

UTAH HERO PROJECT



Tracking Covid-19 to
Inform the Return to Normal



Report Published September 22, 2020

Included in this Report

- HERO Project Phase 1 - Part A summary & key findings
- Phase 1 - Part B summary & key findings
- Phase 2 - West Salt Lake summary & key findings
- Timeline for upcoming study activities

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Executive Summary

Project Background

The Utah Health and Economic Recovery Project (HERO Project) is a collaborative statewide surveillance project designed to help decision makers understand community-based activity of the SARS-CoV-2 virus and Covid-19 infection rates. The goal of the HERO Project is to use local data to help Utah's citizens and economy return to normal in a safe and informed way. Primary project partners include The David Eccles School of Business, University of Utah Health, ARUP Laboratories, Hope Corps, and the Utah Governor's Office of Management and Budget.

The sampling method described below is what sets the HERO Project apart from other testing efforts in the state. Overseen by a team of statisticians, researchers, and doctors, representative sampling is the only way to accurately estimate the prevalence of Covid-19 in the general population. Otherwise we must rely on data from people who are sick enough to get themselves tested, which is a bit like trying to understand exercise trends among average Americans by surveying the participants of a marathon. The HERO Project establishes a system decision makers can rely on to understand the full impact of the pandemic.

Utah HERO Project Objectives

To stop the spread of Covid-19 and responsibly re-engage in social and economic life, the State of Utah needs accurate information to manage the ongoing transitions from social distancing to the use of an advanced testing system that provides accurate and timely information to the systems that govern daily life across the state. The full project, which includes multiple phases, addresses the following key questions:

1. What is the current rate of infection in Utah? How is it changing over time?
2. What share of individuals with self-reported symptoms are infected?
3. What is the distribution of symptoms experienced by COVID-19 infected individuals?
4. What is the range of health outcomes experienced by COVID-19 infected individuals?
5. What proportion of COVID-19 infections are detected?

Project Timeline

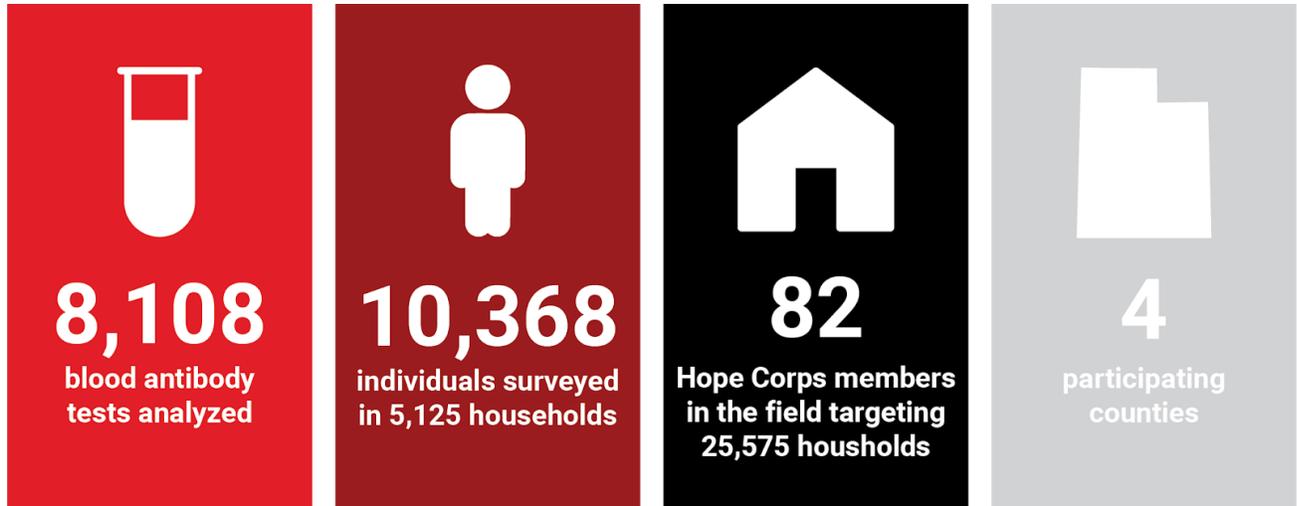
As the HERO Project continues, population sampling will continue in new areas of the state to provide additional local information that can be used for decision making.

Phase 1 - Part A: Between May 1 - July 1, 2020, the field team surveyed households and referred participants to mobile testing sites established in their neighborhoods. Counties in Phase 1 - Part A included Salt Lake, Utah, Summit, and Davis.

Phase 1 - Part B: Between July 7 - August 15, 2020, the project team extended county-level surveying into Washington, Weber and Cache counties, with findings currently pending.

Phase 2: Data collection continues in West Salt Lake where the case count has been more concentrated. Phase 2 also includes a look at school transmission and longitudinal results.

Phase 1 - Part A By the Numbers



Testing and Sampling

The HERO project utilizes two laboratory tests to monitor the spread of the SARS-CoV-2 virus in Utah: (1) a nasal swab that tests for active infection, and (2) a blood test used to detect antibodies for the virus which can tell us who was previously infected. Together, data from these two tests describe the current status of infection, estimate how many infections the state is *not* detecting, and the potential immunity rates found in Utah's communities. Phase 1 - Part A surveys and tests were deployed strategically across Salt Lake, Utah, Summit, and Davis Counties by sampling neighborhoods with both high and low virus prevalence and diverse populations in order to get results that can be generalized to other communities who have not been surveyed and tested.

