

Interim Evaluation of Work-Related Asthma Surveillance and Prevention

Technical Report Number 64-3-2004

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Introduction

An evaluation of the Safety & Health Assessment & Research for Prevention (SHARP) program's work-related asthma surveillance system was conducted with two main goals: (1) to determine the usefulness of the surveillance system by describing the activities and products developed as a result of data collection, analysis, and interpretation, and (2) to assess the efficiency and effectiveness of provider reporting and case follow-up activities. The purpose of this report is to summarize the results of the evaluation and to provide recommendations for system improvements and a plan of action for future work-related asthma surveillance and prevention activities.

I. Level of Usefulness of Work-Related Asthma Surveillance

The overall purpose of SHARP's work-related asthma surveillance project is to use data to achieve positive public health outcomes, Table 1.

Table 1: Logic Model for Work-Related Asthma Surveillance and Prevention

If we conduct the following ACTIVITIES...	...and develop and disseminate these PRODUCTS...	...then we will have an impact on KNOWLEDGE & ATTITUDES...	...that will lead to positive ACTION...	...which will ultimately result in the following OUTCOMES:
Build partnerships with employer and employee groups, health care providers, state and local health departments, community-based organizations and coalitions. Conduct outreach to health care providers Maintain surveillance system: collect, enter, manage, and analyze data Conduct worksite visits and interventions Perform case-based follow-up activities	Educational materials for health care providers: newsletters, articles, CME, presentations, website, etc. Technical reports Peer-review publications Trade journal articles Educational materials and site visit reports for employers Educational materials targeted for workers	Increase health care provider knowledge of work-related asthma diagnosis, management, and reporting requirements Increase employer knowledge of work-related asthma, high-risk industries and hazards, and prevention strategies Increase worker knowledge of work-related asthma, asthma symptoms, high-risk industries and hazards, and prevention strategies Impact attitudes regarding the importance of and need for work-related asthma prevention	Health care providers will appropriately diagnose and manage cases of work-related asthma Health care providers will report cases Employers will improve controls to remove or reduce workplace exposures to sensitizers and irritants Symptomatic workers will seek appropriate and timely diagnosis and care Workers will take measures to protect themselves from hazardous exposures	Decreased exposures to sensitizers and irritants in the workplace Improved health and well-being of workers with work-related asthma (e.g., decreased disability) Decreased incidence of work-related asthma

As described in the logic model, if a reduction in hazardous workplace exposures and a decrease in work-related asthma morbidity is to be achieved, SHARP must first positively impact the knowledge, attitudes, and behaviors of health care providers, employers, and employees.

In an effort to describe the level of usefulness of the surveillance system, this section lists the activities and products that have been conducted and developed by the SHARP program with the aims of changing knowledge, attitudes, and/or behaviors among the three target audiences.

Building Partnerships:

- Members of SHARP staff are working collaboratively with the Washington Asthma Initiative (a statewide asthma coalition), the Lung Association of Washington, and the Washington State Department of Health to develop a statewide plan to address asthma. SHARP's main role is to ensure that work-related asthma is appropriately integrated into the plan. The development of the statewide asthma plan is still in its initial phases; however, SHARP hopes that upon implementation, resources across the state will be leveraged to improve the diagnosis, management, and prevention of work-related asthma.

Case-Based Follow-Up Activities:

- Educational materials are sent to all workers with asthma identified through the surveillance system.
- 67% of all phone follow-up interviews that are attempted are completed – this percentage increases to 80% when the attempts to wrong/disconnected phone numbers are removed from analysis.

Health Care Provider Newsletters/Articles:

- Sep 2000 – article in Washington State Medical Association (WSMA) newsletter on asthma reporting.
- Jan 2001 – article in occupational nursing newsletter on asthma reporting.
- May 2001 – SHARP's Lungs@Work newsletter was sent to over 5000 physicians and health care facilities. The newsletter discussed reporting requirements, diagnosis, and resources.
- Nov 2001 – article on asthma and the reporting requirements sent to all health care providers registered with the Department of Labor and Industries (L&I) through the agency's Provider Update newsletter.
- Sep 2002 – Lungs@Work newsletter sent to 4444 health care providers. This issue provided a summary of surveillance findings and information on asthmagens.

