Brief Report: Health Equity and COVID-19 Prevention in the Manufacturing Industry

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INTRODUCTION

The COVID-19 pandemic has caused substantial morbidity and mortality in the United States (US). Its economic impact has also been devastating, with most industries and age groups affected.[6] Importantly, the economic impact of the COVID-19 pandemic has resulted in significant disparities including in case rates, hospitalizations, and deaths.[4,7,9] These disparities also include economic impacts among Hispanic/Latino communities. These groups are more likely to work in lower-paying jobs including those in the manufacturing industry. Hispanic/Latino individuals may be more likely to work while sick due to the need for income and also potential pressure from employers. However, limited data exists on if individuals in work settings such as the manufacturing industry are working with COVID-19 symptoms, and the extent to which this occurs.

Efforts to mitigate COVID-19 transmission have included lockdowns, remote work, universal masking, physical distancing, testing and quarantine guidelines. Regular screening for COVID-19 symptoms and testing among employees is a critical component of prevention efforts, alongside isolation and quarantine policies for employees who test positive or experience close contact with a positive case. Nearly 84% of cases display some level of symptoms during their infection,[5] and people with symptomatic infection are more likely to be infectious,[8] reinforcing the importance of protocols and supports for avoiding in-person work while symptomatic. The manufacturing industry specifically has faced challenges, as some facilities have been unable to shut down or allow employees to work remotely due to the nature of their operations.

DEVELOPMENT

To explore whether individuals with symptoms present to work and the extent to which this happens, we conducted a cross-sectional study of COVID-19 cases reported to Rhode Island Department of Health (RIDOH) from March 1 to September 18, 2020. We also evaluated race and ethnicity to determine the extent to which disparities contributed to symptom presentation. We reviewed employer and workplace information, defining industry type according to the North American Industry Classification System. We defined whether workplace cases were associated with a major workplace outbreak or cluster. An outbreak was a workplace with at least five cases in a 14-day period with known epi-linked transmission from contact tracing and spread. A cluster was at least two cases within 14 days in one workplace. We identified whether manufacturing employee cases were likely to have worked while symptomatic based on self-reported dates of symptom onset, last day worked, and positive test specimen collection. If a case reported working within the 48-hours prior to symptom onset or positive test specimen collection date, we classified them as working while infectious based on estimates of incubation period which indicate that a person can unknowingly be infectious 48 hours prior to symptom onset.[8]

We compared sociodemographic characteristics and symptom status/timing of non-manufacturing and manufacturing cases using Chi-Square tests (**Table 1a,b**). Among symptomatic manufacturing employee cases, we estimated the association between sociodemographic characteristics and symptom timing and working while infectious using bivariate and multivariable logistic regression. We analyzed data using SAS version 9.4 (Cary, North Carolina). Statistical inferences were based on significance $p<0.05$. This study was exempt from the Rhode Island Dept. of Health (RIDOH) Institutional Review Board.

From March 1 to September 14, 2020, there were 16,239 cases of COVID-19 that met inclusion criteria of which 1,499 (9.2%) were employees in manufacturing. Among symptomatic manufacturing employee cases, 272 (20.1%) reported onset of COVID-19 symptoms prior to last day worked and were thus "working while symptomatic". Symptomatic manufacturing cases were more likely to speak Spanish at home than those who did not work while symptomatic (51.8% vs 23.4%, $p<0.0001$). Those who did work while symptomatic were more often symptomatic prior to SARS-CoV-2 testing (77.9% vs. 70.7%) (**Table 2**).

