

1 **Online Supplement for “Knowledge, attitudes, and practices regarding respirable silica**
2 **exposure and personal protective equipment use among brick kiln workers in Nepal”**

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9 **SUPPLEMENTAL METHODS**

10 **Study setting, design and data collection**

11 In the Kathmandu Valley, where Bhaktapur is located, the bowl-shaped urban basin causes
12 retention of pollutants in the valley (1). The most common kiln in Bhaktapur is the zigzag design,
13 which emits less pollution compared to older designs such as Bull’s trench kilns. In a zigzag kiln
14 design, a continuous fire is moved in a closed rectangular circuit through bricks stacked to guide
15 air flow in a zigzag pattern. Prior to study initiation, we obtained permission from the Bhaktapur
16 Bricks Industries Business Association to conduct our study. Study documents were translated
17 from English into Nepali by our Nepali investigators, who speak and write in both Nepali and
18 English fluently. Participants self-reported any medical condition previously diagnosed by a
19 health professional.

20

21 This study was integrated into a larger study evaluating health effects and pollutant exposures
22 among those who work or live at the brick kilns. For the respiratory PPE study, we excluded two
23 participants who did not actively work at the brick kilns prior to analysis. In the larger study, x-
24 rays and CT scans were conducted, which is why pregnant women were excluded.

25

26

27 **Definitions**

28 We defined daily smoking as using cigarettes, bidis (hand rolled cigarettes), chillum (a type of
29 pipe), or hookah every day. We calculated pack-years of smoking as the number of packs of
30 cigarettes or bidis smoked daily multiplied by the number of years smoked. Chronic respiratory
31 medication use was defined as using any medications regularly (2 times per week or more) to
32 help with breathing in the last 12 months. Acute medication use was defined as using
33 medications for a short period of time to alleviate respiratory symptoms (i.e., exacerbation) in
34 the last 12 months. Cough and phlegm were defined as usually having the symptom. Wheezing
35 was defined as having ever had wheezing while breathing at any time in the past.

36

37 **Data collection tools**

38 We defined silicosis in the middle of the Knowledge, Attitudes, and Practices (KAP) survey. The
39 rationale for this is that we first wanted to see how many workers had previously heard of
40 silicosis, prior to the definition. We then provided a definition of silicosis, as we suspected that
41 workers were not familiar with this term or the disease and wanted to probe into their
42 understanding and perception of silicosis, after being exposed to what silicosis is. A copy of the
43 KAP survey is below.

44

KNOWLEDGE, ATTITUDES, AND PRACTICES SURVEY (KAP)

1. FIELD WORKER ID:
2. DATE (DD-MMM-YYYY): .
3. PARTICIPANT ID: .
4. How concerned are you about the effects of brick kiln dust on your health?
- Not at all
- Slightly concerned
- Moderately concerned
- Highly concerned
5. Which of the following health effects can be caused by breathing in brick kiln dust?
Select all that apply:
- Difficulty breathing
- Cough
- Weight loss
- Feeling tired
- Headache
- None of the above
- Do not know
6. Breathing in brick kiln dust can lead to which of the following diseases? Select all that apply:
- Silicosis
- Tuberculosis
- Lung cancer
- Kidney disease
- Chronic obstructive pulmonary disease (COPD)
- None of the above
- Do not know
7. Prior to this survey, had you heard of a disease called silicosis?
- Yes
- No

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Silicosis is a lung disease caused by breathing in dust that contains silica. Brick kiln dust contains silica. Breathing this dust may lead to scarring of the lungs.

	Yes	No	Do Not Know
8. Do you believe that silicosis is a serious health issue?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Can silicosis be prevented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Can silicosis be cured?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Can brick kiln dust exposure be prevented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Is reducing brick kiln dust an important priority for owners and managers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Is reducing brick kiln dust an important priority for your co-workers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Do your co-workers know that breathing brick kiln dust is unhealthy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Does your brick kiln spray water in the air to reduce brick kiln dust?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Does your brick kiln spray water on the ground to reduce brick kiln dust?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Does your brick kiln require workers to wear masks over the nose to reduce brick kiln dust?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. Does your brick kiln use any other methods besides water spraying or masks to reduce brick kiln dust?

- Yes
- No

If YES, please explain: _____

19. Which of the following items is the best at preventing brick kiln dust exposure? Select one.

Cloth/scarf over the nose and mouth

Surgical mask over the nose and mouth



N95 mask over the nose and mouth



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20. Which of the following items would you be willing to wear at work? Select all that apply.

