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Analysis of the Publications from the Epidemic Intelligence Service classes of 2013-2015 and 2014-2016 at the Centers for Disease Control and Prevention

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Analysis of the Publications from the Epidemic Intelligence Service classes of 2013-2015 and 2014-2016 at the Centers for Disease Control and Prevention

By

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2016

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Health
2018

Abstract

Analysis of the Publications from the Epidemic Intelligence Service classes of 2013-2015 and 2014-2016 at the Centers for Disease Control and Prevention

By Daniel Balcazar

Since the establishment of the Epidemic Intelligence Service (EIS) in 1951, EIS officers have contributed to a wide variety of public health investigations, many of which have resulted in publications. The objective of this study was to describe the types of publications produced by EIS Officers from the classes of 2013-2015 and 2014-2016 and the impact of those publications. A descriptive analysis was performed to explore journal name, geographic location, geographic scope, disease area of focus, and types of recommendations made in the publications. It was followed by an analysis using citation impact metrics to evaluate the broader impact of the publications. Results showed 71% percent of publications were categorized as describing an investigation that had a domestic focus and 27% had an international focus. In terms of recommendations for public health, 44% of articles made recommendations for additional or improved surveillance, 44% made recommendations for education of the public, 40% made recommendations for education of healthcare workers, and 39% made recommendations relating to public health standard procedures. The publications had an average of 16.57 citations listed by SCOPUS and an average Altmetric Attention Score of 17.3. The overall descriptive analysis demonstrates the wide range of investigations that EIS officers are conducting and how they communicate their findings through publications.

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Contents

Introduction

The Epidemic Intelligence Service (EIS) is a 2-year post-doctoral training program in applied epidemiology. EIS officers respond to public health problems and support field investigations throughout the United States and abroad (CDC, 2018). They also conduct analyses of public health data and evaluations of public health surveillance systems. EIS has a rigorous and highly competitive application process. Only candidates with doctoral-level degrees or other health professionals with training and experience in public health are eligible to apply, including physicians, veterinarians, nurses and other health professionals with training or experience in public health, and scientists with doctoral-level degrees in disciplines related to public health (CDC, 2018). EIS Officers are assigned to work in a variety of settings including (1) CDC headquarters in Atlanta or other locations across the United States, (2) state, local, or territorial health departments, and (3) partner organizations or agencies (CDC, 2018). The majority of the training is on-the-job, applied training; however the program supplements field training with targeted classroom-based training. The EIS curriculum is competency-based. To help officers achieve the EIS competencies, officers are required to complete 10 core activities for learning.

Core Activities for Learning (CALs)

- Conduct or participate in a field investigation of a potentially serious public health problem that requires a timely response
- Design, conduct, and interpret an epidemiologic analysis
- Evaluate a public health surveillance system
- Give a public health talk on original work or in the officer's field of study

- Give an oral presentation to a scientific audience
- Write and submit a scientific manuscript for a peer-reviewed journal as first author
- Write and submit a concise public health update that communicates timely information as the primary author
- Write and submit an abstract as first author
- Communicate complex scientific concepts to a nonscientific audience
- Provide service to the agency

(CDC, 2018).

The EIS program has identified various expected outcomes of the program including that officers generate and communicate results and recommendations from public health investigations, and that those results and recommendations are used for public health action. This descriptive study aims to evaluate the extent to which results and recommendations are communicated and used for public health action by examining publications from officers in the EIS classes of 2013-2015 and 2014-2016, including examination of the recommendations made in those publications, and assessment of the impact metrics associated with those publications.

Literature Review

Previous studies of the scientific output of EIS officers have examined scientific outputs from sub-groups of EIS classes or have looked at specific types of scientific output from several EIS classes. For example, a study conducted by Carroll, Rashid, Falk, & Howley (2017) examined publications published during 2006-2015 by EIS officers stationed at the National Center for Environmental Health (NCEH). The authors

categorized the topical focus of the articles and discussed their collective influence on the environmental health literature and the benefits that the investigations brought to public health on a local and larger national scale. The study found that toxic chemicals, natural and human-caused disasters, extreme temperature-related illness and chronic disease were the most researched topics. The authors also summarized key policy/regulatory recommendations produced by the publications, as well as pubic health needs that were addressed. For example, they discussed how officer investigations helped generate increased attention on investigating e-cigarette use and drug overdoses, as well as how investigations provided new risk assessments on market items like dietary supplements and laundry pods.

