

Prevalence of SARS-CoV-2 Antibodies in Arapahoe County First Responders and Validation of Dried Blood Spot and a Novel CU Anschutz Multiplex Assay (CASES Study)



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Introduction:

Given the persistent COVID-19 pandemic in the US, first responders including firefighters, police, and emergency medical service employees are at high risk for exposure to SARS-CoV-2, but data are limited on the seroprevalence of SARS-CoV-2 antibodies in this population. Standard methods for obtaining serum to test for antibodies requires phlebotomists trained in venous blood collection. An alternative is dried blood spot (DBS) samples from finger prick on filter paper. Eluates from filter paper can be used in serologic assays. Collection of DBS requires limited training and fewer resources than venous blood draw. In this study we aim to understand the seroprevalence of SARS-CoV-2 within the first responder population of Arapahoe County, one of the largest counties in Colorado, and to validate the DBS method along with a novel CU Anschutz SARS-CoV-2 multiplex assay using an established CU Anschutz SARS-CoV-2 ELISA assay (Phase 1). We will then conduct a large population-based representative seroprevalence study using the DBS method for sample collection in Arapahoe County (Phase 2).

Materials and Methods:

Both venous and DBS samples were collected, and a questionnaire was completed to assess the first responders' exposure risks. CU Anschutz has established a two-component ELISA for detection of IgG antibodies reactive against the SARS-CoV-2 nucleocapsid and spike receptor binding domain. We will use this assay to compare results from samples collected via venous blood and DBS (Figure 2). The first responders will receive their personal venous blood serostatus and the aggregated results will be shared with Arapahoe County officials. We will also use venous blood to test a novel multiplex assay for antibodies to SARS-CoV-2. As a less expensive test that uses less blood than ELISA, we can use the multiplex in future studies once validated.

