

Working Paper

Classifying and reporting data on non-healthcare workplace outbreaks of infectious disease: Findings and recommendations based on review of public health agency data on outbreaks of COVID-19

CSTE Occupational Health Subcommittee Workgroup on Public Health Reporting of Non-healthcare Workplace Outbreaks – July 2023

The COVID-19 pandemic has underscored the workplace as a locus of infectious disease transmission and the need for better information about settings in which workers are at increased risk to guide interventions to mitigate spread of disease in workplaces. CSTE guidance and related information on collecting information about occupation and industry in case level COVID-19 surveillance systems have been published elsewhere. [1-4] This document focuses on how to structure and publicly report actionable information on workplace outbreaks of infectious disease outside of healthcare settings.

Summary

Introduction. State, Tribal, Local and Territorial public health agency data on outbreaks of Coronavirus Disease 2019 (COVID-19) by setting can provide useful information about potential occupational transmission of airborne transmissible disease (ATD). There is, however, no standard approach to structuring and communicating summary information about outbreaks of COVID-19 in workplaces, beyond healthcare, limiting meaningful use of the aggregate data to target prevention efforts to protect workers and reduce health inequities. In Fall 2022, members of the Council of State and Territorial Epidemiologists (CSTE) Occupational Health Subcommittee convened a workgroup with the broad aim of developing guidance on a standard approach to classifying and reporting actionable public health information about workplace outbreaks, drawing on public health agency data available for outbreaks of COVID-19. We chose to explore the use of an industry-based framework. Our specific aim was to explore the extent to which outbreak setting categories (excluding healthcare settings) currently used by public health jurisdictions in reporting outbreaks of COVID-19 could be aligned with the North American Industry Classification System (NAICS) used by federal statistical agencies.

Methods. We reviewed the full range of detailed setting categories and setting groups used by a convenience sample of 22 public health jurisdictions in reporting aggregate data on COVID-19 outbreaks in non-healthcare settings (pre-July 2022). We organized the setting categories (excluding settings reported as Events) by industry sector and assigned the most detailed NAICS codes possible (2017 revision) to these categories. We also informally identified the major means by which workplace outbreaks of COVID-19 have been detected and users of data on workplace outbreaks beyond public health practitioners.

Findings. The number of setting categories used to collect and/or report outbreak data ranged widely across jurisdictions, from over 70 detailed categories to a small number of broad setting groups. Settings fell into two broad sets: Facility Type, which accounted for most setting categories, and Event. While many Facility Type categories were similar across jurisdictions, terminology used to describe the same Facility Types varied, with some inconsistencies in definitions. Most Facility Types were facilities in which people may work and it was possible to assign specific NAICS codes, at various levels of granularity, to the majority - 52 of 62 Facility Types. Additional challenges in using outbreak data as currently reported from an occupational health perspective were identified. Outside of outbreaks in schools and corrections,

outbreak-associated cases among workers and non-workers were seldom distinguished; and setting groups used were frequently too broad for targeting workplace prevention efforts.

Discussion and Future Directions: Findings in this report underscore the need for a standard approach to classifying and reporting information about workplace outbreaks. Use of existing standard industry classifications, which are used in reporting employment statistics, has many potential advantages. A fundamental challenge is that industry and setting are not necessarily synonymous, although for many Facility Types, industry is a reasonable proxy. The Workgroup offers the following recommendations to improve use of disease outbreak data to inform workplace prevention efforts.

1. Collect detailed industry information as a discrete data element in narrative text format and classify according to NAICS for all workplace outbreaks, using automated coding tools.
2. Align Facility Types on reference lists used to capture the full range of settings with NAICS definitions, where possible;. Reference lists of Facility Types should be structured to address/eliminate not-mutually response options and Facility Type and Event should be captured and reported as separate data elements.
3. Distinguish between cases among workers and non-workers in all outbreak settings, to the extent possible;
4. Collect and make available data on Industry/Facility Type at sufficiently granular level for use to address occupational health as well other critical public health concerns.

Additional training of public health data collectors on how to collect industry information and provision of training and coding resources will be needed to assure the quality and utility of the industry data.

The extent to which the findings and recommendations in this document are generalizable beyond surveillance of COVID-19 and other ATDs remains to be assessed. Collaboration between experts in occupational health, infectious disease and informatics will be important in developing comprehensive guidance on how to classify and structure data on workplace outbreaks across the full range of infectious diseases. Going forward, we need to increase the capacity of our surveillance systems to provide information about the risks and impact of disease in workplaces. This information is critical to directing efforts to protect workers and reduce health inequities. Lessons gleaned from the pandemic can inform this work.

