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Short Communication

A Cluster of Health Symptoms After a Law Enforcement Operation: A Case Study

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ABSTRACT

Law enforcement officers (LEOs) often encounter rapidly changing and uncontrolled situations that expose them to various hazards. A law enforcement agency requested an evaluation by the National Institute for Occupational Safety and Health (NIOSH) when multiple LEOs reported illness after executing a search warrant and taking a suspect into custody. NIOSH investigators interviewed LEOs and reviewed medical records, forensic laboratory results for collected evidence, and environmental testing results of samples taken after the operation. Two-thirds (25 of 38) of LEOs who participated in the operation reported ≥ 1 symptom. Eleven LEOs met a case definition for influenza-like illness (ILI). Members of one unit were more likely to have ILI than non-members (prevalence ratio (PR), 4.1; 95% confidence interval (CI): 1.3–13.0; $p = 0.01$). Influenza vaccination was associated with a lower prevalence of ILI (PR, 0.2; 95% CI, 0.1–0.9; $p = 0.02$). Preventing employees from working while ill and annual influenza vaccination might prevent similar occurrences.

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1. Introduction

Law enforcement officers (LEOs) often encounter rapidly changing and uncontrolled situations in the course of their work. They might encounter multiple types of hazards, including injury, physical, chemical, biological, ergonomic, psychological, and organizational [1]. In 2020, there were an estimated 719,000 full-time sworn LEOs in the United States [2]. Protecting this essential critical infrastructure workforce is important.

In February 2019, a law enforcement agency (Agency) requested a health hazard evaluation (HHE) by the National Institute for Occupational Safety and Health (NIOSH) concerning illnesses among LEOs who participated in a law enforcement operation on December 14, 2018. The operation consisted of taking a subject into custody and executing a search warrant at a residence. Agency officials became concerned that reported illnesses, which consisted of non-specific symptoms and developed over several days among a large proportion of LEOs who worked in close proximity to each

other during the operation, might have been associated with operation-related exposures. The NIOSH HHE Program responds to written requests for workplace evaluations from parties eligible to make requests as specified by the Occupational Safety and Health Act of 1970 and 42 Code of Federal Regulations (C.F.R.) part 85; parties eligible to make requests include employers, employees, and unions. The purposes of this evaluation were to characterize the pattern of symptoms and illnesses reported among LEOs who participated in the operation and to make recommendations for occupational safety and health actions to be considered for similar operations in the future.

2. Methods

This section describes the information that NIOSH investigators gathered during the course of its evaluation. Some information related to this law enforcement operation was not able to be reported here due to the sensitive nature of the work. This activity

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was reviewed by the Centers for Disease Control and Prevention (CDC) and was conducted consistent with applicable federal law and CDC policy. See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq; 42 C.F.R. part 85.

2.1. Incident review

In March 2019, NIOSH investigators visited the Agency and conducted voluntary confidential interviews with 27 of 38 LEOs who participated in the operation. During interviews, job activities and personal protective equipment (PPE) use associated with the operation were discussed. NIOSH investigators also reviewed (1) photographs of potential hazards inside the residence, (2) forensic laboratory results for evidence collected, (3) environmental testing results of samples taken at the residence after the operation, and (4) documents about this incident from the Agency, county sheriff's office, and county public health department.

2.2. Health evaluation

NIOSH investigators gathered employee health information related to the operation from (1) interviews, (2) a spreadsheet of LEOs who participated in the operation (line list), and (3) medical records.

The Agency provided a line list with information on symptoms, medical care sought, and influenza vaccination status for the 2018–2019 season for 37 of 38 LEOs who participated in the operation. The Agency collected this information via an internal questionnaire within 3.5 weeks of the operation developed with input from the county public health department. The initial review revealed that reported symptoms were non-specific and potentially consistent with a viral illness. To allow NIOSH investigators to link information from the line list and interviews, the Agency provided the names of the 27 interviewed LEOs on the line list to NIOSH investigators.

During interviews, NIOSH investigators asked LEOs about demographic information; symptoms experienced before, during, and after the operation; medical care sought; and influenza vaccination status for the 2018–2019 season prior to the operation. NIOSH investigators obtained and reviewed medical records from 5 of 6 interviewed LEOs with their consent. If information about symptoms or influenza vaccination status were available from multiple sources, they were integrated in the following order: medical records, interviews, and line list.

2.3. Data analysis

Descriptive statistics were summarized for demographic, work, and health information.