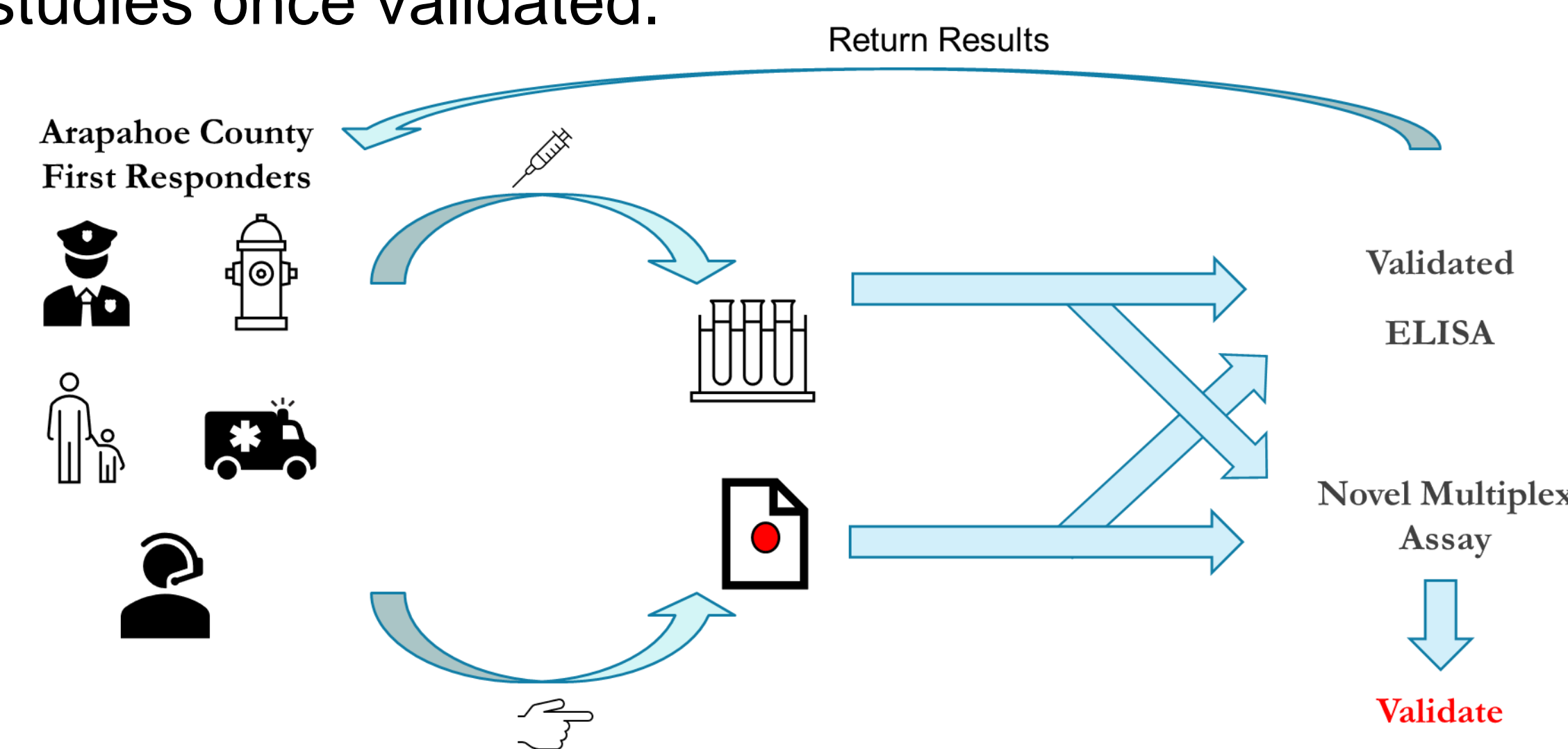


Figure 2

Phase 2 of our study will involve obtaining DBS samples from the Arapahoe County community. We will mail the collection materials to community members and have them mail us back their DBS samples (Figure 3). Using a random sampling from the Arapahoe County community and a questionnaire, we will determine the seroprevalence of SARS-CoV-2 antibodies in the Arapahoe community and in different socioeconomic subpopulations, as well as identify different beliefs as to the severity of the COVID-19 pandemic.

