



**Department of Health and Social Services**  
Valerie J. Davidson, Commissioner

3601 C Street, Suite 540  
Anchorage, Alaska 99503 <http://dhss.alaska.gov/dph/Epi/>

**Division of Public Health**  
Jay C. Butler, MD, Chief Medical Officer and  
Director

Local (907) 269-8000  
24 Hour Emergency (800) 478-0084

**Editors:**  
Joe McLaughlin, MD, MPH  
Louisa Castrodale, DVM, MPH  
Michael Cooper, MD, MS  
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## Increase in Hospital Emergency Department Visits Related to Use of Synthetic Cannabinoids — Municipality of Anchorage, July to September, 2015

Contributed by Yuri P. Springer<sup>1</sup>, Sarah L. Shafer<sup>2</sup>, and Roy R. Gerona<sup>3</sup>

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### Author Affiliations

1. Alaska Division of Public Health, Section of Epidemiology
2. Municipality of Anchorage, Department of Health and Human Services
3. Clinical Toxicology and Environmental Biomonitoring Laboratory, University of California at San Francisco

## **Background**

In July 2015, Municipality of Anchorage (MOA) emergency medical services (EMS) personnel and local media began reporting an increase in the number of people being transported to local hospitals and treated for adverse health effects due to the use of synthetic cannabinoids. Similar spikes in emergency department (ED) visits associated with synthetic cannabinoid use have been documented in other states in recent years.<sup>1-5</sup> Synthetic cannabinoids, often generically referred to as “Spice”, are herbal mixtures sprayed with one or more laboratory-generated chemicals purported to produce effects similar to tetrahydrocannabinol (THC), the principal psychoactive chemical in cannabis. Synthetic cannabinoids have been known to variably produce a number of undesirable effects not usually associated with cannabis use, including agitation, aggressive or violent behavior, seizures, hypertension, and tachycardia, sometimes followed by bradycardia.<sup>4,6</sup> The primary manner of synthetic cannabinoid ingestion is via smoking, although other routes (e.g., vaping) may be used. The chemicals and chemical combinations used to create synthetic cannabinoids vary widely and change regularly to circumvent laws that target specific chemical formulations. Similarly, the nature and severity of the health impacts of synthetic cannabinoid use are also highly variable and difficult to predict.

In response to these reports, the Alaska Section of Epidemiology (SOE) undertook an investigation using information collected from EMS records and Anchorage hospitals’ electronic medical records to 1) quantify the burden on the health care system of synthetic cannabinoid-related ED visits in the MOA; 2) characterize variation in the severity of symptoms and outcomes associated with synthetic cannabinoid use; 3) conduct laboratory testing of synthetic cannabinoid samples obtained from patients and other sources to characterize the chemical formulations circulating in the MOA during the investigation period; and 4) use information gleaned from the investigation to reduce the health burden of synthetic cannabinoid-use in the community.

## **Methods**

### *Preliminary Fact-Finding Investigations*

We conducted two preliminary fact-finding investigations to assess the public health significance of the reported increase in synthetic cannabinoid-related health events and to guide any subsequent systematic analysis. The first involved interviews with and outreach to individuals receiving services at a non-profit community shelter in downtown Anchorage. Reports published in local print media in July 2015 suggested that this population, predominantly homeless, was being disproportionately impacted by adverse health outcomes of synthetic cannabinoid use. At the request of management personnel from this shelter, SOE and MOA Department of Health and Human Services staff conducted a site visit on August 13, 2015. During this visit, a questionnaire designed to gather information about a person’s history and ongoing use of synthetic cannabinoids, attitudes about and perceptions of synthetic cannabinoid use, and knowledge of factors that could be contributing to the ongoing reported spike in associated hospitalizations was administered to clients willing to provide information. A fact sheet with information and warnings about the health risks of synthetic cannabinoid use was distributed to clients.

In the second preliminary fact-finding investigation, SOE staff contacted ED and medical records personnel at the three main MOA hospitals to gather clinical information on the severity of health complications, outcomes observed, and diagnoses assigned to patients evaluated after synthetic cannabinoid use. A convenience sample of approximately 100 ED charts was obtained from the three hospitals. Chart reviews conducted by SOE and MOA Department of Health and Human Services staff indicated highly variable symptom presentation but clear potential for adverse and potentially life-threatening complications associated with synthetic cannabinoid use. Based on results of the initial fact-finding investigations, we initiated a formal, systematic public health investigation.

### *Systematic Investigation: Epidemiologic Characterization*

Access to hospital electronic medical records was requested at the three main MOA hospitals. Records

were searched using a standardized query designed to identify ED visits related to use of synthetic cannabinoids. Among all ED visits during the period July 15 through September 30 in 2015, the query flagged those associated with one or more of the following 11 discharge diagnoses noted as common in the second fact-finding investigation: acute drug intoxication, altered mental status (including with qualifiers “unspecified” and “unspecified altered mental status”), drug abuse, drug ingestion, drug psychosis, drug use, illicit drug use, polysubstance abuse, and substance abuse.

All charts for ED visits (one chart per visit) identified by the search were obtained and reviewed. Each ED visit was classified into one of four exposure categories based on notes recorded in the medical record:

- *Self-proclaimed*—the patient admitted to having used synthetic cannabinoids shortly before arriving at the ED.
- *Suspected*—the patient was explicitly suspected of using synthetic cannabinoids shortly before arriving at the ED. Associated notes were attributable to bystanders who summoned EMS personnel, from EMS personnel who transported the patient, or from ED staff who treated the patient and considered his/her presentation to be consistent with synthetic cannabinoid use.
- *Questionable*—the patient’s presentation appeared to the SOE chart reviewer to be somewhat consistent with synthetic cannabinoid use, but no explicit admission or suspicion of use was recorded in the chart.
- *Unrelated*—the patient arrived at the ED to be treated for one or more conditions that appeared to the chart reviewer to be unrelated to synthetic cannabinoid use (e.g., dementia in an elderly patient resulting in altered mental status).

