WEB-BASED SURVEILLANCE OF ILLNESS IN CHILDCARE CENTERS

Natalie Schellpfeffer, Abaigeal Collins, David C. Brousseau, Emily T. Martin, and Andrew Hashikawa

School absenteeism is an inefficient and unspecific metric for measuring community illness and does not provide surveillance during summertime. Web-based biosurveillance of childcare centers may represent a novel way to efficiently monitor illness outbreaks year-round. A web-based biosurveillance program (*sickchildcare.org*) was created and implemented in 4 childcare centers in a single Michigan county. Childcare providers were trained to report sick children who required exclusion or had parent-reported absences due to illness. Deidentified data on age range, number of illnesses, and illness categories were collected. Weekly electronic reports were sent to the county public health department. Data for reports were gathered beginning in December 2013 and were summarized using descriptive statistics. A total of 385 individual episodes of illness occurred during the study period. Children with reported illness were infants (16%, $n=61$), toddlers (38%, $n=148$), and preschoolers (46%, $n=176$). Illness categories included: fever (30%, $n=116$), gastroenteritis (30%, $n=115$), influenzalike illness (8%, $n=32$), cold without fever (13%, $n=51$), rash (7%, $n=26$), conjunctivitis (1%, $n=3$), ear infection (1%, $n=5$), and other (10%, $n=37$). The majority of reports were center exclusions (55%, $n=214$); others were absences (45%, $n=171$). The detection of a gastroenteritis outbreak by web-based surveillance during winter 2013-14 preceded county health reports by 3 weeks; an additional outbreak of hand-foot-mouth disease was detected during June 2014 when standard school-based surveillance was not available. Web-based biosurveillance of illness in childcare centers represents a novel and feasible method to detect disease trends earlier and year-round compared to standard school-based disease surveillance.

Keywords: Surveillance, Public health preparedness/response, Infectious diseases, Influenza, Childcare

BIOSURVEILLANCE IS CRITICAL for early detection and resource mobilization of disease outbreaks and is especially important given the potential risk of bioterrorism and epidemic outbreaks such as H1N1 influenza,¹⁻⁸ severe acute respiratory syndrome (SARS), and, recently, Middle East respiratory syndrome (MERS) and Ebola. Early de-

tection is one of the most important requirements for biosurveillance systems.⁹ Clinic-based and community-based biosurveillance methods have previously included over-the-counter healthcare-related product sales, work absenteeism, and grade school absenteeism; however, each of these has lacked specificity.⁹⁻¹¹ Similarly, high school-

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based disease surveillance programs have been able to track illnesses such as influenza but were limited because absenteeism in older students did not necessarily indicate illness and because details surrounding the illness were not available.^{2,4,9,11-19} Surveillance also could not occur during school breaks.^{2,4,9,11-19}

Compared to primary and secondary schools, childcare center settings are ideal locations for biosurveillance for several key reasons. More than two-thirds of all children under 5 years of age in the United States are cared for in nonparental childcare settings, and these children typically require year-round care while their parents work. Childcare centers do not have extended summer breaks or holiday breaks like schools do. Younger children in childcare centers are typically sick more often than either children who stay at home exclusively or older school-based cohorts of children.²⁰⁻²⁵ Childcare attendees have been shown to have frequent illnesses. Younger children have relatively naive immune systems and developmental limitations that foster spread of viral illnesses.²⁰⁻²⁵ Additionally, this age group (0-5 years of age) has been found to have prolonged viral shedding after acute illness, which promotes spread to the community and close family contacts such as parents, grandparents, and other young children.² Absenteeism in childcare settings is a more specific measure for illness compared to high school settings, where students may miss school for other non-illness-related reasons.^{26,27} Local licensed childcare providers are required to document illness symptoms if a child is excluded or absent from child care, providing an existing infrastructure for conducting syndromic surveillance in these settings.

