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Evaluation of the pilot program, Pediatric Early Warning Sentinel Surveillance Program (PEWSS), and its efficacy in monitoring pediatric illness in Clark County, Nevada

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EVALUATION OF THE PILOT PROGRAM, PEDIATRIC EARLY WARNING SENTINEL SURVEILLANCE PROGRAM (PEWSS), AND ITS EFFICACY IN MONITORING PEDIATRIC ILLNESS IN CLARK COUNTY, NEVADA.

By

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ABSTRACT

Evaluation of the Pilot Program, Pediatric Early Warning Sentinel Surveillance Program (PEWSS), and its Efficacy in Monitoring Pediatric Illness in Clark County, Nevada.

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The influenza outbreak that occurred during 2009 stimulated the formation of several surveillance programs throughout the country. The majority monitor only influenza; however, there are several other circulating respiratory pathogens, especially within the pediatric community. These other respiratory pathogens cause a variety of illnesses, such as bronchitis, pneumonia, croup, etc. Prior research has provided the medical community with valuable information about respiratory illnesses, especially those which afflict pediatric patients. Areas of knowledge including seasonality, demographics, signs and symptoms, prevention measures, and pathogenicity, have been greatly expanded over the years. This information has been of tremendous help to the medical community in identifying respiratory illness. Coupled with surveillance, this can

further help to expand the knowledge of illnesses that are circulating, especially for local public health communities.

In May 2009, the Southern Nevada Health District (SNHD) and the Southern Nevada Public Health Laboratory (SNPHL) collaborated to create a new pilot surveillance program, the Enhanced Pediatric Influenza Surveillance project (EPIS). It began like most others and monitored only influenza. Evolution of the program took place and ultimately developed into a more enhanced monitoring program, the Pediatric Early Warning Sentinel Surveillance program (PEWSS). This became a one of a kind program that went above and beyond traditional surveillance, to include more than just the reportable respiratory pathogens. The objective of the PEWSS program is to relay the knowledge of circulating viruses to the community to increase public health awareness and prevention, along with developing seasonal baselines for each virus.

Once a public health program is in place, an evaluation should be conducted to determine the efficacy and usefulness of the system. Evaluations can help streamline the goals and objectives, along with improving the manner in which the program operates. In July 2001, the CDC published guidelines that are used as the basis to evaluate any public health surveillance system. These CDC guidelines were the foundation for the evaluation of the PEWSS program.

The goal of this project was to evaluate the efficiency and effectiveness of the PEWSS program by determining the strengths and weaknesses of the program. In addition, an analysis of the data already collected by the EPIS and PEWSS programs was performed. The PEWSS data were compared to similar local and national data sources.

Comparison of data between the PEWSS program and the outside sources showed similar seasons among the different respiratory pathogens, which substantiated the effectiveness of the program. The conclusion of the evaluation and data analysis showed that the PEWSS program is an efficient and effective system that can monitor respiratory illness, and trends, and also provide pertinent circulating respiratory pathogen information to the community.

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CHAPTER 1 - INTRODUCTION

Respiratory illness is listed as the second leading cause of death worldwide in children less than 5 years old.[32] Respiratory viruses are of high importance due to the direct and/or indirect transmission throughout the community. Younger children have a less developed immune system than adults, which makes them a more susceptible population to respiratory viruses. These pathogens are easily spread by person-to-person contact, droplets in the air, and inanimate objects, causing a variety of illnesses.[6] For instance, respiratory syncytial virus (RSV) is the main cause of bronchiolitis and pneumonia in children less than 1 year of age.[6] In cases of acute bronchitis, RSV was 2 times more likely to be the culprit rather than influenza.[12] Overall, it is believed that RSV causes more illnesses in pediatrics than influenza.[12] RSV hospitalizes around 75,000 to 125,000 children each year.[6] Human parainfluenza virus (HPIV) causes tracheobronchitis and pharyngitis in children 1 to 4 years old, and can cause pneumonia, bronchitis, or croup.[6] HPIV is responsible for a wide range, 1,800 to 52,000, of annual hospitalizations in the United States.[32] Adenovirus can cause illnesses that mimic the common cold and pneumonia, but also cause croup and bronchitis.[6] Human metapnuemovirus (HMPV), discovered in 2001, is nearly identical to RSV and can cause a range of illnesses such as laryngitis, bronchitis, pneumonia or asthma.[6,32]