- Cloth/scarf
 Surgical mask
 N95 mask
 None of the above

21. In the past, were masks available for you to wear at the brick kiln?

- Yes
 No

22. Do you currently wear a mask while working at the brick kiln?

- Yes
 No

+ Please answer whether you agree or disagree with the following statements:

	Agree	Disagree
23. I believe that brick kiln dust is unhealthy.	<input type="checkbox"/>	<input type="checkbox"/>
24. Wearing a mask will protect me from brick kiln dust.	<input type="checkbox"/>	<input type="checkbox"/>
25. I know where to get a mask.	<input type="checkbox"/>	<input type="checkbox"/>
26. I know how to select the right type of mask.	<input type="checkbox"/>	<input type="checkbox"/>
27. I have looked for masks.	<input type="checkbox"/>	<input type="checkbox"/>
28. I was able to find masks.	<input type="checkbox"/>	<input type="checkbox"/>
29. I forget to wear my mask.	<input type="checkbox"/>	<input type="checkbox"/>
30. I know how to wear a mask properly.	<input type="checkbox"/>	<input type="checkbox"/>
31. Masks are too expensive to buy.	<input type="checkbox"/>	<input type="checkbox"/>
32. Masks are uncomfortable to wear.	<input type="checkbox"/>	<input type="checkbox"/>
33. Masks slow down work efficiency.	<input type="checkbox"/>	<input type="checkbox"/>
34. Wearing a mask looks weird.	<input type="checkbox"/>	<input type="checkbox"/>
35. I will wear a mask only if it is required by the law.	<input type="checkbox"/>	<input type="checkbox"/>

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A proper mask can cost 400 Nepali rupees (NPR). You would need to replace and purchase a new mask every day.

36. Would you wear a mask while working at the brick kiln if it is available at work free of charge?

- Yes
 No

37. Would you wear a mask while working at the brick kiln if you had to purchase the mask yourself?

- Yes
 No

38. How much would you be willing to pay (in NPR) each day for a mask? _____

There are many reasons why people wear a mask at work. Which of the following would encourage you to wear a mask at work?

	Yes	No
39. Knowledge about the health effects of dust	<input type="checkbox"/>	<input type="checkbox"/>
40. Training on how to wear a mask properly	<input type="checkbox"/>	<input type="checkbox"/>
41. Masks are supplied at your workplace	<input type="checkbox"/>	<input type="checkbox"/>
42. Reminders at your workplace to wear masks	<input type="checkbox"/>	<input type="checkbox"/>
43. Co-workers are wearing masks	<input type="checkbox"/>	<input type="checkbox"/>
44. Mask is comfortable to wear	<input type="checkbox"/>	<input type="checkbox"/>
45. Mask does not interfere with your work efficiency	<input type="checkbox"/>	<input type="checkbox"/>

46. Are there any other factors that would encourage you to wear a mask?

- Yes
 No

If YES, please explain: _____

47. Are there any other factors that would stop you from wearing a mask?

- Yes
 No

If YES, please explain: _____

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51 **Data analysis**

52 Quantitative variables included age, income, number of kiln seasons worked, smoking pack-
53 years, and amount willing to pay daily for respiratory PPE.

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56 **SUPPLEMENTAL RESULTS**

57 **Participant characteristics**

58 A total of 3,534 individuals from 1,111 households were enumerated in the household census
59 survey of 10 brick kilns (E-Figure 1). For our stratified random sample, 98 participants (29 index
60 workers and 69 household members) were potentially eligible for the study and 88 were
61 enrolled. No participants were excluded due to a positive urine screening pregnancy test and 85
62 participants had complete questionnaires for this study.

63

64 Responses from two participants who lived at the brick kilns but had no history of actively
65 working at the kilns were excluded. This left a final sample of 83 workers (94.3% of enrolled
66 participants). This included one participant who completed all questionnaires but declined to
67 answer specific questions on number of brick kiln seasons working in different roles.

68

69 **Knowledge, attitudes, and factors influencing respiratory PPE use**

70 Nearly one-quarter, 22.9% (19/83) reported that respiratory PPE was available to wear at brick
71 kilns in the past. Many workers stated that they were able to find respiratory PPE (95.2%,
72 79/83). A minority of workers (18.1%, 15/83) stated they forget to wear respiratory PPE.

73

74 A higher percentage of workers who wore respiratory PPE stated that they have looked for
75 respiratory PPE (100% vs. 64.4%, $p < 0.001$), compared to workers who did not wear respiratory
76 PPE.

