-CoV-2 infection at work: development of an international job exposure matrix (COVID-19-JEM). *Scand J Work Environ Health*. 2022;48(1):61-70. doi:10.5271/sjweh.3998
12. Fadel M, Gilbert F, Legeay C, et al. Association between COVID-19 infection and work exposure assessed by the Mat-O-Covid job exposure matrix in the CONSTANCES cohort. *Occup Environ Med*. 2022;79(11):782-789. doi:10.1136/oemed-2022-108436
13. van der Feltz S, Peters S, Pronk A, et al. Validation of a COVID-19 job exposure matrix (COVID-19-JEM) for occupational risk of a SARS-CoV-2 infection at work: Using data of Dutch workers. *Annals of Work Exposures and Health*. 2023;67(1):9-20. doi:10.1093/annweh/wxac032
14. Fadel M, Salomon J, Descatha A. COVID-19 job exposure matrix. *J Occup Environ Med*. 2021;63(3):e168. doi:10.1097/JOM.0000000000002148
15. Descatha A, Fadel M, Sembajwe G, Peters S. Using the COVID-19 job exposure matrix for essential workplace preparedness. *J Occup Environ Med*. 2022;64(1):e39-e40. doi:10.1097/JOM.0000000000002437

16. Rhodes S, Beale S, Wilkinson J, et al. Exploring the relationship between job characteristics and infection: Application of a COVID-19 Job Exposure Matrix to SARS-CoV-2 infection data in the United Kingdom. Published online September 21, 2022:2022.09.21.22280191. doi:10.1101/2022.09.21.22280191
17. U.S. Department of Labor Bureau of Labor Statistics. Labor force characteristics by race and ethnicity, 2018. BLS Reports. 2019. Accessed December 14, 2020. https://www.bls.gov/opub/reports/race-and-ethnicity/2018/home.htm
18. Gradín C, del Río C, Alonso-Villar O. Occupational segregation by race and ethnicity in the United States: Differences across states. *Regional Studies*. 2014;49:1-18. doi:10.1080/00343404.2013.864384
19. Thompson D. The workforce is even more divided by race than you think. *The Atlantic*. Published online November 6, 2013. Accessed December 14, 2020. https://www.theatlantic.com/business/archive/2013/11/the-workforce-is-even-more-divided-by-race-than-you-think/281175/
20. Sze S, Pan D, Nevill CR, et al. Ethnicity and clinical outcomes in COVID-19: A systematic review and meta-analysis. *EClinicalMedicine*. 2020;0(0). doi:10.1016/j.eclinm.2020.100630
21. Millett GA, Jones AT, Benkeser D, et al. Assessing differential impacts of COVID-19 on black communities. *Ann Epidemiol*. 2020;47:37-44. doi:10.1016/j.annepidem.2020.05.003
22. U.S. Department of Health and Human Services Centers for Disease Control and Prevention. COVID-19 provisional counts - Weekly updates by select demographic and geographic characteristics. National Center for Health Statistics Weekly Updates by Select Demographic and Geographic Characteristics. December 10, 2020. Accessed December 14, 2020. https://www.cdc.gov/nchs/nvss/vsrr/covid_weekly/index.htm

23. Means AR, Wagner AD, Kern E, Newman LP, Weiner BJ. Implementation science to respond to the COVID-19 pandemic. *Front Public Health*. 2020;8. doi:10.3389/fpubh.2020.00462
24. National Center for O*NET Development. The O*NET® content model. O*NET Resource Center. 2020. Accessed December 11, 2020. https://www.onetcenter.org/content.html
25. National Center for O*NET Development. About O*NET. O*NET Resource Center. 2020. Accessed December 11, 2020. https://www.onetcenter.org/overview.html
26. National Center for O*NET Development. O*NET online help: O*NET overview. O*NET OnLine. 2020. Accessed December 11, 2020. https://www.onetonline.org/help/onet/
27. U.S. Department of Labor Occupational Safety and Health Administration. Worker exposure risk to COVID-19. osha.gov/covid-19. April 2020. Accessed December 12, 2020. https://www.osha.gov/Publications/OSHA3993.pdf
28. U.S. Department of Labor Occupational Safety and Health Administration. COVID-19 - Hazard recognition. Safety and Health Topics: COVID-19. 2020. Accessed December 12, 2020. https://www.osha.gov/coronavirus/hazards#low_risk
29. U.S. Department of Labor Occupational Safety and Health Administration. Protecting workers: Guidance on mitigating and preventing the spread of COVID-19 in the workplace. 2021. Accessed June 17, 2023. https://www.osha.gov/coronavirus/safework
30. American Society of Heating, Refrigerating and Air-Conditioning Engineers. ASHRAE epidemic task force releases updated airborne transmission guidance. April 5, 2021. Accessed June 17, 2023. https://www.ashrae.org/about/news/2021/ashrae-epidemic-task-force-releases-updated-airborne-transmission-guidance