Health Care Provider Outreach Presentations:

- Oct 2000 – presentation on work-related asthma and reporting requirements at the NW Occupational Health Conference.
- Dec 2000 – information on work-related asthma during an L&I CME to physicians.
- Oct 2002 – presentation on work-related asthma data at the NW Occupational Health Conference.

Health Care Provider CME:

- The American College of Occupational and Environmental Medicine has accepted SHARP's application for joint sponsorship of a work-related asthma CME. A committee of experts in the fields of allergy, asthma and occupational medicine was

created to develop the CME. Currently, an initial draft of the medical text of the CME is completed.

Website:

- SHARP has two published webpages with information on work-related asthma. The first provides information on the surveillance system, while the second is targeted for physicians and contains information on the reporting requirements.

Technical Reports:

- Workers' Compensation Based Surveillance of Asthma, Hospitalized Burns, and Adult Blood Lead Levels in Washington State, 1994-1998. SHARP Report # 64-1-2000.
- Work-Related Asthma in Washington State: A Review of Workers' Compensation Claims from 1995-2002. SHARP Report # 64-6-2003.

Site Visits:

- Three cedar mills/cedar processing facilities were visited to learn more about exposures and possible prevention strategies. A site visit report with recommendations was provided to one of the mills.
- A site visit was conducted at a laboratory where a worker was identified as having laboratory animal allergy through surveillance data. A detailed report was provided to this company with recommendations for reducing exposures.
- A site visit was conducted with a plastic product manufacturing company. SHARP staff followed-up with a presentation to company management and will continue to work with this facility in the future to reduce exposures.

Employer Educational Materials:

- A 2-page prevention-focused educational pamphlet titled, "Asthma and Western Red Cedar: Control Workplace Hazards – Protect Worker Health and Productivity" was developed and disseminated to 810 sawmills and wood processing manufacturing companies in June 2004.

Worker Educational Materials:

- A general brochure on work-related asthma titled, "Your Lungs, Your Work, Your Life" was developed in both English and Spanish in 2004. These brochures are disseminated to workers with asthma identified through surveillance efforts, as well as the general public through safety fairs, conferences, site visits, etc.

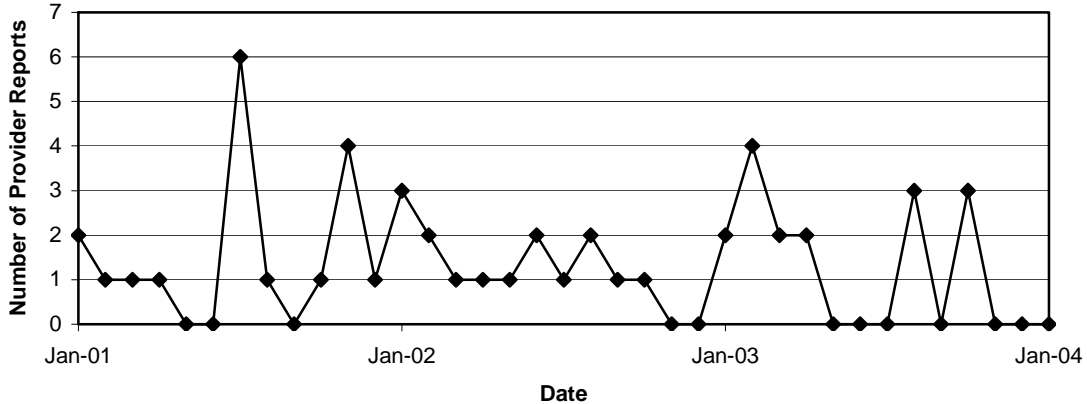
While many activities and products have been developed, there are currently few measures to assess whether the materials have had an impact on the intermediate outcomes of knowledge, attitudes, or behaviors. Outcome measures that currently exist or are being planned are described below.

Health Care Provider Reporting:

During the 3-year period from 2001 through 2003, a number of attempts have been made to inform Washington health care providers about the reporting requirements for work-related asthma. Outreach materials have been disseminated through varied communication channels to over 5000 physicians and other health care providers. As a result, the SHARP program received 48 provider reports for work-related asthma from a total of 26 different providers (Figure 1).

While there was a peak of six cases reported in July 2001, which followed the publication and dissemination of the first Lungs@Work newsletter mailing, there is no clear, apparent relationship between outreach activities targeting health care providers and the number of reports received by the SHARP program.

