

# Special Report

## Initial Clinical Laboratory Response to COVID-19: A Survey of Medical Laboratory Professionals

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### ABSTRACT

**Objective:** To explore the experiences of medical laboratory professionals (MLPs) and their perceptions of the needs of clinical laboratories in response to COVID-19.

**Methods:** We surveyed laboratory professionals working in United States clinical laboratories during the initial months of the pandemic.

**Results:** Overall clinical laboratory testing and overtime work for laboratorians decreased during the first months of the pandemic. Laboratory professionals reported better or unchanged job satisfaction, feelings toward their work, and morale in their workplace, which were related to healthcare facility and laboratory leadership response. They

reported receiving in-kind gifts, but no hazard pay, for their essential work. Important supply needs included reagents and personal protective equipment (PPE).

**Conclusion:** The response by healthcare facilities and laboratory leadership can influence MLPs job satisfaction, feelings toward their work, and laboratory morale during a pandemic. Current COVID-19 laboratory testing management, in the absence of sufficient reagents and supplies, cannot fully address the needs of clinical laboratories.

**Keywords:** COVID-19, laboratory personnel, health workforce, clinical laboratory services, management/administration, occupational safety

The transmission of the novel coronavirus SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), which is the causative agent of the coronavirus disease 2019 (COVID-19), is a worrisome possibility in health care settings.<sup>1</sup> Because of the risk for health care workers becoming ill or having to take time off to provide care to sick relatives, the Centers for Disease Control and Prevention (CDC) issued strategies to reduce potential staffing shortages of health care personnel (HCP), such as identifying additional personnel to work in case of shortages and establishing testing

and tracking protocols.<sup>2</sup> During this ongoing crisis, the concerns of HCPs for their health and safety are heightened by the lack of personal protective equipment (PPE) and limited laboratory-testing resources.<sup>3</sup> Although testing is required to secure a diagnosis, increased demand and shortages of basic necessities, such as test kits, reagents, and supplies, were some of the main concerns during the first months of the pandemic.<sup>3,4</sup>

### Abbreviations:

SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; COVID-19, coronavirus disease 2019; CDC, Centers for Disease Control and Prevention; HCP, health care personnel; PPE, personal protective equipment; MLPs, medical laboratory professionals; US, United States; ASCP, American Society for Clinical Pathology; CAP, College of American Pathologists; ASCLS, American Society for Clinical Laboratory Science; CLS/MLS/MT, Clinical Laboratory Scientist/Medical Laboratory Scientist/Medical Technician; HEROES, Health and Economic Recovery Omnibus Emergency Solutions

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At the intersection between adequate diagnostic testing and HCP shortages are medical laboratory professionals (MLPs). They are key actors within the health care team who provide essential testing of biomarkers that aid in the detection, diagnosis, and treatment of diseases, as well as facilitating efforts to monitor health and engage in disease prevention.<sup>5</sup> Staffing shortages of MLPs were severe before the COVID-19 pandemic.<sup>6</sup> The vacancy rates in United States (US) medical laboratories rose from 7.2% in 2016 to 8.6% in 2018, as reported by the American Society for Clinical Pathology (ASCP) Vacancy Survey. Also, hiring of qualified laboratory professionals and rates of burnout among individuals working in the clinical laboratory were the top concerns for staffing of laboratories.<sup>7-9</sup>

Shortages of clinical laboratory resources and trained staff members can have a critical impact in providing a sufficient response during a pandemic.<sup>10,11</sup> Previously, the College of American Pathologists (CAP) reported the clinical-laboratory response to the H1N1 pandemic by surveying at the laboratory level. Also, the Medical Laboratory Observer annual survey and ASCP satisfaction and burnout survey have documented individual satisfaction and perception of staff shortages among MLPs.<sup>11–13</sup> However, at present, little is known about the practice conditions of HCP on the front lines, particularly the individual perceptions and needs of MLPs associated with the COVID-19 response. We designed and implemented a survey to explore the self-reported practices and experiences of MLPs, and to document their perceptions of the needs of clinical laboratories at the start of the pandemic.

