Washington State's occupational respiratory disease surveillance system, 2016 – 2017: Surveillance methods and a preliminary evaluation

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Introduction

Occupational respiratory diseases are preventable. The purpose of Washington's occupational respiratory disease surveillance system is to identify disease trends that when addressed with prevention activities, may lead to a reduction in respiratory disease burden. The overall objective is to describe the incidence of occupational respiratory diseases, identify high-risk industries and exposures, and identify areas that would benefit from prevention resources.

Surveillance for work-related asthma (WRA) began in Washington in 2001. In 2016, surveillance efforts were expanded to include the respiratory conditions of asbestos-related disease (ARD), silicosis, valley fever, and chronic obstructive pulmonary disease (COPD). The purpose of this report is to describe the data sources, case capture methods, case definitions, disease classification categories, and results for the years 2016 and 2017 under the expanded surveillance program. We evaluated the case capture criteria for newly covered respiratory diseases, and compared our historic work-related asthma surveillance methods to asthma captured under expanded criteria.

Data Sources

Workers' Compensation

Washington State workers' compensation claims are the primary data source. In Washington State, nonfederal employers are required to obtain workers' compensation insurance through the Department of Labor and Industries (L&I), unless they meet specific requirement to self-insure or are covered under an alternative workers' compensation program. L&I's State Fund (SF) insurance program provides coverage for approximately 1.9 million (about two-thirds) of the workers in the state and 99.7% of all employers. Data from both the SF and self-insurance programs are entered into a centralized data warehouse at L&I which contains both medical diagnoses and administrative codes.

Physician Reports

As of July 2000, work-related asthma is a reportable condition (WAC 246-101) for health care providers and health care facilities in Washington State. Physicians submit reports directly to the SHARP Program. At the time of this report, work-related asthma is the only occupational

respiratory condition that is reportable. Less than 5% of all valid asthma cases are reported into the system through physician reports.

Surveillance Procedures

L&I's workers' compensation data warehouse is queried on a monthly basis to capture potential respiratory disease claims. Potential cases are uploaded into SHARP's respiratory disease database where they are reviewed, validated, and classified for disease and exposure. The process of validating cases as valid, not valid, undetermined, or duplicate is referred to as dispositioning. Valid cases of work-related asthma and asbestos-related disease (ARD) are classified as to the specific type of asthma or ARD. The case validation and disease classification process uses information obtained in the workers' compensation medical record to determine whether criteria set forth in the case definition is met. Injured workers with a diagnosis of work-related asthma may be interviewed over the telephone to determine the disease classification and the agent(s) they were exposed to. Because respiratory diseases have long latency periods, exposure is classified for ARD and silicosis as valid exposure, not valid, or undetermined so that prevention activities for exposed workers without clinical disease can be undertaken.

Case Capture

Potential cases are captured using three types of data: a) a text search for keyword terms on the Report of Industrial Injury or Occupational Disease (ROIID) form; b) International Statistical Classification of Disease (ICD-10-CM) codes with clinical modification; and c) Occupational Injury and Illness Classification System (OIICS) codes. The ROIID form initiates the claim and among other things describes the initial treatment reason and the initial work-related diagnosis; it is completed by the injured worker, their physician, and their employer. Diagnosis codes (ICD-10-CM) are assigned by health care providers and are pulled from the ROIID form, the claim adjudication process, and from medical and hospital bills. Injury and illness (OIICS) codes classify and standardize the information on the ROIID form and are assigned by insurance staff. Figure 1 shows a Venn diagram (not scaled) of the case capture criteria. The labels A through F are used to evaluate the various capture sources and are referred to in the Results section. Table 1 shows case capture criteria in detail.

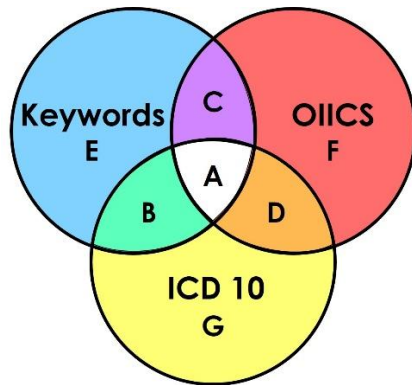Figure 1. Venn diagram showing relationship of case capture criteria.