Another study by Coronado, Chen, Smith, & Glynn (2016), was a descriptive analysis of all scientific products submitted for institutional clearance by CDC's field-based EISOs during 2009–2014. Field-based EISO's are officers who complete their training at state, local, or territorial health departments, health organization partners, or federal agencies other than CDC. Approximately 25% to 30% of the officers in each EIS class are field-based officers. The remaining 70% to 75% complete their training in various CDC-based assignments (Coronado et al. 2016). The study evaluated the timeliness of publication of manuscripts by field-based EIS officers after the manuscripts were cleared for publication through the CDC's institutional clearance process. They found that field-based EIS officers contributed to 287 scientific publications resulting from manuscripts that were cleared during the years 2009 through 2015 (88 publications in the MMWR and 199 in other journals). Of those publications, 83% of the MMWR publications and 75% of the publications in other journals focused on infectious diseases.

The descriptive analysis also noted that 54% of the examined publications in journals other than the MMWR were published in journals with impact factors of 1 to 5, which falls within the average of most public health journals (Coronado et al. 2016). The results offer an analysis of publications by field-based EIS officers during a 5-year frame, however the analysis did not include scientific products produced by the majority of EIS officers who are stationed in CDC locations.

A study by Moolenaar and Thacker (2004) reviewed the publications and post-completion career choices of field-based EIS officers in the EIS classes of 1991-1996. Publications by these officers were categorized by purpose/topic and impact measures were also gathered. The authors found that the EIS officers first-authored or co-authored 309 publications, the majority of which were on infectious disease topics, environmental health or injury control topics, chronic disease topics, or general policy topics. Using EIS records, a retrospective cohort study was also conducted to compare the post-program completion job choices of field-based officers with headquarter-based officers. They concluded that the highest number of EIS field-based officers reported choosing positions in state or local health departments, followed by entering the CDC Preventive Medicine Residency Program, choosing positions at CDC headquarters, entering academia, choosing positions in other federal agencies, pursuing work in the private sector, and lastly choosing to work in an international position (Moolenaar &Thacker, 2004). The authors also noted that field-based officers were more likely to choose a position within a local/state health department than headquarter-based officers.

A broad study conducted by Thacker, Stroup, and Sencer (2011) reviewed Epi-Aids from a 60-year period. Epi-Aids are health authority-requested public health

investigations that are conducted by EIS officers in response to urgent public health problems (Thacker, Stroup, & Sencer, 2011). Epi-Aids typically result in reports or publications. The authors abstracted various information from Epi-Aid records including type of study, statistical methods used in the study, disease type, data collection methods, location of study population, and recommendations. The authors detailed the growth in scope and area of focus of Epi-Aids as they grew from an initial primary focus on infectious agents/outbreaks to include other topics like environmental problems, occupational conditions, reproductive health, substance abuse, and chronic diseases (Thacker, Stroup, & Sencer, 2011). The study provided a strong overview and trend analysis on EIS officer field investigations by focusing on Epi-Aids, thus evaluating the short-term rapid response capacity officers have provided to sites since the foundation of the program. However, Epi-Aids do not always result in publications as some result only in internal reports and reports to public health partners. In addition, Epi-Aids represent only part of the investigations that EIS officers conduct.

Previous literature has not included an extensive analysis of all publications from entire EIS classes. This study aims to present the full breadth of EIS officer publications by examining all publications by two classes and collecting detailed information on each publication, including the impact of those publications. The study will provide the data to help evaluate the extent to which the EIS program is meeting one of its core objectives.

Methods

Publications were selected using the following criteria (1) the first author was an EIS officer in the class of 2013 or 2014, (2) the manuscript was listed in PubMed, (3) the manuscript was published (including as an e-publication) before June 30, 2016 (which is

1 year after completion of the fellowship for the class of 2013 and the time of fellowship completion for the class of 2014), and (4) the manuscript was based on work done by the EIS officer during their EIS fellowship. Publications were identified by reports of publications from EIS officers to the EIS program and searching in PubMed for EIS affiliation and for the last names of EIS officers in the classes of 2013 and 2014 among the author names, including any known name changes. Publications identified through these searches were examined to determine whether the first author was an EIS officer in one of the included classes.

Identified articles were split among three reviewers who each independently completed abstractions using an abstraction protocol. Data abstracted included disease area of focus, disease type, journal name, geographic location, geographic scope, and types of recommendations. Operational definitions of each abstracted variable were created to maintain consistency and accuracy among the reviewers. Data abstraction results were recorded in Excel and subsequently transferred to SAS for further analysis. Re-abstractions on 23 randomly selected articles were conducted by a fourth reviewer to assess the accuracy of the abstractions. Re-abstractions were compared to the initial abstractions in categories by type of information, including general subject area of focus (7 yes/no variables for specific subject areas), geographic focus (7 variables describing geographic focus), and recommendations (21 yes/no variables for various types of recommendations). Disagreement percentages were calculated by dividing the total number of disagreements by the total possible disagreements in each category (number of variables in the category multiplied by 23, for the 23 re-abstractions).

