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ORIGINAL RESEARCH



## The Impact of COVID-19 on Northeast and Appalachian Loggers

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### ABSTRACT

**Objective:** The Northeast Center for Occupational Health and Safety conducted a survey in December 2020 to understand the impact of the coronavirus disease 2019 (COVID-19) and the Androscoggin Mill explosion among loggers in six states: Maine, New Hampshire, Vermont, New York, Pennsylvania, and West Virginia.

**Methods:** Logger mailing addresses were aggregated with the assistance of state logging organizations. A paper survey, including a self-addressed return envelope was mailed to the loggers in December 2020.

**Results:** The mailed survey had a response rate of 13.3% and captured data on 484 loggers. The majority knew someone (including themselves) who tested positive for COVID-19 (71.9%). Less than half (43%) received employer training about COVID-19 prevention measures, though 73% received some form of COVID-19 personal protective equipment from their employers. The health department, Centers for Disease Control and Prevention (CDC), and health care providers were the most trusted sources of health information. Nearly half acknowledged significant change in their home lives and work responsibilities due to the pandemic. The explosion of the Androscoggin Mill affected the business of 80% of Maine loggers, and 18% of loggers that resided outside Maine.

**Conclusion:** The lessons learned can be used to enhance trust in public health institutions and future public health response to this unique occupational group.

### KEYWORDS

Loggers; maine; COVID-19; health; safety

## Introduction

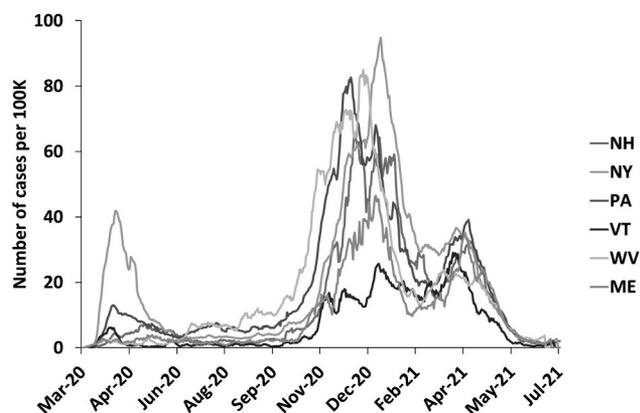
Logging remains one of the most hazardous industries in the United States, despite many safety improvements made in the last decades. In 2019, logging was the second most fatal civilian occupation in the United States, with a fatality rate of 68.9 per 100,000 full-time employees.<sup>1</sup> This rate is almost 20 times higher than the all-worker fatality rate of 3.5 per 100,000.<sup>1</sup>

From late 2018 to mid-2020, the Northeast Center for Occupational Health and Safety in Agriculture, Forestry, and Fishing<sup>2</sup> collected data on health and risk exposures for Maine loggers through quarterly surveys and in-person health screenings. The study's purpose was to close the knowledge gap about non-fatal health and safety issues facing this work population. Baseline results indicate that Maine loggers work long days with long commutes to remote locations, resulting in a lack of time and access to services that could facilitate healthy living.<sup>3</sup> Loggers may also be at

higher risk of cardiac issues, as evidenced by elevated rates of hypertension, obesity, and risk factors for obstructive sleep apnea.<sup>2</sup>

During that study's time, COVID-19 exploded onto the world's stage. COVID-19 is the most significant health event the majority of us have seen in our lifetime. On March 11, 2020 the World Health Organization (WHO) declared the coronavirus COVID-19 a global pandemic.<sup>4</sup> Various Northeast states declared states of emergency between March 4 (West Virginia) and March 16 (Vermont) and lockdowns, also known as stay at home orders, were issued from March 22 (New York) to April 2 (Maine).<sup>5</sup>