Table 1. Case capture criteria for 5 diseases under respiratory surveillance

Capture Criteria	Work-related asthma	Asbestos-related Disease[3]	Silicosis	Valley fever	Chronic obstructive pulmonary disease
Keywords	asthma, astma	asbest, mesothe, misoth	silic	cocci, valley fever	inhal
OIICS[1]	340, 341*, 1443	340, 341*, 1452, 551	340, 341*, 1453, 557	340, 341*, 244	340, 341*
ICD-10-CM[2]	J45*, J46*, J98.01	J61, J91-92*, C45*, C38.4, C78*, D02*	J62*	B38*	J40*, J41*, J42*, J43*, J44*, J98.01

[1] Occupational Injury and Illness Classification System, Event, Nature and Source codes, v1.01
[2] International Classification of Diseases, Tenth Revision
[3] In addition to keywords, OIICS and ICD-10-CM codes, an asbestos-claim flag utilized by the insurance system is used
* Select sub-codes within the umbrella code are excluded

Case Definitions and Classifications

The case definitions for work-related asthma, asbestos-related disease, silicosis, valley fever (*Coccidioidomycosis*) and COPD are summarized in Table 2. In addition to the case definitions, there are disease classifications for work-related asthma, asbestos-related disease, and COPD. Furthermore, there are exposure classifications for asbestos-related disease, silicosis, and valley fever. The purpose of the exposure classification is to count workers who have valid exposure but who may or may not have clinical manifestation of disease.

Table 2. Case definition, disease classification, and exposure classification for occupational respiratory diseases[1]

Case Definition	Disease Classification	Exposure Classification
Work-related asthma		
Surveillance follows the National Institute for Occupational Safety and Health (NIOSH) Sentinel Event Notification System for Occupational Risks (SENSOR) program and NIOSH's work-related asthma case definition and case classification decision logic.[2] Cases are classified at 6 months of claim maturity.		
Healthcare professional's diagnosis consistent with asthma AND Association between symptoms of asthma and work	-Work-aggravated asthma (WAA) New-onset asthma (NOA)[3] - Occupational asthma (OA) - Reactive airways dysfunction syndrome (RADS)	-No classifications
Asbestos-related disease (ARD)		
Case definition developed by the SHARP program. Cases are classified at 12 months of claim maturity.		
History of occupational exposure to airborne asbestos AND Physician diagnosis of asbestos-related disease with reference to HRCT or chest X-ray OR Physician diagnosis of mesothelioma with reference to diagnostic testing; or death certificate with mesothelioma as primary cause of death.	-Asbestos-related disease (includes asbestosis and pleural plaque) -Mesothelioma	-Exposure positive[4] -Exposure negative[5] -Exposure undetermined
Silicosis		
The case definition follows NIOSH's silicosis surveillance case definition.[6] Cases are classified at 12 months of claim maturity.		
History of occupational exposure to airborne silica dust AND Chest radiograph or other imaging technique interpreted as consistent with silicosis OR Pathologic findings characteristic of silicosis	-No classifications	-Exposure positive[7] -Exposure undetermined
Chronic obstructive pulmonary disease (COPD)		
The case definition for COPD was developed by the SHARP program. Case validation and classification logic is under development.		
History of chronic occupational exposure to vapor, gas, dust or fume (VGDF) AND Physician diagnosis consistent with COPD	-Probable COPD -Possible COPD -Probable work-aggravated COPD -Possible work-aggravated COPD	TBD

Case Definition	Disease Classification	Exposure Classification
Valley fever (Coccidioidomycosis) The case definition for work-related Valley Fever is an adaptation from the [Washington State Department of Health's case definition for Valley Fever.](Washington State Department of Health's case definition for Valley Fever)[8] Cases are classified at 12 months claim maturity.		
History of occupational exposure to soil or other medium with suspected or confirmed contamination with *Coccidioides* fungus AND Clinical diagnosis of valley fever with valid clinical symptoms AND Reference in the medical record to positive serologic test for coccidioidal antibodies in serum, cerebrospinal fluid, or other fluid OR Laboratory test for positive serologic test for coccidioidal antibodies in serum, cerebrospinal fluid, or other fluid	-No classifications	-Acquisition in WA State -Acquisition outside WA State[9] -Unknown acquisition location

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[1] Work-related asthma adopted 2001, asbestos-related disease, silicosis, valley fever adopted January 2017. COPD not yet formally adopted. Last updated: Feb 2017.