In 2008, according to the National Ambulatory Medical Care Survey, diseases of the respiratory system were responsible for 10% of the overall primary diagnoses, which fell second to preventative and follow-up care visits at 20.9%.[26] Outpatient primary diagnosis visits had similar findings of 10.9% for diseases of the respiratory system and 18.8% for preventive and follow-up care.[26] In 2008, the highest visited physician specialty was for

pediatrics, which generated 175.1 visits per 100 persons per year, with general and family practice at 75.1 visits per 100 persons per year.[26] During 2009, three quarters of the children in the United States of America had seen a physician at least once within 6 months, according to the Summary Health Statistics for U.S. Children.[2] Three quarters of the children utilized a doctor's office for their usual place of health care and another 24% used clinics as their usual place of care.[2] More children have a usual place of health care, at 95.2%, compared to adults, aged 18 and older, at 83.2%.[2,24] In 2008, 91.5% of children, under 18 years of age, had a visit with a doctor, compared to 82.5% of adults.[2,24] Realizing that children are more likely to visit their physician earlier than an adult, this can be monitored, providing earlier indicators of circulating disease.

The influenza outbreak of 2009 created controversy reaching every part of the globe. Influenza was the known source, however, the strain that caused the epidemic was a mystery. As estimated by the Centers for Disease Control and Prevention (CDC), for the general population, there were over 12,000 deaths, 274,000 hospitalizations and over 60 million cases.[5] For the pediatric group, there were over 1,000 deaths, 86,000 hospitalizations and 19 million cases.[5] This wide spread pathogen demonstrated the need to expand techniques in existing surveillance systems and generate new programs.

To understand which strains are circulating within a community, surveillance needs to be conducted and has become rapidly popular since the 2009 H1N1 scare. Several agencies around the country track respiratory illnesses, such as influenza, utilizing different methodologies of surveillance to capture data. These systems gather information in several ways, such as collecting information from laboratories or hospitals, phone calls, health

surveys, databases, etc. The data are gathered, disseminated, and distributed among the public. Active surveillance systems have begun throughout the country monitoring influenza, including the CDC, which has a dedicated site for influenza.[7] However, influenza is not the only respiratory illness that circulates within a community, particularly the pediatric community. The other website developed by the CDC is the National Respiratory and Enteric Virus Surveillance System (NREVSS), which tracks other viruses such as respiratory syncytial virus (RSV), adenovirus, and human parainfluenza virus (HPIV).[6] These viruses are of high importance in the community due to the direct and/or indirect transmission throughout the community.

Other states and counties have developed their own methods of surveillance, dissemination of the data and reporting for relaying their findings to the public. The majority of the reports examined were lacking a variety of information. A selection of reports only contained information on influenza and rarely any of the other respiratory pathogens. Most of the reports reiterated CDC findings of influenza for a specific location and also used only information and/or charts provided by the CDC website. A few of the surveillance programs monitored only during the "flu season" (i.e. influenza was only monitored during the time frame it normally occurs). A foreseeable problem with that kind of surveillance is that these respiratory viruses can occur at any point throughout the year and any abnormal spike or outbreak would be missed. Charts provided on some of the reports were not complete or they were difficult to decipher (i.e. multiple years on one chart). Pediatric data were not separated from adult data in reports. If pediatric information was separated, the data or charts were difficult to understand. Some included pediatrics to age 13 and some to only age 5. Also not seen, were the ages within the pediatric population being most afflicted by these

pathogenic viruses. Some of the reports were too lengthy; one was found to be 13 pages long. Some locations chose only to report on hospitalized or emergency room data for the population. This provides a biased idea of the activity, because those are the extremely sick of the population. There are several surveillance programs that report rare illness or injury that occur within a population. This is very useful for research or to create policy change if needed, but it does not help with information about commonly circulating illnesses that could affect every person at some point in their life. While it is very important that surveillance be conducted to inform the public of circulating viruses, what is lacking is the specific knowledge of the different respiratory activity within a community, such as seasonal respiratory trends or incidence within a particular age group.