By March 31, 2021, the total number of COVID-19 cases in the United States (U.S.) was 30,213,759, with deaths from the virus totaling 548,162 people.<sup>6</sup> On that last day in March, the U.S. death rate was 165 per 100,000 people, and newly diagnosed cases remained high at over 62,000.<sup>6</sup> The CDC provides state-based statistics



**Figure 1.** New cases of COVID-19 per 100,000 people, reported to CDC, in surveyed logger states as of July 18, 2021.

Source: Prevention 2021.

on transmission and death rates related to the coronavirus pandemic. **Figure 1** provides data available as of March 31, 2021, for each of the states that took part in this survey.<sup>6</sup> It is worth noting that since that period, the Delta and Omicron variants continued to have a significant impact, with surges of the Delta variant in August to September 2021, followed by a surge in Omicron from December 2021 to January 2022.<sup>7</sup>

Not surprisingly due to their populations, New York and Pennsylvania had the highest total number of cases, but each state that took part in the survey saw an increase in case rates since the middle of 2020. Although total case numbers have dropped since peaking in the fall 2020, trends appeared to increase once again in the spring of 2021 as shown in **Figure 1**. At the end of March 2021, the number of new cases was

trending upwards for each state that participated in this survey.

Further compounding issues at the beginning of the pandemic, on April 15, 2020, a pulp digester exploded at the Androscoggin Mill in Jay, Maine. No injuries were reported but operations at the mill were severely hampered. Ultimately, 177 of the 500 mill workers were laid off during 2020.<sup>8</sup> The combination of the ongoing slump in the biomass market (1.6 million tons harvested in 2019 compared to 2.2 in 2018), the increase in imports of forest products in 2019 into Maine, the explosion at Jay, and the disruption in industrial paper product markets from the pandemic has significantly affected the pulpwood and biomass markets.<sup>9</sup>

In the interest of understanding the impact of COVID-19 on loggers in the Northeast region, the Northeast Center developed and distributed surveys to loggers in six states: Maine, New Hampshire, New York, Pennsylvania, Vermont, and West Virginia. The objective was to develop a better understanding of what went well, and what did not go well, in the COVID-19 pandemic response. The information is being used to inform policymakers, medical institutions, and logging stakeholders on how to better assist this essential workforce in the future.

## Methods

The survey consisted of 61 questions in six sections, as described in **Table 1**. In recognition of the isolating nature of the pandemic, the COVID-19

**Table 1.** Composition of survey.

Section	Questions	Source for questions	Comments
Demographics	6	Maine logger study survey and FWNA	Not included in version of COVID survey sent to Maine loggers, as these data were already collected
Work role and company info	4	Maine logger study	
Impact of COVID-19	18	FWNA	
Impact of Androscoggin Mill explosion	1		Explosion at paper mill in April 2020 in Maine
Financial well-being	4	Consumer Financial Protection Bureau Financial Well-Being Scale Questionnaire	Used in Maine logger study survey
Personal health and social support	28	RAND 36-Item Short-Form Survey Instrument and RAND Medical Outcomes Survey Social Support Survey Instrument	Used in Maine logger study survey
Total	61		

impact questionnaire included questions about the level and type of social and emotional supports used by loggers. These questions were drawn from the Medical Outcome Study (MOS) Social Support Survey developed by the Research and Development (RAND) Corporation,<sup>10</sup> a validated and reliable survey tool that is used to determine health outcomes in various healthcare settings. The MOS Social Support Survey includes four functional support scales: emotional/informational, tangible, affectionate, and positive social interaction. It uses these to construct an overall functional social support index.

To understand loggers' emotional well-being, respondents were asked four questions relating to how they felt in the previous four weeks. These questions were drawn from the RAND 36-Item Short-Form Survey Instrument Version 1.0 (SF-36 v1.0).<sup>11</sup> Four questions from the SF-36 v1.0 were used to measure fatigue and energy levels during the pandemic.