[2] Asthma surveillance: https://www.cdc.gov/niosh/topics/surveillance/ords/statesurveillance/reportingguidelines-wra.html#guidelines

[3] New onset asthma includes the classifications of occupational asthma with latency, and RADS which is occupational asthma without latency

[4] Confirmed by positive building material test or work in/near an asbestos abatement area

[5] Confirmed by a negative building material test

[6] Silicosis: https://www.cdc.gov/niosh/topics/surveillance/ords/statesurveillance/reportingguidelines-silicosis.html

[7] Confirmed by documentation for exposure to silica or silica-containing products. There is no classification for negative silica exposure because building materials are not typically tested for silica.

[8] Valley fever: https://www.doh.wa.gov/ForPublicHealthandHealthcareProviders/NotifiableConditions/Coccidioidomycosis

[9] Washington residents who acquire valley fever during work-related travel outside of WA.

Results

During the two-year period 2016 – 2017, a total of 410 potential cases were captured for all conditions using the criteria outlined in Table 1 and Figure 1. Work-related asthma is the most frequently captured of the respiratory disease conditions under surveillance. Table 2 shows work-related asthma for the year 2017 only, cases captured prior to 2017 relied exclusively on text-word search and did not use OIICS nor ICD-10-CM codes in the case capture strategy. WRA data prior to 2017 is available on the SHARP website and has been published in previous technical reports[1] and publications[2].

For all disease conditions, cases are excluded if the injury is not predominant for an inhalation or respiratory illness (see Table 2). Examples of excluded cases are those where keyword capture criteria inadvertently brought in asbestos-abatement workers with traumatic injuries, 'asthma' injuries that are predominant for dermatitis or insect bite, or cardio-pulmonary events that occur in the workplace and trigger pre-existing asthma or COPD. These excluded cases are not included in the denominator to calculate the percent of valid cases.

Potential cases that are not excluded from the system progress to the validation phase and are deemed either Valid (shown in Table 2) or Not Valid (data not shown) using their respective case definition. Case disposition involves in-depth review of the medical record and can take 30 minutes to several hours per potential case. The proportion of valid cases for the disease conditions of Asbestos-Related Disease (ARD) and silicosis are low at 27% and 11%, respectively. This is because exposed workers (including second-hand) may have valid exposure and are ascribed an ICD-10-CM code during clinical evaluation, but ultimately do not have clinical findings consistent with ARD or silicosis.

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[1] Washington State Department of Labor & Industries, Safety & Health Assessment & Research for Prevention (SHARP) Program. *Work-Related Asthma in Washington State, 2009-2013*. Technical Report #75-12-2015. https://www.lni.wa.gov/Safety/Research/OccHealth/Asthma/Prevention.asp.
[2] Claire R LaSee and Carolyn K Reeb-Whitaker. Work-related asthma surveillance in Washington State: time trends, industry rates, and workers' compensation costs, 2002-2016. 2019. *J of Asthma*, https://doi.org/10.1080/02770903.2019.1571084.

An analysis for completeness of key data elements was performed for valid cases (Table 3). Data elements such as industry (NAICS, Risk Class) and occupation (SOC) derive from the administrative data associated with the workers' compensation data. We conclude that industry and occupation codes approach completeness for asthma and valley fever cases. Industry codes are lacking, however, for asbestos-related disease due to long disease latency and a history of multiple employers. In conclusion, a predominant industry code needs to be determined and manually entered during case classification of ARD.