Appendix 1. North American Industry Classification System codes (v.2017) for Healthcare Industries

Appendix 2. State, Tribal, Local and Territorial Public Health Jurisdictions included in the Project sample

Appendix 3. Annotated table of Table 1. Facility Types used by select public health jurisdictions to classify and publicly report non-healthcare COVID-19 outbreaks, with North American Industry Classifications and Census Industry Classifications, organized by broad industry sector. (Excel)

Introduction

Public health reporting of COVID-19 outbreaks by setting provides useful information about potential occupational transmission of disease and worker populations at high risk of exposure to SARS-CoV-2 [5-8]. This information is critical to guide efforts to mitigate disease transmission in workplaces, protecting workers, and in turn the communities in which they work and live. Given that people of color are disproportionately employed in frontline jobs that cannot be performed remotely, this information is also critical to reducing health inequities [9-12]. There is no national system for tracking workplace outbreaks of COVID-19 outside of those in long term care facilities, but many State, Tribal, Local and Territorial public health agencies track COVID-19 outbreaks by setting within their jurisdictions. An initial review of publicly available COVID-19 outbreak data reported by states and localities conducted in Spring 2022 found that there was no standard approach to structuring information about outbreaks of COVID-19 in workplaces, beyond healthcare.¹ This limits meaningful synthesis of information about workplace outbreaks across jurisdictions to inform prevention. Also, aggregated data on workplace outbreaks frequently does not correspond to the standard system used by federal government agencies (e.g., U.S. Census Bureau, Bureau of Labor Statistics, Occupational Safety and Health Administration) for classifying workplaces, thereby limiting the usefulness of these public health data for guiding actions to protect workers and reduce health inequities.

In Fall 2022, the Council for State and Territorial Epidemiologists (CSTE) Occupational Health Subcommittee convened a workgroup with the broad aim of developing guidance on a standard approach for classifying and reporting public health information about workplace outbreaks that would increase the usefulness of these data for guiding workplace prevention efforts. The specific aim of the present project was to explore the extent to which workplace setting categories used in reporting COVID-19 outbreaks could be aligned with the North American Industry Classification System (NAICS) [13]. Healthcare settings were excluded from consideration because there are distinct protocols and procedures in place for tracking outbreaks in healthcare settings, which largely align with NAICS health industry classifications. (See Appendix 1.)

This endeavor identified both conceptual and practical challenges, and the Workgroup presents this document as a working paper, summarizing findings and lessons learned. Included are preliminary recommendations about directions for improvements in our infectious disease surveillance systems to better capture and communicate actionable information about workplace outbreaks.

Rationale for using standard industry classifications

We chose to explore an industry-based framework for structuring workplace outbreak data because industry is a common lens through which those responsible for tracking employment and shaping employment policies to protect workers view the world of work. There are multiple advantages to using standard industry classifications for public health surveillance:

- NAICS has well described standard definitions of industries that can be applied across jurisdictions [14]. Coding rules as well as automated coding tools (including real time applications for coding narrative text) exist and can be used to assign workplaces to these standard classifications [15]. Additionally, the hierarchical structure of NAICS provides a framework for systematically condensing more detailed classifications into broader categories.
- Workplace outbreak data organized by NAICS would correspond with employment data maintained by the federal and state agencies. Data on the number and size of workplaces and number of workers by NAICS are available at state, and sub-state areas. [16-17]. Aligning outbreaks with employment data

¹ This initial review was conducted by several members of the CSTE Occupational Health Subcommittee who later joined the Workgroup that prepared this document.

may allow for estimating the incidence of outbreaks by industry [18] or comparing the ratio of reported outbreaks in specific industries relative to the proportions of these industries among all workplaces [8].

- Occupational segregation by race and ethnicity in the U.S. is well documented [19]. People of color are disproportionately employed in jobs that pose a higher risk of work-related injury or disease and accordingly may have increased risk of exposure to communicable diseases [20-22]. Because key employment data sources provide information about workforce demographics by industry, including race and ethnicity, an industry-based framework can also inform targeted public health planning, outreach, and response to reduce health inequities.
- Employers have control over the work environment and are required under the Occupational Safety and Health Act “to furnish to each of their employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to their employees” [23]. Employers are also subject to specific rules regarding protection of workers. Different agencies (e.g., Occupational Safety and Health Administration, departments of transportation, environmental protection agencies) have responsibility for different industries and, in many instances, there is overlapping agency responsibility. Identifying workplace outbreaks by industry can open a range of potential system changes (e.g., policy and practice interventions) to reduce risk and can foster collaboration across government agencies.

Methods

Definitions of key terms

Setting: Location where people congregate - for work, leisure or other reasons.

CDC Field Epidemiology Manual [24]

Establishment (also called workplace): A “single physical location at which business is conducted or where services or industrial operations are performed.” It is not necessarily identical with a company/firm or enterprise, which may consist of more than one establishment.

Census/BLS [25]

Industry: Industry describes the kind of business conducted at an establishment. Establishments (workplaces) are classified into industries based on their principal product or activity. Establishments using similar raw material inputs, similar capital equipment, and similar labor are classified in the same industry [26]. Industries may be classified using one of two related industry classification systems: the North American Industry Classification system (NAICS) [13] or the Census Industry Classification, a less granular system derived from NAICS [27].

Workplace outbreak: A workplace outbreak in the most general terms is defined as an unusual occurrence of disease among workers in a workplace.

In 2020, CSTE proposed the following surveillance definition for workplace outbreaks of COVID-19 in non-residential non-healthcare worksites:

Two or more cases of laboratory confirmed cases among workers at a facility with onset of illness within a 14-day period, who are epidemiologically linked, do not share a household and have not been identified as a close contact during case investigation and contact tracing. When clusters are identified, further public health assessment is required to determine if they meet the outbreak definition.[28]

Some states and localities adopted the CSTE recommended outbreak definition for non-healthcare non-residential workplace outbreaks; others established their own criteria.