We calculated the number of publications for each officer and compared the

number of publications per officer for the two EIS classes and for field-based and center-based officers within each class. A statistical comparison of the two classes was conducted using the Exact Wilcoxon rank sum test. A non-parametric test was used because of the skewed distribution. Two-sided p-values were reported.

Several impact metrics were collected for the included publications. Each publication's Altmetric Attention Score and number of Scopus-indexed citations were retrieved from those databases by searching on each article's PubMed Identifier (PMID) and digital object identifier (DOI) number. For each type of impact metric, collection of impact metrics was completed for all of the included publications on the same day, to maintain comparability. Because impact metrics might depend on the amount of time that has elapsed since publication, a measure of how the article's Altmetric Attention Score compared with scores of other journal articles published at a similar time was also retrieved. The Altmetric database reports a percentile score that reflects the percentage of articles that had a lower Atlmetric Attention Score than a given article, among articles that were published within 6 weeks before or after that article. That percentile score was obtained for each article from the Altmetric database in order to help eliminate the effect of the time since publication. Journal Impact Factor (JIF) was also recorded for every journal in which publications appeared. JIF's are a yearly measure reflecting the yearly average number of citations a journal's articles yield. JIF's were retrieved using Journal Citation Reports (JCR), an annual publication with impact metric summaries and analytics integrated within the Web of Science database. All JIF scores were retrieved for 2015.

Results

The 2013 and 2014 EIS classes included a total of 159 officers. We identified 218 publications with first authors from one of these two EIS classes during the included time period (130 with authors from the class of 2013-2015 and 88 with authors from the class of 2014-2016). A total of 112 officers (70%) published at least one publication meeting the inclusion criteria for this study during the included time period. The average number of publications per officer among officers with at least one publication was 1.9 with a median of 2 and a maximum of 6. Overall, the average number of publications per officer among all officers was 1.4 with a median of 1 and a maximum of 6 (median of 1 paper per officer for both classes; exact Wilcoxon rank sum p-value=0.255 for comparison between classes; **see Table 1**). When comparing field-based and center-based officers within each class, for the class of 2013 center-based officers had slightly more publications than field-based officers (two-sided p-value=0.033) but the difference between field-based and center-based officers was not statistically significant for the class of 2014 (two-sided p-value=0.866).

The publications had a range of topical areas of focus. About 72% of publications had an infectious disease focus, 8% had a chronic disease focus, 7% had an environmental focus, 7% had a reproductive health focus, 6% had an occupational focus, 5% had an injury focus, and 1% had a mental health focus (some publications had more than one of these topical areas of focus) (see **Table 2**). Ebola (18%), influenza (6%), injuries (4%), tuberculosis (3%), and measles (2%) were among the most frequent specific disease types of interest (see **Table 3**).

The publications were published in 67 different journals. One hundred and six

(49%) articles were published in the MMWR, 10 (5%) were published in Emerging Infectious Diseases, 2 (1%) were published in the Journal of the American Medical Association, and 2 (1%) were published in the New England Journal of Medicine (see **Table 4**). Among the 130 publications with first authors in the class of 2013, 42 (32%) were in the MMWR, compared with 64 of the 88 publications (73%) with authors from the EIS class of 2014.

Overall, 155 (71%) publications were categorized as describing an investigation that had a domestic focus (e.g., the investigation was focused on data relating to the United States or an outbreak that occurred in the United States), 58 (27%) had an international focus (e.g., the investigation was focused on data relating to a location outside the United States or an outbreak that occurred outside the United States), and 5 (2%) were categorized as both domestic and international in focus. We also examined the geographic area covered by the investigation, which we refer to as the geographic scope of the investigation. Investigations are reported according to the largest scope recorded by abstractors. Approximately, 8% had a multinational scope, 46% had a national scope, 15% had a multistate scope, 13% had a state scope, 11% had a county scope, and 6% had a city scope (includes scopes smaller than cities, e.g., neighborhood scope) (see **Table 5**).

In terms of recommendations for public health, 44% of articles made recommendations for additional or improved surveillance, 44% made recommendations for education of the public, 40% made recommendations for education of healthcare workers, 39% made recommendations relating to public health standard procedures, 32% made recommendations relating to hospital standard procedures, 20% recommended

further research, and 17% made vaccination usage recommendations. Other types of recommendations were made less frequently (see **table 6**).

Comparing the original abstractions and the re-abstractions, geographic focus had a disagreement percentage of 10.5%, disease focus had a disagreement percentage of 4.3%, and recommendations had a disagreement percentage of 11.1%. Exceptionally high single-variable disagreement percentages were found for the variable "national" within geographic scope which had a disagreement percentage of 30%, as well as for the recommendation variables for "education of the public" and "other", which also had disagreement percentages of 30% (see **Table 6** footnotes for definitions of recommendation variables).