In Clark County, located in southern Nevada, there was no surveillance program developed for the public to understand which pediatric respiratory viruses were circulating at any time during the year. This led the Southern Nevada Health District and the Southern Nevada Public Health Laboratory to realize the need for a program that would monitor influenza H1N1 among their pediatric patients. In May of 2009, the Southern Nevada Health District (SNHD) and the Southern Nevada Public Health Laboratory (SNPHL) collaborated to develop a pilot surveillance program titled Enhanced Pediatric Influenza Surveillance (EPIS) project. The objective of the program was to monitor influenza within the pediatric community, which is a reportable disease to the SNHD. The information and experience gained from the generation of the EPIS program led to the idea to further expand the program to include other circulating respiratory illnesses in the pediatric community. The Pediatric Early Warning Sentinel Surveillance program (PEWSS) was developed in May 2010, and is the current expansion of the EPIS program. Going beyond influenza A and B, the PEWSS

program also monitors respiratory syncytial virus (RSV), human parainfluenza virus 1/2/3 (HPIV), and adenovirus along with the more recent pathogen, human metapneumovirus (HMPV). Since influenza and RSV are the only two reportable viruses, listed within the pathogens monitored by the PEWSS program, in Clark County, Nevada, the community is not aware of other circulating respiratory pathogens or the seasonality in which they occur. The objective of this program is to use sentinel surveillance to relay the knowledge of these particular viruses to the community to increase public health awareness and prevention along with developing seasonal baselines for each virus.

Sentinel surveillance is a good method for monitoring respiratory pathogens that are not mandated as reportable events,[4] making this form of surveillance ideal for the PEWSS program. Because virus identification is not necessary for initial treatment of the child, it does not delay treatment. Data collection for the PEWSS program occurs throughout the year, since these viruses occur at various times throughout the year. Sentinel surveillance is usually conducted by gathering information from different providers. The SNHD and the SNPHL have taken on the responsibility of all the testing and transportation for the multiple sites to minimize errors and keep consistency in the testing. Conducting surveillance by the way of sentinel sites does have advantages, but also has disadvantages as well. When sentinel surveillance is performed, it is important to remember that the results are not representative of the entire population and sampling bias can exist.[4] However, using sentinel surveillance gives greater design flexibility, uses fewer resources than other systems, and being more personable, can strengthen and build new relationships within the community.[4]

Once a public health program is in place, an evaluation should be conducted to determine the efficacy and usefulness of the system. Evaluations are an important part of a public health program; they can help streamline the goals and objectives, along with improving the manner in which it operates.[14] The CDC states that the purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effectively.[14] In September 1999, through the Morbidity and Mortality Weekly Report (MMWR), the CDC published their first guidelines entitled "Framework for program evaluation".[19] An updated version was provided in July 2001, titled "Updated guidelines for evaluating public health surveillance systems."[14] There have been different program evaluation guidelines published, but none as useful, in depth or easy to follow as the guidelines provided by the CDC. These guidelines provide the basis for performing an evaluation for any public health program. To evaluate the efficacy of the EPIS and PEWSS program, the CDC Updated Guidelines for Evaluating Public Health Surveillance Systems were applied.

For this study, there are three main objectives. The first objective is to perform a program evaluation on the PEWSS program, as described by the tasks listed by the CDC guidelines. This will evaluate the efficiency and effectiveness of the PEWSS program by determining the strengths and weaknesses of the program. The second objective is to analyze and disseminate the data gathered by the PEWSS and EPIS programs, for each virus, to discover the demographics and trends since the inception of the programs. The third objective is to determine, by comparison with similar outside data, if the PEWSS program is accurately capturing the different seasonal trends for the different respiratory pathogens. The goal of this study is to determine whether the PEWSS program is an effective and efficient

program that can successfully monitor pediatric respiratory viruses along with relaying this pertinent pediatric respiratory pathogen information to the community.

CHAPTER 2 - METHODS

DATA COLLECTION

PROGRAM OPERATION

The viruses under surveillance in the PEWSS program are influenza A (with subtypes H1, H1N1 and H3) and B, respiratory syncytial virus (RSV), adenovirus, human parainfluenza virus 1, 2 and 3 (HPIV) and human metapneumovirus (HMPV).

Sentinel sites were selected based on their willingness to participate in the program, the volume of patients and by the mix of financial status of their patients.[1] The practicing physicians are involved in the program on a voluntary basis and allowed to opt out at any time.[1]

The current case definition used by all pediatricians is universal for all of the respiratory pathogens monitored. The case definition is any child aged 17 years or less and that present with a fever >100°F along with a cough and/or sore throat, which is also known as influenza-like illness (ILI).