31. U.S. Environmental Protection Agency. Ventilation and coronavirus (COVID-19). June 18, 2020. Accessed August 8, 2023. https://www.epa.gov/coronavirus/ventilation-and-coronavirus-covid-19
32. U.S. Department of Labor Occupational Safety and Health Administration. COVID-19 guidance on ventilation in the workplace. Published online 2021. https://www.osha.gov/sites/default/files/publications/OSHA4103.pdf
33. U.S. Centers for Disease Control and Prevention National Institute for Occupational Safety and Health. Hierarchy of controls. June 17, 2020. Accessed December 11, 2020. https://www.cdc.gov/niosh/topics/hierarchy/default.html
34. U.S. Department of Health and Human Services National Institute for Occupational Safety and Health. *Proposed National Strategies for the Prevention of Leading Work-Related Diseases and Injuries: Occupational Lung Diseases*.; 1986. Accessed December 13, 2020. https://www.cdc.gov/niosh/docs/89-128/pdfs/89-128.pdf?id=10.26616/NIOSHPUB89128
35. Barnett R, Brickman D. *Safety Hierarchy*. Triodyne Inc.; 1985. Accessed December 13, 2020. http://www.triodyne.com/SAFETY~1/SB_V3N2.PDF
36. Cornell University Department of Environmental Health and Safety. COVID-19 hierarchy of controls. 2020. Accessed December 13, 2020. https://ehs.cornell.edu/campus-health-safety/occupational-health/covid-19/covid-19-hierarchy-controls
37. City of El Paso, Texas. *COVID-19 Report for CDC Week 52*; 2022. https://www.epstrong.org/documents/covid19/health-orders/releases/covid-report-December-19-2022.pdf?1723059672

38. Juarez again to require face masks due to COVID-19 spike. BorderReport. July 15, 2022. Accessed August 7, 2024. https://www.borderreport.com/news/coronavirus/juarez-again-to-require-face-masks-due-to-covid-19-spike/

39. Jackson A. COVID-19 transmission rate "high" in El Paso County; Sheriff's Office sets vaccine drive. El Paso Times. June 27, 2022. Accessed August 7, 2024. https://www.elpasotimes.com/story/news/local/el-paso/2022/06/27/covid-19-transmission-rate-high-el-paso-county/7746491001/

40. U.S. Department of Labor Occupational Safety and Health Administration. COVID-19 - Control and prevention. 2021. Accessed January 12, 2024. https://www.osha.gov/coronavirus/control-prevention

41. Emery RJ, Patlovich SJ, King KG, Rios J. Pivoting the biosafety program in response to COVID-19: Recommendations of key services and tasks to consider for the next pandemic. *Appl Biosaf*. 2022;27(3):119-126. doi:10.1089/apb.2022.0009

42. Pompeii LA, Kraft CS, Brownsword EA, et al. Training and fit testing of health care personnel for reusable elastomeric half-mask respirators compared with disposable N95 respirators. *JAMA*. 2020;323(18):1849-1852. doi:10.1001/jama.2020.4806

43. Clark JR, Terwilliger A, Avadhanula V, et al. Wastewater pandemic preparedness: Toward an end-to-end pathogen monitoring program. *Front Public Health*. 2023;11:1137881. doi:10.3389/fpubh.2023.1137881

44. Pompeii L, Byrd A, Delclos GL, Conway SH. The American Association of Occupational Health Nurses' respiratory protection education program and resources webkit for occupational health professionals. *Workplace Health & Safety*. Published online 2016:2165079916663226.

45. U.S. National Institutes of Health. Human sbjects research. Grants & Funding. 2023. https://grants.nih.gov/policy/humansubjects.htm

46. U.S. Census Bureau. QuickFacts: El Paso City, Texas; El Paso County, Texas. 2022. Accessed January 22, 2024. https://www.census.gov/quickfacts/fact/table/elpasocitytexas,elpasocountytexas/PST045222

47. Goldman N, Pebley AR, Lee K, Andrasfay T, Pratt B. Racial and ethnic differentials in COVID-19-related job exposures by occupational standing in the US. *medRxiv*. Published online April 6, 2021:2020.11.13.20231431. doi:10.1101/2020.11.13.20231431