The website for the National Database of Childcare Licensing Regulations, funded by the US Department of Health and Human Services, shows that states' guidelines do not routinely mandate childcare centers to report on absence-related illnesses unless the disease is among a select group of reportable illnesses (eg, pertussis, measles, varicella).²⁸ In the United States, web-based biosurveillance has not been used routinely in childcare centers.

In Michigan, a statewide online biosurveillance system exists for hospitals, emergency departments, primary care clinics, and schools to report illnesses, but childcare centers are not part of this surveillance system. At the county level, most health departments in Michigan do not routinely collect illness data from childcare centers, unless the illness is a reportable one (eg, shigella, pertussis, varicella). Our county (Washtenaw) is an exception, and it has been collecting illness data from childcare centers for over a decade. However, the illness reporting system currently used in our county is not only paper-based and inefficient, but it collects voluntary reports on only 2 categories of illnesses: influenzalike illness and gastroenteritis illness.

Of the approximately 191 childcare centers in our county, about 30 report on a regular basis (defined as rate of weekly reports submitted >50% over the time period assessed). These average compliance rates were assessed at

regular intervals by the public health department (email correspondence from author to Washtenaw County Public Health, March 2017). These centers voluntarily report only on influenzalike or gastroenteritis illnesses among children, using a 1-page paper form that is emailed or faxed weekly to the county public health department. At the public health department, results from the paper forms are then manually entered each week into an electronic database that is later analyzed with subsequent reports sent to the state, resulting in a standard 7- to 14-day delay in reporting.

According to our local public health department, illness reporting by childcare centers was sporadic. The normal time frame that public health used to accept reports was up to 2 to 3 weeks past the end of each reporting week, but they did allow reports that were up to 1 month late. Some reports that were received beyond the acceptable time frame were not registered with the county public health department, but information on the exact number of these late reports is not collected. Based on public health data, the average weekly reporting rate among the 4 childcare centers, prior to enrolling in *sickchildcare.org*, was 28% over 52 weeks (email from author to Washtenaw County Public Health, March 2017). To our knowledge, this report is the first US evaluation of a simple web-based platform that allows childcare providers to report absence, illness, and symptoms as biosurveillance data.

OBJECTIVE

Our goal was to implement a novel, web-based illness reporting surveillance system in childcare centers to track illness trends and illness-related absences in a vulnerable population. The goal of this system was to increase efficiency of disease reporting by an electronic data capture website to allow faster data collection, analysis, and reporting as compared to the current paper-based method used by the local public health department. A second goal was to collect information on additional types of illness (eg, fever, upper respiratory infections, rashes, lice) as well as more specific details about illness symptoms and management. This article describes our biosurveillance system (*sickchildcare.org*), the first year's results, and the advantages this surveillance method has over the system currently used by the county public health department.

METHODS

Study Design, Setting, and Population

Four different childcare centers for infants and preschool-aged children were recruited for this study. Two of the childcare centers were part of a local privately owned and operated childcare system of 7 centers in southeastern

Michigan. The other 2 childcare centers were enrolled from a university childcare system that specifically serves university employees located in Ann Arbor, Michigan. All 4 centers cared for children year-round, were state licensed, and were accredited by the National Association for the Education of Young Children (NAEYC). None of the participating centers cared for acutely ill children or special-needs children exclusively. All centers were located in a single county (Washtenaw) in southeast Michigan and had already been using a single-page paper form to voluntarily report to the county health department for over a decade (see Appendix 1, Supplementary Material, <http://online.liebertpub.com/doi/suppl/10.1089/hs.2016.0124>). The racial demographics for Washtenaw County (encompassing the study county) based on 2012 US census data were as follows: white (71.7%), black (12.9%), and Hispanic/Latino (4.3%).²⁹ The percentages were similar to Michigan's overall demographics of: white (76.2%), black (14.3%), and Hispanic/Latino (4.6%).²⁹

Website Design

Between June 2013 and September 2013, a web-based, password-protected biosurveillance program (*sickchildcare.org*) designed specifically for preschool/childcare centers was created in collaboration with University Information Technology Services. A secure space on university servers was obtained, and an independent university graduate web developer assisted in designing the web-based surveillance program. The website application and database were housed on separate servers at \$75 per month per server for additional security. No parent, childcare provider, or child-identifying data were collected as part of surveillance program. *Sickchildcare.org* could be accessed via computer or mobile devices. There was no cost for childcare centers or preschools to use this surveillance program. Website development took 20 developer hours at \$85 per hour for a total cost of \$1,700 to create a functioning *sickchildcare.org*.