Figure 1:
Provider-Reported Cases of Work-Related Asthma, Washington State, N = 48



Health Care Provider Knowledge:

SHARP is currently in the process of developing a free CME on work-related asthma. For those physicians who participate in the CME, we will collect information from a self-assessment exam and feedback survey on their knowledge of work-related asthma diagnosis and management, as well as their perceptions of the CME and whether it contributed to their knowledge.

Employer Knowledge, Attitudes, and Behavior:

In response to a case of laboratory animal allergy and asthma identified through the surveillance system, SHARP’s industrial hygienist conducted a site visit to assess exposures and provide recommendations to reduce workers’ exposures to animal allergens. This site visit is used to provide an illustration of the logic model and to describe the resulting outcomes, see Table 2.

Table 2: Illustration of the Logic Model Using an Employer Site Visit Example

ACTIVITIES	PRODUCTS	KNOWLEDGE & ATTITUDES	ACTION	OUTCOMES
SHARP conducted a site visit to a laboratory where employees are exposed to animal allergens.	A site visit report was developed and sent to the Safety Officer with detailed, site-specific guidance for reducing employee exposure to animal allergens.	The employer’s knowledge of animal allergies and asthma and attitude towards prevention were positively impacted, as evidenced by (1) a verbal commitment on the part of management to make change, and (2) voluntary requests for further technical assistance.	As a result, the employer took positive action by developing a hazard assessment and control checklist and requesting SHARP’s input on the content of the checklist. The implementation of the checklist has not been assessed.	No assessment has been conducted to determine if there has been an actual decrease in allergen levels.

Health Outcomes:

SHARP’s ultimate goals for work-related asthma surveillance and prevention activities are to decrease the incidence of work-related asthma and to improve the health and well being of workers with work-related asthma. Some available measures that can be used to assess health outcomes include the following:

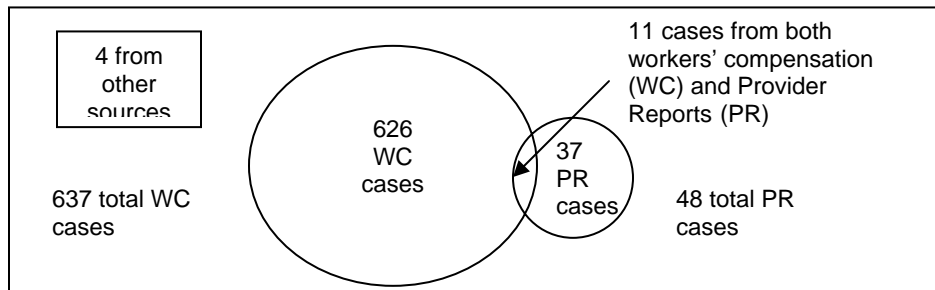
- Claims incidence rate for work-related asthma
- Compensable claims incidence rate for work-related asthma
- Proportion of all asthma claims that result in permanent partial disability reimbursement
- Workers’ compensation costs for work-related asthma claims

There are several limitations to using the above workers’ compensation-based measures to assess the effectiveness of work-related asthma prevention activities. First, changes in the recognition and reporting of work-related asthma will have an impact on claims-related measures. This spurious influence on claims rates can be particularly problematic for a relatively rare condition, such as asthma. Moreover, in the absence of clear evidence that SHARP’s activities lead to positive changes in the knowledge, attitudes, and behaviors of health care providers, employers, and employees, any changes in asthma morbidity cannot necessarily be linked to SHARP’s activities.

II. Provider Reporting

As of January 2004, SHARP received 48 provider reports of work-related asthma (Figure 2), of which workers’ compensation claims were also received for 11 cases (23%). Workers’ compensation claims were not received through the automated data extraction process for the remaining 37 cases. Searching through LINIIS on name and date of injury, it was determined that claims were actually filed for an additional 17 cases, leaving 20 of the 48 physician-reported cases of asthma without associated workers’ compensation claims.