77

78 There were important differences between workers who currently wore and did not wear
79 respiratory PPE. In our sample, 95.8% of workers who currently wore respiratory PPE agreed
80 that respiratory PPE training would encourage them to use respiratory PPE compared to 72.9%
81 who did not wear respiratory PPE ($p=0.02$). All workers who currently wore respiratory PPE
82 agreed that workplace reminders would encourage them to wear respiratory PPE, compared to
83 72.9% of workers who did not wear respiratory PPE ($p<0.01$).

84

85 Nearly all workers agreed that knowledge about the health effects of brick kiln dust (95.2%),
86 comfortable respiratory PPE (92.8%), and respiratory PPE being supplied at the workplace
87 (91.6%), would encourage them to wear respiratory PPE.

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89 **DISCUSSION**

90 A higher percentage of respiratory PPE-users compared to non-respiratory PPE users stated
91 they would be willing to purchase respiratory PPE themselves, which makes sense in the
92 context of their higher income.

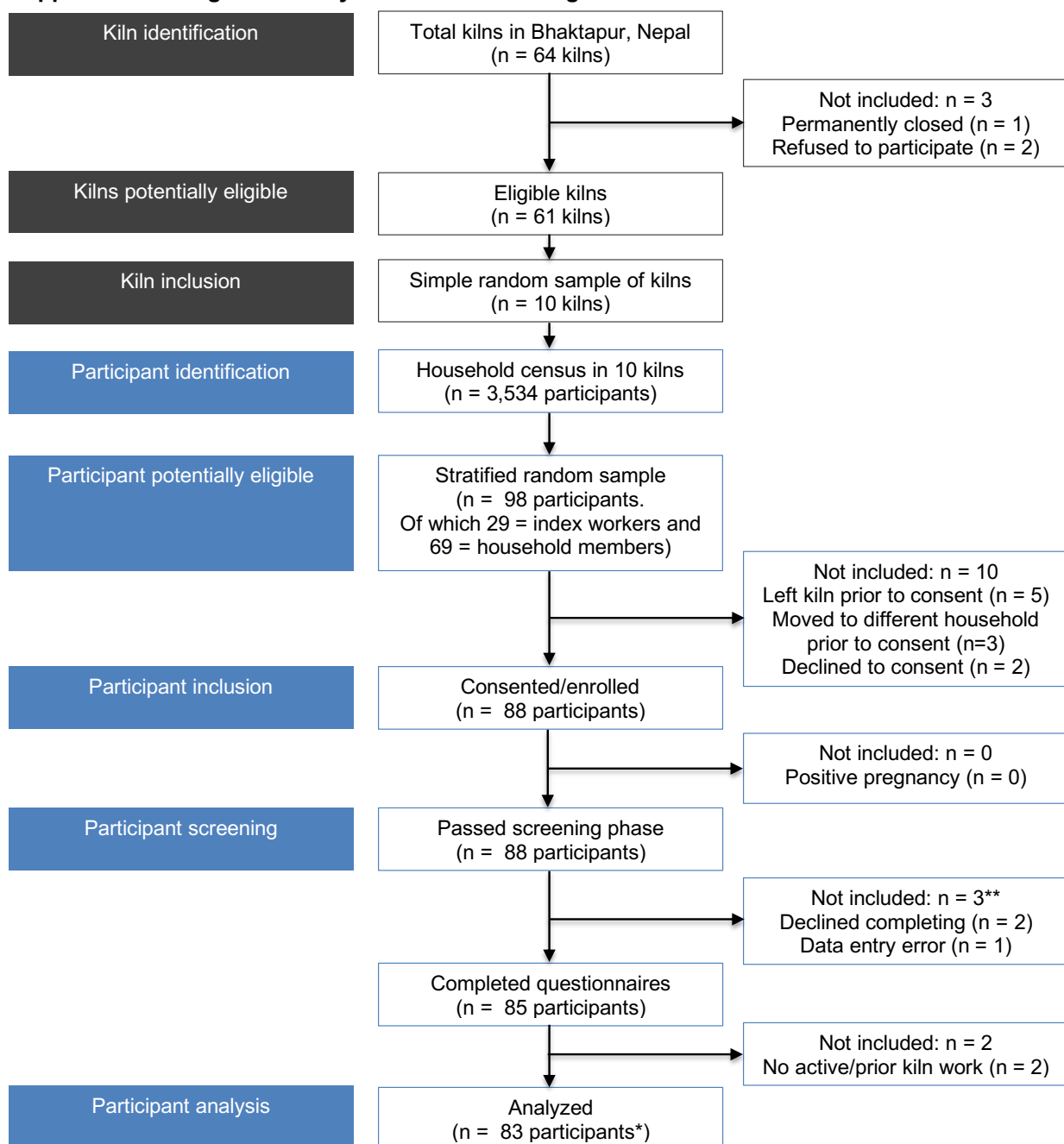
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95 **Supplemental E-Figure 1. Study enrollment flow diagram**