Phase 1 - Part B By the Numbers

1,594

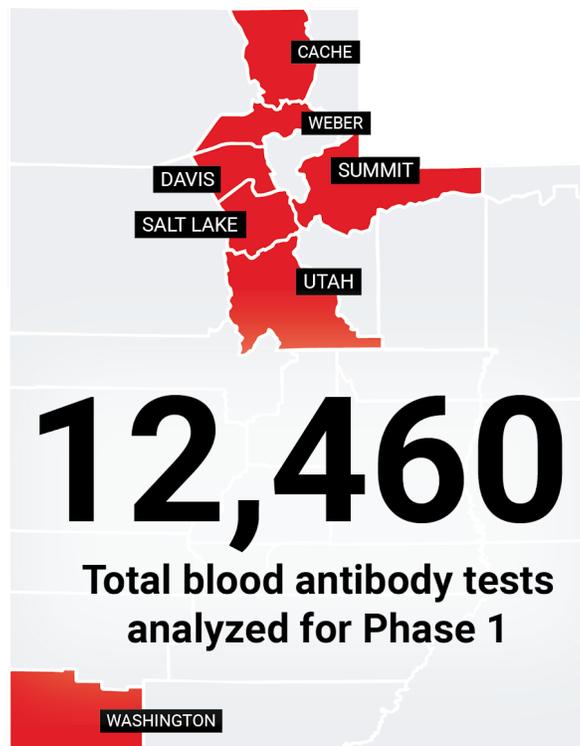
blood antibody tests analyzed in Washington County

1,539

blood antibody tests analyzed in Cache County

1,219

blood antibody tests analyzed in Weber County



Key Findings

Phase 1 - Part A (Salt Lake, Utah, Summit, and Davis Counties)

Findings as of August 10, 2020

An Estimated 0.81% of Utahns age 12 or Older in the Four-County Area Have SARS-CoV-2 Antibodies

When an individual is exposed to the SARS-CoV-2 virus, and is subsequently infected with Covid-19, their body makes antibodies that can be detected by testing for immunoglobulins in the blood. HERO Project leaders used this method of community-wide blood (or serology) testing, to estimate seroprevalence, or the occurrence of Covid-19 infections in the community. Phase 1 results revealed the overall four-county seroprevalence is 0.81%, or about 1 in 124 residents of these counties age 12 or older showed evidence of prior infection.

It is important to interpret the results of all surveys, including the HERO Project, within the context of a margin of error which expresses the uncertainty in each result. This project expresses the margin of error in terms of 95% confidence intervals, which are defined to have a 95% chance of including the true result. The 95% confidence interval for seroprevalence in the four-county area is 0.15% to 1.61%.

The Estimated Clinical Detection Rate is about 40%

The clinical testing rate is the percentage of cases that are “caught” by testing through the available testing sites. Many Utah residents experiencing symptoms consistent with Covid-19 will seek out clinical testing from the healthcare system to confirm their diagnosis. However, not all residents seek testing, and some SARS-CoV-2 carriers do not have active symptoms. The HERO Project’s community-wide testing and analysis (as of tests dated to June-July of 2020) found that for every clinical case detection, there were approximately 1.5 cases that were *not* detected. This ratio of undetected to detected cases is lower than reported in other community seroprevalence studies, meaning Utah’s testing performance in the early months of the pandemic Utah was more effective compared to other states. The 95% confidence interval for the ratio of undetected to detected cases is 0.0 to 4.0.

The Infection Fatality Rate in Utah is about 0.3%

By estimating the number of undetected cases, HERO Project leaders were also able to provide a ballpark estimate of the infection fatality rate among all people infected with Covid-19, including both detected *and* undetected cases. The estimate of 1.5 undetected cases for each detected case translates to an infection fatality rate of about 0.3%, which gives Utah’s decision-makers more accurate information about potential fatality rates associated with future infections.

Infection Rates are Higher for Utah’s Hispanic Population and in Summit County

Across all project areas and subgroups in Phase 1 - Part A, seroprevalence was 0.81%. Comparatively, seroprevalence of Hispanic Utahns was 2.73%— over three times higher. In Summit County, which reported a relatively early outbreak of cases, seroprevalence was 4.59%— over five times higher than the rest of the state. More accurate data about Covid-19 antibodies found among these populations helps Utah monitor equity gaps and develop more effective solutions to slow the spread for all communities in the state.

The secondary household infection rate is 12.2%

Household transmission of the SARS-CoV-2 virus is not a given. In fact, by surveying and testing full households of individuals in the four-county area, project leaders estimate a secondary infection rate within households of 12.2%. That is, among households with at least one seropositive individual, we estimate that 12.2% of the remaining individuals in the household beyond the index case were also seropositive.



Phase 1 - Part B (Washington, Cache, and Weber Counties) Findings as of September 15, 2020

An Estimated 0.51% of Utahns age 12 or Older in Washington County Have SARS-CoV-2 Antibodies

The adjusted seroprevalence for persons age 12 or older in Washington County is lower compared to the four-county sample in Phase 1 - Part A and other counties sampled in Phase 1 - Part B. Community wide seroprevalence was 0.51%, or about 1 out of 195 individuals showed evidence of prior SARS-CoV-2 infection. Of note, Washington County is the only project focus area without a significantly higher seroprevalence rate for Hispanic participants. The confidence interval for seroprevalence in Washington County is 0%-1.59%.

An Estimated 2.31% of Utahns age 12 or Older in Cache County Have SARS-CoV-2 Antibodies

Seroprevalence in Cache County was found to be higher compared to the four-county sample in Phase 1- Part A and the other counties sampled in Phase Part B. The estimated adjusted seroprevalence in Cache County is 2.31%, or about 1 in 42 respondents in Cache County age 12 or older showed evidence of prior infection. The confidence interval for estimated seroprevalence in Cache County is 0.68%-5.71%.