The financial well-being section of the survey used the Consumer Financial Protection Bureau (CFPB) Financial Well-being Scale to measure how loggers were feeling about their personal financial situation. According to CFPB research, "overall consumers perceive financial well-being as a state of being wherein a person can fully meet current and ongoing financial obligations, can feel secure in their financial future, and is able to make choices that allow them to enjoy life".<sup>12</sup> The pillars of financial well-being include security and freedom of choice over an individual's present and future finances.

The survey was distributed by mail, using a mailing list derived from each state's timber harvesting trade groups. To increase the likelihood that the addressee would open the envelope, fill out the survey and return it, West Virginia University and the Pennsylvania Sustainable Forestry Initiative permitted the use of their logos on the outer envelopes and survey instruments for mailings sent to loggers in their respective states. The Maine loggers also received a customized survey that used the Maine logger health and safety study logo. The Maine survey did not include demographic and work role/company questions because previous surveys collected that information.<sup>1</sup>

Survey information was collected anonymously to encourage more transparent responses. Participants from all states except Maine were offered the opportunity to send in a sheet with a mailing address if they wished to participate in a drawing for \$125 in L.L.Bean gift cards. The address sheet was removed from the survey and placed in a separate folder from the surveys to maintain the anonymity of the responses. For the Maine loggers, each previously enrolled logger received a \$25 L.L.Bean gift card with their blank survey, which was consistent with incentives for the prior Maine surveys.

Completed surveys began arriving in December 2020. Any mail returned with a forwarding address was mailed to the new address until February 1, 2021, after which returned mail was considered a non-response. Data entry collection instruments were designed in REDCap (Research Electronic Data Capture, Vanderbilt University) hosted at the Bassett Healthcare Network.<sup>13,14</sup> Staff were trained on data entry and quality control, which was documented in a data entry manual. Data entry was completed on all surveys returned through the cut-off date of March 12, 2021, when analysis was initiated.

Quantitative analysis for the demographics, work role/company information, and COVID-19 sections was performed in the Statistical Analysis System (SAS) software Version 9.4 (SAS Institute Inc., Cary, NC). Quantitative analysis of the financial well-being and personal health/social support sections was performed in Microsoft Excel 2016 following the scoring methodology of CFPB and RAND. Comparisons for social and emotional support results were calculated for Maine loggers using percent difference. In order to assess the differences between Maine respondents and other states, continuous variables were compared using the t-test and categorical variables were compared by using the Chi-square or Fisher's Exact test. Qualitative analysis of the comments was conducted in NVivo 12 (QSR International). The total number for respondents is listed alongside the results where they differ from the total number of respondents – this was because not everyone answered every question.

## Results

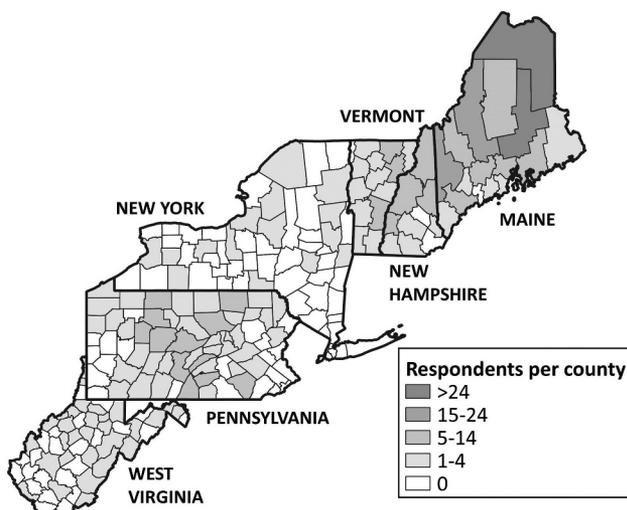
### Demographics of respondents

Of the 3,652 surveys mailed, 484 were returned, for an overall response rate of 13.3%. Table 2 shows the state-by-state response rate, and Figure 2 provides a map of the response rate at the county level.

