# COVID-19 Vaccine Coverage and Hesitancy in Long-Term Care Facilities, Houston, Texas

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## Abstract

### Background

Vaccine hesitancy continues to threaten progress made in tackling vaccine preventable diseases. Houston Health Department assessed COVID-19 vaccine availability and uptake in long term care facilities (LTCF) after emergency use authorization of the vaccine in United States.

### Population and Methods

A facility-based cross-sectional study was conducted using a structured interviewer-administered questionnaire to elicit data on facility demographics, vaccine availability, residents and staff vaccine uptake at time of assessment. The unit of inquiry was the facility. We calculated frequencies and assessed association with facility type. Facilities were classified as small, medium and large-scale facilities according to number of beds (≤ 10 beds-SSF, 11-50 beds-MSF, and > 50 beds-LSF).

**Results**

A total of 118 facilities were enrolled, with 2,431 residents and 2,290 staff. Twenty-five (14.5%) of the facilities were LSF, 47 (39.8%) MSF, and 46 (39.0%) SSF. Overall, 70 (59.3%) facilities had COVID-19 vaccine available. All LSF 25(100%) had vaccines. Majority of residents, (86.5%) were vaccinated with less than half of staff (44.2%) vaccinated ($P < 0.0001$). Staff were four-times as likely to be unvaccinated (prevalence ratio= 4.1; 95% CI= 3.7 - 4.6), as residents. Reasons provided for vaccine hesitancy included fear of side effects, need to wait and see what happens to others, distrust of government, religious beliefs, conspiracy theories among other reasons.

**Discussion**

The findings demonstrated COVID-19 vaccine availability and acceptability variations among LTCF, staff and residents. Houston Health Department activated mobile vaccine distribution and health education campaigns, to address coverage and tackle hesitancy especially among staff.

**Keywords:** COVID-19, vaccination, nursing homes, hesitancy, United States

## Introduction

Vaccine hesitancy is a phenomenon that predates pandemic of the novel coronavirus disease of 2019 (COVID-19) and constitutes public health threat to global wins on vaccine preventable diseases. It is described as “delay in acceptance or refusal of vaccination despite availability of vaccination services” [1]. It is a multifaceted phenomenon comprising the existence of cognitive, psychologic, socio-demographic, and cultural factors that affect attitudes towards vaccine [2-5].

In the context of the COVID-19 pandemic, vaccine hesitancy constitutes a rate limiting step in the development of herd immunity globally [6], as it can lead to certain populations becoming more vulnerable to COVID-19, strictly due to low vaccination rates. An example of such population are the residents and staff of long-term care facilities (LTCF) who were adversely affected by the COVID-19 pandemic.

With the global spread of COVID-19, LTCF became hot spots for transmission of the virus with attendant high morbidity and mortality. LTCF comprise congregate settings where older adults, people with disabilities or chronic health conditions (like heart and lung diseases, diabetes), or people otherwise needing assistance with daily living activities receive services, care, and support [7]. Houston Health Department (HHD) supported LTCF with early detection of facility outbreaks, and rapid deployment of control measures to halt transmission of COVID-19. With the emergency utilization authorization (EUA) of COVID-19 vaccine, the Department in partnership with CDC and pharmacy outlets prioritized the vaccination of residents and staff of LTCFs.

In January 2021, the Houston Health Department assessed COVID-19 vaccine coverage, hesitancy and reasons provided for hesitancy in LTCF within the City of Houston to inform implementation of public health strategies to improve coverage among the most vulnerable population.

## Population and Methods

The HHD medical congregate team conducted a facility-based cross-sectional study conducted among ALF within Houston using a structured interviewer-administered questionnaire. A modified CDC Infection Control Assessment and Response tool was adapted to meet set objectives. The assessment team comprised six field teams, with each team made up of an epidemiologist-lead and two surveillance investigators. A two-day training was conducted for all field staff on the use of the adapted tool. A pilot was conducted to ensure reliability and validity in the reporting. All registered assisted living facilities under the Texas Health and Human Services were assessed except 19 that had had multiagency visit in the last 30 days prior to the assessment.

The following operational definitions were used in this study – resident, staff, vaccinated person(s). A resident is any individual usually older living within the visited facility and receiving help with basic tasks of living e.g., bathing, dressing, personal care, housekeeping or preparing meals and other support services as might be needed. A LTCF staff was an employee who provides any care, treatment, or other services for the facility and/or its residents. A vaccinated person was anyone who had received at least one dose of COVID-19 vaccine at the time of facility assessment.