The single-paged paper form used by public health collected 6 pieces of data: (1) weekly date; (2) current enrollment; (3) total absences for varicella, influenzalike illness, and gastrointestinal illness; (4) school closings; (5) an optional area to report total number of absences by weekday; and (6) childcare center reporter contact information. In contrast, *sickchildcare.org* collected more detailed, de-identified, confidential primary data: (1) daily center census (full- or part-time), (2) child age range, (3) primary illness category, (4) specific illness symptoms, and (5) option to report on actions taken. The center director reported daily center census with every entry. Age of the ill child was recorded as: infant (0-12 months), toddler (13-35 months), or preschooler (36-59 months). Primary illness options included: (1) fever, (2) cold/upper respiratory infection without fever, (3) influenzalike illness (fever or pneumonia with sore throat or cough or generalized muscle

aches (in arms, legs, back), (4) vomiting and/or diarrhea (gastroenteritis or "stomach flu"), (5) pink eye (conjunctivitis), (6) ear infection, and (7) rash/skin/hair (abscess, bite, lice) -related issues. Definitions of influenza and gastroenteritis were exactly the same as those required by the county public health department on the paper-based reporting forms. Symptoms or reason for exclusion included the American Academy of Pediatrics (AAP) childcare illness exclusion criteria, which state that a child unable to participate in normal activities or requiring excessive attention and staff resources due to illness should be excluded from child care.³⁰

Free-text options were also included in the design to allow the childcare provider to add any additional comments. Childcare providers also began routinely entering all phone calls from parents who reported child absences due to illness. The field "action taken" allowed the childcare provider to specify whether (1) the child was excluded immediately, in which case the childcare provider identified who picked up the child; (2) the child was taken to a physician; (3) the child was taken to urgent care; (4) emergency services were contacted; (5) the public health department was contacted; (6) the child was allowed to remain at the center for the rest of the day; (7) the child was placed in isolation and observed; or (8) parent action unknown. Childcare providers were able to choose more than 1 option from these action categories.

The website also included language approved by the local health department asking childcare providers to call the local or state health department immediately if specific reportable illnesses were suspected or confirmed. Such illnesses included measles, mumps, rubella, meningitis, hepatitis A or B, tuberculosis, or any other unusual occurrence or outbreak of any disease or infection.

Institutional IRB approval was obtained from the medical school IRB.

Training of Childcare Providers

All 4 participating childcare centers were already using the paper-based forms to send weekly illness reports to the local county public health department. Childcare provider representatives who were responsible for entering attendance and illness data were selected by each center's director to undergo training to use *sickchildcare.org*. Providers were trained to report on any ill children who required immediate exclusion, those who needed isolation and observation in the center, or sick children who were reported absent by parents by phone. Providers worked independently to enter information into the website. Each report was expected to take the provider 30 seconds or less to complete. While data entry by childcare providers was voluntary, we requested that all absences due to illness be reported daily or the following morning so that data could be collated and sent to the local county health department weekly. Each training

session for childcare providers at a single training session specific to each center took approximately 15 minutes and occurred for all 4 sites over a 2-month period.