48. Schnake-Mahl A, Bilal U. Disaggregating disparities: A case study of heterogenous COVID-19 disparities across waves, geographies, social vulnerability, and political lean in Louisiana. *Prev Med Rep*. 2022;28:101833. doi:10.1016/j.pmedr.2022.101833

49. Tan SB, deSouza P, Raifman M. Structural racism and COVID-19 in the USA: A county-level empirical analysis. *J Racial Ethn Health Disparities*. 2022;9(1):236-246. doi:10.1007/s40615-020-00948-8

50. Schnake-Mahl AS, Bilal U. Person, place, time and COVID-19 inequities. *Am J Epidemiol*. Published online March 12, 2021:kwab058. doi:10.1093/aje/kwab058

51. Billock RM. Required and voluntary occupational use of hazard controls for COVID-19 prevention in non–health care workplaces — United States, June 2020. *MMWR Morb Mortal Wkly Rep*. 2021;70. doi:10.15585/mmwr.mm7007a5

52. U.S. Department of Labor Occupational Safety and Health Administration. Guidance on preparing workplaces for COVID-19. 2020;OSHA 3990-03. https://www.osha.gov/sites/default/files/publications/OSHA3990.pdf

Table 1. Percent of participating businesses per industry sector, n = 102.

	%
Hospitality	32.3
Retail	26.5
Personal services	17.6
Automotive, mechanic, body work, tires	10.8
Professional services	3.9
Construction, real estate	2.9
Childcare	2.9
Wholesaling, distribution	2.0
IT services, technology, systems integrator	1.0

Note: No respondents in the following industry categories: financial services, banking, insurance; health care; non-profit or non-governmental organization; services/resources/environmental science or utilities. Values may not sum to 100% due to rounding.

Table 2. Percent of sample of El Paso small businesses reporting specific COVID-19 transmission-related risk factors, n = 102.

	%
Frequent contact with others	96.1
Indoor climate-controlled setting	87.2
Close contact with others	82.3
Lack of written guidelines to reduce disease transmission	71.6
Lack of vaccination support (i.e., neither mandated nor encouraged)	45.1
Interactions with many people	37.2
Lack of practices limiting disease transmission (e.g., hand hygiene)	25.5
High risk job tasks (e.g., exposed to biological samples, mortuary work)	2.0

Table 3. Controls already in place vs. suggested for implementation by hazard category among sample of El Paso small businesses, n = 102.

	Already in place %		Suggested for implementation %
Sustained Close Contact			
Reduce crowding/bottlenecks	46.5		53.5
Shift flexibility	45.9		54.1
Physical barriers block face-to-face contact	29.5		70.4
Break areas allow physical distancing	25.0		75.0
Employee masking encouraged	20.4		79.6
Contactless payment/scheduling systems	14.7		85.3
Physical distancing floor markers/wall signs	12.1		87.9
Worksite Ventilation			
HVAC systems checked/maintained frequently	33.3		66.7
HVAC maximizes outside air ventilation	31.6		68.4
Air filters maintained/changed frequently	31.3		68.7
Doors/windows opened to allow outside air	29.7		70.3
HVAC run 2 hours before/after business hours	28.1		71.9
Workplace Precautions			
Availability of handwashing/hand sanitizer for employees/customers	76.5		23.5
Encourage/require guidelines/practices to reduce spread of illness	72.5		27.4
Encourage/require vaccination	43.6		56.4
Frequent cleaning/disinfection of high-touch surfaces	24.7		75.3
Implement infection control plan	20.6		79.4

Note: Values may not sum to 100% due to rounding.

Table 4. Correlation between controls by hazard categories.

	Correlation Coefficient		*P* value
Sustained Close Contact vs. Worksite Ventilation	**0.748**		**<0.0001**
Workplace Precautions vs. Worksite Ventilation	**0.252**		**0.01**
Sustained Close Contact vs. Workplace Precautions	0.070		0.48

Notes: Bold values indicate statistical significance at $P < 0.05$.

A novel approach to provide worksite-specific COVID-19 risk assessments and mitigation strategies to vulnerable businesses

Community Health Workers (CHWs) recruited 102 at-risk small businesses, executed an innovative disease transmission risk assessment tool, and delivered targeted mitigation strategies.

96% of participating businesses were characterized as "high risk" or "very high risk" for disease transmission

All had instituted at least one preventative practice, but 30% had not documented their guidelines

47% lacked ≥13 of the 17 controls identified to mitigate risk factors

Outreach led by CHWs identified and educated businesses on infectious disease hazards, and these methods may be transferable to similar communities.

COVID-19 Risk Assessment among Vulnerable Small Business Owners in El Paso County, Texas

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