The Estimated Clinical Detection Rate in Cache County is about 30%

By looking at the Covid-19 case counts 10-17 days prior to the date of testing in Cache County, HERO Project leaders can estimate what proportion of positive cases are detected using clinical tests, and what proportion go undetected. Based on Cache County case counts and serology findings, the estimated clinical detection rate in Weber county is approximately 30%.

An Estimated 1.39% of Utahns age 12 or Older in Weber County Have SARS-CoV-2 Antibodies

The seroprevalence in Weber County also appears to be slightly higher than the seroprevalence rate found four-county testing area for Phase 1 - Part A. Analysis of the blood antibody tests in Weber County revealed an adjusted seroprevalence of 1.39%, or about 1 in 72 respondents in Weber County age 12 or older showed evidence of prior infection. The confidence interval for estimated seroprevalence in Weber is 0.27%-3.66%.

The Estimated Clinical Detection Rate in Weber County is about 35%

In the 10-17 days prior to blood serology testing for the area, the case rate for Weber County was 0.9%. Based on the case count rate and estimated seroprevalence in Weber County, the estimated clinical detection rate in Weber county is approximately 35%.

Seroprevalence in the Hispanic Community Remains Higher in the Phase 1 - Part B Sample

In both Cache and Weber Counties, seroprevalence is approximately twice as high for Hispanic community members compared to the overall rate of seroprevalence across the county.

Phase 2 Findings as of September 15, 2020

An Estimated 2.81% of West Salt Lake residents 12 or Older Have SARS-CoV-2 Antibodies

Analysis of the blood antibody tests in West Salt Lake revealed an adjusted seroprevalence of 2.81%, or about 1 in 36 respondents in West Salt Lake age 12 or older showed evidence of prior infection. To date, this is the highest community-wide seroprevalence found across all HERO study areas. The confidence interval for estimated seroprevalence is 1%-6.36%. Seroprevalence among Hispanic respondents was found to be nearly twice as high compared to community-wide seroprevalence (5.11% compared to 2.81%).

The Estimated Clinical Detection Rate in West Salt Lake is 37%

The case case rate for West Salt Lake in the 10-17 days prior to serology testing was 1.76%. Based on this rate and the seroprevalence estimate, the estimated clinical detection rate in Weber county is approximately 37%.

Phase 1 - Part A: Sampling Design and Project Implementation

Introduction

Phase 1 - Part A of the HERO Project was designed to provide information about Covid-19 infections that can be used by decision makers across the state. To capture an accurate picture of what’s happening in Utah, project leaders carefully designed methodology for sampling to ensure that important subgroups within the community are represented. To do this, the HERO Project utilized a primary and secondary strategy to build a sample that represents all residents. The primary sampling design included an intense recruitment process performed within specifically selected population clusters. The secondary sampling design was broader and more inclusive. Together, these two strategies help source a well-rounded set of data for further study.

An essential component of achieving accurate representation was sampling from four counties: Salt Lake County, Utah County, Davis County, and Summit County. Areas within each county were examined to create strata, or groups, using U.S. Census defined tracts and blocks. Residents in these strata were then contacted by the project and asked to complete household and individual surveys. Residents age 12 or older were then referred for blood and/or nasal swab testing.

Characteristics of the Four-County Area

County	Population Size (individuals)	% Hispanic	Median Age
Davis	340,621	9.4%	30.8
Salt Lake	1,120,805	18.1%	32.6
Utah	590,440	11.6%	24.6
Summit	40,511	11.5%	39

Source: 2018 5-year estimates of the American Community Survey.

Primary Sampling Design

The primary sampling design designated 15 strata which were defined using public data about the age and ethnicity of residents as well as state case count data. Since older individuals are more vulnerable to Covid-19, strata were described by young or old populations; since there have been higher incidences nationwide of transmissions in populations of color, strata were defined as Hispanic or Nonhispanic; and finally, since project leaders aimed to better understand transmission, strata were defined as having high or low case prevalence. The designation of strata helped to assure

an adequate representation of each of these groups. The project targeted 25,575 households in the primary sampling design. These households were approached using an intensive sampling process that included both mailings with a web survey and door to door sampling.

Secondary Sampling Design

The secondary sampling design also used strata defined by case prevalence, Hispanic ethnicity, and age in the four counties selected for Phase 1 - Part A. In contrast to the primary sampling design, households were sampled broadly across the full geographic areas of the respective counties. In total, 14,012 households were selected and asked to participate as part of the secondary sampling design. In order to make sampling across broad geographic areas feasible, a less intensive sampling process was used for the secondary sampling design than was used for the primary sampling design.



Geographic Areas Sampled in the Primary and Secondary Sampling Designs

Methods and Limitations

As is standard for survey designs similar to the type implemented in the HERO Project, the statistical analyses for Phase 1 - Part A include corrections to account for a variety of considerations including sampling, nonresponse, demographic balance, and the accuracy of the two clinical tests used. This process includes assigning higher weights to correct for undersampling subsets of the data. All the seroprevalence results of this report reflect adjusted findings.

The primary limitation in the HERO Project analyses is that estimates of community seroprevalence of Covid-19 have a degree of uncertainty. This uncertainty has several sources, and has also been the case in similar studies. First, weighting and other adjustments to the data might not be perfect. Second, manufacturers of clinical tests pre-determine the likely accuracy of tests, and these estimates could also affect interpretation of the results. As described earlier in this report, to account for these errors, the HERO Project established confidence intervals for all findings which can be used to interpret each estimate presented.



Hope Corps Field Teams & Testing

In partnership with Utah Community Builders, The David Eccles School of Business at the University of Utah established the Hope Corps in response to state-wide impacts of the Covid-19 pandemic. The mission of the Hope Corps is to assist and lift small businesses, nonprofits, and people of Utah. College students applied to join the Corps, and these dedicated young professionals staffed field teams and organized mobile testing sites to collect blood and nasal swabs from participants.