Patient demographic data including sex, age, race, and homeless status were abstracted from charts associated with ED visits categorized as self-proclaimed or suspected. Patients were classified as homeless if they self-proclaimed homelessness, had a local homeless shelter or services center listed as their home address in the chart, or had no home address listed but were noted to have been picked up

by the ambulance at a local homeless shelter or services center. Data on medical interventions and clinical presentation were also abstracted from these charts. These data included whether the patient involved:

- Was physically restrained while en route to or during treatment in the ED
- Underwent endotracheal intubation while en route to or during treatment in the ED
- Was admitted to the hospital from the ED
- Exhibited lethargy while en route to or during treatment in the ED; this could include presenting as unresponsive, confused, sleeping, somnolent, obtunded, or other similar states
- Exhibited agitation while en route to or during treatment in the ED; this could include presenting as distressed, aggressive, anxious, violent, or other similar states
- Exhibited tachycardia (had a heart rate >100 beats/min)
- Exhibited tachypnea (had a respiratory rate >16 breaths/min)
- Had elevated systolic blood pressure (>140 mmHg)
- Had elevated diastolic blood pressure (>90 mmHg)
- Had a fever (temperature  $\geq 100.4$  degrees F)

#### *Investigation: Laboratory Analyses*

As available, drug paraphernalia and product samples were collected by ED staff from patients treated for suspected synthetic cannabinoid use. When samples were obtained, SOE staff collected them and sent them to the Clinical Toxicology and Environmental Biomonitoring Laboratory at the University of California at San Francisco (UCSF) for chemical analyses. Samples were tested for chemicals known or believed to be used in synthetic cannabinoid formulations.

## **Results**

### *Epidemiologic Characterization*

Electronic medical records for ED visits from two of the three MOA hospitals were made available to investigators. In total, 488 ED visits were flagged by the query and included in the analysis; of these, 331 (68%) were from Hospital A and 157 (32%) were

from Hospital B (Table 1). Charts from all 488 ED visits were reviewed and visits categorized; 167 (34%) were categorized as either self-proclaimed (74, 15% of total) or suspected (93, 19% of total), while 321 (66%) were categorized as either unrelated (283, 58% of total) or questionable (38, 8% of total). The 167 ED visits categorized as self-proclaimed or suspected represented 128 unique persons. While the majority (103, 80%) of these patients were only treated in the ED for synthetic cannabinoid-related illness once during the investigation period, 25 (20%) had >1 visit (mean number of ED visits for cannabinoid-related illness among these patients: 2.6; range: 2–5).

Of the 167 ED visits categorized as either self-proclaimed or suspected, 85% involved male patients and 15% involved female patients (Table 2). Among the 25 persons with more than one synthetic cannabinoid-related ED visit during the investigation period, 24 (96%) were male. The mean age of patients across all 167 ED visits categorized as either self-proclaimed or suspected was 37 years (range: 12–62). The number of ED visits involving patients aged 21–30 and 31–40 years was roughly equal, and collectively accounted for 63% of all visits (Table 3). Information on patient race was only available for 87 (52%) of the 167 ED visits categorized as either self-proclaimed or suspected (Table 4). Of these, 41% of the visits involved Caucasian patients, 31% involved American Indian or Alaska Native patients, and 22% involved African American patients. Of the 167 ED visits categorized as either self-proclaimed or suspected, 66 (40%) involved patients who were classified as being homeless.

Across the 78 days of the investigation period, the average number of ED visits per day that were categorized as either self-proclaimed or suspected was 2.1 (range: 0–12). Counts of daily ED visits were consistently lower than the number of daily ambulance transports of suspected synthetic cannabinoid-related cases reported by the Anchorage Fire Department (AFD) (Figure). These AFD data were regularly shared with SOE during the investigation period and provided invaluable insights into temporal variation in the volume of synthetic cannabinoid-related health emergencies in the MOA. For reference, AFD data collected over a period

inclusive of the SOE investigation are presented as an attachment to this report (Appendix A).

Information on medical interventions and clinical presentations were abstracted from charts associated with the 167 ED visits categorized as either self-proclaimed or suspected (Table 5). Seventeen (10%) of the ED visits led to the patient being admitted to the hospital. Among admitted patients, 14 (82%) were male, five (29%) were 21–30 years of age, five (29%) were 31–40 years, four (24%) were 41–50 years, and three (18%) were 51–60 years of age. Of the 167 ED visits, 11 (7%) involved a patient who underwent endotracheal intubation by EMS personnel or ED staff for respiratory insufficiency or for airway protection. Among intubated patients, 10 (91%) were male. Twenty-six (16%) of the 167 ED visits involved a patient who required physical restraints while en route to or during treatment in the ED.

Based on the subset of ED visits for which various data on clinical presentations were available, 115 (69%) involved lethargic patients, 55 (33%) involved agitated patients, and 37 (22%) involved patients exhibiting both lethargy and agitation (Table 5). Patients exhibited tachypnea in 75 (46%) ED visits and tachycardia in 48 (29%) visits.

#### *Laboratory Analyses*

ED staff at Hospital A obtained a total of 20 paraphernalia and product samples from 13 patients during the investigation period. Five additional samples were obtained from other MOA partners. Chemical analyses of these samples for the presence of chemicals known or believed to be used in synthetic cannabinoid formulations indicated that at least 11 different synthetic cannabinoid chemicals were circulating in the MOA during the investigation period, including the following: AB-CHMINACA, AB-FUBINACA, AB-PINACA, AKB48-N-5F-Pentyl analog, APP-CHMINACA, MAB-CHMINACA, NM2201, XLR-11, 5-Chloro-AB-PINACA, 5F-AB-PINACA, and 5F-AMB (Appendix B). Multiple synthetic cannabinoid chemicals were detected in many of the tested samples. While the majority of product samples that tested positive for synthetic cannabinoids were solid and herbaceous, four were clear, viscous liquids. These were labeled for sale as car air fresheners but could easily be

ingested via inhalation using a refillable electronic cigarette. Indeed, feedback received from MOA ED staff indicated that some patients treated for synthetic cannabinoid-related illness during the investigation period admitted to vaping synthetic cannabinoids in liquid form.