Symptomatic manufacturing employees who primarily spoke Spanish had higher odds of having worked while symptomatic/infectious than those who primarily spoke English at home (adjusted odds ratio [aOR]=2.2, 95%

Table 1a.[±] Sociodemographic and symptom characteristics of general and manufacturing employee COVID-19 cases in Rhode Island, March 1 to September 14, 2020. All race/ethnicity groups except for Hispanic/Latino, Declined, and Unknown reported non-Hispanic ethnicity or had unknown ethnicity information

Characteristics	Cases Other Than Manufacturing (n=14740)		Manufacturing Cases (N=1499)		P-value
	N	%	N	%	
Sex Assigned at Birth					
Female	8220	55.77	696	46.43	<0.0001
Male	6496	44.07	801	53.44	
Other/Declined	24	0.16	<5	*	
Age					
16–25	3232	21.93	178	11.87	<0.0001
26–35	3588	24.34	357	23.82	
36–45	3008	20.41	355	23.68	
46–55	2959	20.07	391	26.08	
56–64	1953	13.25	218	14.54	
Race/Ethnicity					
Hispanic or Latino (any race)	6237	42.31	1049	69.98	<0.0001
American Indian or Alaska Native	57	0.39	5	0.33	
Asian	310	2.1	28	1.87	
Black or African American	1887	12.8	84	5.6	
White	4279	29.03	255	17.01	
Other race	144	0.98	11	0.73	
Multiple races	110	0.75	5	0.33	
Declined race	186	1.26	15	1	
Unknown/missing	1530	10.38	47	3.14	
Primary Language in Home					
English	12053	81.77	1019	67.98	<0.0001
Haitian Creole	17	0.12	6	0.4	
Portuguese	85	0.58	19	1.27	
Spanish	2089	14.17	428	28.55	
Unknown/Missing	467	3.17	18	1.2	
Other	29	0.2	9	0.6	
High Density Community (HDC) Resident					
HDC Tier 1	7488	50.8	1014	57.96	<0.0001
HDC Tier 2	2933	19.9	247	16.55	
Non-HDC	3271	22.19	186	12.47	
Unknown/Missing	1049	7.12	45	3.02	

[±]Excludes Congregate setting residents. Age group restricted to 16-64 years

Table 1b. Symptom status in relation to COVID-19 testing for general and manufacturing employee COVID-19 cases in Rhode Island, March 1 to September 14, 2020.

Symptom Status	Cases Other Than Manufacturing (n=14740)		Manufacturing Cases (N=1499)		P-value
	N	%	N	%	
Symptomatic					<0.0001
Before Test	7899	53.59	975	65.04	
At time of test	809	5.49	86	5.74	
After Test	433	2.94	52	3.47	
Out of Time Range*	572	3.88	62	4.14	
Missing Onset Date or Specimen Collection Date**	1864	12.65	177	11.81	
Asymptomatic	1507	10.22	119	7.94	
Not Interviewed ***	931	6.32	9	0.6	
Unknown/Missing	725	4.92	19	1.27	

*Cases reporting symptoms starting more than 14 days before testing or more than 10 days after testing

**A fime frame cannot be established for cases who are missing either their date of symptom onset or their date of specimen collection

***Out of state resident cases

confidence interval [CI]=1.3-3.8; (**Table 3**). Compared to those with symptom onset prior to positive test specimen collection, symptomatic manufacturing cases with symptom onset "out of range" had higher odds of working while symptomatic (aOR=3.4, 95%CI=1.5-7.9), while those with symptom onset at or after positive test specimen collection had lower odds of working while symptomatic (aOR=0.1, 95%CI=<0.1-0.2).

CONCLUSION

A significant number of COVID-19 cases in the manufacturing industry presenting to work were Spanish-speaking, highlighting disparities that exist in this setting. In general, cases were more likely to be male, older, Hispanic/Latino, primarily Spanish-speaking, and residents of dense and lower-income communities with high burdens of COVID-19. Approximately 20% worked while symptomatic. Nationwide, Hispanic/Latinos have been more likely to acquire COVID-19 than Whites.[1,2,3,7] Symptomatic people are likely to be more infectious, and may contribute to higher levels of ongoing transmission in the community.

Reasons why Hispanic/Latino individuals may work while symptomatic are diverse. Individuals may live paycheck-to-paycheck and face significant financial challenges if taken sick. Workers may also feel pressure to work by employers and be concerned about losing their job. Language

Table 2. Sociodemographic and symptom characteristics among symptomatic manufacturing employee COVID-19 cases in Rhode Island who did and did not work while symptomatic, March 7 to September 14, 2020.