The publications had an average of 16.57 citations listed by SCOPUS, with a median of 5, interquartile range of 2 to 17 and a range of 0 to 288 (n=216) (Figure 1). An Altmetric Attention Score was available for 204 of the 218 publications. Among publications with available scores, the average Altmetric Attention Score was 17.3 with a median of 2.5, interquartile range of 0 to 13 and a range of 0 to 475 (n=204) (Figure 2). An Altmetric percentile, (indicating that the article scored higher than X% of contemporaries that were published within 6 weeks on either side of the article's publication date) was retrieved for a total of 148 publications (excluding publications with unavailable Altmetric Attention Scores or with scores of zero). The mean percentile was 67.1. Overall, 50% of publications had a percentile score of 73.5 or above and 25% of publications had a score of 92 or higher. We also collected the Journal Impact Factor (JIF) for the journals in which the publications were published. We retrieved JIFs for a total of 61 journals (JIFs could not be retrieved for 5 journals). Among the 208 articles

with available JIFs, the mean JIF among the publications was 8.3 and the median was 10.588, reflecting the high number of publications that were in the MMWR. Among, 103 publications in journals other than the MMWR for which JIFs were available, the mean JIF was 5.97 and the median was 3.41 (see **Table 4**).

Discussion

This study provides a detailed analysis of the publication output from two complete EIS officer classes. The findings suggest that while infectious diseases were the focus of the majority of articles, EIS officers also published on other important topics like environmental health, reproductive health, and mental health. While it might be generally uncommon for EIS officers to publish so many publications on international topics like Ebola, this reflected the global public health priorities at the time. The overall descriptive analysis demonstrates the wide range of investigations that EIS officers are conducting and how they communicate their findings through publications. The use of impact metrics is an evaluation of dissemination of the findings to the public health and medical fields. While previous studies of the EIS program analyzed particular subsets of EIS officers or specific research outputs, this evaluation of all publications from two entire EIS classes is the first of its kind and gives a more complete picture of the work of the EIS officers.

The statistical comparison of the number of publications per officer yielded some interesting results, notably the publication output when comparing the two EIS classes did not differ significantly, despite the longer follow up for the class of 2013. Additionally, there was a significant difference in publication output for the class of 2013 when comparing field-based to headquarter-based EIS officers. However, there was no

significant difference in publication output for the class of 2014 when comparing field-based to headquarter-based EIS officers. A potential explanation is that the class of 2013 had a longer time frame to publish, and center-based officers might be more likely to have publications published after the end of their fellowship.

There are several limitations worth noting when interpreting the results of this study. The SCOPUS citations and Altmetric Attention Scores depend on the time since the article's publication date. Because scores were retrieved on the same date for all of the publications, articles published earlier would be expected to have higher scores. This prompted the inclusion of Altmetric percentile scores, as these percentiles are compiled by comparing publications with other publications that were published within 6 weeks before or after the publication. No similar metric is available for SCOPUS citations. Another limitation is potential misclassification of recommendations due to the subjective nature of interpreting recommendations.

Re-abstractions overall showed fairly strong levels of agreement, however there were some variables with a relatively high number of discrepancies, as outlined in the results section. A final limitation is related to the fact that we considered publications that were published before June 30, 2016, which is 1 year after completion of the fellowship for the class of 2013 and the time of fellowship completion for the class of 2014. We would expect officers in these classes to have additional publications after that date, especially for the class of 2014. The class of 2014 had less time to produce publications and thus the publications in that class were skewed more towards MMWR publications, which are timelier and might tend to have a more infectious disease and outbreak focus.

The results build on current literature on the work and output of EIS officers.

Cornado et al. (2017) and Moolenaar & Thacker (2004) found similar distributions of topics on which EIS officers published, although both those studies were specifically limited to EIS field-based officers. When comparing the results with Thacker et al. (2011), the percentage of Epi-Aids during the most recent period in the Thacker article (1996-2005) that were related to chronic disease (5%) is lower than the percentage of publications related to chronic disease in this study (7.8%). Also, the total percentage of Epi-Aids the authors categorized as environmental/injury during 1996-2005 (13%) was similar to the combined percentage of the disease focus categories of environmental and injury (12.3%) in this study. The results of this study reflect the trend towards topics beyond infectious disease investigations noted by Thacker et al. (2011) in their trend analysis.

Impact metric results indicate that the outputs of EIS officer investigations are receiving attention. The variety of journals in which EIS officers have published indicates that the work of the EIS officers has influenced public health/medicine beyond only infectious diseases. Domestic investigations were not overwhelmingly at the national level, which suggests EIS investigations are also making significant impacts at the state level and below. The 26.2% of investigations occurring outside of the U.S, reflects the attention that international epidemics, including Ebola, were given **(see Table 5)**. The findings of this study suggest the EIS program continues to achieve some of the important expected outcomes of the program, including communication of investigation results and recommendations, and use of that information.