Data Abstraction and Reporting

Illness reports from *sickchildcare.org* were directly exported via Microsoft Excel (2011) to calculate illness trends and to determine the number of absences due to each illness category. Two of the centers' (1 from each parent affiliate center) paper reports were compared directly to the reports from *sickchildcare.org* after 1 week and were found to be identical ($n = 17$ illnesses), after which all 4 centers switched to online reporting only. Only 2 of the centers were compared, as the additional 2 centers preferred not to participate, given adequate representation of affiliate center in the 2 chosen for comparison. Study authors sent weekly summary reports directly to the county public health department contact. More frequent reports were sent if the research team noticed atypical spikes in illness cases. The local health department did not include our data in their overall county health reports during the study period. Finally, reporting data rates from each of the 4 childcare centers (pre-*sickchildcare.org*) were obtained compared to reporting rates from *sickchildcare.org* (in weeks). Data were summarized using descriptive statistics.

RESULTS

From December 2013 through September 2014, centers reported a total of 385 individual episodes of illness (Figure 1). Age ranges of ill children were: infants (15.8%, $n = 61$), toddlers (38.4%, $n = 148$), and preschoolers (45.7%,

$n = 176$). Further, the distribution of disease burden by childcare center is shown in Table 1, with the highest total burden of illness seen at center 2 with 162 reported illness episodes (42.1% of total illness episodes reported). In addition, center 2 had a higher proportion of infants with both gastrointestinal illness (73%) and fever (81%) compared to the other centers.

About 56% of illnesses were in children who presented to the childcare center, while 44% ($n = 171$) were illnesses phoned in by parents. Childcare providers reported that same-day medical evaluation was provided in 2.9% of cases ($n = 11$), while none required emergency medical services such as an ambulance. About 31% ($n = 120$) of sick children were picked up by parents prior to typical pickup time; of those, 40.8% ($n = 49$) were noted by childcare providers as "unable to participate" and 18.3% ($n = 22$) were marked as "extra care required." Only 1 child required a trip to the emergency department.

Weekly reporting rates prior to enrollment in *sickchildcare.org* were calculated based on data from the local public health department the prior year and compared to reporting rates (weekly) from *sickchildcare.org* for each childcare center (pre-intervention, post-intervention): center 1 (pre 12%; post 100%); center 2 (pre 31%; post 100%); center 3 (pre 37%; post 100%); center 4 (pre 33%; post 100%).

An outbreak of gastrointestinal illness was detected among centers during the winter 2013-14 season approximately 3 weeks ahead of the outbreak reported by the county public health department (Figure 2). During February, March, and April 2014, there were 72 individual episodes of gastrointestinal illness (62% of all cases for the year) that occurred among all 4 centers (center 1, $n = 11$; center 2, $n = 26$; center 3, $n = 25$; center 4, $n = 10$). Specifically, attack rates for gastrointestinal illness during the 3

Figure 1. Illnesses Causing Exclusion or Absences from Childcare Centers (12/9/13-9/30/14)

Table 1. Distribution of Childcare Illnesses Causing Exclusion or Absences Among 4 Studied Childcare Centers