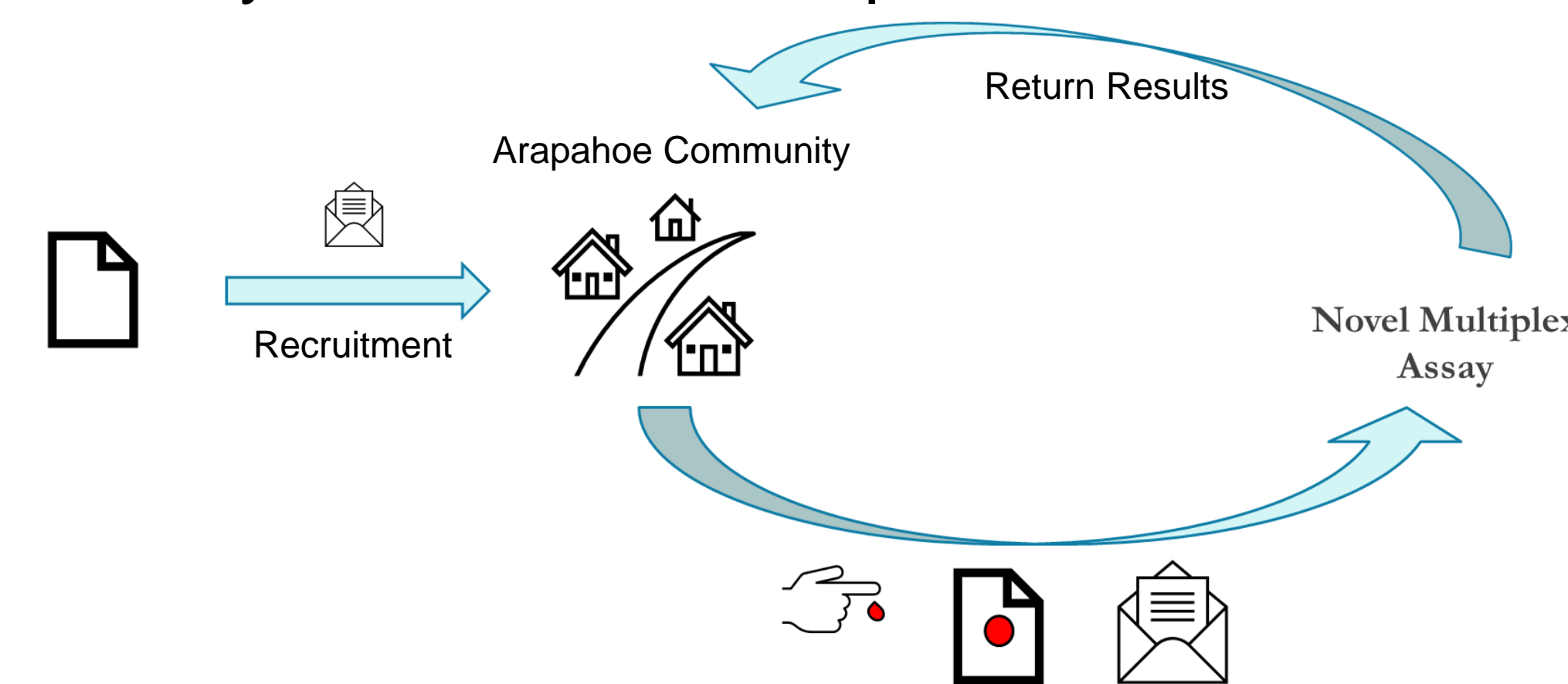


Figure 3

Materials and Methods:

Arapahoe County (Figure 1) is the third most populous county in Colorado with a population of >630,000 people in an area of 805 square miles. The western portion of Arapahoe County is heavily populated in comparison with the more rural eastern portion of the county.

For Phase 1 of our study, Arapahoe County first responders were recruited through email from the Arapahoe County Office of Emergency Management.

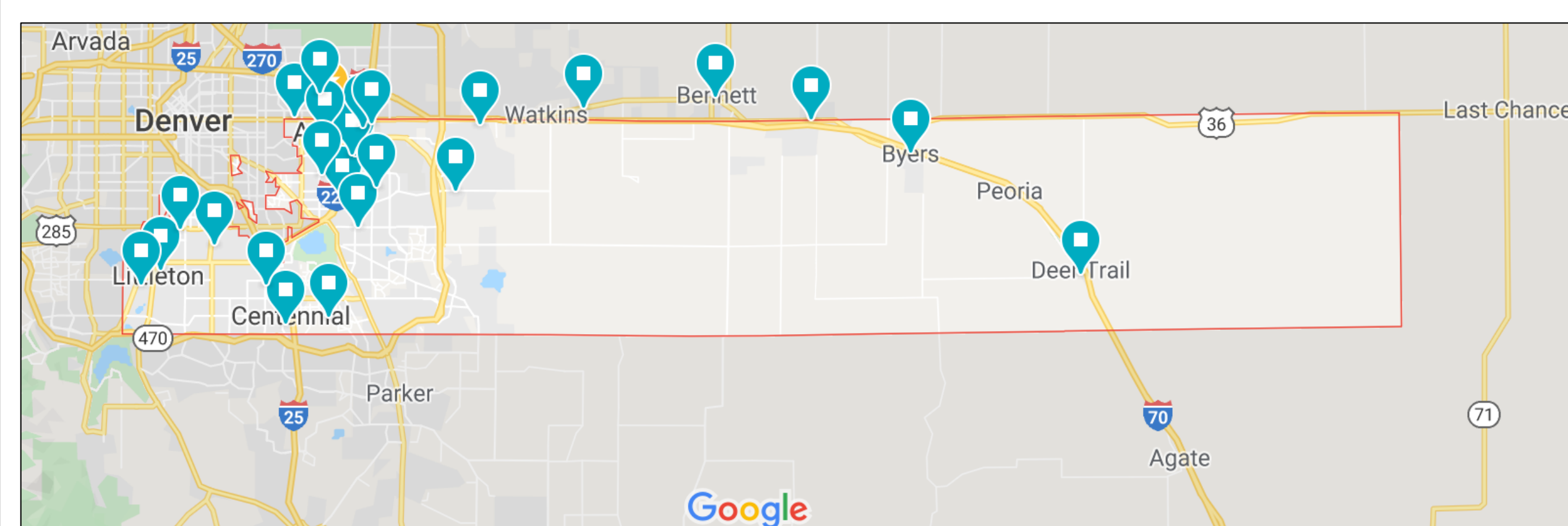


Figure 1

Blue pins show the locations of departments/stations included in the study.