Data on facility demographics, vaccine availability, residents and staff vaccine uptake were obtained from facility administrators who were mostly directors of nursing. Unit of measurement was facility. Data was edited and analyzed using IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA). Frequencies were calculated and bivariate associations determined. The prevalence of the vaccination and hesitancy and their ratios were calculated to assess associations with other characteristics of interest. Chi-square was used in testing for statistical significance of the difference in the estimates, with statistical significance set at a two-sided $P$-value < 0.05. Facilities were classified into three based on their bed capacity: small-scale facilities (SSF) ≤ 10 beds, medium scale (MSF) 11-50 beds, and large-scale (LSF) > 50 beds.

## Results

*Characteristics of Long-Term Care Facilities*

Residing and working within the 118 assessed facilities were a total of 2,431 residents and 2,290 staff members, respectively (Table 1). Forty-six (39.0%) of the facilities had a bed capacity of ≤10. Forty-seven (39.8%) had 11-50 bed-capacity, while 25 (21.2%) had >50 bed-capacity. About two-thirds (62.1%) of the residents resided within large-scale facilities, and about three quarters (72.7%) of the staff were employed within large-scale facilities.

**Table 1. Long-term health care facilities by bed capacity and population of residents and staff, Houston, Texas, 2021**

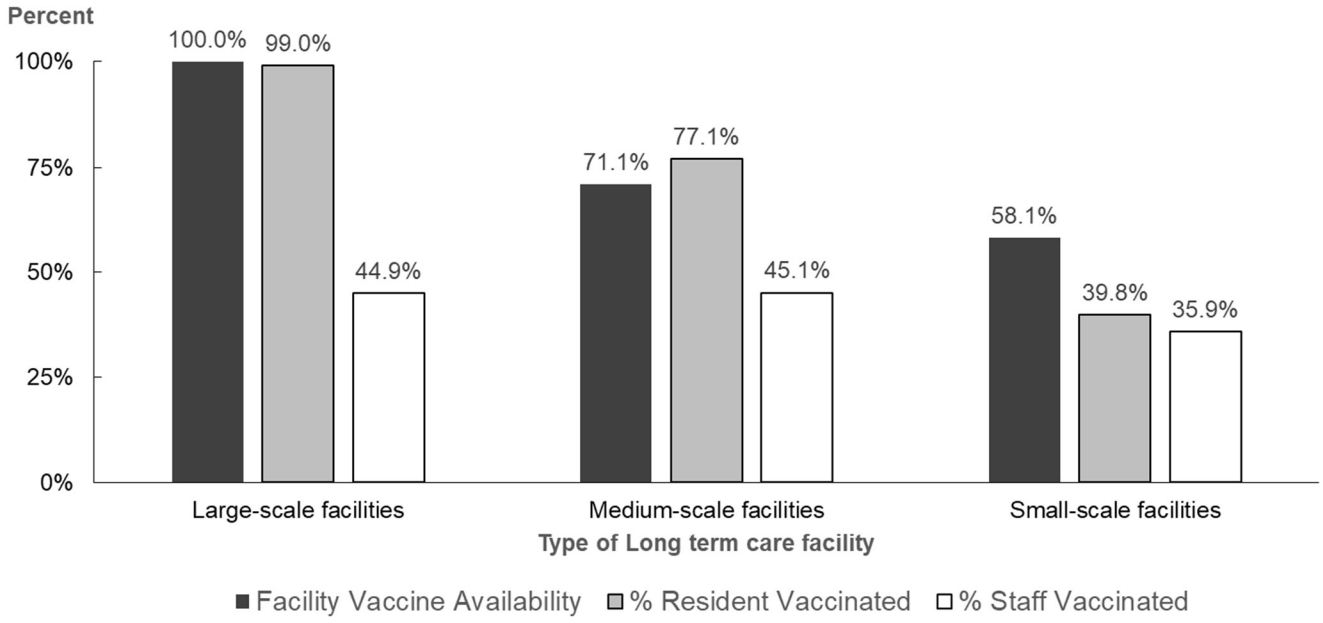
| | **Frequency** n (%) | **95% CI** |
|---|---|---|
| **Facility bed capacity** | **(N = 118)** | |
| <=10 beds | 46 (39.0%) | 30.5 – 48.3% |
| 11-50 beds | 47 (39.8%) | 31.4 – 49.2% |
| >50 beds | 25 (21.2%) | 14.4 – 28.8% |
| **Resident Population** | **(N = 2,431)** | |
| <=10 bed facilities | 276 (11.3%) | 10.1 – 12.6% |
| 11-50 bed facilities | 646 (26.6%) | 22.2 – 30.9% |
| >50 bed facilities | 1,509 (62.1%) | 51.4 – 72.8% |
| **Staff Population** | **(N = 2,290)** | |
| <=10 bed facilities | 198 (8.7%) | 6.9 – 10.0% |
| 11-50 bed facilities | 427 (18.6%) | 13.8 – 24.8% |
| >50 bed facilities | 1,665 (72.7%) | 57.9 – 87.6% |