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Moolenaar RL, Thacker SB. (2004). Evaluation of field training in the Epidemic Intelligence Service: publications and job choices. *American Journal of Preventive Medicine*; 26(4):299-306.

Thacker SB, Stroup DF, Sencer DJ. (2011) Epidemic assistance by the Centers for Disease Control and Prevention: role of the Epidemic Intelligence Service, 1946–2005. American Journal of Epidemiology 174(suppl):S4–S15.

Figure 1: Number of SCOPUS-Indexed Citations (n=216)

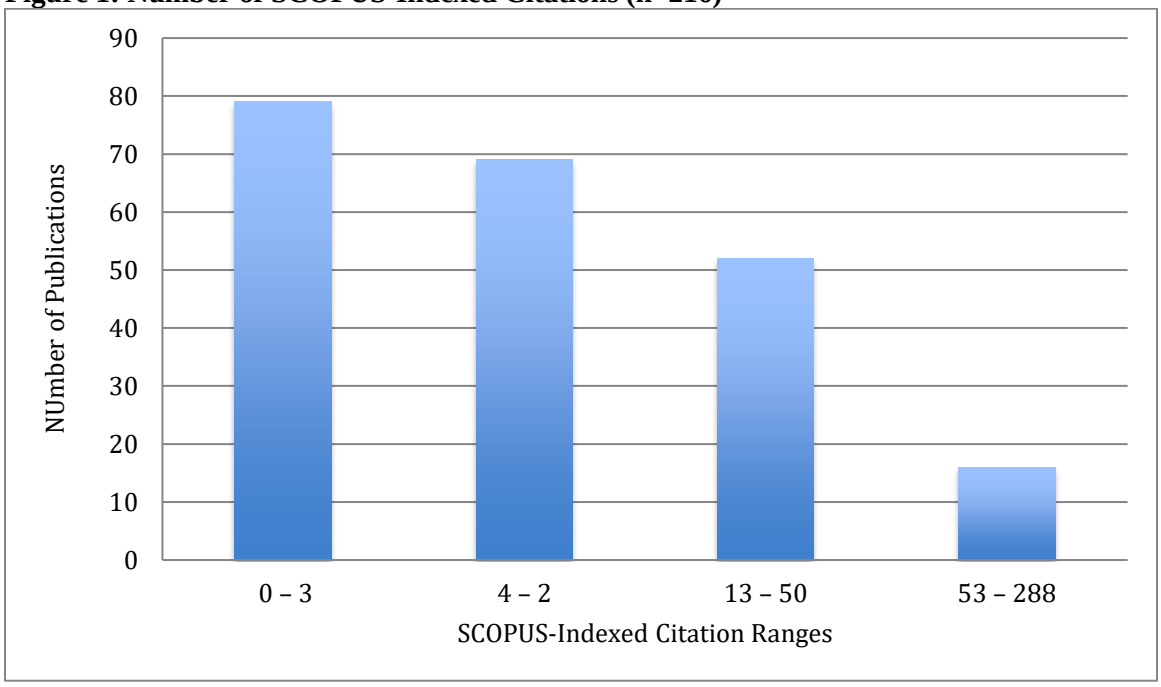

Figure 2: Altmetric Attention Scores (n=204)