Upon review of reported symptoms, a case of influenza-like illness (ILI) was defined as subjective fever or chills and either cough, sore throat, or both with symptom onset on or after December 14, 2018, in a LEO who participated in the operation. This case definition was based on the CDC case definition for ILI used for surveillance purposes [3]. An epidemic curve was plotted by the date when a symptom was first experienced by a LEO who met the case definition.

To assess which characteristics were associated with meeting the case definition, case and noncase LEOs were compared using Fisher's exact test for categorical variables and the Mann-Whitney U test for continuous variables. Prevalence ratios (PRs) and 95% confidence intervals (CIs) were calculated by comparing the prevalence of ILI among LEOs with and without a given characteristic. All statistical tests were 2-sided, with statistical significance set at $p < 0.05$. No adjustment was made for multiple comparisons. R version 3.5.1 was used for statistical analyses.

3. Results

3.1. Description of the incident

Thirty-eight LEOs participated in a law enforcement operation coordinated by the Agency on December 14, 2018. The operation involved taking a suspect into custody and executing a search warrant on a private 2-story residence. Prior to the operation, LEOs reported traveling to a staging area near the residence in personal or work vehicles alone or in small groups. The duration of staging for each LEO varied because different units entered the residence at different times. Staging lasted up to several hours. In general, LEOs reported remaining in vehicles or outdoors for brief periods and mostly interacting with members of their own units during staging.

The suspect was taken into custody by a deputy sheriff during a traffic stop of the suspect's vehicle. The deputy sheriff transported the suspect to sheriff's office headquarters and did not enter the residence. The residence was reportedly inhabited by the suspect and a family member and frequently visited by a child. All 3 individuals were reportedly not exhibiting any health symptoms at the time of the operation. Two LEOs in the investigative squad watched the 2 family members in a nearby residence during the operation. One of these 2 investigative squad members entered the residence for up to 10 minutes.

The remaining 35 LEOs executed the search warrant. Job tasks varied by unit. The special weapons and tactics (SWAT) team ($n = 13$) made initial entry and ensured there were no human threats inside the residence. Next, bomb technicians ($n = 3$) searched for explosive threats inside the residence. After the residence was cleared, the SWAT team and bomb technicians left the operation. The evidence response team (ERT) ($n = 6$) photographed and sketched a diagram of the residence, performed a thorough search for evidence, and processed the evidence collected. The remaining investigative squad members ($n = 13$) also participated in the thorough search and evidence processing.

Interviewed LEOs reported the residence was typical of other residences seen on similar operations. They reported an odor associated with nearby industrial facilities. Loose powders were seen throughout the residence. A small safe was reportedly opened with force within the residence and found to contain substances suspected to be illicit drugs. During the search, substances suspected to be illicit drugs, several guns, and a few small explosive devices were recovered. Forensic laboratory testing showed the presence of cocaine, marijuana, and low explosive black powder in the residence.

Two hazardous materials (HAZMAT) teams entered the sealed residence 12 days later to collect environmental wipe samples; the presence of biological agents and toxins tested was not detected with laboratory testing.

The 27 interviewed LEOs consisted of 10 SWAT team members, 11 investigative squad members, 5 ERT members, and 1 deputy sheriff. Among the 27 interviewed LEOs, 25 entered the residence, spending a median of 2 hours (range: 10 minutes–6 hours) inside. Median total time in the residence varied by unit: SWAT team, 33 minutes (range: 10 minutes–2 hours); investigative squad, 5 hours (range: 10 minutes–8 hours); and ERT, 5.5 hours (range: 5–7 hours). Among the 25 LEOs who entered the residence, 20 (80%) had been on both floors.

Regarding PPE use, 24 of 25 (96%) interviewed LEOs who entered the residence reported wearing gloves. Sixteen of these LEOs (67%) reported wearing nitrile gloves, of which 3 reported wearing a combination of nitrile and tactical gloves. Of the 25 interviewed LEOs who entered the residence, 12 (48%) reported wearing N95 filtering facepiece respirators at some point inside. One LEO reported having facial hair while wearing a respirator

during the operation, and another reported putting on and taking off the respirator with potentially contaminated gloves. Of the 25 interviewed LEOs who entered the residence, 12 (48%) reported wearing eye protection and 22 (88%) reported wearing long-sleeved garments.