### **Discussion**

This investigation describes the first large-scale outbreak of illness associated with synthetic cannabinoid use in Alaska and confirms anecdotal reports of a considerable spike in the number of persons being treated in MOA hospital emergency departments for adverse health effects following use of synthetic cannabinoids. Of the 167 ED visits included in the investigation, 11 (7%) involved patients who underwent endotracheal intubation, and 17 (10%) involved patients who were admitted to the hospital for treatment. Even though these severe outcomes were associated with a minority of the 167 ED visits classified as self-proclaimed or suspected, the overall volume of patients being transported and treated for synthetic cannabinoid use during the investigation period represented a substantial burden on the time and resources of MOA EMS personnel and hospital ED staff.

Similar outbreaks of severe illness associated with synthetic cannabinoid use have been the focus of public health investigations in other states in recent years. For example, acute spikes in synthetic cannabinoid-related hospitalizations occurred in Georgia and Colorado in 2013 and in Mississippi in 2015, and accompanying public health investigations documented results qualitatively similar to those presented here in terms of male-bias, age distribution, variation in clinical presentations, and potential for severe health outcomes among cases.<sup>1,2,4</sup> Moreover, at least two multi-state outbreaks have been documented and were associated with multiple patients experiencing serious health consequences and death attributed to synthetic cannabinoid use.<sup>3,5</sup> Based on published results of other synthetic cannabinoid-related investigations cited herein, unique findings of our investigation include the number of synthetic cannabinoid chemicals in circulation simultaneously, the apparent frequency with which synthetic cannabinoid products contained more than one of these chemicals, and the

relatively large proportion of patients who were classified as homeless.

Information gathered through the fact-finding interviews with individuals receiving services at a community shelter, predominantly homeless individuals, pointed to the ready availability of synthetic cannabinoids in the MOA. Interview participants consistently reported that synthetic cannabinoids were cheaper and easier to obtain than marijuana, and were generally packaged as individual joints (“sticks”) or small, unlabeled baggies that could be purchased for \$10 or less. These products were referred to by a variety of street names including: “King Kong,” “Great Ape,” “Gorilla,” “Godzilla,” “Get Real,” “K2,” “Zero Gravity,” and “Blaster.” Consistent with observations of MOA EMS personnel and ED staff made during the investigation period, respondents who had witnessed a synthetic cannabinoid overdose regularly described it as involving the rapid onset of extreme symptoms ranging from profound somnolence or loss of consciousness to agitation and violence, sometimes accompanied with posturing and seizure-like activity. Many respondents indicated that because synthetic cannabinoids are difficult to visually distinguish from marijuana, use could easily be and is often unintentional. While this public health investigation was conducted independently of any law enforcement activities, concerns among participants regarding potential legal implications of disclosing information about drug use or knowledge of local drug sale and distribution likely limited the amount and level of detail of information gathered through these interviews.

Results of laboratory analyses of paraphernalia and product samples collected from patients by ED staff indicated that at least 11 different chemicals known or believed to be used in synthetic cannabinoid formulations were circulating in the MOA during the investigation period. Some of these are older chemicals that have been associated with synthetic cannabinoids for a number of years (e.g., XLR-11, NM2201) while others are newer, more potent chemicals<sup>7</sup> that are only known to have been circulating in the United States since roughly 2013 (e.g., AB-CHMINACA, MAB-CHMINACA, 5F-AMB). Laboratory analyses further revealed that

many of the tested product samples contained blends that included more than one of the newer, more potent chemicals. These findings provide empirical evidence of the chemical variability of synthetic cannabinoids in terms of both the identity and possible combinations of associated chemicals. When paired with the high likelihood of variation in the concentrations of these chemicals when applied to herbal mixtures to create synthetic cannabinoids, these findings are consistent with the widely variable clinical outcomes observed among synthetic cannabinoid users. They also highlight the fact that it is virtually impossible for a person using synthetic cannabinoids to know what chemical(s) he/she is ingesting, and in what concentration(s). Moreover, a compounding concern is that some of the product samples had strong, sweet-smelling, fruity scents that may increase attractiveness among youth (Appendix B).

For investigations of this type, the circumstances surrounding the initiation and cessation of the associated outbreak are of particular interest. Three potential and not mutually exclusive factors that may have catalyzed this outbreak include 1) a change in the chemistry of synthetic cannabinoids being used; 2) a change in the incidence (rate) of use; and 3) a change in the user population.

Although results of the laboratory analyses did not indicate the presence of previously unknown synthetic cannabinoid chemicals in the MOA during the investigation period, chemistry-related mechanisms could still have contributed to the observed spike in ED visits. These include potential effects of chemical combinations, concentrations, and possible interactive effects of other chemicals that might be present in synthetic cannabinoids. Our findings of multiple, highly potent synthetic cannabinoid chemicals circulating in the MOA during the investigation period, and of many tested product samples containing blends of more than one of these potent chemicals, are both circumstances that could have promoted the spikes in severe illness and associated ER visits observed during the outbreak.

Changes in the incidence (rate) of use are difficult to assess because baseline data on rates of synthetic cannabinoid use in the MOA are extremely limited. A

retrospective evaluation of AFD transport data from 2014 yielded an estimate of seven synthetic cannabinoid-related ambulance transports during the 10-day interval spanning July 31 through August 9. By comparison, there were 84 synthetic cannabinoid-related ambulance transports during the same 10 calendar days of the investigation period. More broadly, the average number of synthetic cannabinoid-related ambulance transports across all 10-day intervals during the investigation period was 52 (range: 15–97). In general, increases in the incidence of use could be driven by increases in the local availability of and/or demand for synthetic cannabinoids. Contributing factors could include accessibility (e.g., number and location of dealers), affordability (e.g., absolute cost, cost relative to alcohol and other drugs), and perceptions about the associated risks of use (absolute and relative to alcohol and other drugs, and in terms of health, social, and/or legal consequences).