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## Materials and Methods

This was a cross-sectional, anonymous, web-based survey of MLPs between April 29, 2020, and May 31, 2020. To recruit participants, we posted invitation messages in online forums and social media, and shared them with professional contacts and groups in which laboratory professionals receive communications. Our main source of recruitment was the membership of the American Society for Clinical Laboratory Science (ASCLS), which had more than 6,800 active members at the time of the study.<sup>14</sup> Only the data for individuals who provided informed consent was included in the sample. The inclusion criteria for the survey were that participants self-identify as a current employee of a clinical laboratory whose usual employment involved participating in the diagnostic laboratory process performing and providing results of clinical laboratory tests using human specimens. The instrument gathered demographic data about participants and their workplace using 32 closed-ended questions, with 8 questions containing branching that allowed for optional open-ended responses. Quantitative responses and demographic information collected were summarized with basic descriptive statistics, and statistical analyses were performed using STATA software, version 16.1.<sup>15</sup> Qualitative responses have been analyzed and will be presented separately. Individuals who completed the survey could opt in to participate in a drawing for the chance to win one of four \$50 gift cards. This project was

approved by the institutional review board at the University of Kansas Medical Center.

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## Results

There were 233 returned surveys, 178 (76.4%) of which were from participants who met inclusion criteria and completed the main instrument.<sup>16</sup> Average survey time was 17.83 minutes (minimum = 4.00; maximum = 229.00; SD = 25.6) excluding one participant who completed the survey during a period of multiple days (1219 minutes).

Demographic data collection on the 178 respondents varied with some answering one or few, but not all, questions. Survey participants were predominantly female and white, and their geographic location was heterogeneously spread across the main regions of the contiguous United States, with 39 states represented ([Supplemental Tables S1 and Table S2](#)). The mean age of respondents was 42.9 years ( $n = 177$ ; minimum = 21.0; maximum = 73.0), and average time in practice was 16.3 years (minimum <1.0; maximum = 47.0; [Supplemental Table S3](#)).

When asked about their current position, respondents reported a mean time in their current role of 6.4 years (minimum <1.0; maximum = 39.0) working, on average, 8.6 hours per shift (minimum = 4.0; maximum = 13.0); most of them worked the day shift ([Supplemental Table S4](#)). Respondents self-reported their position title, which yielded 105 distinct entries. We grouped these titles into categories using terminology from the US Bureau of Labor Statistics Occupational Outlook Handbook and other resources.<sup>17–20</sup> Most respondents were classified as CLS/MLS/MT (Clinical Laboratory Scientist/Medical Laboratory Scientist/Medical Technician), and more than one-third of respondents indicated the laboratory role/area associated with their position was generalist/core ([Supplemental Table S5 and Table S6](#)).

Most respondents reported bachelor's degree as their highest level of education (65%), and more than 78% of them also indicated at least 1 type of national credential, with most holding MLS(ASCP) certification ([Supplemental Table S7 and Table S8](#)). We received 139 responses from MLPs who reported membership with ASCLS, and some of them concurrently or solely held memberships from other professional laboratory societies ([Supplemental](#)

**Table S9).** The proportion of respondents working in a hospital clinical laboratory was 93%, with 33% of them working at hospitals with more than 500 beds (**Supplemental Table S10**).

## Changes in Workload

Survey results showed a statistically significant difference between overtime work before and during the first months of the pandemic  $\chi^2(4, N = 178) = 35.55, P < .001$ ; All chi square values are given in the format:  $\chi^2$  (degrees of freedom,  $N =$  sample size) = chi-square statistic value,  $P = P$  value. Overall, 73.0% of MLPs reported working overtime at least once a month before the declaration of the COVID-19 pandemic by the CDC, with most reporting working overtime between 1 and 3 times a month (**Table 1**). After the pandemic was declared, overall reports of overtime work dropped to 57.9%. We were intrigued to discover that the proportion of respondents who said they worked overtime almost every day before the pandemic was 3.4% but during the first months of the pandemic, daily overtime work increased to 13.5%. On further analysis, there was statistically significant evidence ( $P < .05$ ) of differences in overtime worked before and during the pandemic by area of the laboratory  $\chi^2(6, n = 27) = 14.46, P = .03$ , hospital size  $\chi^2(3, n = 30) = 10.89, P = .01$ , shift worked  $\chi^2(3, n = 88) = 8.58, P = .03$ , and education level  $\chi^2(3, n = 85) = 8.18, P = .04$  (**Supplemental Table S11**).