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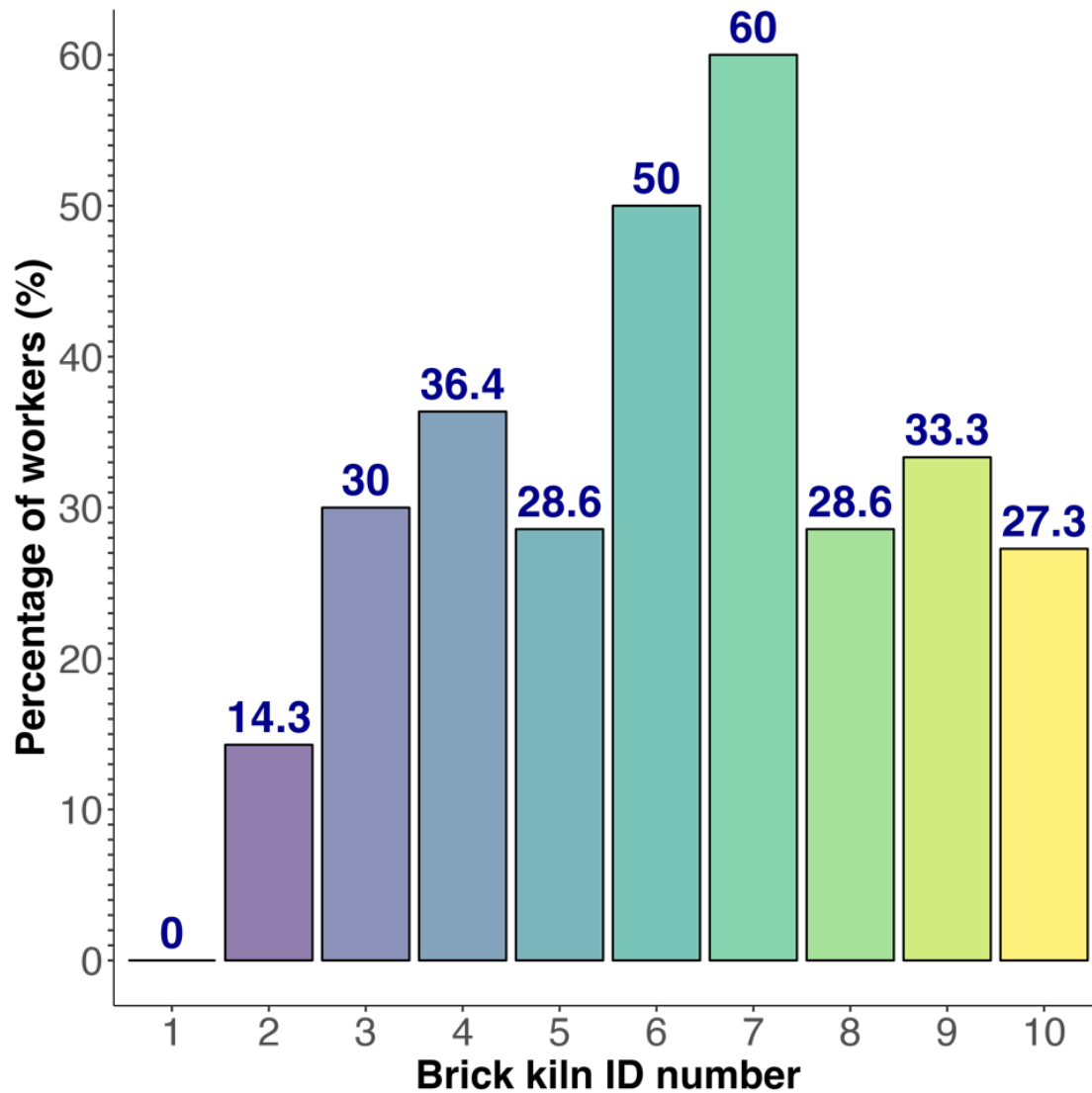
*One of the 83 participants had incomplete data on number of kiln seasons working in different roles. This participant was included in the final analysis sample as rest of their data was complete.