Source: Houston Health Department assessment.

*Availability of COVID-19 Vaccine at Facilities versus Uptake by Residents and Staff*

During the COVID-19 pandemic a government coordinated vaccine allocation and distribution initiative was in place, to make COVID-19 vaccines available in place to each LTCF. In turn, LTFC administrators were required to enroll in the initiative through an online platform allowing them to receive COVID-19 vaccines through a government approved pharmacy distribution network. All 25 (100.0%) large-scale facilities had enrolled and received COVID-19 vaccine through the distribution program, while only 27 (71.1%) and 18 (58.1%) were enrolled and received the COVID-19 vaccine among medium and small-scale facilities, respectively, to serve their resident and staff population (Figure 1).

**Figure 1. Facility Availability of COVID-19 Vaccine versus Uptake by Residents and Staff of Long-term care facilities, Houston, Texas, 2021**




Source: Houston Health Department assessment.

Despite all LSF had COVID-19 vaccine available, with 1,494 (99.0%) resident vaccine uptake, only 748 (44.9%) staff had taken the COVID-19 vaccine. Similar proportion of staff 193 (45.1%) had availed themselves the vaccination opportunity in medium scale ALF. With half of SSF having received COVID-19 vaccine, only 110 (39.8%) residents and 71(35.9%) staff had received vaccine. There is however no

statistically significant relation between vaccine availability at facilities and uptake by staff (*P*-value = 0.3).

*COVID-19 Vaccine Status by Residents and Staff*

Across the facility types, there was a significantly higher proportion of residents who had received COVID-19 vaccine. Most residents, 2,102/2,431 or 86.5%, had 1+ doses of the COVID-19 vaccine; however, the corresponding figure for the staff were 1,012//2,290 (44.2%), a difference that was statistically significant. In other words, the proportion of unvaccinated among the staff of LTCF in Houston was 55.8%, while only 13.5% of residents were unvaccinated, a 4.1-times statistically significant difference (Table 2).

**Table 2. Vaccination status of Long-term Care Facilities Residents and staff by doses received, Houston, Texas, 2021**

| | Vaccination Status | | | | **Prevalence** |
|---|---|---|---|---|---|
| **Facility** | 0 dose | | 1+ dose | **Total** | **Ratio** |
| **Population** | **n** | **%** | **N** | | **(95% CI)** |
| **Staff** | 1,278 | 55.8 | 1,012 | 2,290 | 4.1 (3.7 – 4.6) |
| **Residents** | 329 | 13.5 | 2,102 | 2,431 | 1 |
| Total | 1,607 | | 3,114 | 4,721 | |

Source: Houston Health Department assessment.

Table 3 provides a breakdown of doses already taken by residents and staff of LTCF. The proportions of residents fully vaccinated were 133 (8.8%), 51 (7.9%) and 10 (3.6%) at the large scale, medium scale and small-scale facilities respectively, as many were not due for their 2$^{nd}$ dose at that time. Among the staff, only 55 (27.8%), 155 (36.3%) and 598 (35.9%); had received their 1$^{st}$ dose of COVID-19 vaccine, a statistically significant difference (*P* = 0.02). The proportion of fully vaccinated staff was much lower at 9% in the large and medium scale facilities and 8% at the small-scale facilities. At the small-scale

facilities, 166 (60.2%) residents and 127 (64.1%) staff received zero dose of COVID-19 vaccine, a smaller fraction of 148 (22.9%) residents and 234 (54.8%) staff at the medium scale facilities were yet to receive any vaccine dose. Only 1% of residents at large-scale facilities were yet to receive any dose COVID-19 vaccine, with more than half (55%) staff were yet to receive any vaccine dose.