Household and Individual Surveys

Surveys used in Phase 1 - Part A of the HERO Project gathered information about participant attitudes and behaviors in response to the Covid-19 pandemic, as well as demographic information. Selected participants were sent mailers with project information and instructions to complete household and individual surveys online. Field teams walked door to door in the neighborhoods selected for sampling to further encourage participation. The teams provided information about the HERO Project, described the process, and then delivered surveys to willing participants.



Mobile Testing

Participants who completed surveys selected a time the following day to complete their tests at a mobile testing site. These sites were established in conveniently located parking lots so participants could drive through and limit their contact with staff. Both nasal swabs and venous blood draws were available at the site; participants over age 12 provided a blood sample and some participants provided a nasal swab.

Summary of Total Field Reach for Phase 1 - Part A

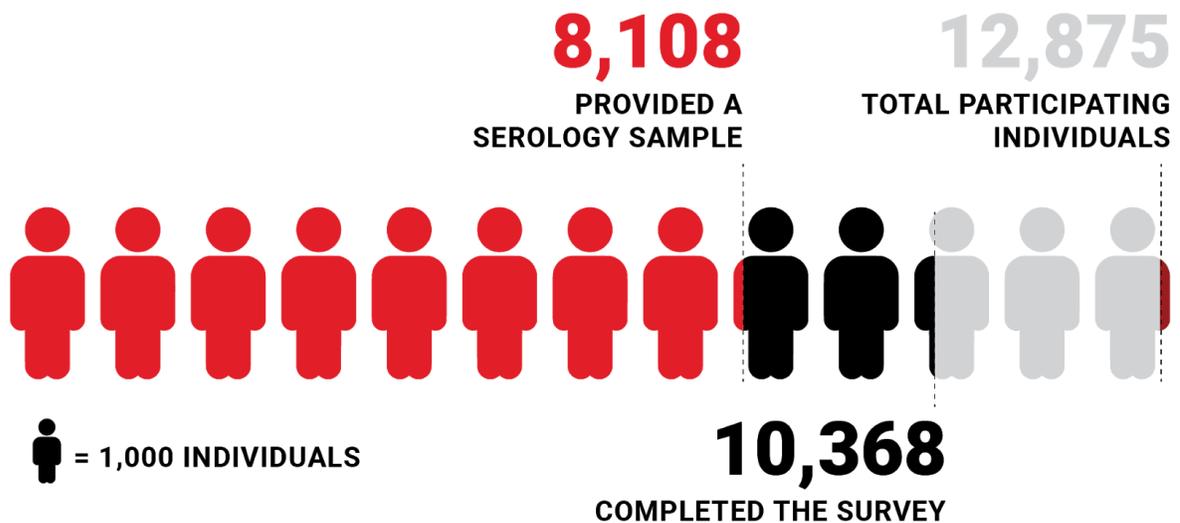
- 5,125 households completed the household survey
- 10,368 individuals completed the individual survey
- 8,108 individuals provided blood tests for serology analysis
- 6,004 individuals were given the PCR nasal swab test

All serology samples in Phase 1 - Part A were collected between May 1 and July 3, 2020. The majority of these blood tests (6,606 out of 8,108) were obtained between May 18 and June 19, 2020.

Graph: Responses by Household



Graph: Responses and Serology Samples by Individuals



Phase 1 - Part A: Results and Findings by Location

Introduction

The primary focus of the HERO Project is to estimate seroprevalence, which can help decision makers estimate potential Covid-19 immunity due to the presence of antibodies in Utah residents' blood. In addition, the project also used zip code specific case counts and nasal swab tests to estimate what proportion of active cases are detected in a clinical setting. This section presents these findings, as well as the relationship between the findings and responses to the household and individual surveys.

Findings from Phase 1 - Part A of the HERO Project are a result of careful analysis that account for best practices consistent with large scale community-wide studies of health. In addition to the adjustments made for sampling that allowed project leaders to make accurate assumptions about the population, the analysis of clinical tests is informed by the test manufacturer's estimates of accuracy and the project's own estimates of test accuracy. Therefore all results in this section have been adjusted in accordance with these best practices.

Testing Sensitivity and Specificity

Once participant samples were submitted to ARUP Laboratories, technologists followed strict procedures to complete the assay, or test, for each sample. The accuracy of assays are defined by sensitivity and specificity. Sensitivity refers to the ability of the test to correctly identify those with the disease, or the true positive rate. Specificity describes the ability of the test to correctly identify those without the disease, or the true negative rate. Based on self-reports from participants who indicated having a prior positive Covid-19 test, project leaders adjusted the sensitivity estimate for Phase 1 based on how many of those participants also tested positive for antibodies. This process changed the sensitivity used in the adjustment from manufacturer's estimate of 0.972 to a HERO Project sensitivity estimate of 0.83. The project used the manufacturer's specificity estimate of 0.996, which the manufacturer obtained by evaluating 1,070 samples collected prior to the start of the COVID-19 outbreak.

INDIVIDUALS OVER AGE 12 TESTED FOR ANTIBODIES ACCROSS THE 4-COUNTY AREA



1 in 124 I.E., **0.81%**
TESTED POSITIVE **SEROPREVALENCE**

Primary Seroprevalence Results

Based on the Phase 1 sample, the estimate of seroprevalence is 0.81%, with a 95% confidence interval ranging from 0.15% to 1.61%. The estimated prevalence of 0.81% reflects the best estimate of prevalence of COVID-19 among those 12 years and older across the four-county area, and represents roughly 1 in 124 individuals. It is important to interpret this estimate of prevalence in the context of its 95% confidence interval, which reflects uncertainty associated with random sampling and potential testing error.