Changes in workload were reported during the COVID-19 response, with 71.4% of respondents indicating that workload in the laboratory had decreased, 5.6% reporting no change, and 23.0% reporting that workload had increased (**Supplemental Table S12**). We noted that there

was a statistically significant relationship between reports of decreased overtime work by MLPs and reports of a drop in workload early during the pandemic  $\chi^2(2, n = 178) = 21.55, P < .001$ .

## Satisfaction, Morale, and Incentives

During the first months of the pandemic, 49.0% of MLPs reported improved satisfaction, with 54.0% reporting feeling better about their job, and 39.0% saying the morale was good in the laboratory. The relationship between reported positive satisfaction and perceived good morale in the workplace was statistically significant ( $t = -5.8610; P < .001$ ). **Figure 1** shows the ratings of questions asking about satisfaction, feelings about work, morale, and response by their facility and laboratory leadership to the health emergency.

Perceptions of how well hospitals and laboratory leadership responded to the COVID-19 pandemic were related to participant ratings of job satisfaction, feelings toward work, and morale in their laboratory (**Table 2**). When participants rated their job satisfaction as better than before the pandemic, 86.0% of them also rated the response to the COVID-19 crisis by their hospital or health care facility as good. For those workers who said job satisfaction was worse, only 61.7% rated the response by their hospital as good. The relationships between job satisfaction and facility response were significant  $\chi^2(2, n = 133) = 13.19, P = .001$ . Similarly, MLPs who rated job satisfaction as better than before considered the response by the laboratory leadership as good 82.6% of the time, but only 55.3% of MLPs who rated job satisfaction as worse said the response by their leadership was good  $\chi^2(2, n = 133) = 11.64, P = .003$ . With respect to MLPs reporting better feelings toward their work, 82.3% said the response by the health care facility was good, but when workers said feelings toward their work were worse, only 58.3% rated the response by their facility as good  $\chi^2(2, n = 132) = 10.55, P = .005$ .

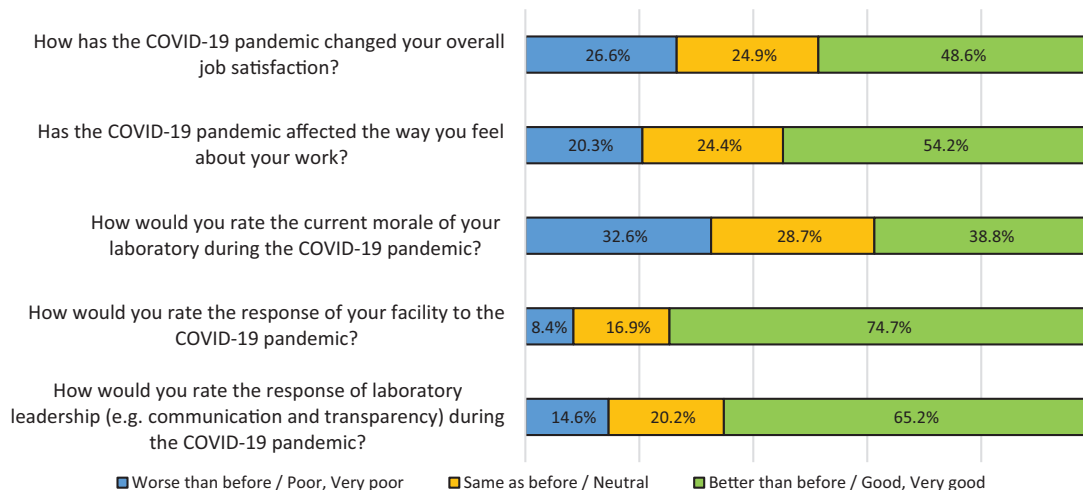
Further, when participants reported the morale in the laboratory where they worked as being good, 88.4% said the response to the COVID-19 crisis by their health care facility was good and, among workers who said morale in their laboratory was poor, only 67.2% rated the response