Similarly, evaluation of changes in the user population is also complicated by lack of baseline data. Our results suggest that 40% of the ED visits associated with synthetic cannabinoid use during the investigation period involved patients classified as homeless. This number is very likely an underestimate because homelessness was not consistently recorded in medical charts and may be difficult to ascertain definitively in a clinical setting because of associated stigma. We are unaware of other investigations into outbreaks of illness associated with synthetic cannabinoid use that have documented a high proportion of cases involving homeless persons. Our estimate of the overrepresentation of homeless persons among the patients with synthetic cannabinoid-related ED visits is consistent with the large proportion of synthetic cannabinoid-related ambulance transports originating near downtown Anchorage (Appendix A) where the Anchorage homeless population is concentrated and where many centers which provide services to the homeless population are located. Because members of the homeless population are much more likely than the general population to have underlying medical conditions that could predispose them to illness following drug ingestion, an increase in the proportion of homeless users during the investigation period is a circumstance that could have promoted

the spike in hospitalizations observed during the outbreak.

On November 10, the Anchorage Assembly passed an ordinance that made possessing and selling synthetic cannabinoids a crime in the MOA. Anecdotal reports from EMS personnel and ED staff suggest that the incidence of synthetic cannabinoid-related ED visits may have declined since the ordinance was passed and enforcement began immediately thereafter. Empirically confirming this decline, determining the extent to which it is sustained, and assessing the contributions of the ordinance to both, are beyond the scope of this investigation.

This investigation was subject to a number of important limitations. First, it was difficult to identify ED visits associated with synthetic cannabinoid use because no formal methods are systematically used to document this condition in medical charts (e.g., ICD-9 or ICD-10 codes). As a result, our query of electronic medical records using qualitative discharge diagnoses consistent with synthetic cannabinoid use had low specificity—over half of the visits flagged by our query were classified as unrelated following review of associated medical charts. Additionally, it is likely that some synthetic cannabinoid-related ED visits were missed because ED staff used discharge diagnoses not included in our query. For a variety of reasons, laboratory confirmation of synthetic cannabinoid ingestion is rarely obtained. Synthetic cannabinoids are not detected by standard urine drug tests, and Alaska ED physicians do not routinely request synthetic cannabinoid-specific tests even when ingestion is suspected because the lack of in-state clinical testing capacity results in reporting delays and because test results typically do not affect the clinical management of patients. Additionally, the reliability of these tests can be limited because the chemicals used to create synthetic cannabinoids vary widely and change regularly; as such, if the set of reference standards used in synthetic cannabinoid tests is not sufficiently broad and/or updated frequently, false negative results will be generated. The product and paraphernalia analyses performed during this investigation were conducted in an academic laboratory with expertise in drug testing and that uses highly sensitive methods and

chemically diverse and up-to-date reference standards.

Second, because baseline data on the frequency of synthetic cannabinoid use or medical treatment for associated illness are essentially unavailable for the MOA, it is not possible to quantify the increase in either phenomenon above typical conditions that occurred during the investigation period. Anecdotal reports from EMS personnel and ED staff in the MOA suggest that the observed pattern represents a considerable increase above normal. Across the 10-week investigation period, the day-to-day variation in the number of ED visits categorized as either self-proclaimed or suspected was highly erratic, did not exhibit any long- or short-term temporal trends, and was consistently lower than the number of ambulance transports of suspected synthetic cannabinoid-related cases reported by AFD (Appendix A).

Third, because the investigation only included patients who were alive at presentation in the ED, some number of synthetic cannabinoid-related deaths during the investigation period may have gone undetected. Persons found dead in the MOA are taken directly to the Office of the State Medical Examiner for evaluation of cause and manner of death. As in the ED, the standard drug and alcohol testing regularly performed as part of postmortem evaluations cannot detect synthetic cannabinoids, and tests capable of detecting synthetic cannabinoids were not routinely performed prior to the recognition of the current outbreak. During the investigation period, testing for synthetic cannabinoids was requested and performed on a total of 10 decedents, of which four tested positive for synthetic cannabinoid-associated metabolites. Death certificates listed synthetic cannabinoids as either the main or a contributing cause of death for these four decedents.

Finally, only two of the three hospitals in the MOA participated in the epidemiologic characterization investigation. Based on the number of ambulance transports of suspected synthetic cannabinoid-related cases reported by AFD (Appendix A), Hospitals A and B represented only 47% of all synthetic cannabinoid-related ED visits that occurred during the investigation period. Consequently, the findings

presented here incompletely represent the true epidemiology of the synthetic cannabinoid-related health effects that occurred in the MOA during the investigation period, and should therefore be interpreted with attentiveness to this important limitation.

In conclusion, this public health investigation, while subject to the aforementioned limitations, has provided valuable insights into what has been characterized as an emerging public health threat nationwide.<sup>5</sup> Evidence from across the United States points to increasing rates of use and adverse health outcomes associated with the abuse of synthetic drugs. It will only be through focused, systematic, and collaborative responses such as this that associated impacts on Alaskans will be minimized.

#### **Acknowledgments**

We gratefully acknowledge the following organizations/agencies (and associated persons, when relevant) for their cooperation during and contributions to this investigation: Anchorage Fire Department (E. Scheunemann), Anchorage Police Department, MOA Department of Health and Human Services, Alaska State Medical Examiner Office (G. Zientek), Alaska State Public Health Laboratory (D. Verbrugge), participating MOA hospitals (Alaska Native Medical Center, Alaska Regional Hospital, and Providence Alaska Medical Center), UCSF Clinical Toxicology and Environmental Biomonitoring Laboratory (M. Friesen, T. Lin), United States Centers for Disease Control and Prevention (A. Kasper), Bean's Café (L. Sauder, S. Stender), and participants in the fact-finding interview.