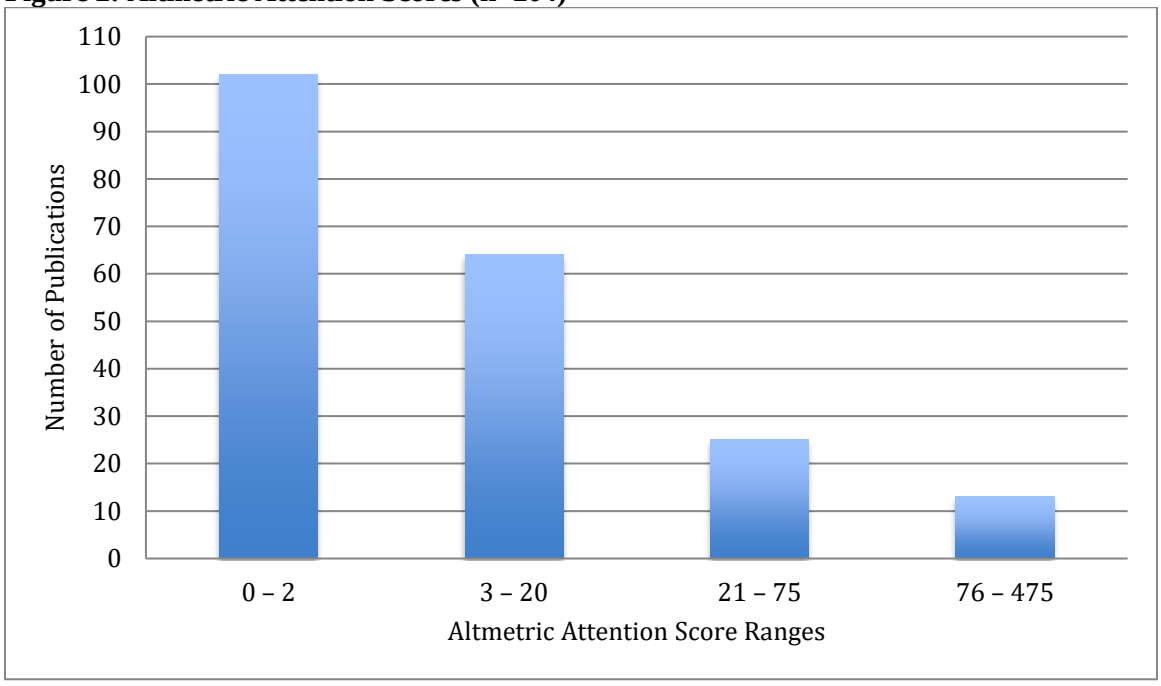

Figure 3: Journal Impact Factor Scores of publications in journals other than the MMWR (n=103) (Excludes publications in journals without JIF scores as well as all publications published in MMWR)

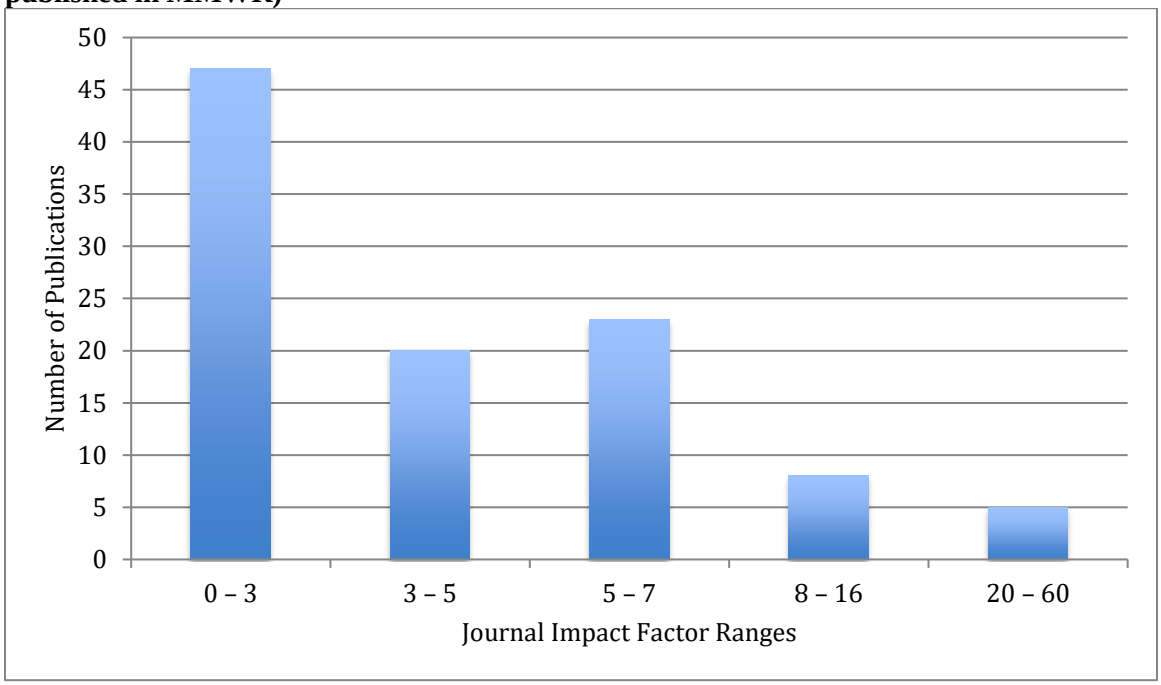

Table 1: Publication output of EIS officers by class year and assignment

	Class of 2013	*Class of 2014*	*Total*
Center-based	Number of officers: 60 Mean number of papers: 1.85 Median number of papers: 1 Interquartile range (25%-75%): 1-2.5 Range of number of papers: 0-6	Number of officers: 56 Mean number of papers: 1.11 Median number of papers: 1.0 Interquartile range (25%-75%): 0-2 Range of number of papers: 0-3	Number of officers: 116 Mean number of papers: 1.49 Median number of papers: 1 Interquartile range (25%-75%): 0-2 Range of number of papers: 0-6
Field-based	Number of officers: 21 Mean number of papers: 0.90 Median number of papers: 1 Interquartile range (25%-75%): 0-2 Range of number of papers: 0-3	Number of officers: 22 Mean number of papers: 1.18 Median number of papers: 1 Interquartile range (25%-75%): 0-2 Range of number of papers: 0-4	Number of officers: 43 Mean number of papers: 1.05 Median number of papers: 1 Interquartile range (25%-75%): 0-2 Range of number of papers: 0-4
Total	Number of officers: 81 Mean number of papers: 1.60 Median number of papers: 1 Interquartile range (25%-75%): 0-2 Range of number of papers: 0-6	Number of officers: 78 Mean number of papers: 1.13 Median number of papers: 1 Interquartile range (25%-75%): 0-2 Range of number of papers: 0-4	Number of officers: 159 Mean number of papers: 1.37 Median number of papers: 1 Interquartile range (25%-75%): 0-2 Range of number of papers: 0-6