The SNPHL provides the sites with materials required for collection (described below) and also training for the collection of samples. The pediatrician's offices then collect and submit the first ten specimens each week from pediatrics fitting the case definition. Depending on the severity of the circulating pathogens, a maximum of 50 samples, 10 per

site, can be collected per week. Samples are transported three times a week by SNPHL couriers. The specimen kits are replenished once a week by the couriers to ensure that each site does not receive more than 10 kits each week. "The SNPHL performs full respiratory panels, APHL real time RT-PCR Assays for Respiratory Virus Pathogens, the CDC Human Influenza Virus Real-time RT-PCR Detection and Characterization Panel, along with the CDC Influenza 2009 A (H1N1) pdm Real-Time RT-PCR Panel."[1] There is no charge to the physicians for sample collection and testing performed for the PEWSS program. The PEWSS physicians agreed that neither the patient nor the patient's insurance would be charged for respiratory surveillance testing performed by SNPHL.

Once testing is complete, each site receives a written report for each sample analyzed. The SNPHL also prepares a summary with all panel results, which contains de-identified results, on a commonly shared spreadsheet for use by the SNHD Office of Epidemiology. The SNHD Office of Epidemiology prepares a weekly report based on the laboratory findings from the previous week. These reports give a brief description of the current circulating pathogens, along with detailed charts and graphs that give a breakdown of the pathogens. The reports are distributed weekly to local healthcare providers by e-mail or fax and can also be found on the SNHD website.

SAMPLE COLLECTION[1]

Sample collection, sample analysis, and influenza viral resistance and surveillance testing sections were previously established methods for laboratory protocols. "The choice

of sample type to utilize for the PEWSS program at the SNPHL was based on multiple factors including:

- Ease of collection
- Minimal training for staff
- Minimal trauma to patient
- Minimal equipment
- Minimal collection time
- Approved for use with test method
- Acceptable sample yield for surveillance testing
- Minimal cost"

"Acceptable sample types for use with the molecular Influenza and non-influenza respiratory virus panel performed at SNPHL included nasopharyngeal or nasal swabs. Previous studies had identified that nasal swab collection samples were comparable to nasopharyngeal swab samples when tested by molecular methods.[16] Due to the ease of collection, minimal cost, and comparability with nasopharyngeal swabs, the nasal swab was identified as the sample type of choice for use in the PEWSS program. During initial PEWSS site visits, clinic staff was instructed on proper nasal swab collection technique."

"Various studies[29,9] have indicated that the use of a nylon flocked nasal swab provides greater yield of epithelial cells for viral testing. The flocked swab lacks the internal mattress core present in traditional fiber wound swabs.[8] This lack of an internal mattress core allows the sample to stay close to the surface rather than be absorbed into the interior.[8] "The perpendicular nylon fibers act like a soft brush and allow for improved collection of cell samples."[8] Because the sample stays close to the surface it is easily released when the flocked swab is mixed with viral transport medium."[8]

"To ensure that the recommended flocked swab was used for sample collection, SNPHL provided standardized sample collection kits to each of the PEWSS sites. The kits included a flocked nasal swab, viral transport media (VTM) and a SNPHL test requisition packaged in an individual sample collection bag. The collection kits were stored at refrigerated temperature until sample collection was performed. Following sample collection, the flocked swab was placed in the VTM and mixed. The entire sample was returned to refrigerated storage until pickup by the SNPHL courier."

SAMPLE ANALYSIS[1]

"After receipt at SNPHL, each sample VTM was extracted on the Roche Compact analyzer (Roche, Indianapolis, IN) utilizing the Roche MagNA Pure Compact Total Nucleic Acid Isolation Kit 1 with external lysis."

"Each extracted nucleic acid sample was analyzed on the Applied Biosystems 7500 Fast DX (Applied Biosystems, Carlsbad, CA) platform using the following real time reverse transcriptase polymerase chain reaction (rRT-PCR) protocols:

Centers for Disease Control and Prevention (CDC) Human Influenza Virus Real-time RT-PCR Detection and Characterization Panel (Influenza A, Influenza A/H1, Influenza A/H3, Influenza B) *In-vitro* Diagnostic (IVD) use – FDA approved

CDC Influenza 2009 A (H1N1) pdm Real-Time RT-PCR Panel *In-vitro* Diagnostic (IVD) use – FDA approved

Association of Public Health Laboratories (APHL) real time RT-PCR Assays for Respiratory Virus Pathogens (Human Metapneumovirus, Adenovirus, Respiratory

Syncytial Virus, Parainfluenza 1,2,3) Laboratory Developed Test – validated by SNPHL"

INFLUENZA VIRAL RESISTANCE AND SURVEILLANCE TESTING[1]

"As a recipient of the CDC influenza surveillance testing reagent kits, CDC requested that SNPHL, routinely, submit up to 5 influenza positive samples collected through the respiratory surveillance program to an assigned virus isolation laboratory. Depending on the level of influenza activity, the samples were submitted either weekly or biweekly."