Table 2. Surveillance summary of occupational respiratory diseases in WA, 2016-2017

Disease	# Captured	# Excluded[1]	# Dispositioned	Pending Disposition	# Valid Cases (% Dispositioned)
Asthma[2]	219	58	161	0	97 (60)
Asbestos-Related	82	16	66	0	18 (27)
Silicosis	13	4	9	0	1 (11)
Valley Fever	4	0	4	0	3 (75)
COPD	92	12	0	80	TBD
Total	410	90	240	80	119

[1] Excluded because potential case was not predominant for an inhalation or respiratory illness
[2] 2017 data only

Table 3. Percent of key data elements complete for valid respiratory disease cases

Data Element	Asthma (n=97)	Asbestosis (n=18)	Silicosis (n=1)	Valley Fever (n=3)
NAICS-Location[1]	99	6	100	100
NAICS-Account[2]	88	6	0	100
Risk Class[3]	94	100	100	100
SOC Code[4]	97	100	100	100
At least 1 AOEC code[5]	100	NA	NA	NA

[1] North American Industry Classification System, 2012. Industry ascribed to the business in the location where the injury occurred
[2] North American Industry Classification System, 2012. Industry ascribed to the umbrella entity that holds the business account
[3] Washington State's Workers' Compensation Risk Classification System
[4] Standard Occupational Classification System, 2010
[5] Association of Occupational and Environmental Clinics, exposure substance codes

Work-related asthma

Surveillance for work-related asthma (WRA) commenced in the SHARP program in 2002. At that time, a simple case capture method using the keyword 'asthma' was searched on the workers' compensation claim initiation form, known at that time as the Report of Accident form. In 2017, our surveillance system was expanded to include additional respiratory diseases utilizing more advanced case capture criteria as outlined in Figure 1 and Table 1. While the case capture methods for WRA changed in 2017, the case definition and case classifications for WRA have remained the same.

We compared annual case capture for WRA from 2010 through 2016, which used keyword-only capture methods, to the enhanced capture methods for WRA launched in 2017. WRA case capture declined from 151 cases captured in 2010 to 87 cases in 2016 (Table 4). In 2017, the enhanced capture methods resulted in an increase of 137 cases captured and 43 cases deemed valid compared to keyword-only case capture (Tables 4 and 5). The enhanced system successfully yields an 80% increase in valid cases. The distribution of valid cases by case classification shifted somewhat under the enhanced method (Table 5); there were proportionally fewer valid WAA cases and proportionally more cases of RADS, OA, and cases that could not be classified. The distribution assessment is limited to a single year and will be repeated in subsequent years to establish whether these trends are consistent.

Table 4. Work-related asthma case capture and valid cases by year and capture method

Year of Injury	# Captured	# Valid Cases	Case Capture Methods
2010	151	105	Keyword only
2011	181	111	Keyword only
2012	160	87	Keyword only
2013	158	107	Keyword only
2014	136	96	Keyword only
2015	137	98	Keyword only
2016	87	80	Keyword only
2017[1]	83	54	Keyword only (derived)
2017[1]	219	97	Enhanced surveillance: Keyword + OIICS + ICD-10-CM

[1] Based on year claim was established, not on year of injury

Table 5. Valid WRA case classification distribution compared by case capture method, 2017

| WRA Classification | Case Capture Method | | |
	Keyword Only[1] (% of total)	Enhanced (% of total)	Change
Work Aggravated Asthma (WAA)	48 (89)	78 (80)	+30
New Onset Asthma			
-Occupational Asthma (OA)	4 (7)	10 (10)	+6
-Reactive airways dysfunction (RADS)	1 (2)	3 (3)	+2
Insufficient data to classify	1 (2)	6 (6)	+5
Total	54 (100)	97 (100)	+43

[1] Derived from 2017 data by ascertaining the number of potential cases identified by keyword only

Figure 2 and Table 6 below show the percent of valid work-related asthma cases by case capture criteria for the year 2017. As expected, potential cases having all three case capture criteria (venn A: keyword, OIICS code and ICD-10-CM diagnosis codes) returned the highest percentage of valid cases at 90%. Table 4, which shows the potential cases captured in more detail, reveals that ICD-10-CM diagnosis codes-only (venn G) returned 39 readily excluded cases, the highest percentage at 78% of captured cases. However, of the G cases that were dispositioned, a high percentage (73%, n=8) were valid. This means that ICD-10-CM codes (venn G), when used alone for case capture, bring in a high percentage of non-specific cases that do not involve a work-related respiratory event. However, for the cases (venn G) that actually do involve a respiratory event, those potential cases often prove to be valid for asthma upon medical record review.