**Table 1. Overtime Work Before and During the COVID-19 Pandemic**

Overtime	No. (%) <sup>a</sup>	
	Before Pandemic	During Pandemic
Reports overtime work		
Between 1 and 3 times a month	72 (40.4%)	43 (24.2%)
Once a week	22 (12.4%)	9 (5.1%)
Between 2 and 4 times a week	30 (16.9%)	27 (15.2%)
Almost every day	6 (3.4%)	24 (13.5%)
Any overtime	130 (73.0%)	103 (57.9%)
No overtime	48 (27.0%)	75 (42.1%)
<b>Total</b>	<b>178 (100%)</b>	<b>178 (100%)</b>

<sup>a</sup>Percentages may not total 100% because of rounding.

**Ratings of satisfaction, morale and the response to the COVID-19 emergency by hospital/healthcare facility and laboratory leadership (n=178)**



**Figure 1**

Ratings by participants of job satisfaction, feelings about work, workplace morale, and response by facility and laboratory leadership where they work during COVID-19.

**Table 2. Laboratory Professionals Ratings of Hospital/Health Care Facility and Laboratory Leadership Response<sup>a</sup>**

Facility Response	Job Satisfaction <sup>b</sup>			Feelings Toward Work <sup>c</sup>			Workplace Morale <sup>d</sup>		
	Worse	Better	Total	Worse	Better	Total	Poor	Good	Total
Poor	10 (21.3%)	3 (3.5%)	13 (100%)	8 (22.2%)	5 (5.2%)	13 (100%)	10 (17.2%)	2 (2.9%)	12 (100%)
Neutral	8 (17.0%)	9 (10.5%)	17 (100%)	7 (19.4%)	12 (12.5%)	19 (100%)	9 (15.5%)	6 (8.7%)	15 (100%)
Good	29 (61.7%)	74 (86.0%)	103 (100%)	21 (58.3%)	79 (82.3%)	100 (100%)	39 (67.2%)	61 (88.4%)	100 (100%)
<b>Total</b>	<b>47 (100%)</b>	<b>86 (100%)</b>	<b>133 (100%)</b>	<b>36 (100%)</b>	<b>96 (100%)</b>	<b>132 (100%)</b>	<b>58 (100%)</b>	<b>69 (100%)</b>	<b>127 (100%)</b>
<b>Leadership Response</b>									
Poor	10 (21.3%)	6 (7.0%)	16 (100%)	7 (19.4%)	12 (12.5%)	19 (100%)	14 (24.1%)	3 (4.4%)	17 (100%)
Neutral	11 (23.4%)	9 (10.5%)	20 (100%)	8 (22.2%)	11 (11.5%)	19 (100%)	20 (34.5%)	6 (8.7%)	26 (100%)
Good	26 (55.3%)	71 (82.6%)	97 (100%)	21 (58.3%)	73 (76.0%)	94 (100%)	24 (41.4%)	60 (87.0%)	84 (100%)
<b>Total</b>	<b>47 (100%)</b>	<b>86 (100%)</b>	<b>133 (100%)</b>	<b>36 (100%)</b>	<b>96 (100%)</b>	<b>132 (100%)</b>	<b>58 (100%)</b>	<b>69 (100%)</b>	<b>127 (100%)</b>

<sup>a</sup>Percentages may not total 100 because of rounding.

<sup>b</sup>n = 133.

<sup>c</sup>n = 132.