Adjusted Seroprevalence by County

The table below includes the total number of blood tests collected for each county, the number of positive test results, and the adjusted seroprevalence. The project found a higher prevalence in Summit County, the location of the state’s first Covid-19 outbreak in Park City, Utah.

County	Total Serology Tests Received From ARUP	Positive Serology Test Results	Adjusted % Seroprevalence	95% Confidence Interval
Davis	1,703	16	0.15%	0-1.26
Salt Lake	4,021	38	0.70%	0-1.78
Summit (Park City)	345	10	4.59%	1.02-15.11
Utah	2,039	25	1.21%	0.12-3.41
All	8,108	89	0.81%	0.15-1.62

Adjusted Seroprevalence by Population Subgroup

The table below lists the seroprevalence for population subgroups, including participant age, sex, and Hispanic ethnicity. As is consistent with communities across the nation, the Hispanic population in the four-county project area demonstrates a significantly higher seroprevalence. The table also includes survey-collected data showing the correlation between seroprevalence and known contact with an infected individual, and living in a household with another seropositive individual. As expected, known contact and sharing a household with a seropositive individual is correlated with increased rates of infection.

Because seroprevalence is low overall, the confidence intervals for different subpopulations often overlap.

Population Subgroup	Adjusted Seroprevalence (%)	Seroprevalence 95% Confidence Interval (%)
Age [12 – 45]	0.88	0.10-2.07
Age [45 – 65]	0.80	0.11-1.70
Age [65 +]	0.45	0-1.36
Male	0.74	0.05-1.65
Female	0.89	0.17-1.85
Nonhispanic	0.48	0-1.09
Hispanic	2.73	0.62-8.01
Known contact: No	0.41	0-1.12
Known contact: Yes	8.51	3.27-19.66
Known contact: Don't Know	0.24	0-1.47
Reside in household with other seropositive individual	24.88	10.55-49.33
Reside in household without a seropositive individual	0.32	0-0.88

Clinical Detection Rate

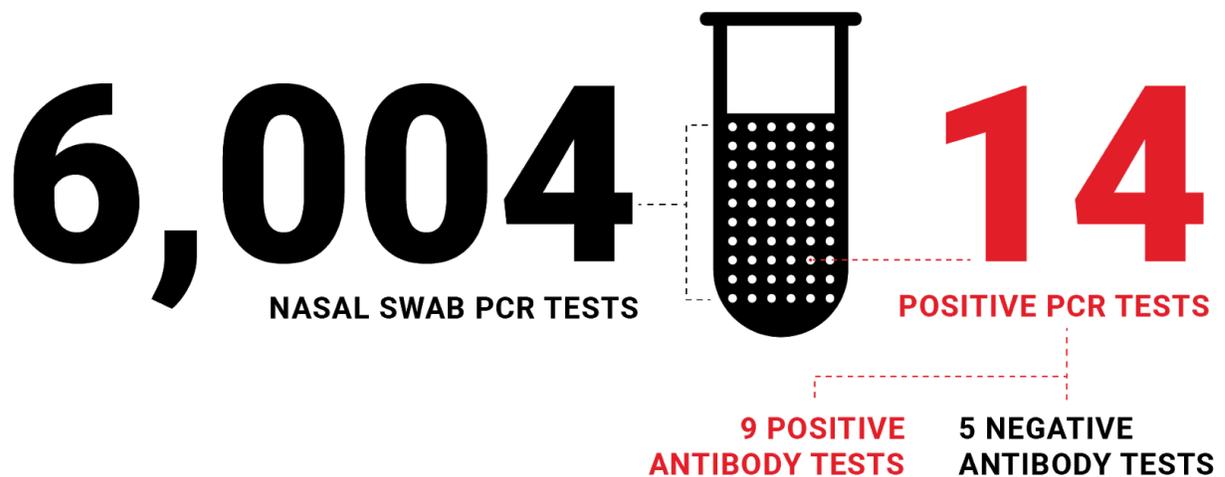
Since not all individuals experiencing symptoms get tested, and some do not experience symptoms, the sampling method used in the project gives an indication of how many active cases are missed. To better understand the rate of clinical detection in the four-county area, HERO Project leaders examined seroprevalence alongside the positive case count in participants' zip codes between 10 - 17 days prior to the blood test. The positive case count gives an indication of what you might expect seroprevalence to look like. By comparing the case count collected in clinical settings to the random sample in Phase 1, the project estimated about 40% of cases are detected. In other words, for every detected case, another 1.5 active cases go undetected.

Since testing included only residents with age 12 and older, the clinical detection rate is subject to some uncertainty since it does not account for young children.

Infection Fatality Rate

The case fatality rate is commonly calculated as the number of deaths divided by the number of clinically diagnosed cases, adjusted for the delay between diagnosis and death. This can be misleading because it does not accurately count all of the infections. The clinical detection rate also helped project leaders determine an estimated infection fatality rate (deaths divided by the true number of infections) of approximately 0.3% among those 12 years or older. This factors in fatality among both detected *and* undetected cases. Similar to the limitations of the estimated clinical detection rate, the infection fatality rate is subject to some uncertainty given the exclusion of children under 12.

PCR Results



Over the course of Phase 1 testing, 6,004 nasal swab PCR tests were administered and 14 tests came back positive. Six of the individuals with positive PCR results reported having a prior positive PCR test. Of the 14 individuals with positive PCR results, 9 individuals also had a positive antibody test, and 5 individuals had a negative antibody test.

Household Transmission Trends

A total of 56 households had at least two individuals tested and at least one individual who was seropositive. By assuming there was one primary case in each household, the project was able to estimate the rate of secondary infection within a household. Within these 56 households, 70 individuals were seropositive and 101 were seronegative, resulting in 14 secondary seropositive individuals. Based on this sample, the four-county estimated secondary household infection rate is 12.2%. In other words, for households with at least one seropositive individual, an estimated 12.2% of the remaining individuals within that household were also seropositive.