FACILITY						
		CENTER #1	CENTER #2	CENTER #3	CENTER #4	TOTAL
NUMBER OF CHILDREN ENROLLED FULL/PART TIME AT EACH CENTER (% Across all centers)		140 (23%)	160 (26%)	140 (23%)	167 (28%)	607
CONDITIONS (% of Total Number of Illnesses)	Age Range	N= (%)	N= (%)	N= (%)	N= (%)	N=
FEVER (30%)	INFANT	1	22	0	4	27
	TODDLER	6	41	5	6	58
	PRESCHOOL	2	10	9	10	31
	TOTAL	9 (8%)	73 (63%)	14 (12%)	20 (17%)	116
GASTROINTESTINAL ILLNESS (30%)	INFANT	1	11	3	0	15
	TODDLER	5	11	14	5	35
	PRESCHOOL	7	25	23	10	65
	TOTAL	13 (11%)	47 (41%)	40 (35%)	15 (13%)	115
COLD SYMPTOMS (13%)	INFANT	0	2	1	1	4
	TODDLER	5	1	1	8	15
	PRESCHOOL	1	7	1	23	32
	TOTAL	6 (12%)	10 (20%)	3 (6%)	32 (63%)	51
INFLUENZA-LIKE ILLNESS (8%)	INFANT	0	1	1	1	3
	TODDLER	9	3	0	0	12
	PRESCHOOL	10	4	1	2	17
	TOTAL	19 (59%)	8 (25%)	2 (6%)	3 (9%)	32
RASH (7%)	INFANT	0	6	0	0	6
	TODDLER	6	11	0	0	17
	PRESCHOOL	0	3	0	0	3
	TOTAL	6 (23%)	20 (77%)	0 (0%)	0 (0%)	26
EAR INFECTION (1%)	INFANT	0	2	0	0	2
	TODDLER	2	0	0	0	2
	PRESCHOOL	0	1	0	0	1
	TOTAL	2 (40%)	3 (60%)	0 (0%)	0 (0%)	5
PINK-EYE (1%)	INFANT	0	0	0	0	0
	TODDLER	2	0	0	0	2
	PRESCHOOL	0	1	0	0	1
	TOTAL	2 (67%)	1 (33%)	0 (0%)	0 (0%)	3
OTHER (10%)	INFANT	0	0	0	4	4
	TODDLER	0	0	0	7	7
	PRESCHOOL	0	0	2	24	26
	TOTAL	0 (0%)	0 (0%)	2 (5%)	35 (95%)	37
FACILITY		Center #1	Center #2	Center #3	Center #4	Total
TOTAL NUMBER OF REPORTED ILLNESS EPISODES AT EACH CENTER (% ACROSS ALL CENTERS)		57 (14.8%)	162 (42.1%)	61 (15.8%)	105 (27.3%)	385

Figure 2. Gastrointestinal Illness Rates Comparing *sickchildcare.org* vs. Availability of County Public Health Reports Collected by Paper-based Method.

months were calculated as follows: center 1 (7.8%), center 2 (16.2%), center 3 (17.8%), and center 4 (5.9%).

Our system also detected a large outbreak of hand-foot-mouth-like disease during June 2014 when standard grade school-based surveillance was not available (Figure 3). During winter 2013-14, the incidence of influenzalike illness cases in the pediatric population was low compared to

previous seasons. Influenzalike illness cases reported through *sickchildcare.org* showed similar trends in comparison to county public health-based reporting for schools and preschools (Figure 4). No other outbreaks of disease that were undetected by the *sickchildcare.com* system were noted by the public health department during this period of monitoring.

Figure 3. Reports via *sickchildcare.org* Describing Hand-Foot-Mouth-like Illness

Figure 4. Influenzalike Illness Rates in Children in a Single County: *Sickchildcare.org* vs. County Public Health Paper Reports (Preschool and Grade Schools).

DISCUSSION

Countries outside the United States have recently been conducting routine biosurveillance in childcare centers, with the Netherlands reporting the first national childcare center–based biosurveillance network.^{31–33} Through their system, the team in the Netherlands is able to monitor disease patterns, both through clinical manifestations as well as microbiological surveillance, across the entire country.³¹ The potential this system affords for disease burden reduction and identification of outbreak trends is commendable. However, the Netherlands' national childcare system differs substantially from that of the United States; the Netherlands' childcare system is part of the national education system, while childcare centers in the United States are regulated at the individual state level, with the majority of centers not formally associated with the education system.³¹

In the United States, childcare providers are an underused resource for biosurveillance and health education purposes. In the early 1980s, attempts to perform both active and passive biosurveillance in childcare centers in Seattle, WA, failed because of the substantial delays in reporting and the labor-intensive work required to enter, collect, and collate data using paper-based forms from each center.³⁴ Subsequent development of computer technology and online access has decreased reporting times and the labor required to collect surveillance data. Many states have developed online surveillance systems using data from hospital systems and clinics.⁹