Table 2: General topic areas of focus. Publications could fall under more than one category of disease focus (n = 218)

Disease Focus	**n (%)**
Infectious	157 (72.0%)
Chronic	17 (7.8%)
Environmental	16 (7.3%)
Reproductive Health	15 (6.9%)
Occupational	13 (6.0%)
Injury	11 (5.0%)
Mental Health	2 (0.9%)

Table 3: Specific disease types or topic areas (n = 218). (Each publication was assigned only one specific area of focus; diseases or topic areas with at least four publications are listed.)

Disease Type	Frequency	Percent
Ebola	39	17.8
Influenza	13	6.0
Injuries (other than opioid addiction)	9	4.1
Tuberculosis	7	3.2
Measles	5	2.3
Breastfeeding	4	1.8
Lyme Disease	4	1.8
Salmonella	4	1.8
Syphilis	4	1.8
Zika	4	1.8
Opioid addiction or overdose	4	1.8
Pneumoconiosis	4	1.8

Table 4: Journals in which EIS officer publications were published (n=218).	**Frequency**	**Percent**	**2015 Journal Impact Factor**
MMWR Morbidity and Mortality Weekly Report	106	48.6	10.588
Emerging Infectious Diseases	10	4.6	6.994
Clinical Infectious Diseases	6	2.8	8.736
Pediatrics	6	2.8	5.196
American Journal of Tropical Medicine and Hygiene	5	2.3	2.463
Open Forum of Infectious Diseases	5	2.3	N/A
American Journal of Infection Control	4	1.8	1.995
American Journal of Preventive Medicine	3	1.4	4.465
Epidemiology and Infection	3	1.4	2.515
Infection Control and Hospital Epidemiology	3	1.4	3.669
American Journal of Industrial Medicine	2	0.9	1.632
International Journal of Infectious Diseases	2	0.9	2.229
Journal of Environmental Health	2	0.9	0.887
Journal of Human Lactation	2	0.9	2.233
The Journal of Infectious Diseases	2	0.9	6.344
Journal of the American Medical Association	2	0.9	37.684
The New England Journal of Medicine	2	0.9	59.558
Obstetrics and Gynecology	2	0.9	5.656
Travel Medicine Infectious Disease	2	0.9	2.192
Vaccine	2	0.9	3.413
AIDS Patient Care STDS	1	0.5	3.578
American Journal of Kidney Diseases	1	0.5	6.269
American Journal of Medicine Hygiene	1	0.5	2.453
American Journal of Transplantation	1	0.5	5.669
American Journal of Health Promotion	1	0.5	2.033
American Journal of Respiratory and Critical Care Medicine	1	0.5	13.118
Annals of Epidemiology	1	0.5	2.335
Asian Pacific Journal of Clinical Nutrition	1	0.5	N/A
Birth	1	0.5	1.867
Chest	1	0.5	6.136
Child Abuse and Neglect	1	0.5	2.397
Clinical Microbiology and Infection	1	0.5	4.575
Drug and Alcohol Dependency	1	0.5	3.349
European Journal of Public Health	1	0.5	2.751
Expert Rev Vaccines	1	0.5	4.222
Injury Prevention	1	0.5	1.693
International Journal of Tuberculosis and Lung Disease	1	0.5	2.148
Journal of the Academy of Nutrition and Dietetics	1	0.5	3.609
Journal of Acquired Immune Deficiency Syndrome	1	0.5	3.806
Journal of the American Veterinary Medical Association	1	0.5	1.501
Journal of Clinical Microbiology	1	0.5	3.631
Journal of Community Health	1	0.5	1.476
Journal of Immigrant Minority Health	1	0.5	1.579
The Journal of Pediatrics	1	0.5	3.890
Journal of Perinatology	1	0.5	2.087
Journal of Substance Use	1	0.5	0.893