Phase 1 - Part B: Washington County Sample and Results

Introduction

Washington County was the next county sampled after the initial four-county sample in Phase 1 - Part A of the HERO Project. Testing in Washington County included both blood antibody and nasal swab PCR tests taken between July 7–14, 2020. Results in this section are adjusted using methods described earlier in this report for Phase 1 - Part A. These adjustments account for a variety of considerations including sampling, nonresponse, demographic balance, and the accuracy of the two clinical tests used. Where available, confidence intervals are presented alongside the adjusted results to provide context for the interpretation.

Washington County Sampling Design

A simple random sample of addresses was used to create a targeted sample group in Washington County. A total of 12,500 households were identified and sent a mailed invitation to participate in the study and complete household and individual surveys. Individuals age 12 and older who completed the survey were invited to provide a blood sample for antibody testing.



Survey and Serology Response Rates in Washington County

HERO Project leaders carefully monitored response rates throughout the project to ensure outreach efforts were effective and sampling results were representative of the area. The table below summarizes response rates based on completion of the household survey, individual survey, and the individuals who provided a blood serology test. Household response rate is presented as a ratio of households who either completed the household survey or at least one individual survey. Individual response rates are presented as the proportion individuals age 12 or older that completed the individual survey. Serology response rates are presented as the proportion of individual survey respondents who also provided a serology sample. The overall response is estimated as the product of the household, individual, and serology level response rates.

	Contacted via Mail #Responded/# Approached; % Responded
Response	
Household Survey	931 out of 12,500; 7.4%
Individual	1,827 out of 2,095; 87.2%
Blood Test	1,594 out of 1,893; 84.2%
Overall Response Rate	5.4%

Washington County Serology Results

Out of 1,594 blood antibody tests, 14 of the samples obtained were positive. The adjusted community-wide seroprevalence for persons age 12 or older in Washington County is 0.51%, or about 1 out of 195 individuals showed evidence of prior SARS-CoV-2 infection. This rate is lower than the overall seroprevalence determined in the four-county Phase 1 - Part A findings. This finding has been adjusted using the HERO Project derived 0.83 assay sensitivity estimate, and the manufacturer's specificity estimate of 0.996. The confidence interval for seroprevalence in Washington County is 0%-1.59%.

Adjusted Seroprevalence by Population Subgroup

Consistent with lower community seroprevalence, adjusted seroprevalence by population group is also lower overall. Seroprevalence in Washington County appears to be higher for individuals between the ages of 45-65, and those who had known contact with a positive individual. Confidence Intervals are not available by population subgroup due to a small sample size.

Population Subgroup	Total Number	Total Number Seropositive	Adjusted Seroprevalence (%)
Age [12 – 45]	472	1	0.00
Age [45 – 65]	413	8	2.35
Age [65 +]	708	5	0.57
Male	738	7	0.66
Female	851	7	0.37
Nonhispanic	1,522	13	0.52
Hispanic	56	1	0.54
Known contact: No	1,115	7	0.5
Known contact: Yes	74	4	2.79
Known contact: Don't Know	402	3	0.00
Reside in household with other seropositive individual	14	0	0.00
Reside in household without a seropositive individual	1,580	14	0.52

Prior Positives and PCR Results

Out of the 1,594 individuals who provided a blood sample, 225 individuals self-reported they had received a prior Covid-19 PCR nasal swab test, and 11 individuals reported a prior positive test result. Further PCR tests found an additional 5 positive individuals out of 14 individuals positive for blood antibodies.

Phase 1 - Part B: Cache County

Sample and Results

Introduction

Cache County was sampled for the HERO Project between July 29–August 15, 2020. Testing in Cache County included both blood antibody and nasal swab PCR tests. Results in this section are adjusted using methods consistent with Phase 1 - Part A, which account for a variety of considerations including sampling, nonresponse, demographic balance, and the accuracy of the two clinical tests used. Where available, confidence intervals are presented alongside the adjusted results to provide context for the interpretation.

Cache County Sampling Design

A simple random sample of addresses was used to create a targeted sample group in Cache County. A total of 14,055 households were identified and sent a mailed invitation to participate in the study and complete household and individual surveys. Out of the full sample, 945 households were selected to receive a knock on the door and in-person interview. Individuals age 12 and older who completed the survey were invited to provide a blood sample for antibody testing.



Survey and Serology Response Rates in Cache County

HERO Project leaders carefully monitored response rates throughout the project to ensure outreach efforts were effective and sampling results were representative of the area. The table below summarizes response rates based on completion of the household survey, individual survey, and individuals who provided a blood serology test. They are listed based on the contact strategy used— either in person and mail or mail only. Household response rate is presented as a ratio of households who either completed the household survey or at least one individual survey. Individual response rates are presented as the proportion individuals age 12 or older that completed the individual survey. Serology response rates are presented as the proportion of individual survey respondents who also provided a serology sample. The overall response is estimated as the product of the household, individual, and serology level response rates.

Response	In-Person and Mail Contact #Responded/# Approached; % Responded	Mail Only Contact #Responded/# Approached; % Responded
Household Survey	247 out of 945; 26.1%	910 out of 13,110; 6.9%
Individual	372 out of 581; 64%	1,827 out of 2,163; 84.5%
Blood Test	205 out of 386; 53.1%	1,333 out of 1,896; 70.3%
Overall Response Rate	8.9%	4.1%



Cache County Serology Results

The estimated adjusted seroprevalence in Cache County is 2.31%. In other words, about 1 in 42 respondents in Cache County age 12 or older showed evidence of prior infection. The confidence interval for estimated seroprevalence is 0.68%-5.71%. Adjustments for this finding assume the HERO Project derived 0.83 assay sensitivity estimate, and the manufacturer’s specificity estimate of 0.996.