**Figure 2:
Distribution of Work-Related Asthma Cases by Reporting Source, N = 678**



Under-Reporting to the Workers’ Compensation System

Provider reports of asthma identified 20 instances where workers’ compensation claims were not filed (or at least not identified through the workers’ compensation database). The reasons why claims were not filed for 6 of the 20 cases are unknown. In two of the cases, the workers were federal employees, and therefore, not covered by the state’s workers’ compensation system. Five workers were employed by self-insured employers – these workers may have filed claims that were still open, and therefore not yet reported to the state. Additionally, self-insured claims resulting in less than 4 days of

timeloss are typically not available through the state’s workers’ compensation databases. In the remaining seven cases, the reporters were nurse practitioners, who are unable to legally file workers’ compensation claims in the State of Washington. Conversations with the two nurse practitioners revealed that they both worked in rural clinics where the workers were predominantly low-income, temporary, or seasonal workers. These workers could be treated at the clinic for low costs, outweighing the barriers to filing claims. At least one of these workers was self-employed as a subcontractor at a sawmill, and therefore would generally not be covered by the workers’ compensation system.

In summary, provider reporting added only a very small proportion of new cases, though it does appear to identify subsets of cases that either will not be identified or will be underestimated through workers’ compensation based surveillance. Specifically, these include federal workers, the self-employed, workers employed by self-insured companies, and possibly low-income, temporary, and seasonal workers.

Industry Distributions

Provider reporting identified 20 cases of work-related asthma that were not reported, or identified through the workers’ compensation system and 16 cases where workers’ compensation claims were missed by the case extraction process, for a total of 37 cases that would not have been obtained through current workers’ compensation surveillance. Data on industry were available for 36 of the 37 cases identified solely through provider reports – these cases were in the 15 different industries listed in Table 3. Each of these 15 industries were also identified among the cases obtained through workers’ compensation data – there were a total of 637 cases identified through workers’ compensation data and these cases belonged to a total of 66 different SIC groups. While each of the industries identified through provider reports was also identified through workers’ compensation data, the industry distributions were not significantly correlated (Spearman’s Correlation Coefficient was 0.119).

Table 3: Proportion of Work-Related Asthma Cases by Industry* Obtained Through Physician Reports (n = 36) vs. Cases Identified Through Workers’ Compensation Data (n = 637)

2-Digit SIC & Description	Proportion (PR Data)	Proportion (WC Data)
37 – Transportation Equipment Manufacturing	27%	4%
24 – Lumber and Wood Products Manufacturing	19%	2%
01 – Agricultural Production, Crops	11%	3%
17 – Special Trade Contractors (Construction)	5%	5%
75 – Automotive Repair, Services, and Parking	5%	1%
80 – Health Services	5%	9%
20 – Food and Kindred Products Manufacturing	3%	2%
49 – Electric, Gas, and Sanitary Services	3%	2%
51 – Wholesale Trade, Nondurable Goods	3%	9%
58 – Eating and Drinking Places	3%	2%
59 – Miscellaneous Retail	3%	2%
65 – Real Estate	3%	2%
82 – Educational Services	3%	11%
91 – Executive, Legislative, and General Gov., Except Finance	3%	4%
95 – Administration of Env. Quality and Housing Programs	3%	1%
Total:	99%	59%

* Industries are categorized according to 2-digit Standard Industrial Classifications (SIC)

Common sources identified through provider reports were also identified through workers' compensation cases. These included cedar dust, isocyanates, and mold (6 cases each), as well as pesticides (4 cases). Other sources reported included ozone, fire/smoke, tobacco smoke, perfume, crab, diesel fumes, solvents, and cleaning products. It is possible that physicians may more likely report cases where the worker is exposed to a classic asthma-causing agent, such as cedar dust or isocyanates. Therefore, this may explain why the proportion of cases obtained for the Transportation Equipment and Wood Products Manufacturing industries is higher among physician-reported cases, relative to those obtained through workers' compensation data.

Resources and Costs

In addition to the staff time required to add work-related asthma to the reportable conditions list, develop reporting forms and processes, develop newsletters and distribution lists, and provide physician outreach (such as presentations and articles), the costs associated with printing and mailing the provider newsletters (Lungs@Work) have been considerable. The printing and mailing costs associated with these two newsletters totaled \$6307, or \$170 for each of the 37 provider reported cases that were not identified through the workers' compensation claims data.

As outlined in the preceding sections, the expenditure of \$170 per new case (not including additional staff time) did not lead to the identification of new industries or hazards, though it did help to identify subpopulations of workers that are not covered by or are underreported to the workers' compensation system (e.g., self-employed, federal employees, self-insured, or contingent workers).

