

## Conversion Rates to COVID-19 Infection Among Exposed Healthcare Workers

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### ABSTRACT

**Objectives:** To determine the percentage of exposed healthcare workers who converted to COVID-19 after exposure to an individual with COVID-19, and to describe the venue of exposure and time to conversion among healthcare workers at an academic health system.

**Methods:** 1,749 healthcare workers who self-reported a significant COVID-19 exposure from June 10, 2020 to November 30, 2020 were quarantined or could be allowed to work while wearing a mask, and tested at least once by day 14 from time of exposure. Exposure was defined as being within six feet from a person with COVID-19 for more than 15 minutes without a face covering. Venues of exposure were categorized by either household, community, or workplace.

**Results:** 290 (17%) of 1,749 converted to COVID-19 in a median of 4.1 days (range: 1–13). The median days to conversion by venue of exposure were four for household, and community, and five for workplace. Between September 1, 2020 to November 30, 2020, the percentage of healthcare workers who converted to COVID-19 by venue of exposure was 26% (N=159), 18% (N=75), and 10% (N=14) for household, community and workplace exposure, respectively.

**Conclusion:** The conversion rate to COVID-19 among healthcare workers after an exposure was relatively low, but was higher in household exposures and lowest in the workplace.

### Keywords

COVID-19, Conversion period, Healthcare workers, Exposure types.

### Introduction

The novel respiratory virus Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), has infected more than 18 million people in the United States alone in less than a year and caused more than 325,000 deaths as of December 2020. The average and range of the incubation time from exposure to symptoms is reported to be between 2–14 days [1-3]. We determined the proportion of healthcare workers who converted to COVID-19 after an exposure to a COVID-19 infected individual. We also describe time to conversion by venue of exposure to COVID-19 among healthcare workers at an academic health system.

### Methods

1,749 healthcare workers in the University of Iowa health system self-reported a COVID-19 exposure to employee health from June 10, 2020 to November 30, 2020. They were quarantined or could be allowed to work wearing a mask. They were tested at least once using a nasopharyngeal COVID-19 PCR test by day 14 from time of exposure. Exposure was defined as being within six feet from an individual diagnosed with COVID-19 for more than 15 minutes without a face covering. Venues of exposure were categorized as either household, community, or workplace. Individuals were followed up by employee health personnel who noted whether the workplace exposure was to patients, co-workers, or others such as visitors.

### Results

290 (17%) of 1,749 converted to COVID-19 infection in a median

of 4.1 days (range: 1–13) with 83% of conversions occurring by day 7 and 96% by day 10 (Figure 1). The median days to conversion by venue of exposure were 3.6, 4.1, 5.0, for household, community, and workplace, respectively (Figure 2). Between September 1, 2020 to November 30, 2020, the percentage of healthcare workers who converted to COVID-19 infected by venue of exposure were 26% (N=159), 18% (N=75), and 10% (N=14) for household, community and workplace exposure, respectively (Figure 2). Of workplace conversions, 14% (N=2) were due to exposure to infected co-workers. Among the 150 workers with household exposure, the median number of days to conversion decreased with older age, and percentage of those who converted increased with older age above age 30 (Table 1).

Age Cohort	N	Median Conversion Day	Conversion %
<30	57	4.3	26.3%
30-45	53	3.7	22.3%
46-60	31	3.3	24.0%
>60	9	2.1	36.0%

**Table 1:** Days to conversion and percentage converting among 150 workers with household exposure from 09/01/2020 to 11/30/2020.

## Discussion

The overall 4.1 median days from time of exposure to infection is consistent with other studies [1-3]. The fact that 96.2% of conversions occurred by day 10 supports the recent CDC recommendation for limiting quarantine of exposed individuals to 10 days [4].

The nearly 17% conversion rate to COVID-19 infection among healthcare workers after significant exposure is relatively low, but is higher in those with household exposure than in those with community or workplace exposure. Of the 248 conversions, household conversions represented 64%, whereas community and workplace conversions represented 30% and 6%, respectively. Given that household exposures are likely to be longer and closer than workplace exposures, these results are not unexpected.