Clinical Detection Rate

In the 10-17 days prior to blood serology testing for the area, the adjusted zip code case case rate for Cache County was 1.63%. Based on this rate and the estimated seroprevalence, the estimated clinical detection rate in Weber county is approximately 30%.

Adjusted Seroprevalence by Population Subgroup

Seroprevalence among the Hispanic community in Cache County is about two times higher than the rest of the county (5.11% compared to 2.31%). When compared to those who identified as nonhispanic the rate is even more startling at nearly four times higher (5.11% compared to 1.39%). Seroprevalence in Cache County was also higher for individuals age 12 to 45, those who had known contact with a positive individual, and those residing in a house with another seropositive individual. Confidence intervals are not provided the subgroup age 65+ due to a small sample size.

Population Subgroup	Total Number	Total Number Seropositive	Adjusted Seroprevalence (%)	Seroprevalence 95% Confidence Interval (%)
Age [12 – 45]	918	22	3.38	0.92-9.32
Age [45 – 65]	477	10	1.43	0.16-4.42
Age [65 +]	229	2	2.56	-
Male	728	14	2.92	0.73-8.66
Female	894	20	2.71	1.07-5.76
Nonhispanic	1,328	21	1.39	0.33-3.22
Hispanic	289	13	5.11	1.19-16.36
Known contact: No	1,150	19	0.87	0.08-2.06
Known contact: Yes	151	11	17.82	5.36-46.45
Known contact: Don't Know	322	4	0.78	0-3.75
Reside in household with other seropositive individual	31	11	83.87	33.83-112.49
Reside in household without a seropositive individual	1,513	15	1.05	0-5.04

Prior Positives and PCR Results

Out of the 1,538 individuals who provided a blood sample, 1,340 individuals self-reported they had a prior Covid-19 PCR nasal swab test, and 6 individuals reported a prior positive test result. Further PCR tests found an additional 5 positive individuals out of 23 individuals positive for blood antibodies.

Phase 1 - Part B: Weber County

Sample and Results

Introduction

Rounding out the counties sampled in Part B of Phase 1 was Weber County. Testing in Weber County included both blood antibody and nasal swab PCR tests taken between August 5–14, 2020. Results in this section are adjusted using methods consistent with Phase 1 - Part A, which account for a variety of considerations including sampling, nonresponse, demographic balance, and the accuracy of the two clinical tests used. Confidence intervals are presented alongside the adjusted results to provide context for the interpretation.

Weber County Sampling Design

A simple random sample of addresses was used to create a targeted sample group in Weber County. HERO Project leaders focused on areas with the highest reported incidence of Covid-19 by examining case counts. A total of 11,900 households were identified and sent a mailed invitation to participate in the study and complete household and individual surveys. Out of this sample, 2,700 households were randomly selected to receive an interview knock on the door and complete the survey in person. Individuals age 12 and older who completed the survey were invited to provide a blood sample for antibody testing.



Survey and Serology Response Rates in Weber County

HERO Project leaders carefully monitored response rates throughout the project to ensure outreach efforts were effective and sampling results were representative of the area. The table below summarizes response rates based on completion of the household survey, individual survey, and individuals who provided a blood serology test. They are listed based on the contact strategy used. Household response rate is presented as a ratio of households who either completed the household survey or at least one individual survey. Individual response rates are presented as the proportion individuals age 12 or older that completed the individual survey. Serology response rates are presented as the proportion of individual survey respondents who also provided a serology sample. The overall response is estimated as the product of the household, individual, and serology level response rates.

Response	In-Person and Mail Contact #Responded/# Approached; % Responded	Mail Only Contact #Responded/# Approached; % Responded
Household Survey	382 out of 2,700; 14.1%	500 out of 9,200; 5.4%
Individual	659 out of 948; 69.5%	1,023 out of 1,176; 87%
Blood Test	387 out of 659; 58.7%	832 out of 1,023; 81.3%
Overall Response Rate	5.8%	3.8%



Weber County Serology Results

Analysis of the blood antibody tests in Weber County revealed an adjusted seroprevalence of 1.39%, or about 1 in 72 respondents in Weber County age 12 or older showed evidence of prior infection. The confidence interval for estimated seroprevalence is 0.27%-3.66%. Adjustments for this finding assume the HERO Project derived 0.83 assay sensitivity estimate, and the manufacturer's specificity estimate of 0.996.

Clinical Detection Rate

In the 10-17 days prior to blood serology testing for the area, the adjusted zip code case rate for Weber County was 0.9%. Based on this rate and the seroprevalence estimate, the estimated clinical detection rate in Weber county is approximately 35%.

Adjusted Seroprevalence by Population Subgroup

Consistent with the findings from Phase 1 - Part A and other national research, seroprevalence appears to be higher for the Hispanic community, with a rate of 2.46%. Seroprevalence in Weber County was also higher for individuals over age 45, those who had known contact with a positive individual, and those residing in a house with another seropositive individual. Confidence intervals are not provided for some subgroups due to a small sample size.