"The SNPHL propagated large quantities of influenza virus from the submitted samples which were then sent to CDC for additional antigenic characterization. The testing performed at CDC included antigenic characterization, genetic analysis (sequencing) and tests for sensitivity to FDA-approved drugs. The information from the additional testing provided CDC and the World Health Organization (WHO) with valuable data which were used to identify the influenza strains to be used in the 2011-2012 influenza vaccine. The results of this testing performed at CDC were for epidemiological purposes only. If SNPHL received results of the additional CDC testing, it was not reported back to the submitting physician. At the initial program site visit, the physicians were notified that additional testing could be performed at CDC and that they would not receive a written report of the additional testing."

"Additional testing for Influenza A H1N1 viral resistance was performed by regional contract laboratories. Up to 5 PEWSS surveillance samples that were Influenza A H1N1 positive were submitted either weekly or biweekly by SNPHL to the assigned laboratory.

The regional laboratory performed pyrosequencing to identify oseltamivir resistance in influenza A H1N1 viruses caused by H275Y mutation in the neuraminidase."

"Chapter 3 of the Regulations Governing the Reporting of Diseases, Exposures, and Sentinel Health Events[27], along with the Nevada Administrative Code (NAC) 441A[20], provide the necessary authorities for investigation of events or outbreaks of public health significance and to request cooperation from other persons or medical laboratories in the investigation and suppression of disease."

METHODS FOR TASKS IN THE CDC GUIDELINES FOR EVALUATING PUBLIC HEALTH SURVEILLANCE SYSTEMS

This evaluation used the CDC Updated Guidelines for Evaluating Public Health Surveillance Systems published in the Morbidity and Mortality Weekly Report (MMWR) in July 2001.[14] The guidelines outlined each task and the components required to fulfill each task. There are 6 total tasks listed in the guidelines as Tasks A-F. Not all of the tasks will have a method component, this is because various portions are descriptive only. Nevertheless, components of each task can be seen in the CDC's check list (Appendix A), along with the detailed sections for each task (Appendix B).

The Institutional review board (IRB) at University of Nevada, Las Vegas (UNLV) gave approval to conduct this project as exempt on February 28th, 2011 (Appendix C).

TASK A - ENGAGE THE STAKEHOLDERS IN THE EVALUATION

Task A was comprised of defining who the stakeholders are for this evaluation and gathering their input about the program. The stakeholders in this evaluation are those that receive the weekly information and/or those that provide the data, which consist of all health professionals within the medical field, scientific community, the general public, and the sentinel sites which provide the samples that provide the data used to generate the reports. The manner in which the data are being used and by whom was investigated using two methods, interviews of people who receive the data and surveys that were distributed among the various stakeholders.

It is important to understand the self-selection bias utilizing these surveys. Two surveys were administered, one for the users of the PEWSS bulletins (public surveys described below) and the other for the sentinel sites that provide the data (sentinel site survey) (Appendices D and E). The first survey (Appendix D), was sent only to those who receive the weekly bulletin via e-mail or fax and was completed only on a voluntary basis. Targeted were those that received and read the bulletin, and also had the time and willingness to complete the survey. The sentinel site survey (Appendix E), was only sent to the individual sites to be completed by different personnel. The nature of selecting specific groups of people to complete these surveys and giving them the option to respond, generated the self-selection bias.

INTERVIEWS

Interviews were held regarding the information contained in the PEWSS bulletins. Interviews included staff members in the SNHD Office of Epidemiology with other health care professionals, such as laboratory manager and public health officers.

PUBLIC SURVEY

Survey Monkey, an internet-based electronic survey tool, was used to create a survey to gather feedback of the stakeholders for those who read and use the information generated by the PEWSS program. A survey was formulated on the Survey Monkey website, with a trial survey administered within the SNHD Office of Epidemiology, for feedback and accuracy (Appendix D). The survey was then given to the stakeholders in the form of e-mail and fax when they received a weekly bulletin. A link was contained in the fax or e-mail to allow them to voluntarily participate in the survey. A time frame of two weeks was given to complete the survey.