**Table 3. Vaccination status of Long-term care residents and staff by doses received, Houston, Texas, 2021**

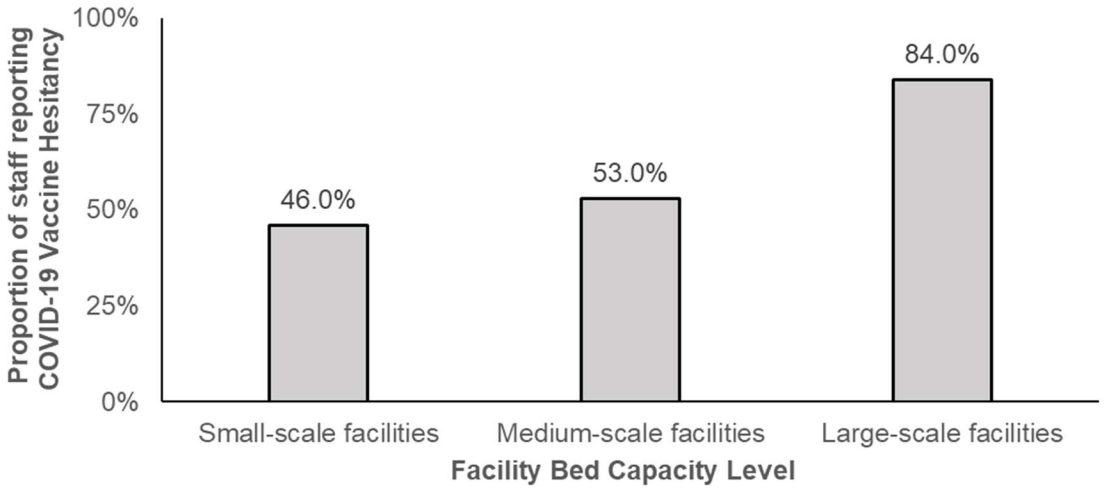
| Facility Types | Vaccine Doses Taken | Residents | | Staff | |
|---|---|---|---|---|---|
| | | n (%) | 95% CI | n (%) | 95% CI |
| All types | | **(n = 2,431)** | | **(n = 2,290)** | |
| | 2nd dose | 194 (8.0) | 7.0 – 9.1 | 204 (8.8) | 7.7 – 10.1 |
| | 1st dose | 1,908 (78.5) | 76.8 – 80.1 | 808 (35.3) | 33.4 -37.3 |
| | 0 dose | 329 (13.5) | 12.2 – 15.0 | 1,278 (55.8) | 53.8 – 57.8 |
| Small-scale | | **(n = 276)** | | **(n= 198)** | |
| | 2nd dose | 10 (3.6%) | 1.8 – 6.4 | 16 (8.1%) | 4.9 – 12.5 |
| | 1st dose | 100 (36.2%) | 30.6 – 42.0 | 55 (27.8) | 21.9 – 34.3 |
| | 0 dose | 166 (60.2%) | 54.3 - 65.8 | 127 (64.1%) | 57.3 – 70.6 |
| Medium-scale | | **(n = 646)** | | **(n = 427)** | |
| | 2nd dose | 51 (7.9%) | 6.0 – 10.2 | 38 (8.9%) | 6.5 – 11.9 |
| | 1st dose | 447 (69.2%) | 65.6 – 72.7 | 155 (36.3%) | 31.8 – 41.0 |
| | 0 dose | 148 (22.9%) | 19.8 – 26.3 | 234 (54.8%) | 50.1 - 59.5 |
| Large-scale | | **(n = 1,509)** | | **(n = 1,665)** | |
| | 2nd dose | 133 (8.8%) | 7.5 – 10.3 | 150 (9.0%) | 7.7 – 10.5 |
| | 1st dose | 1,361 (90.2%) | 88.6 – 91.6 | 598 (35.9%) | 33.6 – 38.2 |
| | 0 dose | 15 (1%) | 0.6 – 1.6 | 917 (55.1%) | 52.7 – 57.5 |

Source: Houston Health Department assessment

*COVID-19 Vaccine Hesitancy among staff by type of facility*

Twenty-one (45.7%) of the small-scale facilities reported having staff expressing hesitancy to the vaccine, while 25 (53.2%) of the medium scale facilities had staff hesitant to receiving vaccine administration, with 21 (84.0%) of the large-scale facilities' staff expressing hesitancy to take the vaccine; ($P < 0.01$). There was, however, no statistically significant difference between vaccine availability and the level of hesitancy expressed by the staff across all facilities (*P*-value=0.4).