The North American Industry Classification System [13]: NAICS is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. NAICS is a 6-digit hierarchical coding structure, with 1,012 industries grouped into 20 broad industry sectors (2- digit) and 96 (3-digit) subsectors. There are standard definitions for each industry category. NAICS codes can be cross-walked to the less granular Census industry Classification codes [27].

Approach

How workplace outbreak data should be classified cannot be considered independently from how outbreaks are detected and potential data users. As an initial step, the Workgroup informally identified the primary means by which workplace outbreaks of COVID-19 are identified and then brainstormed potential users of aggregate data – in addition to local public health practitioners.

The central task was a review of detailed setting categories and setting groups used by a convenience sample of 22 jurisdictions (Appendix 2) in reporting aggregate data on COVID-19 outbreaks in non-healthcare settings (pre-July 2022). Information about setting categories was obtained primarily from jurisdiction dashboards, websites, and peer reviewed articles, and in response to a request for information sent to select states.² Setting categories for several additional states were obtained from a National Governors Association report [29]. The full range of settings was reviewed rather than those explicitly identified as workplaces because most Facility Types reported as settings are locations in which workers as well as others, such as clients, customers, religious congregants, students (hereafter referred to as non-workers) may be present. We organized the detailed setting categories by industry sector and manually assigned the most detailed NAICS code possible (2017 revision) to these categories. The assigned codes were reviewed for accuracy by expert coders at NIOSH. Many jurisdictions reported outbreak settings in broad groups. These were also reviewed to better understand intended aims of presenting grouped outbreak data.

Findings

How workplace outbreaks of COVID-19 have been detected and data users

Based on qualitative input from public health practitioners and review of outbreak reports from health departments, workplace outbreaks of COVID-19 were most often detected through: 1) direct reporting or requests for assistance by employers, including mandatory reporting by employers in some jurisdictions³; 2) other reports or requests for assistance from employees and their unions, healthcare providers or other government agencies; and 3) public health case investigation and contact tracing. Routine analysis of case level COVID-19 data can also be used to identify workplace outbreaks through searching by employer name or other employment related variables (e.g., employer name and address, industry, occupation) [30]. To our knowledge, this was seldom done given limited availability of employment data in case level surveillance systems as well as and limited resources.

² States provided funding through the Coronavirus Aid, Relief, and Economic Security (CARES) Act and the Coronavirus Response and Relief Supplement Appropriations Act to enhance collection and use of industry and occupation surveillance data for COVID-19 and other vaccine-preventable and respiratory conditions.

³ Public health requirements for employer reporting of workplace outbreaks of COVID-19 varied by jurisdiction. Some jurisdictions activated mandatory employer reporting requirements of workplace outbreaks of COVID-19 under existing public health regulations; some promulgated new employer reporting requirements specific to COVID-19 under public health or, in some instances, state labor codes.

Multiple data users beyond public health practitioners responsible for immediate outbreak response were identified, including elected officials who used the aggregate outbreak data to inform decisions about opening and closing sectors of the economy and public health agencies that used the data to prioritize vaccination outreach to high-risk worker groups. Other agencies with regulatory authority over select industries were also identified as potential data users, (e.g., Occupational Health and Safety Administration, food safety agencies, departments of education and transportation). Non-governmental data users included unions, trade associations, professional associations (e.g., American Industrial Hygiene Association), researchers, and the media.

Setting Categories and alignment with NAICS codes

The number of categories of settings used by jurisdictions to collect and/or report outbreak data in general (not limited to workplaces) ranged widely across jurisdictions. Some had as many as 70 detailed categories whereas others simply appeared to collect/and or combine information into a small number of broad setting groups. Settings fell into two broad sets: 1) Facility Type, which characterizes physical location; and 2) Event, which describes the reason for congregating and captures information about the social context. Both Facility Type and Event provide essential information to guide intervention and prevention efforts. Events, however, in most instances did not provide information about physical location, (e.g., a wedding could be in a hotel, a church or a park or multiple settings). In assigning NAICS codes, the Workgroup focused on Facility Types, which made up most of the setting categories.

While many Facility Type categories were similar across states (e.g., daycare/childcare, homeless shelter, restaurant, hotel) the terminology used to describe the same/similar settings varied, with some minor inconsistencies in definitions. For example, some states included preschool with education whereas others included it with daycare. There were no two states with the same setting list. California stood out as the only state to report suspected workplace outbreaks by the detailed industry classification system routinely on their website. California implemented regulations requiring employers to report workplace outbreaks of COVID-19 and had an online reporting system, in which industry was collected as narrative text [31]. Some jurisdictions (e.g., Los Angeles County, Oregon, Colorado, Hawaii) also routinely reported outbreaks, including workplace outbreaks, by named facility, organized into broad categories. Several jurisdictions did have special reports or peer reviewed publications summarizing workplace outbreaks by industry. In most special reports/publications reviewed, workplace outbreaks were classified using either NAICS or Census Industry Classifications.