Results:

Table 1
Demographics of CASES Study Phase 1 First Responders

Characteristic	N=261
Median Age (Range)	38 (22-66)
Gender (%)	
Male (%)	119 (46)
Female (%)	142 (54)
Race	
White (%)	228 (85)
Black (%)	14 (5)
Asian (%)	6 (2)
Native American/Pacific Islander (%)	7 (3)
Other ¹ (%)	12 (5)
Hispanic or Latino/Latina (%)	29 (11)
Employment Status	
Full-time (%)	243 (95)
Part-time (%)	6 (2)
Other (%)	8 (3)
Case Worker (%)	56 (21)
Command (%)	10 (4)
Detentions (%)	10 (4)
Dispatch (%)	15 (6)
Firefighter (%)	15 (6)
Investigations (%)	21 (8)
Medic/EMT (%)	18 (7)
Patrol (%)	47 (18)
Supervision (%)	25 (10)
Support Services (%)	15 (6)
Other ² (%)	29 (11)

¹ Other includes: East Indian, Hispanic, Latino/a, Mixed, Non-White

² Other includes: Accounting, Administrator, Autopsy Technician, Courts, Registered Nurse

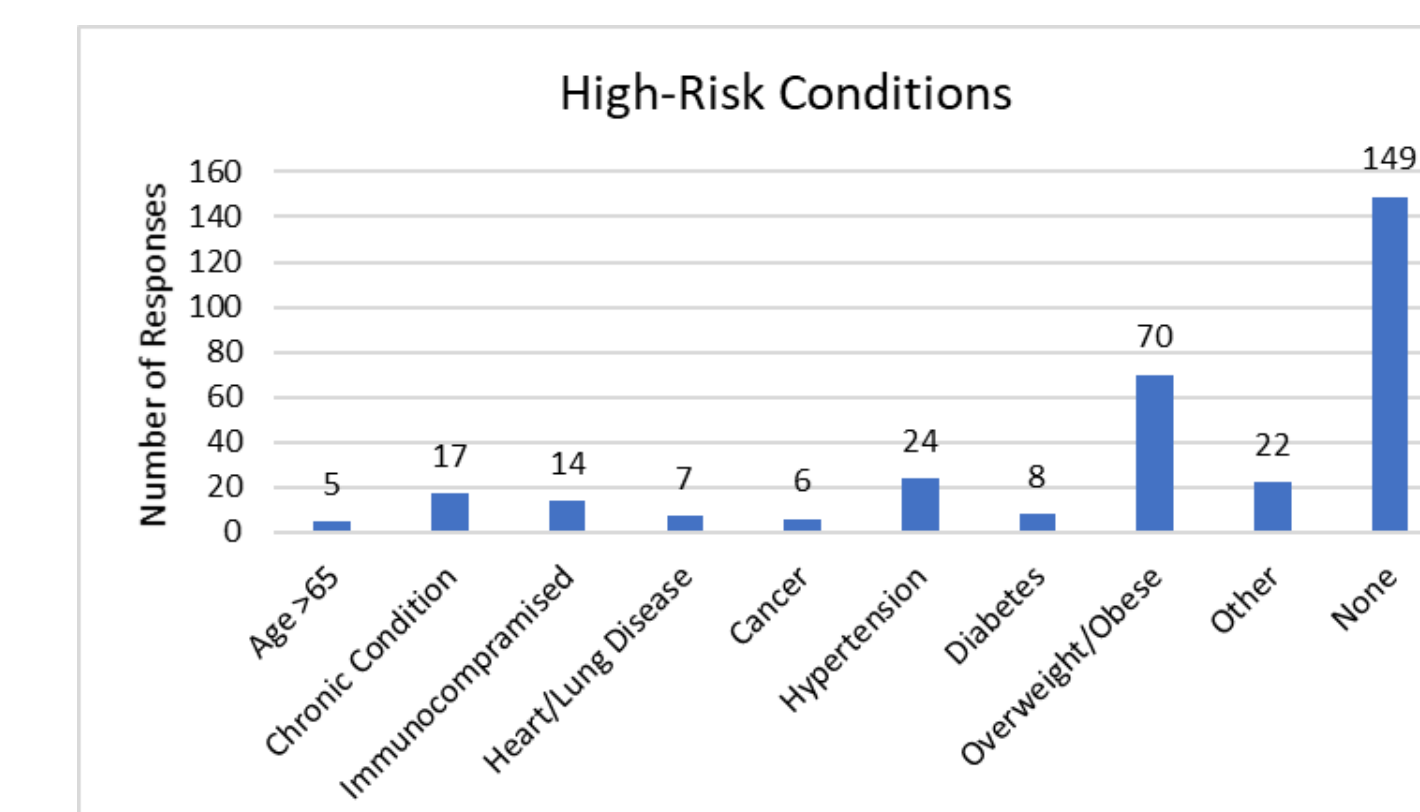


Figure 4
Other responses include asthma and smoker.