**These participants and the previously mentioned participant* were included in an analysis comparing participants with (n=82) and without (n=4) complete data.

98 **Supplemental E-Figure 2. Respiratory PPE requirements vary across ten surveyed brick**99 **kilns**

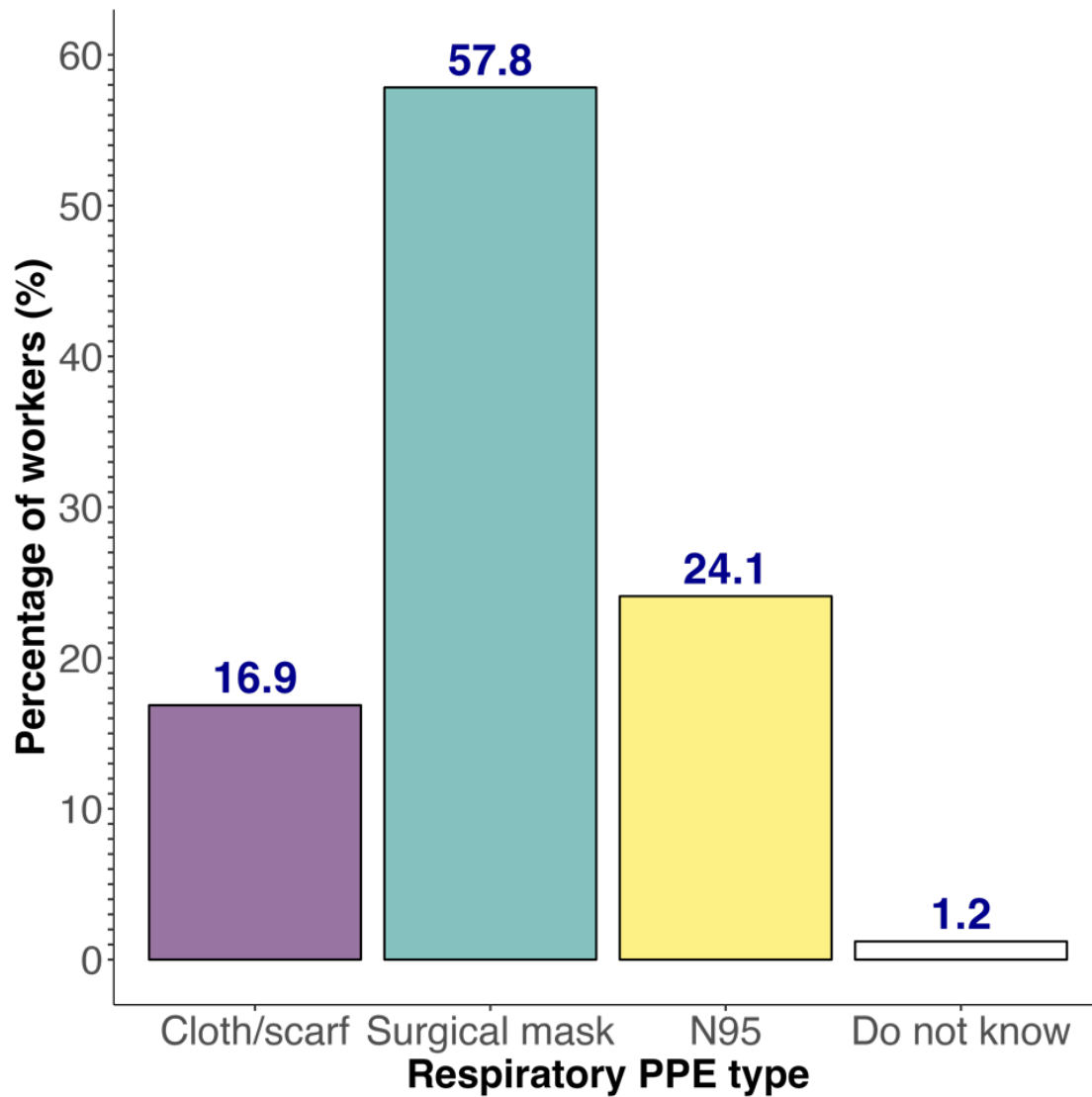
100 Percentage of surveyed workers within each brick kiln who reported their kiln requires