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**Table 1. Number and Percentages of ED Visits by Hospital and Exposure Category**

| Hospital   | Exposure Category |           |              |           |       |
|------------|-------------------|-----------|--------------|-----------|-------|
|            | Self-Proclaimed   | Suspected | Questionable | Unrelated | Total |
| Hospital A | 38                | 41        | 27           | 225       | 331   |
| Hospital B | 36                | 52        | 11           | 58        | 157   |
| Total      | 74 (15%)          | 93 (19%)  | 38 (8%)      | 283 (58%) | 488   |

**Table 2. Number and Percentages of ED Visits by Exposure Category and Sex of Patient (n=167 visits)**

| Exposure Category | Sex       |          |
|-------------------|-----------|----------|
|                   | Male      | Female   |
| Self-proclaimed   | 63        | 11       |
| Suspected         | 79        | 14       |
| Total             | 142 (85%) | 25 (15%) |

**Table 3. Number and Percentages of ED Visits by Exposure Category and Age of Patient (n=167 visits)**

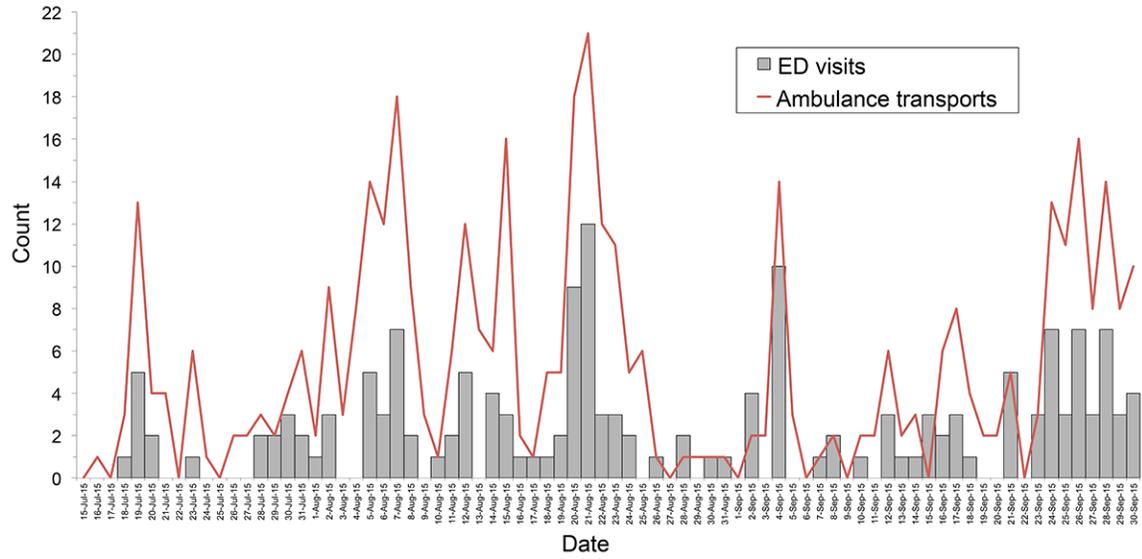
| Exposure Category | Age Range in Years |          |          |          |          |        |
|-------------------|--------------------|----------|----------|----------|----------|--------|
|                   | ≤20                | 21–30    | 31–40    | 41–50    | 51–60    | >60    |
| Self-proclaimed   | 4                  | 23       | 25       | 7        | 14       | 1      |
| Suspected         | 7                  | 30       | 27       | 13       | 15       | 1      |
| Total             | 11 (7%)            | 53 (32%) | 52 (31%) | 20 (12%) | 29 (17%) | 2 (1%) |

**Table 4. Number and Percentages of ED Visits by Exposure Category and Race of Patient (n=87; race was not recorded for 80 of 167 visits)**

| Exposure Category | Race             |                                  |        |           |                  |
|-------------------|------------------|----------------------------------|--------|-----------|------------------|
|                   | African American | American Indian or Alaska Native | Asian  | Caucasian | Pacific Islander |
| Self-proclaimed   | 10               | 13                               | 1      | 14        | 1                |
| Suspected         | 9                | 14                               | 2      | 22        | 1                |
| Total             | 19 (11%)         | 27 (16%)                         | 3 (2%) | 36 (22%)  | 2 (1%)           |

**Table 5. Number and Percentages of ED Visits Categorized as Self-Proclaimed or Suspected that were Associated with Various Medical Interventions and Clinical Presentations**

| Medical Interventions                                 | Number (%) of Visits |
|---|----------------------|
| Patient admitted to hospital from ED                  | 17 (10%)             |
| Patient physically restrained (en route or in ED)     | 26 (16%)             |
| Patient intubated (en route or in ED)                 | 11 (7%)              |
| Clinical Presentation                                 |                      |
| Lethargy (en route or in ED)                          | 115 (69%)            |
| Tachypnea (respiratory rate >16 breaths/min)          | 75 (46%)             |
| Agitation (en route or in ED)                         | 55 (33%)             |
| Tachycardia (heart rate >100 beats/min)               | 48 (29%)             |
| Lethargy and agitation                                | 37 (22%)             |
| Elevated systolic blood pressure (pressure >140 mmHg) | 22 (13%)             |
| Elevated diastolic blood pressure (pressure >90 mmHg) | 17 (10%)             |
| Fever (temperature ≥100.4°F)                          | 3 (2%)               |