Of the respondents, 98% were male, and the average age was 50, with the youngest respondent being 19 and the oldest 84. The average household size was 3.2 people, with 42% of respondents having someone aged 18 or younger in the house.<sup>11</sup> The majority (80%, N = 480) of loggers reported working either as sole operators (38%) or in smaller companies with 10 or fewer employees (42%). The others worked for midsize companies with 11 to 50 workers (15%) or large sized companies with 50 or more workers (5%). Most respondents (43%, N = 472) work in conventional logging operations, while 33% do work in mechanized operations. Twenty-four percent (24%) of loggers work in both conventional and mechanized operations. Between operating logging equipment and hand-felling trees, 68%

**Table 2.** Survey response rates by state.

State	Count	Mailed	Response Rate (%)
Maine	154	293	52.6
New Hampshire	37	244	15.2
New York	24	218	11.0
Pennsylvania	167	1685	9.9
Vermont	45	313	14.4
West Virginia	57	899	6.3
Total	484	3652	13.3



**Figure 2.** Logger survey response rates by county.

of respondents said they spend most of the workday felling trees, in addition to administrative tasks, trucking, and equipment maintenance.

### COVID-19 exposure

When asked if they personally knew anyone who had tested positive for COVID-19, almost 6 out of every 10 loggers knew more than two people who had tested positive, and 21 (4%) had tested positive themselves.

### Worksite COVID-19 infection control preparedness

Approximately one in three respondents stated that they work alone (38%, N = 480); as a result, worksite infection control practices were relevant to 62% of loggers who responded. Of those loggers who worked with others, we asked those who were employees about whether their employer supplied personal protective equipment (PPE) specific to controlling the spread of COVID-19: hand sanitizer and a face covering of some kind (cloth face covering, bandana/neck gaiter) or a respirator. Of the 317 who responded, 65% received hand sanitizer and some kind of face covering. Twenty-seven percent (27%) of loggers did not receive COVID-19 PPE from their employers.

To limit the spread of COVID-19, the CDC recommended social distancing by at least 6 feet, wearing a face covering, and washing hands. Loggers were less inclined to wear face coverings when unable to maintain 6 feet of distance from their co-workers. Sixty-two percent said that they never or rarely wore face coverings and 55% noted that their co-workers never or rarely wore face coverings in these situations.

Of loggers, 43% (185 of 428) said that employers or supervisors informed them on how to prevent getting COVID-19. Of the 185 that received employer-based training, some of the training topics that were covered included how to social distance, how long to wash your hands, how to use a respirator or face covering, how to recognize COVID symptoms, and what to do when you have symptoms. Employers used a number of different formats to deliver the training, with the majority (63%) talking with staff and/or providing

an informational sheet (33%). Only a small number (11%) were shown how to use the PPE.

### Daily work

Many (44%) of the survey respondents indicated that the COVID-19 pandemic affected their daily work activities in profound ways, including loss of jobs, loss of workers, loss of market for wood, increased quotas at mills, and significant changes in home life and work responsibilities. A number of loggers switched to tree work, firewood, trucking, machine maintenance, drilling water wells, construction, and other side jobs to make up for the loss in income. Some of these jobs, such as construction, may have brought workers into closer proximity with one another, potentially increasing their risk of exposure to Covid-19.

Sentiments about how the pandemic affected their daily operations focused on business changes including how they interacted with customers and landowners

I have not been able to run my business and have not worked for two months. My two employees are on unemployment, which is very hard on them. I still don't know whether or not I will continue my business.

In my line of work, there are always financial struggles, but since the COVID-19 pandemic, the struggle has been constant. Putting food on the table has been a literal and constant struggle.

When meeting with landowners spacing makes it harder to communicate with them. Some 40 have canceled altogether the cut.

### Health

When asked, "Where do you find reliable health information?" the results were mixed. Over one out of three (39%) of respondents selected the Department of Health (DOH) and/or CDC, as well as their own healthcare providers, as reliable information sources. These two public health sources were followed closely by television/radio (36%) and internet research (30%). One-quarter of respondents looked to friends and relatives as a source of reliable health information. A little more than 14% of respondents selected social media as a reliable health information source.

