DOI: 10.1002/ajim.23349

LETTER TO THE EDITOR

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE WILEY

Noise as a risk factor for COVID-19 transmission: Comment on Zhang: "Estimation of differential occupational risk of COVID-19 by comparing risk factors with case data by occupational group"

Zhang published an important article examining occupational risk factors for COVID-19 transmission in the state of Washington during the early months of the pandemic using O*NET data on major occupational groups.[1] Zhang found exposure to diseases at work as a risk factor, as would be intuitively expected, as well as physical proximity between workers. We wish to comment on the consideration of another exposure—occupational noise—as a potential risk factor for COVID-19 transmission.

Loud noise in the workplace causes difficulties in worker communication. Particularly loud work environments can lead to noise-induced hearing loss and require the use of hearing protection devices (HPDs). Both hearing loss and HPD use make oral communication even more difficult. However, in the context of the COVID-19 pandemic, policies intended to mitigate the spread of COVID-19 have centered on strategies, such as recommendations to maintain 6 ft of social distancing between workers, that may further impair communication between workers. Furthermore, the widespread use of personal protective equipment in the form of masks and face coverings as a result of the COVID-19 pandemic has been shown to impair middle- to high-voice frequencies, resulting in substantial reductions in speech intelligibility.[2] As such, adherence to social distancing and mask requirements may be lower in high-noise work environments due to the need to communicate with fellow workers, which could, in turn, increase the risk of COVID-19 transmission among workers. To test this hypothesis, we performed a small, simple analysis based in part on the same data used by Zhang.

We merged the data reported in table 1 by Zhang (total employment, COVID-19 case counts, and incidence rate per 100,000 employees) by major US occupational groups[1] with posterior mean estimates of occupational noise exposure estimated from our US/Canadian noise Job Exposure Matrix (NoiseJEM) that were reported in table 3 by Roberts et al.[3] The NoiseJEM currently does not have any estimates from the legal occupational group (major standard occupational classification-SOC, code "23-0000"), so we imputed the posterior mean noise estimate for this group using the posterior mean estimate for office and administrative support occupations (78.4 dBA, major SOC code "43-0000"), as we believe legal occupations realistically have exposures to noise similar to those of office workers. We then ran a simple Poisson regression model using the posterior mean noise estimates as a predictor of COVID-19 case counts, with an offset of the total employment count divided by 100,000 so that the effect estimates of the regression were normalized per 100,000 employees and could be interpreted as incidence rate ratios (IRRs). Since Zhang's analysis did not include farming, fishing, and forestry occupations (major SOC group "45-0000") after deeming the reported COVID-19 incidence rate to be statistically influential (rate of 3330 cases per 100,000 employees), we ran this regression twice: once with the farming, fishing, and forestry occupations included (Model 1), and once without (Model 2).

Table 1 displays the results of these two regression models. The full regression model (Model 1) indicates that a 1 dB increase in occupational noise exposure is significantly associated with a 16% (95% confidence interval: 15%, 18%) increase in the incidence of COVID-19, while a doubling of exposure (3 dB increase) is significantly associated with a 57% (52%, 62%) increase in COVID-19 incidence. Excluding farming, fishing, and forestry occupations from the model (Model 2) did not substantially alter the effect estimate of the model, with a still significant 10%- and 33% higher incidence rate of COVID-19 associated with a 1 dB increase in, and 3 dB doubling of, occupational noise exposure, respectively.

TABLE 1 Poisson regression on COVID-19 incidence by posterior mean noise exposure among major US occupational groups

Variable	Model 1—Full IRR (95% CI)	Model 2—No influential point[a] IRR (95% CI)
TWA_{OSHA} (per 1 dB)	1.16 (1.15, 1.18)	1.10 (1.09, 1.11)
TWA_{OSHA} (per 3 dB)	1.57 (1.52, 1.62)	1.33 (1.28, 1.37)

Abbreviations: T_{CI}, confidence interval; IRR, incidence rate ratio;TWA_{OSHA}, time-weighted average noise level measured according to the occupational safety and health administration noise regulation.

[a]Model excluded farming, fishing, and forestry occupations as Zhang[1] deemed it a statistically influential point.

The findings from this preliminary analysis provide support for our hypothesis that occupational noise exposure may be a substantial risk factor of COVID-19 transmission in the workplace. We recommend that workplaces consider targeting reductions in noise exposure as a method of mitigating the risk of COVID-19 transmission among workers, such that the need for close physical proximity can be removed as a barrier to social distancing and mask use, particularly for vulnerable workers with existing hearing loss. Furthermore, the implications of these findings are likely not restricted to COVID-19, but also to other infectious diseases with similar transmission modes.

ACKNOWLEDGMENT

We would like to acknowledge our colleagues at the California Department of Public Health who originally suggested this hypothesis.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DISCLOSURE BY AJIM EDITOR OF RECORD

John Meyer declares that he has no conflict of interest in the review and publication decision regarding this article.

AUTHOR CONTRIBUTIONS

Abas Shkembi conceptualized the work. Abas Shkembi acquired, analyzed, and interpreted the data. Abas Shkembi drafted the work and Richard L. Neitzel revised it critically for important intellectual content. Abas Shkembi and Richard L. Neitzel gave final approval of the version to be published. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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