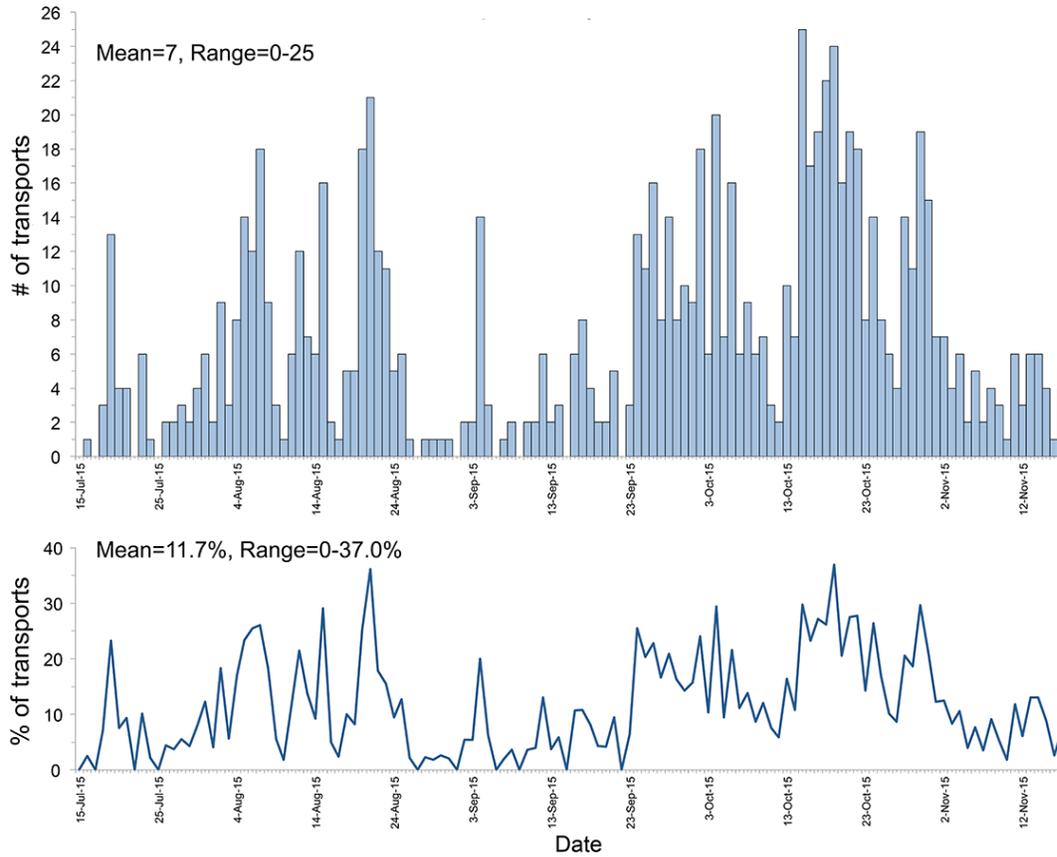
**Figure. Daily Counts of ED Visits Categorized as Self-Proclaimed or Suspected, and AFD Ambulance Transports of Suspected Synthetic Cannabinoid-Related Cases — MOA, July 15 through September 30, 2015.**

Appendix A

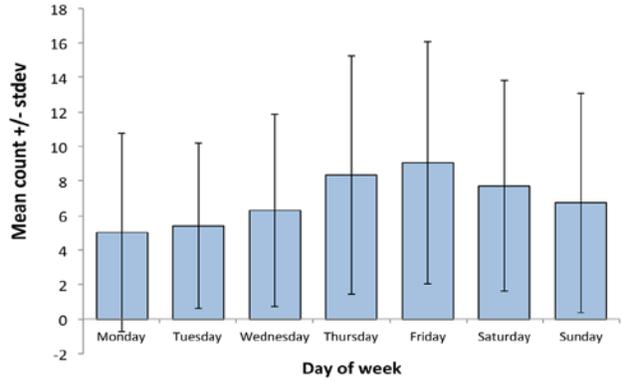
Summaries of Data Collected by the Anchorage Fire Department (AFD) on Ambulance Transports of Suspected Synthetic Cannabinoid-Related Cases to MOA Hospitals,

July 15, 2015 through November 17, 2015

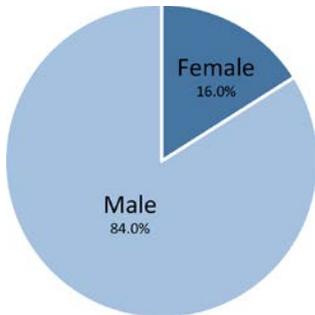
Courtesy of Erich Scheunemann, Assistant Chief, AFD



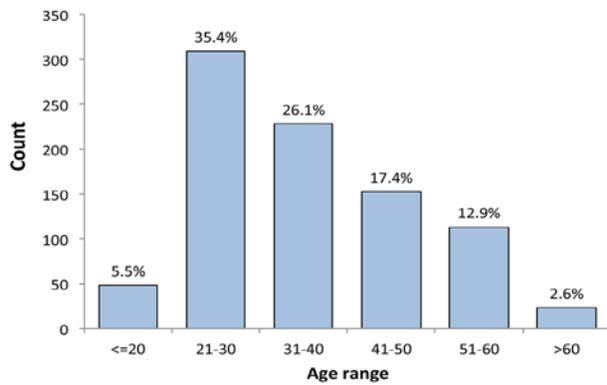
**Figure 1. Number of Daily AFD Ambulance Transports of Suspected Synthetic Cannabinoid-Related Cases to MOA Hospitals and Percent of All Daily Ambulance Transports Associated with Synthetic Cannabinoid-Related Illness. Total Number of Synthetic Cannabinoid-Associated Transports: 873**