3.2. Health evaluation

Among the 27 LEOs interviewed, the median age was 41 years (range: 32–55 years). Twenty-three (85%) were male. Median job tenure was 10 years (range: 1–32 years). Seventeen (63%) interviewed LEOs worked in the same headquarters building.

Seven interviewed LEOs reported ill contacts around the time of the operation: 4 reported ill Agency coworkers, 2 reported ill household members, and 1 reported ill coworkers at another job. Two LEOs who participated in the operation were identified as appearing ill during the day of the operation. Interviews and the line list revealed that among the 38 LEOs who participated in the operation, 15 (39%) reported receiving the 2018–2019 seasonal influenza vaccine.

Among the 38 LEOs who participated in the operation, 25 (66%) reported at least one symptom with onset on or after December 14, 2018. Symptom onset occurred from the morning of December 14 (prior to the operation) to December 22, 2018. None reported acute symptom onset during the operation. Three LEOs with symptoms described on the line list were not interviewed.

Fig. 1 summarizes the symptoms reported by LEOs. The most common symptom was fatigue ($n = 21$), followed by body aches ($n = 15$), runny or stuffy nose ($n = 12$), and headache ($n = 12$). Four LEOs reported predominately gastrointestinal symptoms, such as stomach ache, diarrhea, and abdominal pain. Among the 27 interviewed LEOs, 6 sought medical care and 1 was hospitalized.

Eleven LEOs met the case definition for ILI (case LEOs). This corresponds to 29% of LEOs who participated in the operation and 44% of symptomatic LEOs. Among case LEOs, symptom onset occurred over a range of 6 days, from December 14 (the day of the operation) to December 19, 2018 (Fig. 2). Two case LEOs (18%)

reported receiving the influenza vaccination for the 2018–2019 season.

Among the 10 interviewed case LEOs, 4 received outpatient medical care and had medical records available for review. One case LEO experienced fatigue prior to the operation and was diagnosed with influenza A based on a rapid influenza diagnostic test after the operation. Another case LEO had a negative rapid influenza diagnostic test.

Investigative squad members were more likely to have ILI than non-investigative squad members (PR, 4.1; 95% CI, 1.3–13.0; $p = 0.01$). Conversely, LEOs who received an influenza vaccine in the 2018–2019 influenza season had a lower prevalence of ILI than LEOs who did not receive an influenza vaccine (PR, 0.2; 95% CI, 0.1–0.9; $p = 0.02$).

LEOs with ILI were similar to LEOs without ILI in terms of age ($p = 0.54$), sex ($p > 0.99$), whether they worked in the headquarters building ($p = 0.41$), and whether they had been on the second floor of the residence ($p > 0.99$) or used gloves ($p > 0.99$) or respirators ($p = 0.43$) during the operation. The median amount of time spent in the residence was higher among case LEOs ($p = 0.01$). However, upon further examination, this apparent difference was explained by the strong association between being a member of the investigative squad and meeting the case definition.

4. Discussion

In this evaluation, multiple types of hazards needed to be considered based on the nature of the operation. Although one of the early concerns of the Agency, the evaluation revealed that the symptoms among LEOs were unlikely due to exposures to substances found in the residence during the operation. Instead, almost 30% of LEOs who participated in the operation and over 40% of symptomatic LEOs met the case definition for ILI. While the types of symptoms and the timing of symptom onset suggest a cluster of ILI, more than one type of illness was likely, as 4 LEOs reported predominately gastrointestinal symptoms. This evaluation highlighted the importance of having a comprehensive approach to occupational safety and health [4] to address potential hazards and infection prevention and control during law enforcement activities.