<sup>d</sup>n = 127.

by their hospital as being good  $\chi^2 (2, n = 127) = 9.89, P = .007$ . Likewise, when respondents rated workplace morale as being good, they considered the response by the laboratory leadership as being good 87.0% of the time. In contrast, MLPs who rated the morale in their laboratory as being poor also rated the response by laboratory leadership as being only 41.4% of the time  $\chi^2 (2, n = 127) = 29.35, P < .001$ .

Also, we captured information associated with incentives received during the COVID-19 response. The proportion of participants who said they had received pay increases or hazard pay for work during the early months of the COVID-19 response was 5.1%. However, 82.0% of participants indicated they received in-kind incentives in appreciation of their work. A total of 64.0% said they received free meals and 50.0% reported

receiving thank you emails or cards at their workplace (Supplemental Table S13).

### Impact on Workplace and Laboratory Needs

When asked if there had been changes in staffing conditions at their laboratory, 35.9% responded affirmatively, including 64 reports of staff being reassigned to other areas and 11 instances of staff being hired temporarily (Supplemental Table S14). When asked if cost-reduction measures (eg, reduction in work hours, being furloughed, or being laid off) had been applied at their workplace, 61.2% of participants reported such changes. Bivariate analysis assuming equal variances showed that reports of cost-reducing measures were higher for individuals who reported a poor response to COVID-19 by their hospital or health care facility ( $t = 2.9308$ ;  $P = .004$ ).

Most of the MLPs surveyed reported they were not worried about contracting the COVID-19 virus at their workplace (59.5%). Two-thirds of respondents said their laboratory allowed for proper social distancing per CDC guidelines, and 94.9% of them said that their facility had policies regarding face covering (Supplemental Table S15).

Regarding laboratory-testing capacity and methodologies, 36.0% of laboratory professionals reported that existing methods were revalidated, and 36.5% reported that new instruments were acquired for COVID-19 testing (Supplemental Table S16). Table 3 shows the variety of testing options reported by participants. Respondents conveyed that 75.3% of test results for COVID-19 were reported out of the laboratory to clinicians and patients within 2 days, with 11.2% reporting test results in 3 to 4 days and

1.7% reporting test results in 5 days or more (Supplemental Table S16).

When asked whether there were any restrictions placed on COVID-19 testing at their facility, 61.2% of participants stated there were. Table 4 shows the types of testing restrictions that were reported by respondents. Finally, when asked about necessary laboratory equipment that they considered to be in short supply or causing problems when trying to perform COVID-19 testing, most respondents said that PPE and reagents for testing were the most pressing needs for the laboratory. Table 5 shows the breakdown of supply needs.

Multivariate logistic regressions (with robustness estimator) were calculated for worse satisfaction, worse feelings toward work, and worse morale during the pandemic, using incentives, ability to socially distance, facility and laboratory leadership response, the provision of COVID-19 testing in-house, and overtime work before and during the COVID-19 pandemic (Supplemental table S17). The results of these analyses indicated that, for MLPs who rated the response by facility leadership as being poor, the odds of reporting worse satisfaction were 8 times higher than for those who said the facility leadership response was not poor (OR, 8.647; 95% CI, 2.127–35.146). Similarly, for MLPs indicating poor response by facility leadership, the odds of reporting worse feelings toward work were 13.6 times higher (13.617; 3.368–55.062), and the odds of reporting worse morale in the laboratory were almost 4 times higher (3.96; 1.224–12.813), compared with those indicating that the response was not poor. Moreover, for MLPs that worked overtime before the COVID-19 pandemic, the odds of reporting worse morale in their laboratory were 6 times higher (6.008; 1.518–23.778) than for MLPs who did not report working

**Table 3. Types of COVID-19 Tests Available**

Response to Survey Question “What testing methodologies are available at your facility for COVID-19 testing? (Check all that apply)”	No. (%) of Responses <sup>a</sup>
In house testing using molecular amplification by RT-PCR	105 (32.9%)
In house testing using rapid antigen by nucleic acid testing	33 (10.4%)
In house testing using serology by ELISA	18 (5.6%)
In house testing using serology by rapid immunochromatography	13 (4.1%)
Specimen collection for molecular methods, tests sent out to reference laboratory	80 (25.1%)
Specimen collection for all methods, tests sent out to reference laboratory	46 (14.4%)
No specimen collection or testing for COVID-19 at all in this facility	2 (.6%)
Unsure/do not know/does not report	22 (7.0%)
<b>Total</b>	<b>319 (100%)</b>

COVID-19, coronavirus disease 2019.