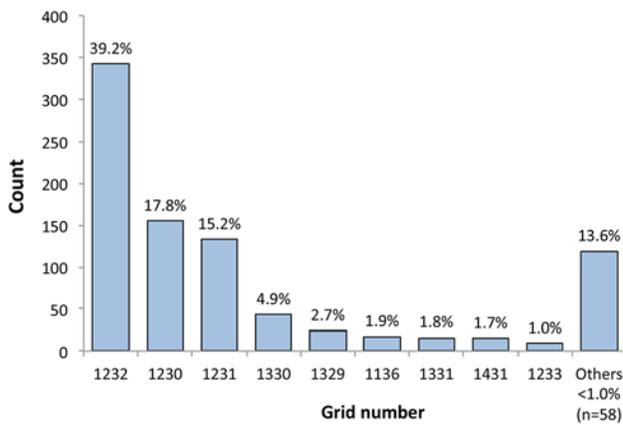
**Figure 2. Mean and Standard Deviation of Counts of Daily AFD Ambulance Transports of Suspected Synthetic Cannabinoid-Related Cases to MOA Hospitals by Day of the Week.** *Total Number of Synthetic Cannabinoid-Associated Transports: 873*



**Figure 3. Sex of Individuals Transported by AFD Ambulances to MOA Hospitals for Illness Suspected to be Due to Synthetic Cannabinoid Use.** *Percentages are Relative to Total Number of Synthetic Cannabinoid-Associated Transports (n=873)*



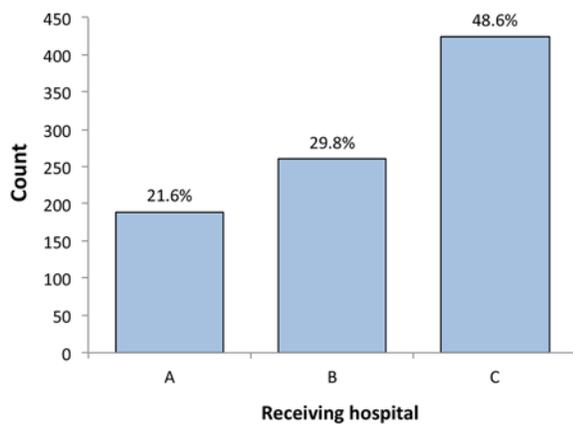
**Figure 4. Age Distribution of Individuals Transported by AFD Ambulances to MOA Hospitals for Illness Suspected to be Due to Synthetic Cannabinoid Use. Percentages are Relative to Total Number of Synthetic Cannabinoid-Associated Transports (n=873)**



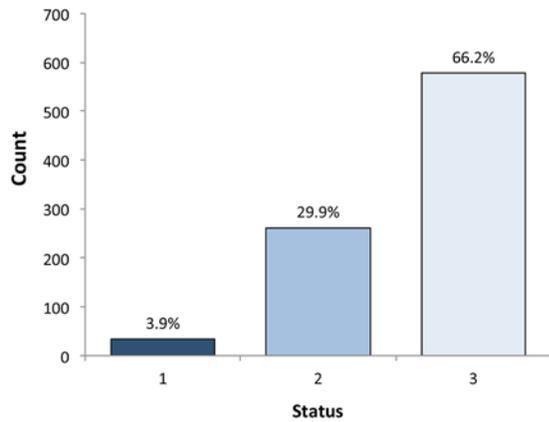
**Figure 5A. Grid Number of Pickup Location Associated with Individuals Transported by AFD Ambulances to MOA Hospitals for Illness Suspected to be Due to Synthetic Cannabinoid Use. Percentages are Relative to Total Number of Synthetic Cannabinoid-Associated Transports (n=873)**



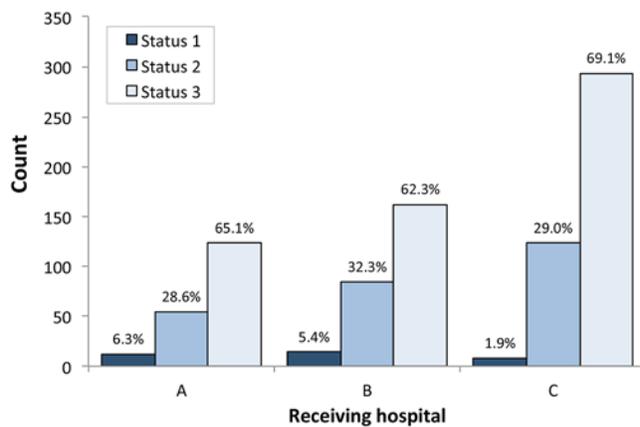
**Figure 5B. Locations of Grids 1230, 1231, and 1232 in Downtown Anchorage.**



**Figure 6. Name of MOA Hospital Receiving Individuals Being Transported by AFD Ambulances to MOA Hospitals for Illness Suspected to be Due to Synthetic Cannabinoid Use. Percentages are Relative to Total Number of Synthetic Cannabinoid-Associated Transports (n=873)**



**Figure 7A. Health Status of Individuals Being Transported by AFD Ambulances to MOA Hospitals for Illness Suspected to be Due to Synthetic Cannabinoid Use.** Status Levels 1: Unstable (Immediate Threat to Life or Limb); Status 2: Stable at This Time (Potential Threat to Life or Limb); Status 3: Stable (No Potential Threat to Life or Limb). Percentages are Relative to Total Number of Synthetic Cannabinoid-Associated Transports (n=873)



**Figure 7B. Health Status of Individuals Being Transported by AFD Ambulances to MOA Hospitals for Illness Suspected to be Due to Synthetic Cannabinoid Use, Presented by Hospital.** Status Levels 1: Unstable (Immediate Threat to Life or Limb); Status 2: Stable at This Time (Potential Threat to Life or Limb); Status 3: Stable (No Potential Threat to Life or Limb). Percentages are Relative to Total Number of Synthetic Cannabinoid-Associated Transports Received by Each Hospital (Hospital A=189, Hospital B=260, Hospital C=424)