As shown in Table 1, of the 62 Facility Types reported, 52 could be coded to NAICS, at different levels of granularity. A common exception was “office,” a frequently used Facility Type that is not specific to industry. Another notable exception was “home or household” likely intended to identify transmission among household members, but ambiguous because homes can also be places of employment (excluding remote work), (e.g., home care, domestic services.) Moreover, the general term “senior housing” could not be coded to NAICS because it was not clear what was intended to be captured by this term. Potential NAICS classifications for senior housing are split between the Healthcare sector (e.g., Assisted living) and other sectors. (An annotated version of Table 1 that also includes Census Industry Classifications is found in Appendix 3.)

Table 1. Facility Types used by select public health jurisdictions to classify and publicly report non-healthcare COVID-19 outbreaks, with North American Industry Classification System (NAICS) codes, organized by broad industry sector			
Industry sector	Setting: Facility Type (terms used by jurisdictions)	NAICS code (2017)	NAICS Title
Agriculture, forestry fishing	Agriculture, agricultural operations/farm/ranch/dairy	111/112/1151/1152	Crop production/Animal production and aquaculture/Crop production support activities/Animal production support activities
Construction	Construction/construction site/contracting	23	Construction
Utilities	Utilities	22	Utilities
Manufacturing	Manufacturing/factory/production facility/industrial setting	31-33	Manufacturing
Manufacturing	Food processing/packaging facilities	311	Food Manufacturing
Manufacturing	Poultry and meat processing	3116	Animal slaughtering and processing
Manufacturing	Non-food manufacturing	31-33 (excl. 311)	Manufacturing, excluding food manufacturing
Manufacturing	Apparel manufacturing	315	Apparel manufacturing
Retail trade	Retail/retail space/retail trade	44-45	Retail Trade
Retail trade	Grocery store	4451	Grocery stores (includes convenience stores)
Retail trade	Beer, wine and liquor store	4453	Beer, wine and liquor stores
Retail trade	Gas station	447	Gasoline stations
Retail trade	Pet store	45391	Pet and pet supply stores
Retail trade	Supercenter	4523	General merchandise stores including warehouse clubs and supercenters (sells perishable groceries as well as general merchandise)
Transportation	Airline, flights/airport	481/4881	Air transportation/Support activities for air transportation
Transportation	Cruise boat/maritime travel	48312/ 48314/483211	Deep sea and Coastal/Great Lake/Inland passenger transportation
Transportation	Public transit/mass transit/bus/subway	4851/4852	Urban transit/intercity and rural bus transportation
Transportation	Taxi, limousine, ride service. Uber, Lyft	4853	Taxi and limousine service
Transportation	Employer provided transportation	4854	School and employee bus transportation
Transportation	Transportation hub: ferry slip, train station	4883/4883	Support activities for water transportation/Support activities for rail
Transportation	Delivery service	492	Couriers and messenger
Warehousing and Storage	Warehouse, distribution center	49	Warehousing and storage
Professional & Business Services	Library	51912	Libraries and archives
Professional & Business Services	Animal services/animal shelter/ veterinary clinic/ veterinary hospital	54194	Veterinary services
Information	Movie theater	51213	Motion picture and video exhibition
Educational services	Elementary and secondary school	6111	Elementary and secondary schools
Educational services	Colleges and universities	6112/ 6113	Junior colleges/Colleges, universities and professional schools
Social Assistance	Youth services	62411	Child and youth services, non-residential
Social Assistance	Senior center/adult daycare	62412	Services for elderly and persons with disabilities, non-residential
Social Assistance	Soup kitchen/ pantry	62421	Community food services
Social Assistance	Homeless shelter	624221	Community Housing: Temporary Shelters
Social Assistance	Transitional housing	624229	Community Housing: other housing services
Social Assistance	Childcare, daycare, nursery school, early	6244	Child daycare services
Arts, Entertainment & Recreation	Entertainment venue, theater/concert hall.	7111	Performing arts companies
Arts, Entertainment & Recreation	Parks	71219	Nature park and other similar institutions
Arts, Entertainment & Recreation	Theme park/water park	71311	Amusement and theme parks
Arts, Entertainment & Recreation	Camp (day)	71319	All other amusement and recreational activities
Arts, Entertainment & Recreation	Casino	71321/72112	Casinos (except casino hotels)/Casino hotels
Arts, Entertainment & Recreation	Fitness center/gym/spa/swimming pools	71394	Fitness and recreational sports centers
Accommodation & Food Services	Hotel/motel/lodging	7211	Traveler accommodation
Accommodation & Food Services	Camp (overnight)	721214	Recreational and vacation camps
Accommodation & Food Services	Migrant camp, worker camp/employer	7213	Boarding Houses, Dormitories and Worker Camps
Accommodation & Food Services	Caterers/mobile food trucks	7223	Specialty foods services including food service contractors, caterers,
Accommodation & Food Services	Bars and night clubs	7224	Drinking places (alcoholic beverages)
Accommodation & Food Services	Restaurant/cafeteria/banquet facility	7225	Restaurants and other eating places,
Other Services except Public Administration	Barber shop, beauty salon, nail salon	81211	Hair, nail and skin care services
Other Services except Public Administration	Pet care	81291	Pet care services, except veterinary
Other Services except Public Administration	Funeral home	81221	Funeral homes and services
			Continued on next page.