<sup>a</sup>Percentages may not total 100 because of rounding.

<sup>b</sup> $n = 178$ .

**Table 4. Restrictions to COVID-19 Testing by Patient Status<sup>a</sup>**

<b>Response to Survey Question “From the following list, which options describe restrictions to COVID-19 testing at your facility? (Please mark all that apply)”</b>	<b>No.(%) of Responses<sup>b</sup></b>
<b>Inpatient</b>	
No restrictions applied to COVID-19 testing	33 (10.0%)
Only patients who met CDC’s COVID-19 risk factors are tested <sup>a</sup>	56 (16.9%)
Unsure/do not know/does not report	12 (3.6%)
<b>Outpatient</b>	
No restrictions applied to COVID-19 testing	5 (1.5%)
Only patients who met CDC’s COVID-19 risk factors tested <sup>a</sup>	68 (20.5%)
Only patients being admitted with COVID-19 symptoms tested <sup>a</sup>	27 (8.2%)
Unsure/do not know/does not report	9 (2.7%)
<b>Health Care Professionals</b>	
No restrictions applied to COVID-19 testing	11 (3.3%)
Only staff who were in contact with people who tested positive	31 (9.4%)
Only staff who showed COVID-19 symptoms/fulfilled risk factors <sup>a</sup>	60 (18.1%)
Unsure/do not know/does not report	19 (5.7%)
<b>Total reported restrictions</b>	<b>331 (100%)</b>

COVID-19, coronavirus disease 2019; CDC, Centers for Disease Control and Prevention.

<sup>a</sup>n = 178.

<sup>b</sup>COVID-19 symptoms and risk factors according to CDC guidelines.

**Table 5. Shortages of COVID-19 Testing Supplies and Equipment**

<b>Response to Survey Question “Which of the following resources would you say are in short supply or cause problems when trying to perform COVID-19 testing? (Please mark all that apply)”</b>	<b>No. (%) of Responses<sup>a</sup></b>
Instrumentation capacity	55 (16.6%)
PPE inventory	73 (22.0%)
Reagents for quality control	31 (9.4%)
Reagents for testing	90 (27.2%)
Other	42 (12.7%)
Unsure/do not know/does not report	40 (12.1%)
<b>Total reported supply shortages</b>	<b>331 (100%)</b>

COVID-19, coronavirus disease 2019; PPE, personal protective equipment.

<sup>a</sup>n = 178.

overtime before the pandemic. In contrast, having received a gift/recognition at work reduced the odds of reporting worse feelings toward work by 68.5% (0.315; 0.114–0.867), and performing tests for COVID-19 in-house reduced the odds of reporting worse morale in the laboratory by 55.4% (0.446; 0.175–1.134).

## Discussion

This survey study captures the firsthand experiences of MLPs before and during the initial response to the COVID-19 pandemic. It documents the emotions of MLPs toward

their work, their perceptions on how well their workplace has adapted to the pandemic, and their knowledge of the supply needs of clinical laboratories as they respond to COVID-19.

Despite a 20.8% reduction in reported overall overtime work, 57.9% of MLPs were working overtime during the first months of the pandemic, which provides evidence that shortages in the workforce continue to be a concern, as reported in previous years.<sup>8</sup> The immediate impacts of COVID-19 to laboratory workload were a reduction of overall testing and a general reduction in staff overtime.