Our study, to our knowledge, is the first study in the United States to demonstrate that childcare settings represent a reliable setting from which to gather data for web-based biosurveillance purposes. Our biosurveillance model was successful in documenting disease rapidly among 4 childcare centers in a timely and confidential manner using

de-identified data. The main strength of our web-based surveillance system was efficiently and rapidly collecting infectious disease data electronically in a previously untested pediatric age group. Collection of data through *sickchildcare.org* was not only feasible, but it was a faster process compared to the prior standard of using paper-based reports that were then hand-entered into a spreadsheet by local public health officials at least 1 to 2 weeks after the original report. The county public health department received data in a timely manner in electronic form and was able to explore outbreaks when reported (email from author to Washtenaw County Public Health, December 2014 and March 2015). In addition to the benefit of faster reporting times, no additional labor was required by the public health department to transfer data from the paper form to an electronic database. And the public health department now had data on an increased number of illness categories, including fever, URIs, rashes, lice, and skin infections, which had not previously been collected.

Sickchildcare.org was widely accessible because it is online and compatible with mobile phone devices. Prior to our study, there was substantial variability for collecting information for absences that were phoned in by parents, but as a result of our program, childcare providers began routinely asking parents about illness type, condition, and symptoms. In assessing actions taken after events, our program provided potentially new data to determine if parents were using medical resources for sick children in child care.

Childcare providers of all ages with and without substantial technologic savvy were trained in short, small-group sessions without reported difficulty. The straightforwardness of use of our system, coupled with organized professional training sessions, was necessary to achieve provider buy-in for our program. This was especially true considering the continuity and proposed longevity of the project. All childcare centers were given the option of

returning to the previous, paper-based system after study completion, but all childcare centers chose to remain with the web-based biosurveillance system because of its ease of use. Beginning in September 2014, the local health department began including our data in their official reports.

Aside from systems-based improvement in acquisition of epidemiology data on pediatric disease in Washtenaw County, during our first year, we were able to demonstrate earlier detection of outbreak spikes for gastroenteritis and hand-foot-mouth disease. Data were collected from childcare centers that were all operating from within a single county, and our data were compared only to illness data available from local hospitals, emergency departments, and schools from within the same county, making the illness spikes observed from each data set highly likely to be related. The disparity of the illness burden of center 2 compared to the other centers was explained by a more severe outbreak of gastroenteritis, with a higher number of individual cases reported. In addition, our surveillance system was the only system to report the outbreak of hand-foot-mouth disease, because other childcare centers using the old system did not report on rashes, fevers, or oral sores. Further, no disease outbreaks were missed by our system when compared to the data available to the public health department.

The ability of our system to detect disease earlier than prior methods in our county for the seasons of hand-foot-mouth disease and viral gastroenteritis demonstrates that *sickchildcare.org* has the potential to improve disease surveillance in childcare centers and, potentially, preschool settings. No specific action was taken because of these outbreaks aside from notification to the centers that more intensive cleaning precautions would be prudent; however, the acknowledgment of these detected outbreaks has increased awareness for future monitoring.

Unlike gastroenteritis or hand-foot-mouth disease, we did not see any significant trends related to influenzalike illness during the 2013-14 season, likely because of low influenza activity in the pediatric population in our region. One explanation may be that during the recorded season the majority of cases in our region were the H1N1 strain, which was included in the seasonal influenza vaccine for the 3 years prior to our study.³⁵ Our county trend appeared to mirror national trends with the predominance of H1N1 strain in 2013-14 and studies showing substantial significant vaccine effectiveness during that same time period.^{35,36}

Additionally, the cost for development of the website only was approximately \$1,700. Maintenance expenses are approximately \$75 per month to house the website on the university's secure server. An estimate of yearly cost-savings at the public health level with elimination of the need for data to be manually entered into a spreadsheet was calculated to be about \$780, given savings of about 0.5 hour per week at a compensated rate of \$30 per hour. It should be noted that this cost saving is limited to the single county

within which this study was performed. More widespread adoption of an electronic reporting system such as ours could have increasingly meaningful effects for cost saving across other county health departments. Our calculations do not include potential costs associated with the 15-minute training sessions that would be required for each center.