Employers and trade journals/newsletters were least relied on for health information.

Of the 484 loggers that answered questions about at-risk conditions relating to COVID-19, less than two percent (2%) have kidney disease, and less than six percent (6%) indicated that they have asthma. However, over 30% of the respondents reported that they have hypertension, a significant risk factor in COVID-19 disease. Sixty-six percent of loggers indicated nothing would stop them from getting medical care during the pandemic. However, one in five (20%) respondents indicated that fear of getting coronavirus in the healthcare facility would stop them from getting medical care during the pandemic. Other issues, including no medical insurance, no sick days at work, and not being able to afford medical expenses, were reported as factors that would prevent loggers from seeking care.

Mental health issues related to the pandemic have been felt on a community-wide basis (Figure 3). Sixty-four percent (64%) responded that they had noticed their own community members seeming more tense, restless, nervous, and anxious because of the pandemic. More than half of those surveyed said people seemed down, depressed, or hopeless in recent months. Twenty-five percent reported noticing more alcohol and illicit drug use since March 2020. In addition, 13% of loggers said they noticed individuals in the community who were verbally or physically abusive to their family/household members since March 2020.

As indicated in Table 3, northeast loggers overall ranked positively at 77.23 out of 100 points for

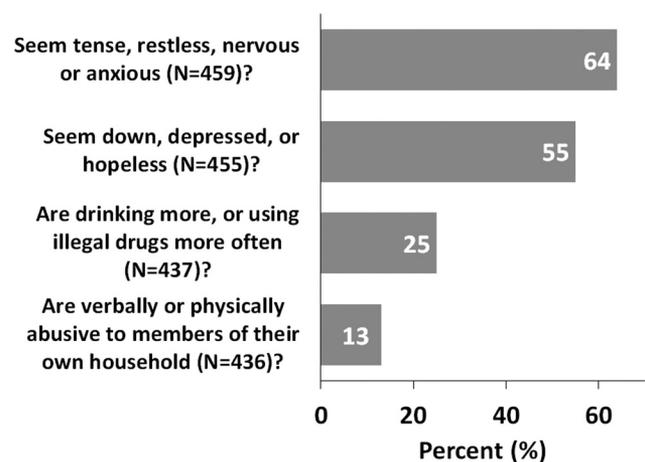


Figure 3. Behavioral changes related to mental health in the logging community.

**Table 3.** Social and emotional support results (N = 478).

Section	Score
Emotional/Informational support	71.46
Tangible support	81.15
Affectionate support	83.88
Positive social interaction	80.30
Additional item	78.35
Overall	77.23

social support. They scored 71.46 out of 100 points for emotional/informational support, which was the lowest scoring component of the functional support scale; and the highest scoring was affectionate support at 83.88. In terms of overall emotional wellbeing, the 476 respondents scored an average of 72 out of 100, indicating a more positive emotional status. Table 3 also shows the comparisons for social and emotional support for Maine loggers, as these questions were also asked for that cohort prior to the pandemic. For fatigue and energy levels, the 476 respondents scored an average of 53 out of 100, which may not be surprising given the often-physical nature of logging work.

### Childcare

Of the 278 loggers that reported having children, 42% indicated that the pandemic has been a serious issue when it comes to childcare and education. Many have had to rely on family members to care for young children as well as home-school older children. This has affected incomes and altered familial roles, which has been a difficult adjustment for the logging community. Some families decided to keep their children home even when their local districts were teaching in person, and others were struggling to make mandatory remote learning effective for their children:

I became a logger because I wanted to be a logger. I didn't want to be a teacher. I should get some of the teacher's pay while they are sitting at home.

We decided to keep our daughter home due to rising covid cases in our area.