One study looking at diabetes management during COVID-19 indicated that approximately 65% of clinicians

in the United States were worried about keeping their practices open due to low volume of reimbursable work, with visits for chronic care of asymptomatic patients down by 50%.<sup>21</sup> Fewer routine and preventive health services and cancellations of elective procedures may explain why certain areas of the laboratory experienced decreased volumes of testing. We were intrigued to find that the proportion of MLPs reporting overtime work daily after the pandemic declaration increased from 3.4% to 13.5%. This finding may have been related to overtime work for individuals involved in managing COVID-19 testing. The detection of the SARS-CoV-2 virus depends heavily on molecular diagnostics. These specialty tests require qualified professionals to implement tests and process specimens using sophisticated equipment and complex diagnostic instrumentation.<sup>22</sup> The other areas of the laboratory that reported an increase of everyday overtime included core/generalist, microbiology, and administration. The lattermost is particularly responsible for selection, validation, and preparation of test guides and documentation when a new viral test, such as the one for SARS-CoV-2, becomes part of the laboratory testing menu, which may have also impacted the increase reports of daily overtime work.<sup>23,24</sup>

MLPs reported increased or unchanged satisfaction with their job, rating the morale in their workplace as being better or unchanged. However, earlier literature<sup>12</sup> reports that 88% of MLPs are somewhat or very satisfied with their job, which suggests that reported job dissatisfaction may have doubled during the first months of the pandemic. Job satisfaction, feelings toward work, and perceived morale in the workplace were affected by the response to the pandemic by the administration particularly at the health care facility level. Further, those who were already working overtime before the pandemic were more likely to report that the morale in their laboratory worsened after the pandemic was declared.

Working in a positive laboratory environment can help employees feel efficient and can satisfy their need for professional fulfillment. Some management strategies that can be helpful during high-workload times include increased communication (constantly updating laboratory workers on the situation as it unfolds), keeping an open dialogue, and allowing input from MLPs during organizational decision-making.<sup>25</sup>

The Maslow Hierarchy of Needs indicates that a sense of professional accomplishment can be attained when

workers receive recognition for their achievements, and that feelings toward work can also be influenced by perceptions of value and adequate compensation for the work performed.<sup>26</sup> Although the Centers for Medicare and Medicaid Services reportedly doubled the reimbursement for COVID-19 testing, this increase in reimbursement did not seem to provide monetary compensation for MLPs.<sup>24</sup> As testing for COVID-19 increased exponentially through the summer of 2020, the House of Representatives passed H.R. 6800, the Health and Economic Recovery Omnibus Emergency Solutions (HEROES) Act, which would help employers provide premium pay for essential workers.<sup>27</sup> The Heroes Act in its original form did not make it out of committee in the Senate, and was reintroduced as H.R. 8406 in September of 2020 followed by a companion senate bill (S. 4800), but neither bill received a vote in the 116th Congress.<sup>28</sup> Despite the lack of additional pay, many MLPs reported receiving recognition through in-kind gifts and messages of support for their work. We found that these gifts contributed to MLPs reporting positive feelings about their work.

The changes to laboratory staff in response to the COVID-19 pandemic were considerable, with many respondents reporting cost-reducing measures being implemented; however, others reported reassignments and temporary hiring of laboratory personnel. During the H1N1 epidemic, 16% of clinical laboratories surveyed by CAP reported staffing shortages, and approximately 6% indicated they had increased staffing to address testing needs; however, almost 90% of laboratories reported that the surge in testing did not impact patient care.<sup>11</sup> It is too early to know whether the COVID-19 pandemic will have a similar or different effect on clinical laboratories.

The use of universal precautions and strategies to mitigate transmission of the virus among HCPs is the first line of defense for essential workers.<sup>2</sup> Policy changes to establish protections against coronavirus transmission within the laboratory, as reported by participants, seemed to follow CDC guidelines regarding recommendations for use of a face covering.<sup>2</sup> However, according to our survey findings, more than one-third of respondents were unable to maintain the recommended physical separation while at work. Laboratories are usually closed spaces with no windows, which decreases opportunities for spatial distancing and for adequate ventilation. Even with new policies and procedures in place, 40.5% of MLPs were concerned that they may become exposed to COVID-19 through workplace transmission.