III. Case follow-up Activities

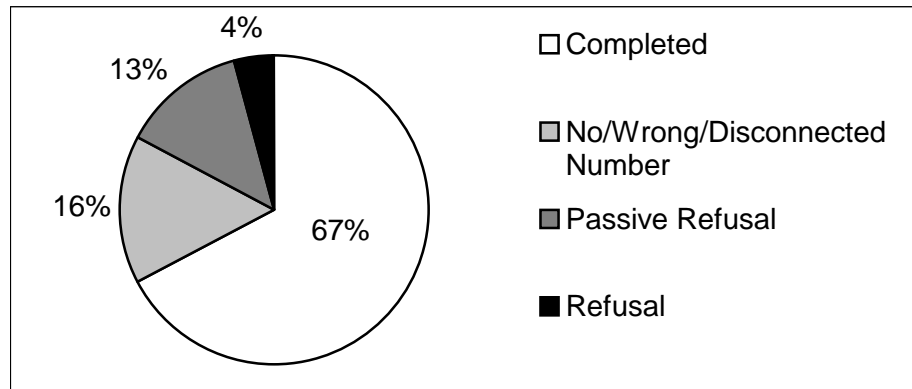
Case follow-up activities began in October 2001, following approval by the Institutional Review Board to contact cases. Since that time, all cases identified through the system have been sent educational materials on work-related asthma and the workers' compensation system, information on SHARP's work-related asthma program, and a letter informing them that SHARP will be contacting them for an interview. These materials have also been translated into Spanish, and at least 17 cases have been sent materials in Spanish.

As of January 2004, interviews had been attempted with 419 work-related asthma cases. As shown in Figure 3, interviews were completed with 282 (67%) of those cases. Only 18 workers (4%) refused to participate in the interview. A total of 54 workers (13%) could not be reached, despite a minimum of four attempts to contact the worker – these cases are categorized as passive refusals in Figure 3. If the 65 workers without available phone numbers are removed from the denominator, the response rate increases to 80%. SHARP employs the services of a Spanish-speaking interviewer, and uses a translation service for languages other than English or Spanish. Therefore, a number of interviews have been conducted with non-English speaking cases, though as this information has not been tracked, the exact proportion of such interviews is not available.

Information collected during follow-up interviews is used to verify that cases meet the case definition and to classify cases as occupational asthma, work-aggravated asthma, or RADS according to SENSOR criteria¹. Information is also collected to identify and

code the source of the exposure. Additional information, such as demographics, medical and family history, information on PPE use and coworker exposure, are useful for generating hypotheses for future research and to help prioritize worksites for case-based employer follow-up.

Figure 3: Response Categories for Attempted Interviews (n = 419)



Staff resources

Conducting phone follow-up interviews with workers can be very time-intensive. To estimate the average amount of time spent on the phone to contact and complete the interview, phone records were reviewed for 10 workers with completed interviews – this was a convenience sample based on cases with available long-distance phone records. Between one and six phone calls were made in order to obtain the completed interview (average = 3.1 calls per completed interview). The total time spent on the phone to contact each worker and complete the interview ranged from 20 to 47 minutes, with an average of 28.1 minutes. It should be noted that the sample of ten cases did not contain any non-English speaking workers. Based on anecdotal evidence, interviews conducted with the assistance of a translator service can take much longer, typically around an hour, to complete.

A minimum of four phone calls are placed to each worker in an attempt to obtain an interview. Attempts are made on different days and at different times, including at least one evening attempt. In reality, many more phone calls (sometimes up to a dozen) are actually made in an attempt to reach workers.

Interviews vs. Workers' Compensation Records

A comparative analysis was conducted in order to determine whether workers' compensation records could be reviewed (as a substitute for phone interviews) in order to classify cases according to the SENSOR case classification scheme and to identify the exposure source.

In this analysis, a random sample of 65 (25%) of the first 258 cases in which interviews had been conducted, and which also had an associated workers' compensation claim, were drawn. Workers' compensation claim records, including the Report of Accident Form and medical records, were reviewed to determine if the case met the SENSOR case definition of work-related asthma, to classify the case, and to identify and code the exposure source.

In addition, a subset of 33 out of the 65 claim reviews was timed. It took an average of 3.2 minutes (range = 1-10 minutes) to review the claim records, make a classification determination, and identify the source.