Conclusion:

Most first responders in this study reported interacting with the public for their work with some reporting a known COVID-19 contact. However, most first responders reported a doubtful likelihood of previously having COVID-19. We are currently processing samples and will obtain a second sample from first responders in the fall 2020. During Phase 2 we will estimate the seroprevalence of SARS-CoV-2 specific antibodies in the Arapahoe County community.

Acknowledgements:

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CASES Study Website

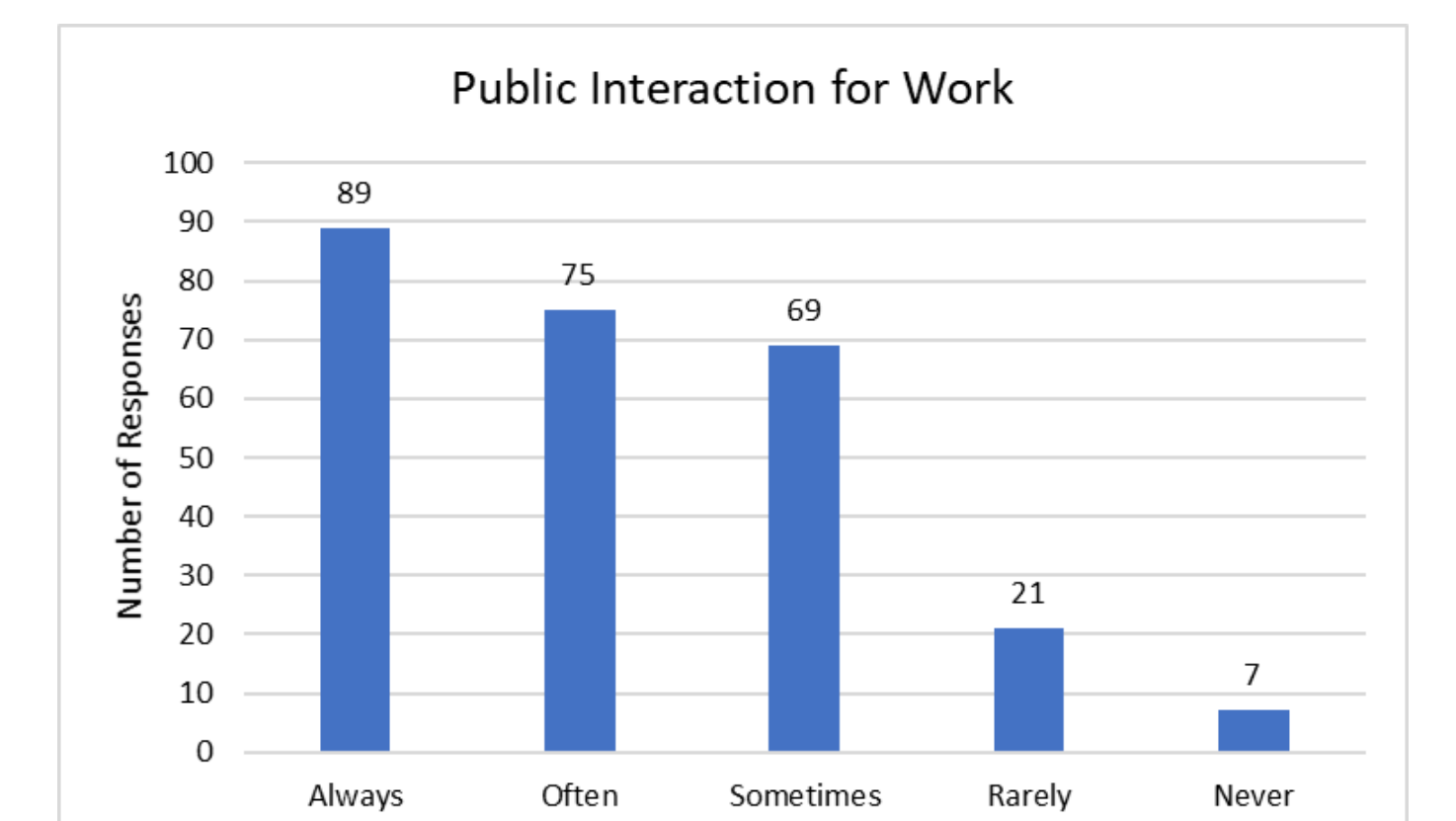


Figure 5

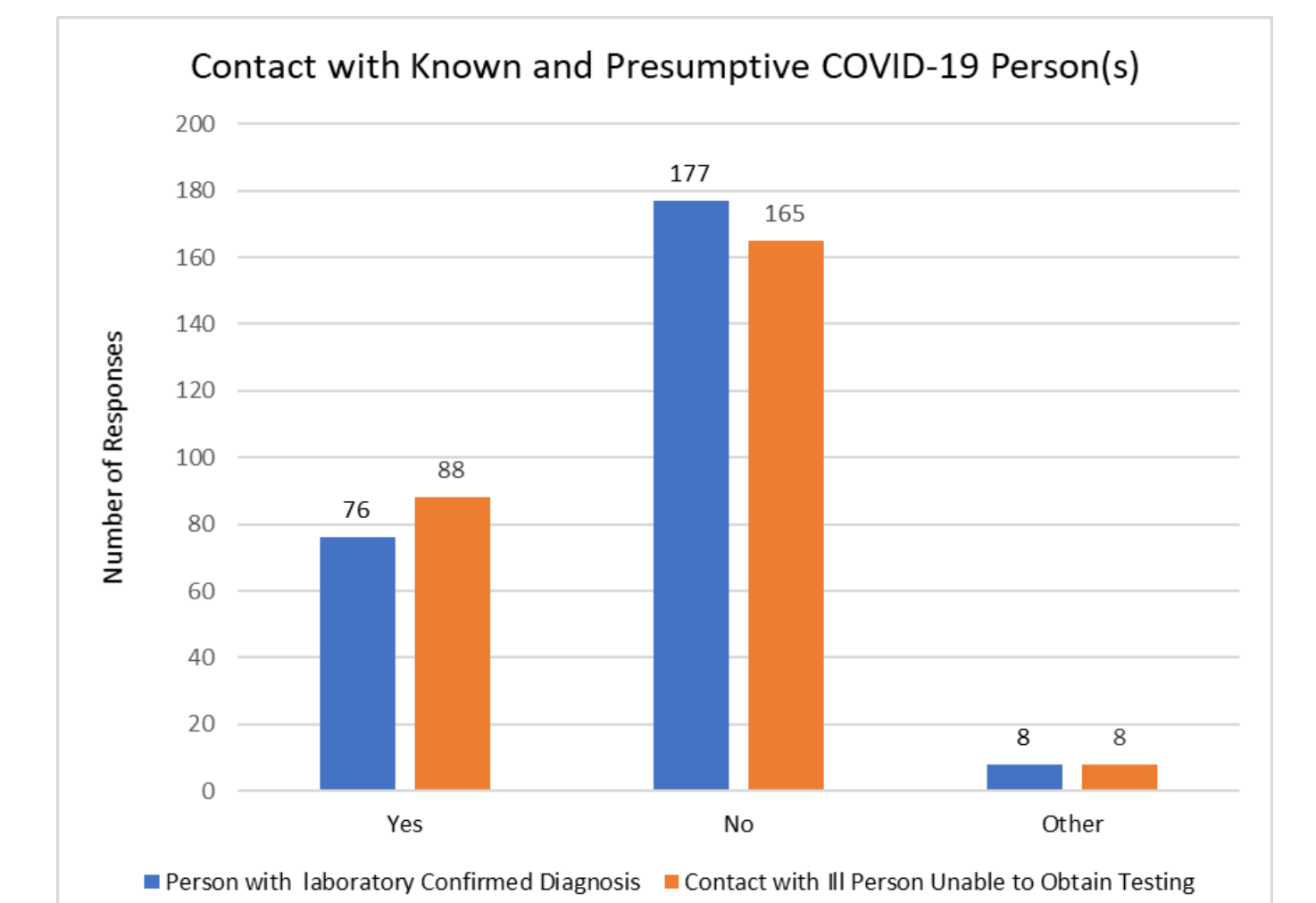


Figure 6

Other responses include unknown, secondary contacts, and contact with deceased COVID-19+ persons.