Table 1.(continued) Facility Types used by select public health jurisdictions to classify and publicly report non-healthcare COVID-19 outbreaks, with North American Industry Classification System (NAICS) codes, organized by broad industry sector			
Industry sector	Setting: Facility Type (terms used by jurisdictions)	NAICS code (2017)	NAICS Title
Other Services except Public Administration	Church/temple/rectory/convent/religious organization	8131	Religious organizations
Public Administration	Police/Fire protection	92212/ 92216	Police Protection/Fire Protection
Public Administration	Correctional institution, e.g. jail, prison, detention center, work release	92214	Correctional institutions
Public Administration	Military	92811	National Security
Facility Types that did not align well with standard industry classifications			
Office setting/office space/work space			
Household ^a			
Single family home			
Apartment/town house			
Single room occupancy			
Homeless encampment			
Emergency medical services ^b			
Non-residential homeless services			
Spectator sport			
Independent living/senior housing ^c			
Higher education institutions with/without dormitories.			
Casual car pool			
Government			
^a NAICS 814: Private Household - is used to identify private households that engage in employing workers on or about the premises in activities primarily concerned with the operation of the household, e.g. cooks, maids gardeners, caretakers. Primary purpose of this setting is to identify household member transmission.			
^b EMS is not an industry but a task carried out in multiple industries that cross the Healthcare and non-Healthcare sectors. For example, Fire, and Police are in the Public Administration Sector and Ambulance Services are in the Healthcare Sector.			
^c Within NAICS, Continuing Care Retirement Communities (CCRs) and Assisted Living Facilities for the Elderly are classified as industries (NAICS 62331) within the Healthcare Sector (NAICS 62) and can be differentiated at the 6-digit level. Independent living settings outside of CCRs are coded to the general category of Lessors of Residential Buildings and Dwelling (NAICS 5311), which is not useful in identifying Independent Living facilities. Further definition of what should be included in senior living is needed.			

A challenge in interpreting the findings is that in many jurisdictions, Facility Type categories that corresponded with NAICS codes were not mutually exclusive. For example, meat and poultry processing, food processing, and manufacturing were frequently listed as three distinct settings, whereas from a NAICS perspective, meat and poultry processing is a sub-category of food processing, and food processing is a sub-category of manufacturing. Another common example is that grocery store, which is a type of retail store, was frequently listed as a distinct category from retail stores. This problem could be resolved by structuring data using the NAICS hierarchy, which is exemplified in the list in Table 2. This table includes commonly used Facility Types with corresponding NAICS codes structured to eliminate non-mutually exclusive Facility Types within sectors. An option for including “Offices in Facility Types not elsewhere classified” is found in this Table. This approach fails to capture offices within listed Facility Types but may suffice for surveillance purposes. Consideration might be given to include key sub-settings on these lists; employer provided housing for agricultural settings is provided as an example.

Table 2. Example: List of Common Facility Types used to classify COVID-19 outbreaks, in mutually exclusive categories, coded to the North American Industry Classification System where possible

Industry sector	Facility Type	NAIC code
Agriculture, Forestry and Fishing	Agricultural operation, e.g. ranch, farm dairy	111/ 112/1151/1152
	<i>With employer provided housing</i>	—
	<i>With employer provided transportation</i>	—
Construction	Construction	23
Manufacturing	Manufacturing: Meat and poultry processing	3116
	Manufacturing: Other food manufacturing	311 (excl. 3116)
	Manufacturing: All other	31-32 (excl 311)
Retail trade	Retail: Grocery store	4451
	Retail: Beer, wine and liquor store	4453
	Retail: Supercenters/general merchandise stores	4523
	Retail: All other	44-45 (excl. 4451/4453/4523)
Transportation	Airline/flights	481/4881
	Passenger boat	48312/48314/483211
	Urban transit/Intercity and rural bus transportation	4851/4852
	Taxi, limousine, ride share	4853
	School/employee bus transportation	4854
	Courier/messenger,	492
Warehousing and Storage	Warehousing and storage	49
Professional & Business Services	Veterinary service	54194
Educational services	Elementary and secondary school	6111
	College, university or professional school/junior college	6113/6112
	School associated sporting event: Assign to school	—
Social Assistance	Child daycare services (includes Pre-K unless part of school program)	6244
	Child and youth services, non-residential. e.g. youth center	62411
	Services for elderly and persons with disabilities, non-residential,	62412
	Community food services/pantries	62421
	Homeless Shelter	624221
Information	Movie theater	51213
Arts, Entertainment & Recreation	Performing arts establishment/facility	71
	Nature park	71219
	Amusement/theme park	71311
	Casino/casino hotel	71321/72112 ^d
	Fitness and recreation centers (including swimming pools)	71394
Accommodation & Food Services	Hotel/motel/lodging	7211
	Recreational or vacation camp (overnight)	71214
	Bars and night clubs (alcoholic drinking, places)	7224
	Restaurants and other eating places	7225
	Specialty Food services, incl. caterers/mobile food trucks & food service contractors	7223
Other Services except Public Administration	Barber shop, beauty salon, nail salon	81211
	Funeral home	81221
	Church, synagogue, mosque, other religious institutions, e.g. convent, monastery.	813110
Public Administration	Police/Fire	92212/92216
	Correctional institution	92214
	Office setting - in facility type not specified above	NA
	Household	NA
	Single family home	NA
	Apartment/town house	NA
	Single room occupancy	NA
	Senior independent living	NA
	Spectator sport facility/stadium, arena	NA
	Other Facility Type, Specify	

^a This list is intended to present detailed data on the more common Facilities Types. It does not specify all industries within Industry Sectors thus doesn't allow for comparing with the employment data for the broad Sectors, only with employment data at the corresponding industry level.