Figure 2. Percent of dispositioned work-related asthma cases that proved valid, by case capture criteria, when the number of valid cases ≥ 5.
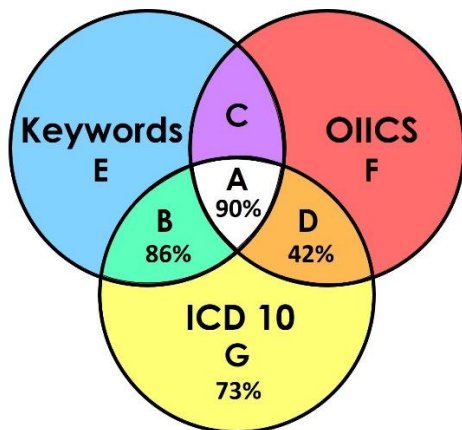
Table 6. WRA case capture, exclusion, disposition, and number valid, by case capture criteria, 2016-17.

Capture Criteria, Venn Label	# Captured	# Excluded[1]	# Dispositioned	# Valid Cases (% Dispositioned)
A	52	2	50	45 (90)
B	11	4	7	6 (86)
C	6	1	5	3 (60)
D	67	5	62	26 (42)
E	10	3	7	3 (43)
F	5	3	2	1 (50)
G	50	39	11	8 (73)
S[2]	18	1	17	5 (29)
Total	219	58	161	97 (60)

[1] Excluded because potential case was not predominant for an inhalation or respiratory illness
[2] S refers to cases with an ICD-10-CM code for bronchospasm and no other respiratory ICD-10-CM codes. The bronchospasm-only code is flagged for the conditions of asthma and COPD.

The vast majority of valid work-related asthma cases were classified as work-aggravated asthma (Table 7). Among the OA cases, six had objective medical evidence, such as lung function tests and four had no objective evidence in the medical record. Regarding industry sector, most work-related asthma cases occurred in the Health Care and Social Assistance, followed by Manufacturing and Retail Trade (Table 6).

Table 7. Valid WRA case classifications, 2017 (n=97)

Asthma Classification	Count
Work Aggravated Asthma (WAA)	78
New Onset Asthma	
-Occupational Asthma (OA)	10
-Reactive Airways Dysfunction Syndrome (RADS)	3
Insufficient data to classify	6

Of the valid WRA cases, all had at least one AOEC exposure substance code, 16 cases had two codes, five cases had three codes, two cases listed four AOEC codes, and 1 case listed 5 AOEC codes. Smoke, mold, and dust were the leading causes of WRA (see Table 9), followed by indoor air pollutants, chemicals, paint, and cleaning materials. Regarding workers' compensation claim adjudication by the Washington State Department of Labor & Industries, 49

surveillance cases for WRA were accepted, 47 were rejected, and one was pending at the time of this report (data not shown).

Table 8. Valid WRA cases by industry sector, 2017 (n=97)

Industry Classification (2-digit NAICS code)	Count
Health Care and Social Assistance (62)	19
Manufacturing (31 to 33)	11
Retail Trade (44 to 45)	11
Administrative & Support & Waste Management & Remediation Services (56)	7
Wholesale Trade (42)	6
Other Services (except Public Administration) (81)	6
Public Administration (92)	6
Educational Services (61)	5
Construction (23)	4
Transportation and Warehousing (48 to 49)	4
Accommodation and Food Services (72)	3
Agriculture, Forestry, Fishing and Hunting (11)	3
Information (51)	2
Real Estate and Rental and Leasing (53)	2
Professional, Scientific, and Technical Services (54)	2
Arts, Entertainment, and Recreation (71)	2
Utilities (22)	1
Finance and Insurance (52)	1
Management of Companies and Enterprises (55)	1
Missing	1