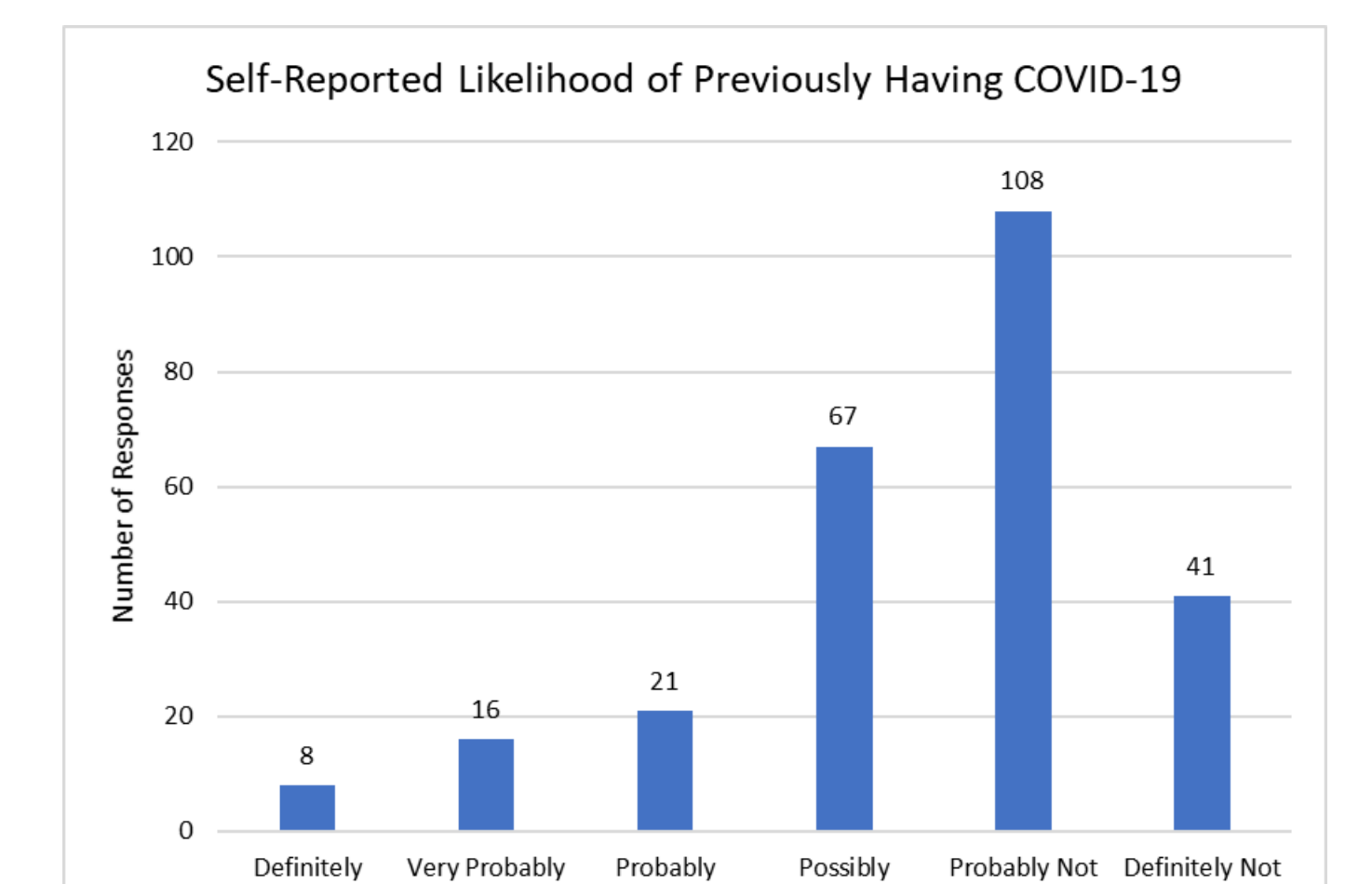


Figure 7