^b Employer provided housing/transportation may be important in other industries as well and provided here as an example of collecting key sub-settings

^c Per NAICS, schools-associated sporting events are assigned to school.

^d Casino hotels are coded in NAICS under the Accommodation and Food Sector.

Broad Setting Groups

Most jurisdictions presented outbreak data in broad groups, often designed to capture other dimensions of critical public health importance, such as congregate living, food supply, education, or people experiencing homelessness. In many instances workplaces/occupational settings were listed as a distinct category on these lists of Facility Types, most of which were places of work. No two states used the same groups. These broad settings groups, while important in addressing other public health concerns, often limited meaningful use and interpretation of the data from an occupational health perspective. For example, some jurisdictions, in grouping settings, combined agricultural operations, food manufacturing, grocery stores and restaurants – all relevant to food production and distribution. These Facility Types are all in different industry sectors, subject to different regulatory authorities, and involve different stakeholders (e.g., trade associations, unions, etc.). While this grouping provides some information useful to those responsible for food safety, it provides little actionable information for targeting workplace prevention efforts. While public health agencies may have internal data that is more granular, the usefulness of the publicly available grouped data to others (e.g., policy makers, agencies/researchers/unions/employers) is limited.

Classification of outbreak-associated cases as workers or non-workers

Many jurisdictions reported outbreaks in corrections and schools separately, differentiating between outbreak-associated cases among workers and non-workers (e.g., detainees, students.) For website reports of outbreaks in other non-healthcare Facility Types, cases among workers and non-workers were seldom distinguished. There were exceptions, however, for example, Colorado and Los Angeles, which reported numbers of cases among staff and non-staff by named facility for all outbreaks.⁴

Discussion and recommendations

Findings in this report underscore the need for a standardized approach to classifying and reporting information about workplace outbreaks. Use of existing standard industry classifications has many potential advantages for public health surveillance. A fundamental challenge in developing an industry-based approach to structuring workplace outbreak data is that Facility Type is not necessarily synonymous with industry. Whereas industry captures the type of business being carried out at a location and is commonly used in research as a proxy for workplace exposures, setting is intended to capture information about the physical location/exposure conditions where the outbreak occurred. In many instances (e.g., restaurant, grocery store, daycare) industry serves as a good proxy for setting, capturing relevant information about physical location. However, in other instances, for example, mobile industries where work is carried out in different places, industry and setting do not necessarily coincide.

RECOMMENDATION 1. Capture detailed industry information and classify according to NAICS for all workplace outbreaks.

From an occupational health perspective, industry is considered first order information about workplace outbreaks and optimally should be collected as a separate data element in narrative text format (in addition to employer name and address) and assigned NAICS codes using available automated coding tools. It should be recognized that Industry information may fail to capture broader contextual information about the environment in which the exposure occurred relevant to outbreak response, (e.g., a construction site within a health care facility.) Industry may likewise fail to capture more detailed information about sub-settings within workplaces (e.g., an eating area within a manufacturing facility, or kitchens vs. customer service

⁴ Some jurisdictions publicly report the actual name of workplaces/facilities in which COVID-19 outbreaks occurred, typically within broad setting groups. Whether the facility identifiers should be routinely posted publicly is an important surveillance consideration that will depend on public health policy and privacy and confidentiality regulations of the different jurisdictions

areas in a restaurant). This detailed information is important to guide immediate outbreak response and increase understanding of factors related to transmission and may be documented on intake forms and/or investigation reports. Information about the occupations of cases can help shed light on the super- and sub-settings.

Consider the following strategies for collecting industry data given the different means of outbreak detection.

- **Outbreaks reported by the employer, union, worker(s), healthcare provider or others.** The public health agency could obtain narrative information about the type of business in response to a standard intake question about the type of business recorded in a distinct field. Industry narratives could then be automatically coded using NIOCCS (i.e., the California model).
- **Outbreak identified by public health agencies through process of case investigation and contact tracing.** If industry as well as occupation of the initial case has been collected as narrative and coded by NIOCCS as a routine part of the interview, as recommended elsewhere [1-4], the industry of that case may be used to identify the industry in which an outbreak occurred. It should be noted that use of employer identifiers alone to designate industry can be challenging and time-consuming given differences in abbreviations, spelling, and addresses as well as missing or ambiguous information. Employer name is essential in planning an immediate outbreak response but is not sufficient to inform evidence-based policy (e.g., re-opening, or vaccine prioritization.)
- **Routine analysis of case level data.** If employment data are routinely collected in case level surveillance databases and coded, some outbreaks could be identified by timely summary analysis of case level data, using industry, occupation, employer name, address, date range, etc. Because infectious disease surveillance is carried out based on place of residence vs. place of work, this approach applied at the local level will inherently be limited as it would fail to capture workplace outbreaks involving individuals who cross jurisdictional boundaries to work. State level analysis would be more informative, albeit still subject to limitations due to interstate commuting. Again, the use of employer identifiers alone to glean industry can be challenging and resource intensive.