Schools and daycares have been shutting down. Both me and my wife work. Have poor internet.

We have a grandson with autism and school helps him, no school and we see the regression.

My wife has to miss 2 to 3 days a week from work in order for my son to take online classes.

### Housing

Most loggers (96%) reported that their households did not increase or decrease in size due to the pandemic. When asked how they would handle a household member getting COVID-19, 44% indicated they would isolate the person in a separate room, and 34% said they had no plan.

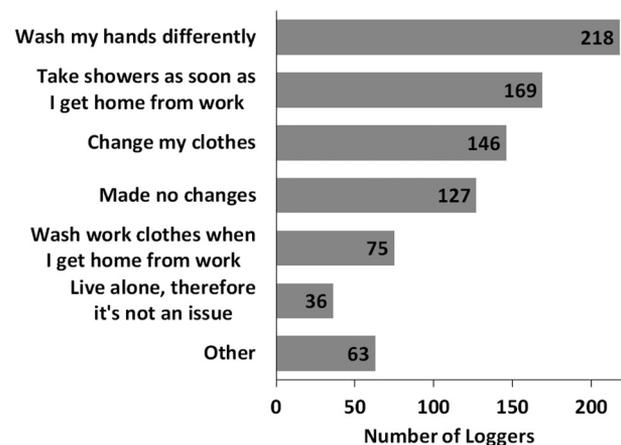
In response to a question about how loggers had changed their behavior to protect household members when they got home from work, the top three behavioral changes were washing hands differently, taking a shower upon arrival, and changing out of work clothes (see Figure 4).

### Other topics

#### Androscoggin mill explosion

More than 8 out of 10 loggers surveyed in Maine said the digester explosion at the Androscoggin Mill had affected their business. An additional 18% of Northeast loggers surveyed who did not reside in Maine said the closing of that mill also affected their business.

With very limited paper mills left in ME, the Jay Mill digester explosion has broken a link in one of the last solid chains of the logging industry. Every wood lot produces pulp and if that pulp has no market it becomes a cost. There is no more room in the industry for more costs.



**Figure 4.** Loggers' behavioral changes to protect household members (N = 484).

The local markets for softwood pulp and biomass were already questionable. Our company hasn't sold a single load of pine pulp since the explosion. And chipping the softwood pulp isn't a great option either. Very tight quotas and biomass pays considerably less money.

### Financial well-being

For the 439 loggers who answered the financial well-being portion of the survey, the average score was 54 out of 100 total points, with a minimum score of 19 and high score of 95 indicating great variation among respondents. According to the CFPD, "A higher score indicates a higher level of measured financial well-being, but there is not a specific cut-off for a 'good' or 'bad' financial well-being score." (Consumer Financial Protection Bureau 2017).<sup>[12]</sup>

### Comparisons between Maine and other states

Given the response rate for Maine was higher than for the other states (Table 2) we compared results between loggers in Maine and those who lived outside the state (Table 4). Out of the entire sample, all women respondents ( $n = 10$ ) replied from states other than Maine ( $p = 0.0348$ ). Maine respondents were also more likely to work for larger companies (11 employees or more) versus smaller companies and sole operators ( $p < .0001$ ). In addition, Maine respondents were also more likely to work in mechanical logging (76.1 vs 12.0%) over the other states ( $p < .0001$ ). Fewer Mainers reported knowing at least one person

(including themselves) who tested positive for COVID-19 ( $p = 0.0030$ ). In addition, fewer Maine loggers reported disruptions to their work activities due to the pandemic, over loggers in other states ( $p = 0.0139$ ). Maine respondents looked to CDC or their health department for reliable health information more frequently than their counterparts in other states ( $p = 0.0184$ ). Regardless of state, respondents were statistically similar on many items, including age, where they find reliable health information (with the exception noted above), the percentage of people in their communities seeming down/depressed/hopeless or tense/restless/nervous/anxious because of COVID-19, and the community perception of drinking or illegal drug use or verbal or physical abuse since March 2020.