The first step in the SENSOR classification scheme is to confirm that the case meets the case definition, i.e., a health care provider’s diagnosis of asthma and an association between asthma symptoms and the workplace. In five cases, all self-insured claims, the information necessary to determine whether the case met the case definition was not available. In three cases, the physician’s diagnosis was inconsistent with asthma. In two cases, workers with pre-existing asthma had asthma episodes at work, however, there was no indication that workplace factors were associated with the episodes. Therefore, claim record reviews would have ruled out five cases as not meeting the SENSOR case definition.

The second step of the SENSOR classification scheme is to use standardized criteria to categorize the asthma as Work-Aggravated Asthma, Occupational Asthma, or Reactive Airways Dysfunction Syndrome (RADS). Reviewing workers’ compensation data did not provide enough information to make this classification in 13 cases. In 11 of these cases, eight of which were self-insured, no additional information was available to classify these cases beyond a work-related asthma diagnosis. In the other two cases, a determination of new-onset asthma could be made, however, not enough information was available to determine whether or not the worker should be classified as having RADS or occupational asthma. Therefore, of the 65 cases, workers’ compensation data was sufficient to classify only 47 cases, or 72%. Thirteen of the 18 cases that could not be classified were self-insured.

Table 4: Comparative Analysis of Work-Related Asthma Classification Using Interview versus Workers’ Compensation Data, Washington State, n = 65

Work-Related Asthma Classification	Interview Data	Workers’ Compensation¹
Unlikely Asthma	-	3 (6%)
Unlikely Work-Related Asthma	-	2 (4%)
Work-Aggravated Asthma	26 (40%)	31 (66%)
Occupational Asthma	29 (45%)	9 (19%)
Reactive Airways Dysfunction Syndrome	10 (15%)	2 (4%)
Subtotals:	65	47
Could Not Be Classified:		
Unknown (diagnosis information not available)	-	5
Work-Related Asthma (Not Otherwise Classified)	-	11
New-Onset Asthma (Not Otherwise Classified)	-	2
Totals:	65	65

¹ The denominator used to calculate proportions was 47 cases, as not enough information was available to classify 18 of the cases.

Next, the 47 cases where classifications could be determined using workers’ compensation data were reviewed and their classifications were compared to those made based on interview data. Overall the classifications matched in only 26 (55%) of the cases – classifications did not match in the remaining 21 cases.

Thirteen cases that were classified as work-aggravated asthma using workers’ compensation data were classified as a form of new-onset asthma based on interview

data – occupational asthma (in nine cases) or RADS (in four cases). According to the SENSOR scheme, the case should be classified as work-aggravated asthma if it meets the following criterion:

“increased asthma symptoms or increased use of asthma medication (upon entering an occupational exposure setting) experienced by a person with preexisting asthma who was symptomatic or treated with asthma medication within the 2 years prior to entering that new occupational setting”¹.

In each of the cases that were classified as work-aggravated asthma, workers’ compensation records clearly indicated that the worker had pre-existing asthma that was exacerbated by workplace exposures. However, information from the workers’ compensation system cannot consistently provide evidence as to whether the worker was symptomatic or using medications during the two years prior to starting work with the employer of interest. In the absence of this information, these workers were classified as having work-aggravated asthma. Therefore, using workers’ compensation data to classify cases will likely overestimate the relative frequency of work-aggravated asthma. Interestingly, in eight cases where claim records indicated that the worker had pre-existing asthma, the worker denied ever having pre-existing asthma during the interview. This suggests that real inconsistencies exist between the information provided in workers’ compensation claim records versus that obtained during the interview process.

In addition to case classifications, the associated exposure sources identified through interview data and claim records were compared for the sample of 65 cases. In eight cases, half of which were self-insured, not enough information was available in the workers’ compensation records to identify the source. For the remaining 57 cases, only 30 (53%) had matching sources. For the 37 cases where sources did not match exactly, the interview data provided a more specific source in 15 of the cases (e.g., mold vs. indoor air pollutants or disinfectant cleaners vs. household cleaners). In general, interview data provide more complete and detailed information regarding exposures sources, compared to workers’ compensation data.