**Figure 2. Staff Hesitancy to COVID-19 Vaccine by Long-Term Facility Type, Houston, Texas, 2021**



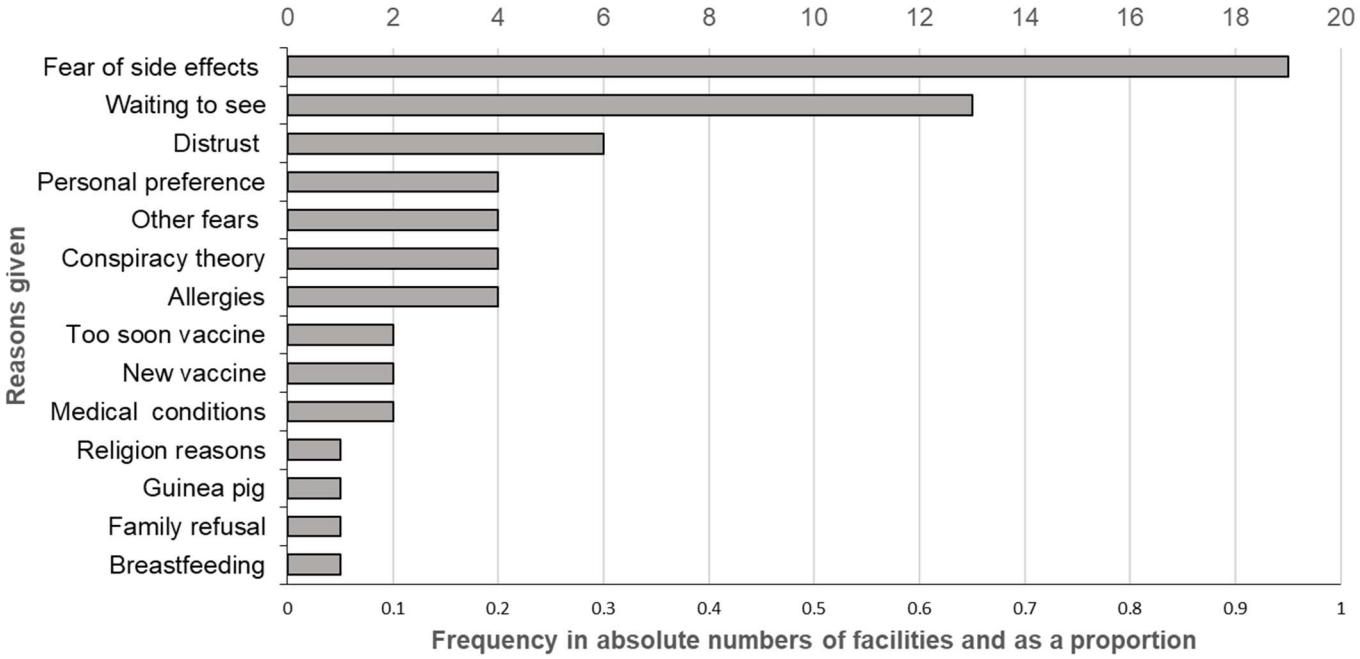

Source: Houston Health Department assessment.

*Reasons Given by Staff for Vaccine Hesitancy*

While large-scale facilities had the highest proportion reporting staff hesitancy to COVID-19 vaccine, similar reasons were provided for hesitancy across the three facility types. The most frequent reasons stated for vaccine hesitancy by the staff of the facilities included concerns about side effects, breastfeeding, a quote of a known conspiracy theory such as the "vaccine used for government control", lack of trust in the vaccine, fear of side effects, reluctance among the close relative of the staff member to get vaccinated, preexisting medical conditions such as lupus, newness of vaccine, personal preference not to be vaccinated, and even some staff stating they did not want to be COVID-19 "guinea

pigs", inadequate information on how COVID-19 vaccine works, arguments based on their religious beliefs, suspicion about a vaccine that was available in what they believe was "too short" period of time, not enough research on it and wanting to wait and see what would happen (Figure 3).