Table 9. Most frequently referenced exposures among valid WRA cases, 2017 (n=97)

Rank	Times Listed	AOEC Code	AOEC Description
1	17	330.03	Smoke, NOS
2	9	391.01	Mold, NOS
2	9	010.00	Dust, NOS
4	7	320.33	Indoor Air Pollutants from Building Renovation
5	5	320.06	Chemicals, NOS
5	5	171.01	Paint, NOS
7	4	322.00	Cleaning Materials, NOS
8	3	050.18	Sodium Hydroxide
8	3	322.10	Sodium Hypochlorite
8	3	320.23	Perfume, NOS

Asbestos-related disease

For the years 2016 and 2017, a total of 82 potential asbestos-related diseases (ARD) were captured. As shown in the ARD diagram (Figure 3), the highest proportion of cases that proved to be valid were brought in by capture criteria labeled as venn A and venn C at 33% and 26%, respectively. A notable proportion of potential ARD cases were captured using keyword only (venn E, n=17), but most of these cases were excluded because they were not a respiratory event and none were deemed valid. An example of excluded cases are acute injuries occurring in asbestos abatement workers (captured with the keyword 'asbestos').

Of the 18 valid cases of asbestos-related disease, 10 were classified as mesothelioma (10 deceased) and eight for asbestosis (1 deceased). Of the remaining 48 dispositioned cases, 47 were not valid and one was a duplicate. Of the 48 cases that were not valid, 28 did have confirmed exposure to asbestos while 19 had unknown or undetermined exposure (data not shown). Table 11 shows the industry noted for workers with valid asbestos exposure. Unfortunately, most workers with clinically valid ARD do not have administrative codes for industry sector. In the future, industry will be manually coded for these cases.

Figure 3. Percentage of dispositioned asbestos-related disease cases that proved valid, by capture criteria
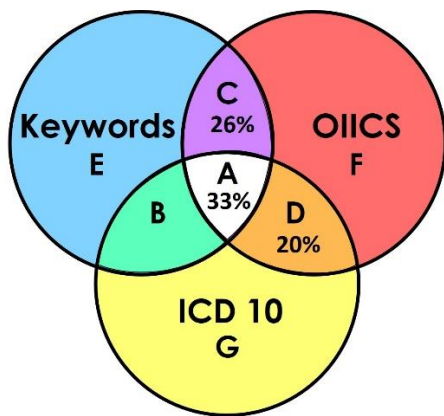
Table 10. Potential asbestos-related disease (ARD) case exclusion, disposition, and number valid, by case capture criteria, 2016-17.

Capture Criteria	# Captured	# Excluded[1]	# Dispositioned	# Valid Cases (% Dispositioned)
A	37	1	36	12 (33%)
B	1	0	1	0
C	19	0	19	5 (26%)
D	5	0	5	1 (20%)
E	17	12	5	0
F	1	1	0	0
G	2	2	0	0
Total	82	16	66	18 (27%)

[1] Excluded because potential case was not predominant for an inhalation or respiratory illness

Table 11. Industry classification for 46 cases with confirmed exposure to asbestos; clinical disease is present in 18 of the exposed cases. For the years 2016-2017.

Industry Classification (2-digit NAICS code)	# Confirmed Asbestos Exposure	# Valid Clinical Disease
Utilities (22)	1	0
Construction (23)	4	0
Manufacturing (31 to 33)	1	0
Wholesale Trade (42)	1	0
Retail Trade (44 to 45)	1	1
Transportation and Warehousing (48 to 49)	1	0
Finance and Insurance (52)	1	0
Real Estate and Rental and Leasing (53)	2	0
Professional, Scientific, & Technical Services (54)	2	0
Administrative and Support and Waste Management and Remediation Services (56)	1	0
Health Care and Social Assistance (62)	1	0
Other Services (except Public Administration) (81)	3	0
Public Administration (92)	4	0
Missing	23	17
Total	46	18

Silicosis

For the two-year time-period 2016-17, 13 cases were captured for silicosis, nine were dispositioned, and only one case proved valid (Table 12). The valid case was captured with an ICD-10-CM code only. Of the eight cases that were not valid for silicosis, five had confirmed exposure to silica. These cases with exposure but no clinical disease occurred in the industry NAICS sectors of Manufacturing (31-33), Wholesale Trade (42), Real Estate and Rental Leasing (53), Educational Services (61), and Other Services (except Public Administration) (81).