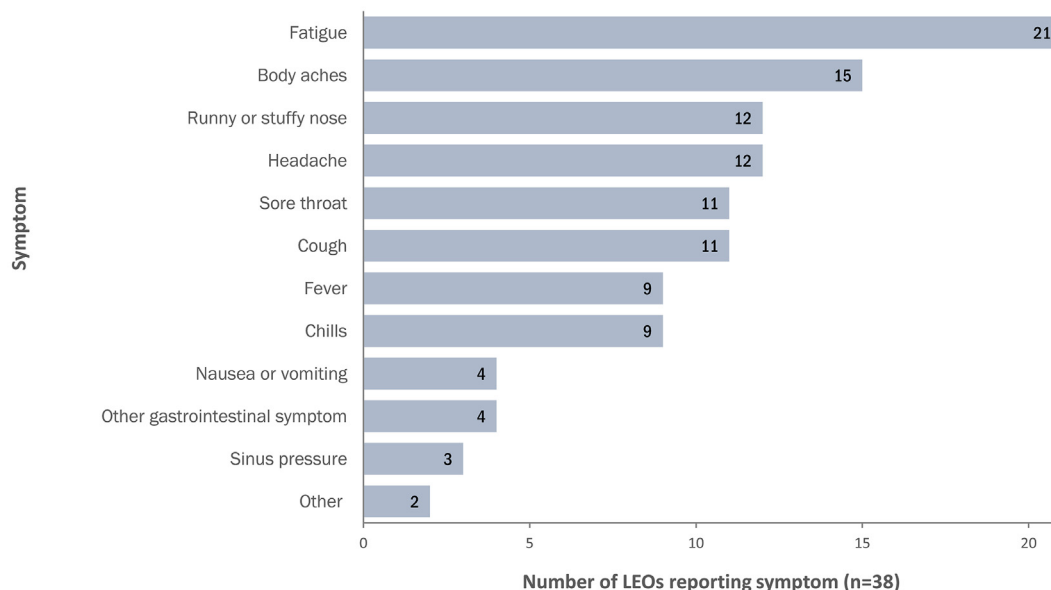


Fig. 1. Symptoms reported by law enforcement officers (LEOs) who participated in the operation ($n = 38$).

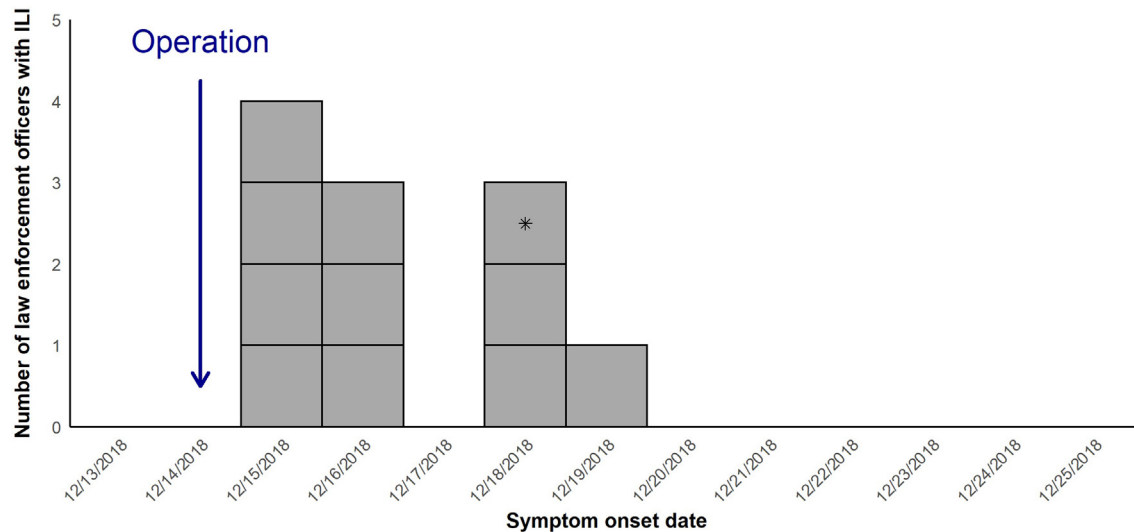


Fig. 2. Epidemic curve of the onset of influenza-like illness (ILI) symptoms among 11 law enforcement officers who met the case definition for ILI. *One law enforcement officer with onset of ILI symptoms on December 18 experienced fatigue on December 14, prior to the operation.

Exposure to substances at the residence was unlikely to be associated with the symptoms reported. None of the LEOs reported becoming acutely ill during the operation, which is inconsistent with symptoms reported after illicit drug exposures [5,6] or other substances identified in the residence. Environmental sampling after the operation did not detect the presence of biological agents or toxins.

Over 40% of symptomatic LEOs met the case definition for ILI and one LEO had tested positive for influenza. During interviews, 2 LEOs were identified as appearing ill during the operation, which occurred in mid-December 2018. In the United States, ILI activity began to increase in November 2018 and peaked in mid-February 2019 [7]. Based on viral shedding dynamics, adults with influenza who are otherwise healthy are infectious starting approximately 1 day before symptom onset and up to 5–7 days after symptom onset [8,9]. The timeline of influenza-like symptom onset among case LEOs is consistent with the transmission dynamics of influenza. While only one LEO tested positive for influenza, many patients do not seek medical attention for ILI as most cases are mild and self-limited, and diagnostic testing is not performed for all patients. Among 27 interviewed LEOs, only 6 (22%) sought medical care. While one LEO had a negative rapid influenza diagnostic test, meta-analyses have demonstrated that a negative test result does not rule out influenza when influenza viruses are circulating, especially if the test has low sensitivity [10–12].