IV. Conclusions and Recommendations

It should be noted that this was not a comprehensive evaluation of SHARP’s work-related asthma surveillance system, such as that recommended by the Centers for Disease Control and Prevention’s *Updated Guidelines for Evaluating Public Health Surveillance Systems*ⁱⁱ. Instead, this evaluation was focused on two main goals: (1) to determine the usefulness of the surveillance system by describing the activities and products developed as a result of data collection, analysis, and interpretation, and (2) to assess the efficiency and effectiveness of provider reporting and case follow-up activities.

First, a process evaluation was conducted to identify the level of usefulness of SHARP’s work-related asthma surveillance system– i.e., to assess whether surveillance data have been used to achieve positive public health outcomes. This portion of the evaluation revealed that SHARP has conducted a variety of activities and developed a number of products; however, few outcome measures exist to assess their impact on the knowledge, attitudes, and behaviors of health care providers, workers, and employers.

Recommendations:

- Continue collaborations with public health partners to leverage resources for improving the diagnosis, management, and prevention of work-related asthma throughout the state.
- Increase Industrial Hygiene support for worksite visits and employer site visit reports, and conduct follow-up visits with employers to assess and document any changes in equipment/processes and exposure reductions.
- Consider the costs and benefits of evaluating the impact of educational materials on the knowledge, attitudes, and behaviors of the target audience(s), and implement evaluations when feasible.

The second evaluation goal was to assess the efficiency and effectiveness of two components of SHARP's surveillance system -- provider reporting and case follow-up activities. First, the addition of provider reporting to workers' compensation based surveillance of work-related asthma was shown to identify only a small proportion of new cases (3%). These cases were found to be similar to those identified through workers' compensation data with respect to industry and exposure source. Several of the provider reports were, however, for workers that are either not covered by the state workers' compensation system (e.g., federal employees and the self-employed) or are underestimated through workers' compensation data (e.g., workers with self-insured employers). There is also some evidence that provider reports help to identify other worker groups that may be underestimated in the workers' compensation data, such as low income, seasonal, or temporary workers. However, as outreach efforts to physicians were expensive, the capture of these additional cases came at a considerable expense.

Recommendations:

- As there is some evidence that provider reports have contributed a small number of cases that are under-reported or unavailable through workers' compensation data, continue minimal outreach efforts with physicians to encourage reports and continue to monitor the industry/source distributions of provider reported cases relative to those obtained through workers' compensation data.
- Explore alternate, less-expensive methods for conducting outreach to physicians regarding work-related asthma reporting and information dissemination.
- Consider the removal of work-related asthma from the state's Reportable Conditions Rule during the next revision process of the Department of Health and State Board of Health.

In the comparative analysis of workers' compensation claim reviews and phone follow-up interviews, claim reviews were found to be insufficient for classifying cases according to the SENSOR criteria. Case classification and exposure source determinations matched in only about half of the cases. For case classifications, the relatively low match was partly due to the finding that claim reviews tend to over represent the proportion of cases classified as work-aggravated asthma. Interview data tend to provide more detailed information regarding the exposures associated with causing or aggravating the workers' asthma. Unfortunately, these analyses can only provide

information regarding the completeness and the level of detail of the data available from each of the data sources, and does not provide any evidence as to which of the data sources provides more accurate data. Finally, phone follow-up interviews were shown to take a considerable amount of staff time, on average 28 minutes per interview, compared to just the few minutes needed to look up information in the claim file.

Recommendations:

- As the information available in claim documents is not sufficient to adequately classify cases according to SENSOR criteria (i.e., they tend to over represent the proportion of work-aggravated asthma cases), continue to conduct phone follow-up interviews with workers.
- Conduct a comprehensive analysis of interview data to assess the utility of the other data variables collected through phone follow-up interviews (e.g., medical history, family history, demographics, etc). Consider whether the interview can be shortened to cut down on staff time required to complete the interview.

ⁱ Jajosky RAR, Harrison R, Reinisch F, et al. (1999). Surveillance of Work-Related Asthma in Selected US States Using Surveillance Guidelines for State Health Departments – California, Massachusetts, Michigan, and New Jersey, 1993-1995. MMWR, 48(SS-03):1-20.

ⁱⁱ Centers for Disease Control and Prevention. Updated guidelines for evaluating public health surveillance systems: recommendations from the guidelines working group. MMWR 2001;50(No. RR-13):1-35.