Though this dataset is quite small, the ICD-10-CM codes were the only capture criteria needed to find the valid clinical case. Conversely, if one is looking for exposed cases in need of prevention resources, then ICD-10-CM diagnosis codes alone may be a limited approach compared to what was found using keyword and OIICS codes.

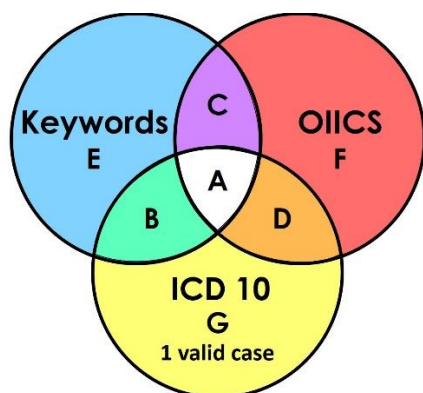Figure 4. Valid cases of silicosis, by case capture criteria

Table 12. Silicosis case exclusion, disposition, and num. valid, by case capture criteria, 2016-17.

Capture Criteria	# Captured	# Excluded[1]	# Dispositioned	# Valid Cases
A	0	0	0	0
B	0	0	0	0
C	8	0	8	0
D	0	0	0	0
E	4	4	0	0
F	0	0	0	0
G	1	0	1	1
Total	13	4	9	1

[1] Excluded because potential case was not predominant for an inhalation or respiratory illness

Valley Fever

Four potential cases of valley fever were captured, all were dispositioned, and three proved valid for valley fever (Figure 6 and Table 13).

Among the three valid valley fever cases, one case acquired valley fever endemic to Washington in the agriculture sector (NAICS 11). Two cases acquired valley fever during work-related travel outside of Washington in the industry sectors of Construction (NAICS 23) and Education Services (NAICS 61).

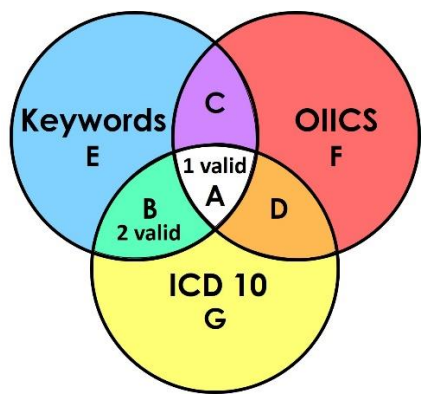Figure 6. Valid cases of valley fever, by case capture criteria

Table 13. Potential valley fever case exclusion, disposition, and number valid, by case capture criteria, 2016-17.

Capture Criteria	# Captured	# Excluded[1]	# Dispositioned	# Valid Cases
A	1	0	1	1
B	2	0	2	2
C	1	0	1	0
D	0	0	0	0
E	0	0	0	0
F	0	0	0	0
G	0	0	0	0
Total	4	0	4	3

[1] Excluded because potential case was not predominant for an inhalation or respiratory illness

Chronic Obstructive Pulmonary Disease

For the years 2016 and 2017, a total of 92 potential COPD cases were captured, 12 were excluded for not being predominantly for a respiratory nature, and 80 are pending disposition.

Table 14. Potential COPD case exclusion, disposition, and validation, by case capture criteria, 2016-17.