The prevalence of ILI was higher among members of one unit than among non-members. This finding is consistent with reports that LEOs tended to interact mostly with members of their own units during the operation but does not allow definitive conclusions about whether one unit or LEO was the source of illness for others and whether transmission occurred during the operation. However, as the prevalence of ILI was lower among LEOs in the operation who received seasonal influenza vaccination and influenza imposes a significant disease burden [13], taking steps to prevent the spread of seasonal influenza in the workplace is prudent. Modeling studies have shown that workplaces account for approximately 16% of influenza transmission [14].

NIOSH investigators recommended that the Agency encourage its employees to get an annual seasonal influenza vaccine. According to a recent survey of police departments in Pennsylvania, 47% of participating departments recommended influenza

vaccination to their workforce [15]. Other recommendations to prevent influenza in the workplace include advising employees to not work when they are sick and ensuring that sick leave policies and staffing levels encourage sick employees to stay home. Working with symptoms of ILI is common [16,17]. Most studies, which have focused on health care personnel, have identified system-level and sociocultural factors associated with working while ill [16]. Systems to ensure coverage for ill employees might be needed to prevent staffing shortages [18]. Studies in other worker populations, especially critical infrastructure workers such as LEOs, are needed to help guide workplace policies and procedures to address this phenomenon and ensure sufficient staff for the safe continuation of work. Preventing employees from working while ill can prevent workplace transmission and help avert situations in which a law enforcement agency's ability to carry out its mission is compromised due to multiple ill employees. Such policies and procedures, in the context of an occupational health and safety program, might also be applicable to other communicable diseases [19,20].

Law enforcement agencies recognize security threats to their operations. For example, this operation planned for a SWAT team and bomb technicians to enter first and secure the residence. The evaluation identified some room for improvement with job tasks and work practices with respect to occupational safety and health. For example, a safe was reportedly opened with force, which might potentially cause substances around or inside the safe to become airborne, leading to inhalation or mucus membrane exposures. PPE use inside the residence varied from 96% for gloves to 48% for N95 filtering facepiece respirators. LEOs described having facial hair during respirator use and taking off a respirator while wearing potentially contaminated gloves. These practices highlight the need for training about respirator use and PPE donning and doffing procedures, as well as the opportunity to incorporate general occupational safety and health considerations while planning operations.

This evaluation had several limitations. One limitation was the timing and incomplete participation in interviews. Consequently, the type and level of detail in the information included in the analysis varied. The line list might not have captured enough detail about symptoms to accurately classify LEOs as meeting the case definition, leading to misclassification bias. However, most LEOs

who were not interviewed were asymptomatic according to the line list, and information from the line list was sufficient to classify 1 LEO who was not interviewed as meeting the case definition. In addition, interviews occurred approximately 3 months after the operation, possibly leading to recall bias. However, medical records and the line list, which included information collected shortly after symptom onset, were used whenever possible. In addition, most symptoms were based on self-report as most LEOs did not seek medical attention or undergo diagnostic testing. No case definition can perfectly classify individuals, so it is possible that some noncase LEOs with symptoms had ILI despite not meeting the case definition and some case LEOs did not have ILI. However, this type of misclassification tends to produce a bias towards the null. Another limitation was that environmental sampling occurred 12 days after the operation, which might have affected the findings. In addition, performing multiple comparisons of case and non-case LEOs without adjustment increases the potential that characteristics associated with meeting the case definition were identified due to chance.

5. Conclusion

Approximately two-thirds of LEOs who participated in a law enforcement operation experienced health symptoms over several days. The symptoms and timing of symptom onset suggest a cluster of LEOs with ILI rather than health effects from exposure to substances at the residence in the operation, such as illicit drugs or explosives. Incorporation of occupational health and safety measures in law enforcement planning, such as improving infection prevention and control practices and annual influenza vaccination, is likely to help prevent similar occurrences in the future.

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Disclaimer

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Conflicts of interest

The authors declare no conflicts of interest.

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