**Appendix B**

**Results of Laboratory Analyses of Paraphernalia and Product Samples Collected by ED Staff from Patients Treated for Suspected Synthetic Cannabinoid Use**

| Patient | Product/Paraphernalia  | Chemical(s) Detected <sup>1</sup>               |  |                               |
|---------|--|---|--|-------------------------------|
|         |  | Major   | Minor  | Trace                         |
| 1       | Partial joint 1  | <b>5F-AMB; MAB-CHMINACA</b>                     |  |                               |
| 1       | Partial joint 2  | <b>5F-AMB; AB-CHMINACA</b>                      | <b>MAB-CHMINACA</b>                              | <b>NM2201</b>                 |
| 1       | Small piece of foil, burnt   | <b>5F-AMB; MAB-CHMINACA</b>                     |  |                               |
| 1       | Plastic pen tube used as pipe  | <b>5F-AMB; MAB-CHMINACA</b>                     |  |                               |
| 2       | Partial joint 1  | Cotinine; Nicotine; Anatabine                   |  |                               |
| 2       | Partial joint 2  | <b>5F-AMB; MAB-CHMINACA</b>                     |  |                               |
| 2       | Pipe bowl  | THC; Cannabinol; Cocaine; Benzoylecgonine; HHMA | <b>XLR-11; AB-PINACA; 5F-AB-PINACA; Caffeine</b> | Cannabidiol                   |
| 2       | Pipe stem  | THC; Cannabinol; Cocaine; Benzoylecgonine; HHMA | <b>XLR-11; Caffeine</b>                          | Cannabidiol; <b>AB-PINACA</b> |
| 3       | Clear unlabeled Ziploc bag containing dried herbal product               | Cotinine; Nicotine; Anatabine                   |  |                               |
| 4       | Clear unlabeled Ziploc bag, essentially empty but with apparent residues | <b>5F-AMB; MAB-CHMINACA; AB-CHMINACA</b>        | <b>AKB48- N-5F-pentyl analog</b>                 |                               |
| 5       | Clear pill capsule 1, essentially empty but with apparent residues       | MDMA  |  | Cocaine                       |

| Patient | Product/Paraphernalia   | Chemical(s) Detected <sup>1</sup> |  |                         |
|---------|---|-----------------------------------|--|-------------------------|
|         |   | Major                             | Minor                                  | Trace                   |
| 5       | Clear pill capsule 2, essentially empty but with apparent residues                                    | MDMA                              |  | Codeine;<br>Theobromine |
| 6       | Loose dried herbal particles collected from patient's pocket  | No chemical(s) of note detected   |  |                         |
| 7       | Clear unlabeled Ziploc bag containing dried herbal product, strong watermelon smell                   | <b>MAB-CHMINACA</b>               | <b>5F-AMB</b>                          |                         |
| SOE     | Sealed plastic package labeled "CBD hemp oil"   | Cannabidiol                       |  | Cannabinol              |
| SOE     | Plastic dropper bottle filled with clear liquid 1, labeled "Cloud XXX - Cherry"                       | <b>AB-PINACA</b>                  | <b>5-Chloro-AB-PINACA</b>              |                         |
| SOE     | Plastic dropper bottle filled with clear liquid 2, labeled "Cloud XXX - Raspberry"                    | <b>AB-PINACA</b>                  | <b>5-Chloro-AB-PINACA; AB-FUBINACA</b> |                         |
| SOE     | Plastic dropper bottle filled with clear liquid 3, labeled "Cloud XXX - Raspberry"                    | <b>AB-PINACA</b>                  | <b>5-Chloro-AB-PINACA; AB-FUBINACA</b> |                         |
| SOE     | Plastic dropper bottle filled with clear liquid 4, labeled "Cloud XXX - Strawberry"                   | <b>AB-PINACA</b>                  | <b>5-Chloro-AB-PINACA</b>              |                         |
| 8       | Foil-covered Ziploc bag containing dried herbal product, labeled "Zero Gravity Potpourri - Blueberry" | <b>MAB-CHMINACA</b>               | <b>5F-AMB</b>                          |                         |
| 9       | Foil-covered Ziploc bag containing dried herbal product, labeled "Get Real - Cherry"                  | <b>5F-AMB</b>                     | <b>AKB48 N-(5-Fluoropentyl) analog</b> |                         |
| 10      | Burnt herbal product in metal pen pipe  | No chemical(s) of note detected   |  |                         |
| 11      | Foil-covered Ziploc bag containing dried herbal product, labeled "Zero Gravity Potpourri - Blueberry" | <b>MAB-CHMINACA</b>               | <b>5F-AMB</b>                          |                         |

| Patient | Product/Paraphernalia  | Chemical(s) Detected <sup>1</sup> |       |                     |
|---------|--|-----------------------------------|-------|---------------------|
|         |  | Major                             | Minor | Trace               |
| 12      | Black plastic film canister containing dried herbal product, unlabeled | <b>MAB-CHMINACA</b>               |       | <b>APP-CHMINACA</b> |
| 13      | Loose clumps of dried herbal product collected from patient's pocket   | THC                               |       |                     |

<sup>1</sup> Names of chemicals classified as synthetic cannabinoids are in bold text.

**Photos of Some of the Above Samples Shortly after Collection from Patients in the ED and Prior to Laboratory Analyses**



**Photo 1. Clear Unlabeled Ziploc Bag Containing Dried Herbal Product, Strong Watermelon Smell (Patient 7)**



Photo 2. Plastic Dropper Bottle Filled with Clear Liquid 1-4, Labeled “Cloud XXX - Cherry” (Also Raspberry and Strawberry, SOE)



Photo 3. Foil-Covered Ziploc Bag Containing Dried Herbal Product, Labeled “Zero Gravity Potpourri - Blueberry” (Patient 8, Very Similar in Appearance to Sample Collected from Patient 11)



Photo 4. Foil-Covered Ziploc Bag Containing Dried Herbal Product, Labeled “Get Real - Cherry” (Patient 9)