Capture Criteria	# Captured	# Excluded*	# Pending Disposition	# Valid Cases
A	18	0	18	TBD
B	4	1	3	TBD
C	0	0	0	TBD
D	43	1	42	TBD
E	0	0	0	TBD
F	0	0	0	TBD
G	27	10	17	TBD
S^2	0	0	0	TBD
Total	92	12	80	TBD

[1] Excluded because potential case was not predominant for an inhalation or respiratory illness
[2] S is for cases with ICD-10-CM bronchospasm code-only, this case capture criteria is not shown in the Venn diagram

Discussion

Evaluation of overall expanded surveillance system

The surveillance system described here was developed using three case capture criteria (keyword, OIICS and ICD-10-CM codes) across five different disease conditions. While the number of cases for some conditions is low, it appears the criteria performed differently for the different conditions. For example, ICD-10-CM codes are important capture criteria, but they were not useful in identifying deceased asbestos-related disease cases or in identifying silica-exposed workers. The capture criteria of keyword and OIICS proved more useful in finding those cases.

The case capture methods developed for the various respiratory conditions are most accurate for the conditions of asthma and valley fever, returning 60 and 75 percent of valid cases, respectively. Asbestos-related and silicosis capture methods returned a lower proportion of valid cases at 27 and 11 percent, respectively. For asbestos-related disease, 26% of valid cases were captured without ICD-10-CM codes. A review of industry and occupation codes showed that

career-spanning latent conditions such as asbestos-related (and possibly silicosis, n=1) have high proportions of missing industry codes, therefore these will need to be manually coded. Based on this evaluation, changes will be made to the case capture algorithm for asbestos-related disease to improve its current capture efficiency of 27 percent valid cases. The capture methods for all other conditions will remain as outlined in Table 1.

Evaluation of work-related asthma

Using 2017 data, a comparison was made between historic capture methods (keyword only) and enhanced capture methods (keyword, ICD-10-CM codes, OIICS codes) for work-related asthma. The enhanced capture methods brought in an additional annual 136 cases (167% increase), with the implication of a larger workload to validate these cases. Ultimately, the enhanced system yields an 80% increase in the number of valid WRA cases. The distribution of WRA across asthma classification categories shifted slightly with the expanded surveillance, with the expanded system having a decreased proportion of WAA (down from 89% to 70%), and an increased proportion of cases with insufficient data to classify (up from 2% to 12%). This shift in classification will continue to be monitored over time. A permanent shift, or bias, in WRA case classification between the expanded and historic methods may make comparing time-trend data between the two methods inappropriate.

A note about Valley fever

Valley fever is a fungal disease that affects the lungs as well as other body systems. Occupational exposure to soil dust containing *Coccidioides* fungal spores is risk factor for outdoor workers who may inhale the dust. Industries and jobs at high risk in Washington include construction, agriculture, landscaping, truck drivers, wildland firefighters, and heavy machine operators. Valley fever is included in our respiratory surveillance system for the following reasons: a) the *Coccidioides* fungus is recently identified as endemic to eastern Washington, making valley fever an emerging disease; b) occupational surveillance data is shared with Washington State's Department of Health where Coccidioidomycosis is a notifiable condition; and c) early detection of exposure and disease may significantly improve clinical outcomes for exposed work groups.

Strengths and limitations

Workers' compensation is the primary data source for this surveillance system. Factors that contribute to under-estimating the disease burden with this data source include injured workers unaware of the workers' compensation system, failure by both workers and/or healthcare providers to recognize the work-relatedness of a condition, and other barriers to filing a workers' compensation claim such as a perceived fear of retribution or job loss. The advantages of this system are a stable reporting source, standardized injury and illness codes, consistent and controllable case capture methods, and longevity. With these limitations and strengths in mind, this surveillance system is expected to identify workers and industries with high or emerging disease and exposure risk.

Conclusion

Surveillance case capture criteria, case definitions, case validation logic, and classification categories have been established for work-related asthma, asbestos-related disease, silicosis, and valley fever. Case capture for COPD is estimated at 40 cases per year, and the validation logic is currently under development. The expanded surveillance system described here has identified 96 valid cases of work-related asthma for the year 2017. Valid cases identified for the years 2016 and 2017 include 18 cases of asbestos-related disease, one case of silicosis, and three cases of valley fever. While the case count of silicosis disease is low in Washington, the ongoing surveillance for valid silica exposure will be used to identify the occupations and industries in need of prevention resources.

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