### Discussion

The response rate was highest for the state of Maine, where the Northeast Center research team has an established research relationship with the logging community. In general, the demographics of respondents were consistent with the logging industry across the Northeast and Appalachian in terms of age, work role, and type of logging,<sup>3,15,16</sup> with a higher percentage of mechanized loggers reporting in Maine. This survey provided a one-time snapshot of COVID-19 impacts, and those impacts are likely to have continued as the pandemic raged on.

In many ways, logging has always been a socially distanced profession, especially in the woodlot. Even those working alone acknowledged pandemic impacts, for example, it was difficult to meet in-person with landowners to discuss a cut. When working with others, it was evident that infection control precautions varied widely amongst loggers. Less than half of loggers received employer based COVID-19 training; to assist in this, the International Labour Organization released a Covid-19 safety checklist tailored to the logging community, useful as a standardized metric across operations of various sizes within the industry.<sup>17</sup> We know that loggers mostly relied on vetted sources of public health data, such as the state or local department of health, the CDC or a healthcare professional. However, trust in these

**Table 4.** Responses from Maine versus the other states.

Section	Other States		P value
	Maine %	Combined % (NH, VT, NY, PA, WV)	
Gender (% Male)	100	96.7	0.0348
Company Size (% companies with 11 or more employees)	42.1	10.4	<.0001
Type of Operation (% Mechanized)	76.1	12.0	<.0001
Knew of one or more who tested positive (inc. self) for COVID-19	61.9	75.1	0.0030
Work activities changed due to the pandemic (%)	36.1	48.1	0.0139
Uses Health Department or CDC for reliable health info (%)	46.5	35.3	0.0184

institutions seemed to be higher in Maine over the other states, which is important to consider when planning future public health promotion across the region. Trust is critical in effectively communicating health information. To this end, loggers sought health information from healthcare providers at a similar rate, and it would be important for those providers to educate patients on how to identify quality health information.

Perhaps most important, are the economic impacts the pandemic has had on the industry. This loss of market was clearly voiced by survey respondents, both due to the pandemic, as well as the mill explosion. According to some industry stakeholders, harvesters and haulers are suffering the worst of the market declines.<sup>18</sup> In Maine, some felt that loggers had been left out of initial federal COVID-19 relief packages, with most dollars going to larger corporations and mills.<sup>19</sup> Maine loggers reported fewer COVID-19 related disruptions in their work, and this could have been influenced by the fact that they were often employed by larger, mechanized logging companies who may have had greater resources to buffer pandemic effects (e.g. human resources department, greater fund reserves, ability to apply for federal assistance, etc.).

With changes to work, some worried about not having medical insurance or being able to pay for medical expenses. More, a sizeable portion (1 in 5) noted worry about contracting COVID-19 from a healthcare facility, which could further delay other important healthcare. Like in many areas around the country, the pandemic has taken a toll on the mental well-being of community members. Thankfully, many loggers reported having strong social and emotional supports.

The first time that most of the Maine loggers completed the MOS survey questions was prior to or at the beginning of the pandemic. Having data prior to and concurrent with the pandemic was useful in providing insight into the changes in emotional and social well-being. Preliminary analysis of data collected from COVID-19 surveys distributed in Maine indicate a negative correlation between loggers' social support and the pandemic. In all MOS categories, Maine loggers scored lower (−1% to −5%) during the pandemic

compared to the months leading up to the pandemic.

Fatigue was commonly reported, and was likely exacerbated by additional stressors such as taking on educational responsibilities and financial worry. Parents noted the stress of providing school at home weighed heavily on them, and the lack of education resources were particularly poignant for children with special needs. In day-to-day activities, loggers reported few changes in their daily practices, aside from being more vigilant about cleaning (hands, showering, washing clothing more frequently).