We discovered that performing COVID-19 testing in-house, whether by incorporating new methodologies or revalidating existing methods, contributed to reports of better morale in clinical laboratories. MLPs have demonstrated a capacity to adapt by readily incorporating tests for an emerging disease to their repertoire and drastically modifying their work output to produce millions of test results for COVID-19 daily during a global crisis.<sup>29</sup> We find that test results for detection of SARS-CoV-2 were reportedly produced quickly, matching reports of increased testing despite the lack of adequate supplies and regardless of any guarantee that testing would be appropriately funded.<sup>24,29,30</sup>

As evidenced by our data, what worried MLPs the most was the availability of essential supplies to allow them to continue producing needed test results. Another factor to consider was the implementation of restrictions on SARS-CoV-2 tests, including testing only people who displayed symptoms and those who had come in close contact with someone with confirmed infection, among others.<sup>31</sup> In response to the H1N1 influenza pandemic of 2009, the CDC issued restrictive guidelines after experiencing a 100% surge over the usual influenza testing.<sup>11</sup> Our findings, which show that most testing was reserved for patients or health care professionals who had certain risk factors at the start of the pandemic, indicate that early implementation of testing restrictions may have helped manage the scaling up of COVID-19 testing. Notwithstanding these restrictions, the results of a survey of CLIA-certified laboratories found that scarcity of supplies for all types of testing continues to persist, particularly of commercial testing kits and consumables.<sup>32</sup>

This was an observational, cross-sectional study and thus possesses limitations inherent to its design. Due to the use of purposive sampling through professional organizations, our findings are not generalizable. People who belong to professional societies are already motivated to volunteer their time on behalf of the profession and participate in surveys, and their opinions may not represent all the viewpoints of MLPs.<sup>33</sup> The survey completion rate was low, representing approximately 2% of total ASCLS membership.

Some strengths include that this study provided person-level data from MLPs working in diverse geographical areas in the United States and a variety of clinical laboratory specialties. It also allowed for individual laboratory professionals to express the impact that COVID-19 was having on

their work environment in real time, compared with a few months earlier, before the pandemic was declared. More research is needed to measure longitudinal changes during this unprecedented surge in the need for adequately trained laboratorians and sufficiently equipped clinical laboratory services.

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## Conclusion

Our study identified key changes experienced by medical-laboratory professionals during the initial months of the SARS-CoV-2 outbreak. CDC policies are meant to control spread of COVID-19 in the workplace. However, these policies did not address continued laboratory staffing shortages or reduce demands on existing staff members to incorporate new SARS-CoV-2 detection technologies into the testing menu. Further, public health guidelines cannot fully address concerns about safe social distancing in clinical laboratories, and many MLPs fear they may become ill with COVID-19 through exposure at work. Positive ratings for the response to the pandemic by health care facilities and laboratory leadership influenced MLP job satisfaction, feelings toward their work, and laboratory morale.

Although MLPs receiving in-kind gifts and recognition at their workplace influenced positive feelings toward their work, laboratories reportedly implemented cost-reducing measures and appeared unable to provide monetary compensation to MLPs. This circumstance may be due to lack of relief funds from the government and concerns about reduced revenue associated with a drop in the provision of routine health care services, which are issues that are likely to continue in the next few months, even as the COVID-19 vaccination campaign gets underway.

Finally, policies to limit test utilization for COVID-19 may have helped manage a surge in diagnostic laboratory testing. When a pandemic is ongoing, we need not only trained scientists but also individuals who possess the knowledge and flexibility to perform complex clinical laboratory tests for the purpose of diagnosis and treatment, quickly and on a massive scale. However, test management and an able workforce, in the absence of a federally coordinated distribution of necessary reagents and supplies, cannot fully address the increased demand for COVID-19 tests.



We know that MLPs can readily produce millions of tests very quickly, but the strain placed on laboratory management, including availability of supplies and inability to provide additional pay, can impact MLP job satisfaction, feelings toward their work, and morale at the workplace. Successful management and scaling up of COVID-19 diagnostic testing will remain a challenge for clinical laboratories if shortages of needed resources are not addressed. **LM**

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None reported.

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