Characteristic	MFG cases did not work while symptomatic (N=1080)		MFG Cases worked while Symptomatic (N=272)		P-value
	N	%	N	%	
Sex Assigned at Birth					
Female	516	47.82	128	47.06	0.8595
Male	563	52.18	144	52.94	
Age					
16-25	131	12.13	32	11.76	0.8220
26-35	254	23.52	70	25.74	
36-45	260	24.07	63	23.16	
46-55	290	26.85	66	24.26	
56-64	145	13.43	41	15.07	
Primary Language in Home					
English	801	74.37	127	46.69	**<.0001**
Haitian Creole	5	0.46	0	0.00	
Portuguese	12	1.**11**	<5	*	
Spanish	252	23.4	141	51.84	
Other	7	0.65	<5	*	
Symptom Timeline					
Before Test	763	70.**65**	212	77.94	**<.0001**
At Time of Test	83	7.69	<5	*	
After Test	52	4.81	0	0	
Out of Time Range*	41	3.8	21	7.72	
Missing Onset Date or Specimen Collection Date**	141	13.06	36	13.24	

Table 3. Characteristics associated with working while symptomatic among symptomatic manufacturing employee COVID-19 cases in Rhode Island, March 7 to September 14, 2020. Significant values at p <0.05 are bolded.

Characteristic	Bivariate Analysis*			Multivariate Analysis*		
	OR	95% CI		aOR	95% CI	
		Lower	Upper		Lower	Upper
Primary Language at Home						
English	REF	REF	REF	REF	REF	REF
Spanish	**3.60**	**2.65**	**4.87**	**2.09**	**1.22**	**3.60**
Other Language	1.26	0.42	3.74	0.78	0.18	3.32
Symptom Timeline						
Symptom Onset: Before Test	REF	REF	REF	REF	REF	REF
Symptom Onset: At or After Test	**0.08**	**0.03**	**0.26**	**0.07**	**0.02**	**0.23**
Symptom Onset: Out of Time Range	1.73	0.99	3.01	**2.96**	**1.31**	**6.69**
Associated with Major Workplace Outbreak (Known Epi-Linked Transmission)						
Yes	1.26	0.88	1.82	1.29	0.81	2.04
Associated with Workplace Cluster (2+ cases in 14 day period)						
Yes	0.40	**0.90**	2.19	1.30	0.74	2.27
High Density Community (HDC) Resident						
HDC Tier 1	0.72	0.47	1	1.11	0.53	2.30
HDC Tier 2	0.62	0.36	1.07	0.92	0.44	1.93
Non-HDC	REF	REF	REF	REF	REF	REF
Unknown	0.50	0.16	1.54	0.40	0.06	2.57

and cultural barriers may also result in reduced understanding of proper protocols and procedures. Nationally, the largest burden of COVID-19 cases falls on young Black or Hispanic/Latino males of lower economic status.[4,7,9] These communities likely experience multiple factors that place them at higher risk for infection and worse outcomes, reinforcing the importance of culturally-competent messaging and accessible vaccination/testing.

Health disparities are costly societal burdens, and the pandemic provides a window of opportunity to build more equitable healthcare infrastructure.[3,9] This holds true for manufacturing, which was recently demonstrated by this journal as having the highest incidence of workplace clusters of any industry within Rhode Island.[10] Rhode Island has attempted to mitigate disparities seen with COVID-19 by providing free bilingual testing sites with more sites in certain neighborhoods.

In conclusion, symptomatic transmission of COVID-19 occurs in the manufacturing industry and is more prominent among underserved communities. This supports national data on racial and ethnic disparities for COVID-19 and highlights the need for improved public health efforts to support at-risk communities from COVID-19 including support in the workplace. Public health interventions should ensure employers of all industries may implement appropriate measures to prevent COVID-19 spread (e.g., masking and distancing) as the pandemic evolves.

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