**Figure 3. Reasons Given for COVID-19 Vaccine Hesitancy among Staff of Long-Term Facilities, Houston, Texas, 2021**




Source: Houston Health Department assessment.

## Discussion

Our findings of less than 40% of staff of LTCF vaccinated by 2021 were surprising, as we expected 100% vaccination coverage for all eligible residents (seniors/elderly) and workers at LTCF; given the need to promptly halt on-going transmission in those high-risk settings, the high government priority given to the vulnerable population, and guidelines and recommendations issued by CDC at the time of the assessment. It should be noted that this study was conducted early 2021, about two months after emergency use authorization was granted for the newly designed vaccine in the United States. Also, surprisingly a smaller proportion of the staff of small and medium-scale facilities reported vaccine hesitancy than that of large-scale facilities.

The scientific literature has shown reduced hesitancy with mass roll-out of vaccines and increased trust overtime, as the toll of COVID pandemic became evident [8]. The United States adult population vaccine acceptance rates experienced inconsistent changes over the first year of the pandemic, 2020, across states and subgroups. For example, between April 1–14 and November 25–December 8, 2020, the vaccine acceptance rate declined from 74% to 56% [9]. Another national representative survey showed a longitudinal decline of 10.8% points in the vaccine hesitancy between October 2020 and March 2021 [8].

Vaccine hesitancy is a complex problem attributable to many underlying factors that change across time and communities [10]. In our study population, the commonest reasons given for vaccine hesitancy by staff of the assisted living facilities were fear of side effects and re-stating falsehoods propagated on the internet. The COVID-19 pandemic will be remembered as a period when fake news and misinformation was spread across news media and social media platforms. The reasons given by the staff of LTCF in Houston, Texas in 2021 mirrors the fears and distrust propagated through the internet and certain formal media outlets. Carrieri V *et al*., in their study on vaccine hesitancy and fake news established a causal link between misinformation on measles-mumps-rubella vaccine and a decline in vaccination rate in Italy [11].

Previous research has shown similar reasons for vaccine hesitancy to include fear of side effects, inadequate information, short duration of immunity, alongside lack of insurance or financial resources [12,13]. Other researchers have also shown that safety and effectiveness were the most important determinants of vaccine hesitancy [14] while in some marginalized settings, dissatisfaction with the health system owing to past experiences of discrimination, systematic racism deterred them from vaccination [15]. Other correlates of vaccine hesitancy in the general US population as studied by other researchers include gender, age, race, socioeconomic status, and educational level. Women are known to have lower intentions than men to be vaccinated with self-reported likelihood of getting COVID-19 vaccine being lower among females than males (51 vs. 62%) [8,12]. This may partly explain the high

hesitancy rates found in this study as female constitute majority of staff working at the assisted living facilities assessed.

## Conclusion and Recommendations

The levels of COVID-19 vaccine availability and uptake of the COVID-19 uptake by the patient population increased with the size of the facilities. However, vaccine uptake by the staff, who are expected to have better understanding of the benefits of vaccination as healthcare providers, remained poor across all the facilities irrespective of the vaccine availability levels. The top commonest reasons for vaccine hesitancy are similar to findings from previous studies in the USA. The Houston Health Department with support from CDC and non-governmental agencies developed information, education and communication tools and initiated the Project Firstline to provide LTCF staff with needed strategies for COVID-19 infection prevention and control, tackle vaccine hesitancy and improve uptake. The Huston Health Department also activated mobile vaccine teams to provide vaccination at the doorsteps of facilities yet to receive their allocated doses.

## Acknowledgement

Deep appreciation to all staff members who supported the assessment from planning, designing, actual on-site visitations, daily field logistics support, data management and report writing. This work was supported by fundings available to the Houston Health Department through the CARES Act (ELC Enhancing Detection Expansion Grant). The contents however are those of the authors and do not necessarily represent the official views of, nor an endorsement, by the US Department of Human and Health Department (HHS), US Centers for Disease Prevention and Control (CDC), Houston Health Department (HHD) or the U.S. Government.

## Declaration of Conflict of Interest

Authors do not have any conflict of interest associated with this publication and no significant financial support that could influence its outcome.

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