Training Data Collectors

Training of data collectors on how to collect industry (and occupation) information has been found to be important to increase collection of codable narrative information. Standard, well tested questions for collecting industry as well as occupation information, brief training tools and training resources for Public Health agencies are available [33]. NIOSH is available to assist Public Health agencies and NIOSH funded Occupational Health Programs in states can be a valuable resource for other Public Health programs [34].

Reference lists used to capture and report the full range of settings with potential for disease transmission will remain central in documenting outbreaks. These lists of settings can be enhanced to improve their usefulness for surveillance of workplace outbreaks.

RECOMMENDATION 2. Align Facility Types on reference lists used to capture the full range of settings with NAICS definitions, where possible

Facility Type information aligned with standard industry classifications can provide useful if less comprehensive information about workplace outbreaks. Given the difference in industrial make up across states, it is reasonable that Facility Types reported will vary across jurisdictions. The challenge is not to necessarily have the same setting list for all jurisdictions but to have the same definitions for those settings which are common across jurisdictions. Aligning Facility Types with NAICS to categorize settings would promote this consistency. It would also allow consideration of workplace outbreaks in context of all

outbreaks. As discussed, alignment with NAICS definitions is possible for many but not all commonly reported Facility Types. Jurisdictions, in adding their own local Facility Types should look to NAICS definitions of industries. Reference lists of Facility Types should be structured to address/eliminate not-mutually response options and Facility Type and Event should be captured and reported as separate data elements.

Outbreaks may involve both workers and non-workers, and in practice only arise to the level of a workplace outbreak when a specified criterion is met (e.g., number of cases among workers within a specified time period, with an epidemiologic link.) There is, therefore, a distinction between workplace outbreaks and outbreaks in Facility Types that are workplaces involving non-workers or a combination of workers and non-workers.

RECOMMENDATION 3. Distinguish between cases among workers and non-workers in all outbreak settings, to the extent possible

It is important from an occupational health perspective to differentiate outbreak associated cases among workers and non-workers to the extent possible in all outbreaks to increase understanding of potential risk to workers. Since the number of workers can usually be ascertained, the rate of disease can be calculated for the workplace and potentially for the industry. This differentiation has important implications for policy/enforcement options that may be available or needed to control the spread of disease (e.g., workplace ventilation requirements, paid sick leave.) It also has important ramifications for individuals who may be eligible for workers' compensation due to exposure at their places of work. In short, data documenting that workers specifically are at risk can be critical to advocating both for individual workers and for broad policy changes to mitigate disease transmission in workplaces.

It is recognized that for outbreaks in workplace settings in which members of the general public may also be exposed (e.g., customers in a grocery store) Public Health agencies will generally not have capacity to track cases among the general public. Likewise, employers in these settings cannot be expected to know about cases among customers for reporting purposes.

As discussed, the broad setting groups used in many jurisdictions can provide important information relevant to addressing other critical public health concerns but often limit meaningful interpretation and use of the data from an occupational health perspective.

RECOMMENDATION 4. Collect and make available data on Industry/Facility Type at sufficiently granular level for use to address occupational health as well as other critical public health concerns.

In accord with state confidentiality rules, aggregate data on outbreak by Industry/Facility Type should be collected and made available to external data users at a sufficient level of detail to address occupational health as well as other critical public health concerns. Development of guidance for consistent groupings of Industry/Facility Types by other public health dimensions of concern (i.e., those beyond the scope of occupational health such as congregate living, people experiencing homelessness) should also be considered.

Limitations and next steps

Limitations of our data analysis need to be considered. First, we collected data on outbreak setting categories from only a sample of jurisdictions. Thus, not all settings in which workplace outbreaks of COVID-19 have been reported and identified here for coding to NAICS. The data from the 22-jurisdiction sample do, however, provide valuable insight about the types of challenges to be addressed in structuring outbreak data for infectious disease. Secondly, because we relied on data on outbreaks of COVID-19, the setting list we attempted to code to NAICS did not capture the full range of settings relevant to infectious diseases in general. We believe it is reasonable to generalize the NAICS codability findings to settings relevant to STD,

but the extent to which setting categories can be aligned with industry for the full range of settings remains to be evaluated. Further work to assign NAICS codes and structure the full range of categories on the setting list in the National Occupational Reporting System (NORS) for food and waterborne and enteric diseases would be a useful step [34].

Not addressed in this document but discussed by the Workgroup was the need for better data on workplace risk factors for disease. For example, while a number of risk factors for airborne transmission (e.g., working indoors, in close proximity to others or in public facing jobs) are widely recognized, public health surveillance data on these risk factors are limited [35]. Collection of additional risk factor information may be challenging for surveillance during public health emergencies, but the feasibility of systematically collecting such information in workplace outbreak investigations and making this available to other stakeholders should be explored. Again, data elements and exposure settings used in NORS may be a good starting point. NORS does, for example, include outdoor places of work on its setting list [34]. Notably NORS also calls for collection of industry narratives for occupational exposures and “associated events” and “settings of exposure” are reported as separate data elements.