Population Subgroup	Total Number	Total Number Seropositive	Adjusted Seroprevalence (%)	Seroprevalence 95% Confidence Interval (%)
Age [12 – 45]	581	4	0.07	0.0-3.43
Age [45 – 65]	364	9	3.93	0.65-14.58
Age [65 +]	274	5	2.49	0.16-11.11
Male	563	9	0.76	0-2.58
Female	648	9	2.04	0.47-5.6
Nonhispanic	1,112	16	1.17	0.24-2.69
Hispanic	93	2	2.46	-
Known contact: No	920	9	0.5	0-2.07
Known contact: Yes	74	6	14.83	1.42-66.93
Known contact: Don't Know	225	3	1.48	-
Reside in household with other seropositive individual	19	2	29.21	-
Reside in household without a seropositive individual	1,200	16	0.88	0.06-2.15

Prior Positives and PCR Results

Out of the 1,219 individuals who provided a blood sample, 1,003 individuals self-reported they had a prior Covid-19 PCR nasal swab test, and 9 individuals reported a prior positive test result. Further PCR tests found an additional 4 positive individuals out of 18 individuals positive for blood antibodies.

Phase 2 - West Salt Lake Sample and Results

Introduction

Phase 2 of the HERO project allows project leaders the opportunity to gain further insight about smaller population clusters, SARS-CoV-2 transmission trends, and longer term outcomes across the original study areas. An emerging trend of high case counts in West Salt Lake quickly became a focus area so that community leaders and decision makers could better support efforts to limit spread in the area. Blood antibody and nasal swab testing in West Salt Lake took place between July 13–August 4, 2020.

This section contains adjusted results using methods described in Phase 1 - Part A. Adjustments account for a variety of considerations including sampling, nonresponse, demographic balance, and the accuracy of the two clinical tests used. Confidence intervals are presented alongside the adjusted results to provide context for the interpretation.

West Salt Lake Sampling Design

Using data from the Utah Department of Health, project leaders pin-pointed small health areas in West Salt Lake with high case counts as of early June, 2020. Small health areas were mapped along Census tracks, then a simple random sample of addresses was used to define a targeted sample of 14,060 households. All households within the sample were sent a mail invitation to participate in the project. Out of the larger sample, 1,980 households were randomly selected for an in-person knock on the door and interview. Those who completed the survey were then asked to provide a blood sample for serology testing.



Survey and Serology Response Rates in West Salt Lake

HERO Project leaders carefully monitored response rates throughout the project to ensure outreach efforts were effective and sampling results were representative of the area. The table below summarizes response rates based on completion of the household survey, individual survey, and individuals who provided a blood serology test. They are listed based on the contact strategy used. Household response rate is presented as a ratio of households who either completed the household survey or at least one individual survey. Individual response rates are presented as the proportion individuals age 12 or older that completed the individual survey. Serology response rates are presented as the proportion of individual survey respondents who also provided a serology sample. The overall response is estimated as the product of the household, individual, and serology level response rates.

Response	In-Person and Mail Contact #Responded/# Approached; % Responded	Mail Only Contact #Responded/# Approached; % Responded
Household Survey	432 out of 1,980; 21.8%	782 out of 12,080; 6.5%
Individual	718 out of 1,068; 67.2%	1,465 out of 1,781; 82.3%
Blood Test	418 out of 737; 56.7%	1,208 out of 1,534; 878.7%
Overall Response Rate	8.3%	4.2%



West Salt Lake Serology Results

Analysis of the blood antibody tests in West Salt Lake revealed an adjusted seroprevalence of 2.81%, or about 1 in 36 respondents in West Salt Lake age 12 or older showed evidence of prior infection. To date, this is the highest community-wide seroprevalence found across all HERO study areas. The confidence interval for estimated seroprevalence is 1%-6.36%. Adjustments for this finding assume the HERO Project derived 0.83 assay sensitivity estimate, and the manufacturer's specificity estimate of 0.996.

Clinical Detection Rate

In the 10-17 days prior to blood serology testing for the area, the adjusted zip code case rate for West Salt Lake was 1.76%. Based on this rate and the seroprevalence estimate, the estimated clinical detection rate in Weber county is approximately 37%.

Adjusted Seroprevalence by Population Subgroup

Seroprevalence among Hispanic respondents was found to be nearly twice as high compared to community-wide seroprevalence (5.11% compared to 2.81%). Seroprevalence in West Salt Lake was also higher for individuals age 12 to 45, those who had known contact with a positive individual, and those residing in a house with another seropositive individual. A confidence interval is not available for age 65+ due to a small sample size.

Population Subgroup	Total Number	Total Number Seropositive	Adjusted Seroprevalence (%)	Seroprevalence 95% Confidence Interval (%)
Age [12 – 45]	918	22	3.38	0.92-9.32
Age [45 – 65]	477	10	1.43	0.16-4.42
Age [65 +]	229	2	2.56	-
Male	728	14	2.92	0.73-8.66
Female	894	20	2.71	1.07-5.76
Nonhispanic	1,328	21	1.39	0.33-3.22
Hispanic	289	13	5.11	1.19-16.36
Known contact: No	1,150	19	0.87	0.08-2.06
Known contact: Yes	151	11	17.82	5.36-46.45
Known contact: Don't Know	322	4	0.78	0-3.75
Reside in household with other seropositive individual	31	11	83.87	33.83-112.49
Reside in household without a seropositive individual	1,595	23	1.23	0.28-2.9

Prior Positives and PCR Results

Out of the 1,626 individuals who provided a blood sample, 333 individuals self-reported they had a prior Covid-19 PCR nasal swab test, and 13 individuals reported a prior positive test result. Further PCR tests found an additional 13 positive individuals out of 31 individuals positive for blood antibodies.

Next Steps

Current Project Activities

- Additional projects are underway including longitudinal testing results of project participants and an emphasis on school-based transmission of the virus in k-12 settings.
- These new project areas will continue to provide local information to inform decision making, confirm findings from Phase 1, and provide new information about how Covid-19 detection and transmission in Utah.

In the Next Update

- Initial results from the longitudinal study will provide an update on original study participants. Updating the original sample will provide more effective monitoring on community spread, as opposed to starting from scratch in the same area.

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