According to national CFPB data for all people, the average score for ages 18–61 was 49.<sup>12</sup> As a group, loggers seem to fall in the “medium-high” (50–57) range for financial score range and financial experiences. People who fall in this range are more likely to have direct deposit retirement accounts, pay off their credit cards monthly and very few (<16%) have food insecurity or hardship (Consumer Financial Protection Bureau 2017).

While the financial well-being score for the cohort is considered medium-high, many loggers indicated in comments that the industry as a whole is suffering, which in turn affects people on an individual level. Loss of markets, loss of workers, and changes in family roles and care for children have taken a toll on the financial and overall well-being of Northeast loggers. The seeming contradiction between the medium-high financial well-being score and the comments about the financial strain they are experiencing may be explained by the way that the CFPB financial well-being scale was developed, which included people with a wide range of incomes, including those making less than \$20,000.<sup>12</sup> A population of employed loggers may tend to skew higher on the CFPB scale because their incomes may start at a higher range.

### **Limitations**

The findings of this report are subject to several limitations. The mailing list, which included 3,652 individuals and/or businesses, was not a complete list of all Northeast loggers, and may not be representative of the entire population. The Northeast Center has varying levels of

name recognition in the six logging states, most known in Maine, which may be reflected in the state-specific response rates (see Table 2). Researchers attempted to overcome the lack of name recognition by partnering with local organizations and branding the surveys with the partners' logos, but that effort may have had limited success. In addition, the surveys were mailed when the U.S. Post Office was experiencing delivery issues, which may also have affected the response rate.<sup>III</sup> The 484 loggers who did respond may also not represent the views of all loggers. As with any self-reported data, these results are subject to memory decay, reporting bias, and limited detail.<sup>20</sup> The components of the survey that used validated instruments – RAND SF-36, RAND MOS Social Support Survey, and CFPB – have not been used with this population before; comparing the results to the general population may be of limited relevance.

## Conclusions

The COVID-19 impact survey revealed that the pandemic has had a significant impact on Northeast loggers. The impact was exacerbated – and in the case of Maine loggers, eclipsed – by the paper mill explosion in Jay, Maine, in April 2020. Loggers faced many challenges, including but not limited to: a changing economic environment, supporting their children's education, and dealing with the consequences of COVID-19 illness. These challenges affected the loggers' families and community. Loggers reported significant increases in stress in their communities, based on observing higher incidence of anxiety, depression, alcohol/drug use, and physical/verbal abuse. Loggers also indicated that they had relatively strong emotional and social supports. The lessons learned here can be used to enhance trust in public health institutions and future public health response to this unique occupational group, ensuring the inclusion of the logging community in public policies and potential government relief packages.

## Notes

- I. The survey tool is available by contacting the authors.
- II. Data on household size and composition were not gathered for the Maine loggers (n = 154).
- III. The Northeast Center received returned mail with no forwarding address as late as May 2021, six months after it was mailed.

## Acknowledgments

The Northeast Center thanks the loggers who answered the survey, and the following industry partners, which provided mailing lists and/or advice: New Hampshire Timberland Owners Association, New York Logger Training, Pennsylvania Sustainable Forestry Initiative, Vermont Logger Education to Advance Professionalism, West Virginia University, Northeast Loggers Association, and the Professional Logging Contractors of Maine.

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

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## Authors' contributions

Dr. Scott, Dr. Sorensen, and Ms. Hirabayashi were involved in the conception and design of this research. Ms. Hirabayashi, Dr. Scott and Ms. Graham were responsible for the survey creation, distribution and data acquisition. Dr. Scott, Ms. Hirabayashi, and Ms. Graham completed these analyses. Ms. Hirabayashi and Dr. Scott authored the majority of the manuscript, assisted by Ms. Graham and Dr. Hansen Ruiz. The entire team reviewed the final manuscript and made edits.

## Institution and Ethics approval and informed consent

All protocols were approved by the Institutional Review Board of the Mary Imogene Bassett Hospital (Bassett Medical Center).

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