Table 4: Journals in which EIS officer publications were published (n=218).	**Frequency**	**Percent**	**2015 Journal Impact Factor**
Journal of Travel Medicine	1	0.5	1.868
Journal of Tuberculosis Research	1	0.5	N/A
The Lancet Respiratory Medicine	1	0.5	15.328
Medical Mycology	1	0.5	2.644
NCHS Data Brief	1	0.5	N/A
Occupational and Environmental Medicine	1	0.5	3.745
PLoS Neglected Tropical Diseases	1	0.5	3.948
PLoS One	1	0.5	3.057
The Pediatric Infectious Disease Journal	1	0.5	2.587
Prehospital and Disaster Medicine	1	0.5	N/A
Prehospital Emergency Care	1	0.5	2.104
Preventive Medicine	1	0.5	2.893
Public Health Nutrition	1	0.5	2.433
Public Health Report	1	0.5	1.737
Risk Analysis	1	0.5	2.225
Sexually Transmitted Infections	1	0.5	3.015
Sexually Transmitted Diseases	1	0.5	2.968
The Lancet Infectious Diseases	1	0.5	21.372
Ticks and Tick-borne Diseases	1	0.5	2.690
Wilderness and Environmental Medicine	1	0.5	1.163
Zoonoses and Public Health	1	0.5	2.574

Table 5: Geographic scope and location of studies described in EIS officer publications (n=218).

	Domestic	International	Both	**Total**
National	78 (35.8%)	23 (10.6%)	0	101 (46.3%)
Multistate	29 (13.3%)	4 (1.8%)	0	33 (15.1%)
State	26 (11.9%)	3 (1.4%)	0	29 (13.3%)
County	14 (6.4%)	11 (5.0%)	0	25 (11.5%)
Multinational	0	12 (5.5%)	5 (2.3%)	17 (7.8%)
City	8 (3.7%)	5 (2.3%)	0	13 (6.0%)
Total	155 (71.1%)	58 (26.6%)	5 (2.3%)	218 (100%)

Table 6: Types of recommendations made in EIS officer publications (n=218). An individual publication could have multiple types of recommendations.

Recommendations	n (%)
Surveillance[1]	95 (43.6%)
Education of the Public[2]	95 (43.6%)
Education of HealthCare Workers[3]	87 (39.9 %)
Public Health Standard Practices[4]	86 (39.5%)
Hospital Standard Practices[5]	69 (31.7%)
Further Research[6]	44 (20.2%)
Vaccination Usage[7]	36 (16.5%)
Policy[8]	26 (11.9%)
Medication Usage[9]	22 (10.1%)
Personal Protective Equipment Usage by Workers[10]	22 (10.1%)
Personal Protective Equipment Usage by the Public[11]	22 (10.1%)
Health Organization Program Unit[12]	14 (6.4%)
Environmental Hazard Mitigation[13]	12 (5.5%)
Personal Product Usage[14]	9 (4.1%)
Food Safety[15]	9 (4.1%)
Drug Safety[16]	7 (3.2%)
Mental Health Services[17]	6 (2.8%)
Use of Reproductive Health Products[18]	4 (1.8%)
Water Safety[19]	4 (1.8%)
Other Product Safety[20]	4 (1.8%)
Other[21]	30 (13.8%)

[1] Regarding the methods used to monitor specific health outcomes or health-related behaviors and conditions
[2] Information-based interventions to address existing misconceptions and to introduce new information to the public
[3] Information-based interventions to address existing misconceptions and to introduce new information specific to those in the healthcare industry
[4] Establishing, improving, or continuing standard operational procedures in response to injuries, epidemic outbreaks, and disasters other than surveillance
[5] Recommendations to establish, improve, for specific hospital practices
[6] Identifying a need for more research or gap in literature
[7] Recommendations to reduce, increase, or begin using vaccination and immunizations
[8] Recommending a new policy or a policy change
[9] Recommendations to reduce, increase, or begin using pharmaceutical drugs
[10] Regarding physical garments and equipment that are used to protect the wearer's body from injury or infection, recommendations specific to an occupation
[11]The general public's use of physical garments and equipment that are used to protect the wearer's body from injury or infection
[12] Establishing, enhancing, or continuing a program, unit, or organization to meet a public health need
[13] Interventions that target chemical and physical hazards and natural, technologic, or terrorist disasters that pose a public health threat.
[14] Recommendations to reduce, increase, or begin personal products such as sunscreen, insect repellant.
[15] Interventions that target the end product itself and/or manufacturing and supply systems involved in its production or delivery of food production, supply, and food itself
[16] Interventions that target the end product itself and/or manufacturing and supply systems involved in its production or delivery of pharmaceutical and recreational drugs
[17] Recommendations to provide for mental health needs
[18] Recommendations to reduce, increase, or begin using contraceptives/abortion, menstruation, STI-protection
[19]Interventions that target the end product itself and/or manufacturing and supply systems involved in its production or delivery of water and water supply systems
[20] Interventions that target the end product itself and/or manufacturing and supply systems involved in its production or delivery of other items such as children's toys, toiletries, pets
[21] Recommendations that do not fall under one of the above categories