101 respiratory PPE



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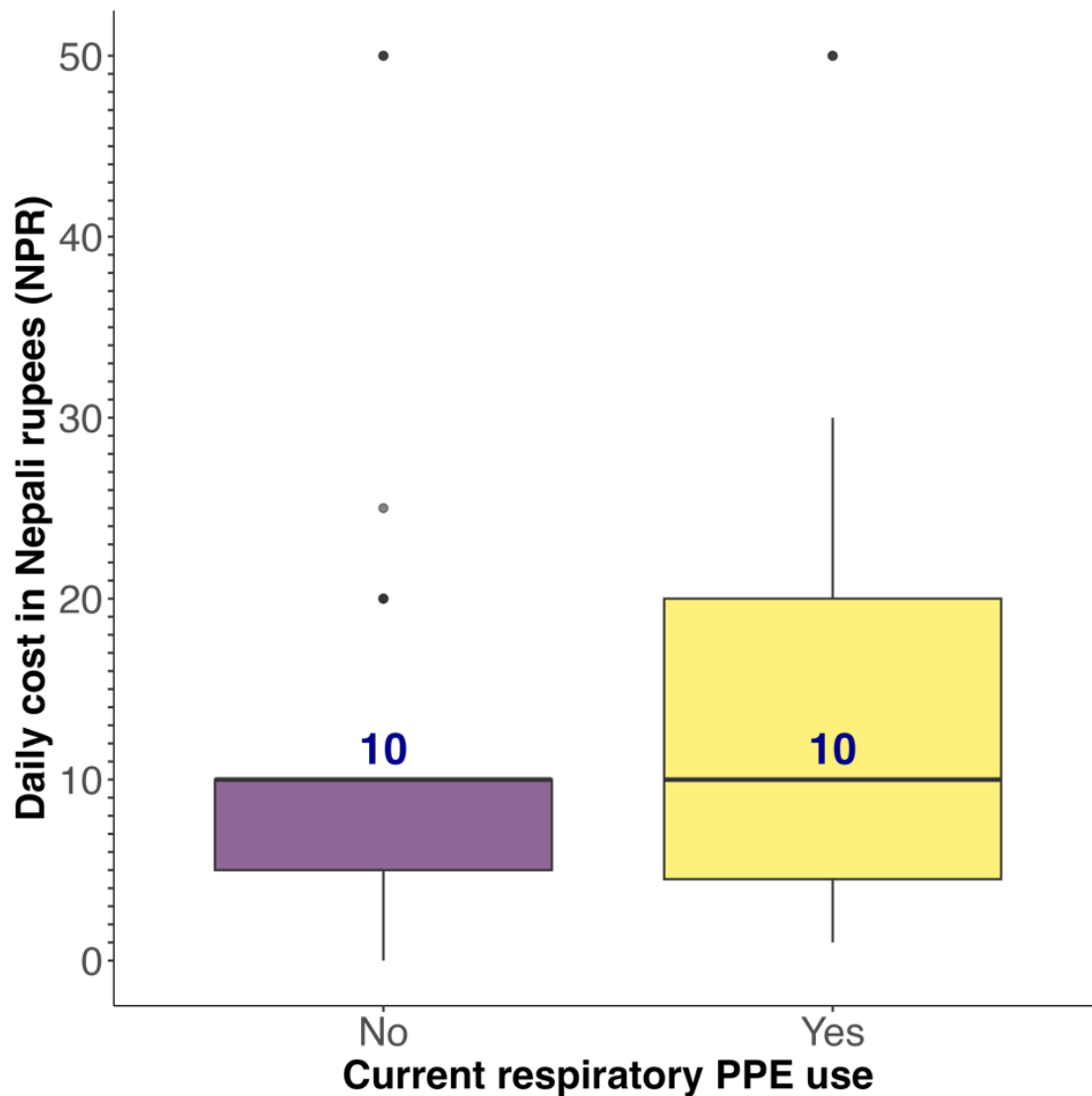
103 **Supplemental E-Figure 3. Worker response to best respiratory PPE for reducing brick**
104 **kiln dust exposure**



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106 **Supplemental E-Figure 4. Amount workers are willing to pay daily for respiratory PPE,**
107 **stratified by current PPE use**

108 1 USD = 131 NPR. The mean was \$12.01 NPR among all participants, \$11.00 NPR among
109 those who do not currently use respiratory PPE, and \$14.50 NPR among those who do use
110 respiratory PPE.



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114 **Supplemental E-Table 1. Number of workers in each role**

Worker role	Total (n = 83)
Brick hauler	29
Green brick stacker	26
Green brick maker	21
Coal crusher	4
Fire master	2
Other role (helper)	1

115

116

117 **REFERENCES**

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