Also not addressed in this report is the challenge of multi-employer workplaces. These are workplaces in which more than one employer is present in the same physical facility. Workplace outbreaks in these situations can be challenging to characterize by industry, as outbreak-associated cases may be employed in different industries. Consider, for example, janitorial workers employed by a janitorial agency in a manufacturing facility. Generally, employer mandates for reporting outbreaks specify that cases are among employees or those supervised by the employer. It is not clear in state published reports if cases among people working for other employers in the same facility (i.e., contractors), are included as outbreak associated cases if identified upon investigation. This issue needs further clarification.

Conclusion

In this working paper, we provide preliminary recommendations on how to collect and structure information on workplace outbreaks of infectious disease, after having reviewed COVID-19 outbreak data from 22 jurisdictions. While our findings are based on review of COVID-19 data and the federal Public Health Emergency for Covid-19 has ended, we believe that our recommendations are relevant to surveillance of infectious disease outbreaks more generally. This – and the extent to which NAICS codability findings can be generalized to settings beyond those used to characterize outbreaks of ATDs remains to be assessed. Collaboration between experts in occupational health, infectious disease, and informatics will be important in developing comprehensive guidance regarding how to classify and structure data on workplace outbreaks across the full range of infectious diseases.

Important to the discussion about generating actionable information on workplace outbreaks is the need to better understand the process by which workplace outbreaks have been detected during the pandemic. In particular, it is important to understand the role of employer reporting and the ways outbreak data were used in jurisdictions to organize outbreak response in targeted workplace settings [36]. It is also necessary to better understand the respective roles of Public Health and Labor Department agencies with respect to workplace outbreak reporting and response and to learn from states such as California, Washington and Virginia where Labor and Public Health agencies have successfully worked together during the COVID-19 pandemic. Going forward, we need to increase the capacity of our surveillance systems to provide information about the risks and impact of disease in workplaces. This information is critical to directing efforts to protect workers and to reduce health inequities. Lessons gleaned from the pandemic can inform this work.

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Appendix 1. North American Industry Classifications (v. 2017) for Health Care Industries

Health Care industries are classified within the broader Health Care and Social Assistance Sector. This sector comprises establishments providing health care and social assistance for individuals. The sector includes both health care and social assistance because it is sometimes difficult to distinguish between the boundaries of these two activities. The industries in this sector are arranged on a continuum starting with those establishments providing medical care exclusively, continuing with those providing health care and social assistance, and finally finishing with those providing only social assistance. The services provided by establishments in this sector are delivered by trained professionals. All industries in the sector share this commonality of process, namely, labor inputs of health practitioners or social workers with the requisite expertise. Many of the industries in the sector are defined based on the educational degree held by the practitioners included in the industry.

NAICS Code (2017)	NAICS Title
62 Healthcare and Social Assistance	
621 Ambulatory Health Care Services	
6211 Offices of Physicians:	
621111	Offices of Physicians (except Mental Health Specialists):
621112	Offices of Physicians, Mental Health Specialists:
6212 Offices of Dentists:	
6213 Offices of Other Health Practitioners	
62131	Offices of Chiropractors:
62132	Offices of Optometrists
62133	Offices of Mental Health Practitioners (except Physicians)
62134	Offices of Physical, Occupational and Speech Therapists, and Audiologists
62139	Offices of All Other Health Practitioners
621391	Offices of Podiatrists:
621399	Offices of All Other Miscellaneous Health Practitioners:
6214 Outpatient Care Centers	
62141	Family Planning Centers
62142	Outpatient Mental Health and Substance Abuse Centers
62149	Other Outpatient Care Center
621491	HMO Medical Centers
621492	Kidney Dialysis Centers:
621493	Freestanding Ambulatory Surgical and Emergency Centers:
621498	All Other Outpatient Care Centers:
6215 Medical and Diagnostic Laboratories	
62151	Medical and Diagnostic Laboratories
621511	Medical Laboratories:
621512	Diagnostic Imaging Centers:
6216 Home Health Care Services	
6219 Other Ambulatory Health Care Services	
62191	Ambulance Services
62199	All Other Ambulatory Health Care Services
621991	Blood and Organ Banks:
621999	All Other Miscellaneous Ambulatory Health Care Services
622 Hospitals	
6221	General Medical and Surgical Hospitals:
6222	Psychiatric and Substance Abuse Hospitals
6223	Specialty (except Psychiatric and Substance Abuse) Hospitals:
623 Nursing and Residential Care Facilities	
6231 <u>Skilled Nursing Care Facilities</u>	
6232	Residential Intellectual and Developmental Disability, Mental Health, and Substance Abuse Facilities
62321	Residential Intellectual and Developmental Disability Facilities
62322	Residential Mental Health and Substance Abuse Facilities
6233 Continuing Care Retirement Communities and Assisted Living Facilities for the Elderly:	
623311	Continuing Care Retirement Communities
623312	Assisted Living Facilities for the Elderly
6239 Other Residential Care Facilities	
62399	Other Residential Care Facilities

Appendix 2. Jurisdictions included in the convenience sample.

California
Chicago
Colorado
Connecticut
Georgia
Hawaii
Illinois
Los Angeles
Massachusetts
Michigan
Minnesota
Mississippi
Nevada
New Hampshire
New Jersey
North Carolina
Oregon
Vermont
Virginia
Washington State
Wisconsin