The observation that median days to conversion in household exposures decreased with increasing age, and a higher percentage of older workers converted might reflect more exposure in older people staying at home and less robust immune responses. Despite the density and significant population of an academic healthcare setting and number of patients with COVID-19, the conversion rate in the healthcare workplace is actually relatively low provided safe practices are employed. Moreover, only 14% of workplace conversions were due to exposure to infected co-workers as opposed to exposure to patients who were not known to be infected at the time of exposure. These workplace exposures, while low, point out the need to continuously employ safe practices at all times around patients and co-workers in the workplace.

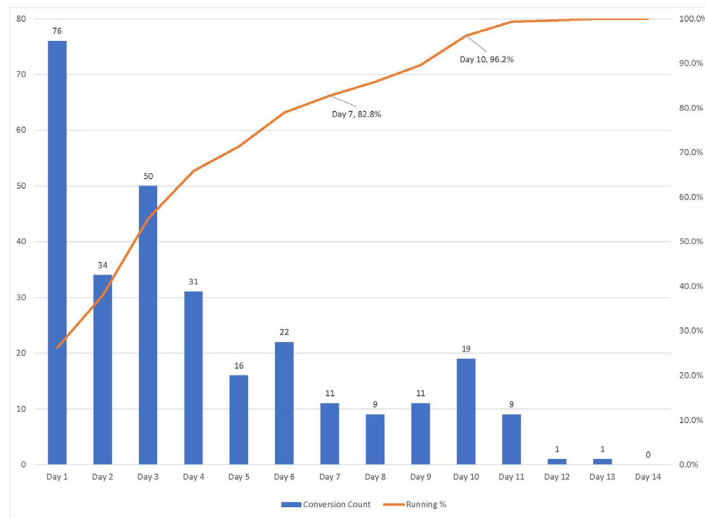
The limitations of our study include the fact that workers were not tested by PCR daily after exposure so that the number of days from exposure to detection of asymptomatic infection may likely be fewer. In addition, it is likely that the percentage of household exposures in our study is overrepresented in that there is likely more certainty of having been exposed and reporting the exposure in a household exposure than in community or workplace exposures.

Nevertheless, exposure and subsequent COVID-19 infection is significant among healthcare workers and occurs primarily outside the workplace.

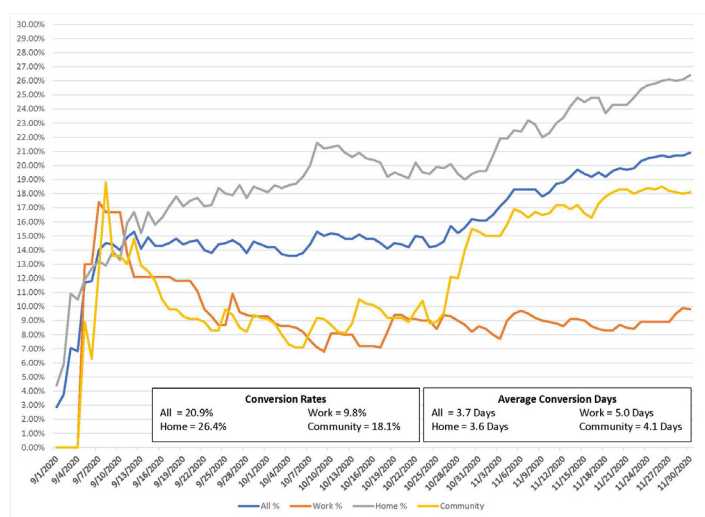
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**Figure 1:** Conversion Rate (%) by Day with Running Total (September 1, 2020 – November 30, 2020).



**Figure 2:** Conversion Rate (%) by Quarantine Source (September 1, 2020 – November 30, 2020).

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Program in Hospital Epidemiology contact tracing teams who collected the data regarding employee exposures and infections.

## References

1. Guan WJ, Ni ZY, Hu Y, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med.* 2020; 382: 1708-1720.
2. Li Q, Guan X, Wu P, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *N Engl J Med.* 2020; 382: 1199-1207.
3. Lauer SA, Grantz KH, Bi Q, et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. *Ann Intern Med.* 2020; 172: 577-582.
4. <https://www.cdc.gov/coronavirus/2019-ncov/more/scientific-brief-options-to-reduce-quarantine.html>