Our study has several potential limitations. First, the centers chosen to participate were large, licensed, NAEYC-accredited childcare centers with highly trained staff. Our findings may not be applicable to unlicensed centers, smaller childcare settings, centers with a lower proportion of trained staff, childcare centers outside of our county, or centers that do not routinely report to a public health department. However, among the 191 childcare centers in our county, another 20 centers currently report on a regular basis using the paper-based form. We anticipate enrolling the rest of the 20 centers as sentinel childcare centers in a manner similar to sentinel primary care offices that report during influenza season. Second, the data lacked specific child demographic data; however, this allowed for surveillance without storage of sensitive data or protected health information. In today's climate of concern for patient privacy and digital security, the anonymity of data obtained with our system addressed a significant apprehension for most childcare directors and owners who participated.

Additionally, childcare reporting of child disposition "reasons for exclusion" and "action taken" were optional, with 32% ($n=124$) of reports not having a "reason for exclusion" and another 25% ($n=97$) not having "action taken." We also did not have a formal way to determine if any illness cases were not reported. However, state childcare policy is to internally document any child who is absent due to illness or is sent home due to illness. Given that centers were using our system for recording these absences, we feel that the majority of illness cases were reported by childcare centers. We also began collecting data on other illnesses (URIs, rashes, lice), so the actual number of cases using *sickchildcare.org* increased compared to illness reports using the paper-based system. Finally, data provided regarding illness symptoms were not confirmed with laboratory testing of children. This could lead to possible incorrect categorization of illness with potential over- or underestimation of disease burden and reduction in overall sensitivity. However, our biosurveillance goals were to look for overall trends, not diagnoses.

Given the success of the web-based surveillance, we have already expanded the number of childcare centers to 11, including preschool settings, to increase the catchment area of our system. In doing so, the goal is to allow for better estimates of local illness trends in this population of children and to determine if our system can detect influenzalike illness and gastroenteritis trends earlier compared to current methods used by local and state surveillance systems. After increasing centers within our county, the next goal would be to consider

presentation of our system at the state level, with possible participation solicited from other county health departments.

We have found this web-based surveillance system sustainable, as none of the centers have gone back to the previous paper form when given the chance, and none of the centers have dropped out of our network. As we observe illness trends, our next steps will include updates for childcare centers and just-in-time online podcasts for childcare providers regarding AAP guidelines for safe inclusion, as well as necessary exclusion of ill children from childcare centers and preschools using the same website (sickchildcare.org). We have already begun testing a childcare provider user platform, where they will be able to access pooled regional data to discover what specific illness trends are affecting their county.

The 2-way avenue to communicate regarding illness outbreaks would be a significant step forward, as previously childcare centers may not have perceived any immediate benefit to reporting on a daily basis. Access to real-time information would allow centers to be better prepared to increase staff during anticipated times of illness, promote more thorough cleaning protocols, and disseminate timely family and worker influenza immunization reminders or in-center influenza immunization clinics. This could ultimately aid in dissemination of accurate medical information on disease outbreaks in real time.

Future goals of our biosurveillance reporting system would be to provide active surveillance using laboratory-confirmed testing of ill children for different pathogens in the community, data that would potentially allow for study of disease trends and efficacy of environmental cleaning measures.

Finally, we will be working toward giving childcare providers access to data and illness trends on the website. Providers could then mobilize resources for intensive cleaning, encourage renewed diligence and training for hand washing, and enhance efforts to immunize staff and children in a timely fashion.

CONCLUSIONS

Web-based biosurveillance in childcare centers represents a novel method for tracking illness year round. The strength of using web-based surveillance in early learning settings is quickly and efficiently reporting evolving patterns of infectious disease among a vulnerable population in an attempt to detect some disease trends earlier in comparison to school-based surveillance.

ACKNOWLEDGMENTS

We thank Heidi McFadden and Jennie McAlpine, directors of the childcare centers, for substantial assistance with this study.

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*Manuscript received December 23, 2016;
revision returned May 1, 2017;
accepted for publication May 2, 2017.*

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