SENTINEL SITE SURVEY

A separate survey, created by the SNPHL, was administered only to the staff at the five participating sentinel sites (Appendix E). Helping to build and strengthen the relationship between the personnel at the sites and the SNHD, one person from each office, Office of Epidemiology and the SNPHL, visited each of the five sentinel sites to administer the survey. The office personnel were given the surveys and asked to return it, by fax or courier, to the SNPHL.

TASK B – DESCRIBE THE SURVEILLANCE SYSTEM TO BE EVALUATED

Task B involved 3 separate components. Section B1 was to describe the significance of the public health event under surveillance in the program. Section B2 listed the details of the program, to include purpose, objectives, case definition and components of the program. Lastly, section B3 listed the funding sources and cost analysis, which were utilized to run the program. This cost analysis to included the cost of the system for the SNHD, Office of Epidemiology and the SNPHL. For the SNHD, the analysis consisted of the manpower used for the start-up of the program, which included the estimated time it took to develop the customized spreadsheets, estimated time it took to decipher how to organize and disseminate the data and who was going to be responsible for certain duties. The other analysis was for the average ongoing maintenance needed for the year. The cost analysis does not include the monetary value of computers, software, printers, phones, fax, etc. It is assumed that the office has already been established, implying the basic office items are already in place. These would not be considered as additional resources needed for the program. The only cost is for the personnel to conduct the analysis for the program itself.

Before implementing the laboratory portion of the EPIS program, time was reserved to develop the details to plan the EPIS program, write the project description, validate test methods, and also to create the kits and paperwork supplied to each site. Lastly, time was also devoted to selecting the sites and conduct specimen collection training at each location. The laboratory cost analysis consisted of 3 different elements. Two parts of the cost analysis are similar to the cost analysis of the Office of Epidemiology, a startup personnel cost and an ongoing maintenance personnel cost. The third part involved the cost of laboratory supplies.

To calculate the cost for startup and yearly maintenance for the laboratory, information was required from the laboratory, such as the amount of time the laboratory personnel utilized to setup the program, the amount of time per week they spend processing samples, and the amount of time for couriers to transport specimens.

TASK C – FOCUS THE EVALUATION DESIGN

Task C involved streamlining the evaluation to certify that time and resources were used as effectively as possible.[14] Topics for this task were to identify the stakeholders, previously defined in Task A, determine the specific purpose of the evaluation, contemplate what will be done with the findings of the evaluation, indicate questions that will be answered by the evaluation, and ascertain the standards for assessing the program performance.

To determine the standards for assessing the performance of the PEWSS program, a literature review was conducted to find similar programs. [23,28,32]

TASK D – GATHER CREDIBLE EVIDENCE

The first segment of Task D required the system to answer at least 1 of the following 6 questions.[14] Does the system:

1. Detect diseases of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate?
2. Detect trends that signal changes in the occurrence of disease, injury or adverse or protective exposure, including detection of epidemics (or outbreaks)?
3. Lead to improved clinical, behavioral, social, policy, or environmental practices?

4. Provide estimates of the magnitude of morbidity and mortality related to the health related event under surveillance, including the identification of factors associated with the event?
5. Permit assessment of the effect of prevention and control programs?
6. Stimulate research intended to lead to prevention or control?

Gathering evidence involved a second segment of Task D, which entailed the 9 components of evidence used to evaluate the system.[14] Ratings for the components were either high, medium, low or not applicable (N/A).

1. Simplicity – The structure and ease of the program operation[14]
2. Flexibility – How the program will adapt to any form of change[14]
3. Data quality – Completeness and validity of the data[14]
4. Acceptability – How willing are the contributors engaged in the program? [14]
5. Positive Predictive Value (PVP) – Can the system measure the proportion of reported cases that are true positives using calculated numbers from the true positives and the false positives? [14]
6. Sensitivity – Can the system detect outbreaks and monitor changes in the amount of cases over time or can it be measured using the true positives and the false negatives? [14]
7. Representativeness – Can the system accurately portray the health event under surveillance and the distribution by place and person? [14]
8. Timeliness – How long does it take between each step in the process of the program? [14]
9. Stability – Is the method of collection of data a reliable system and are the machinery used to run the program stable? [14]

TASK E – JUSTIFY AND STATE CONCLUSIONS, AND MAKE RECOMMENDATIONS

Task E involved gathering all of the evidence and analyzing and interpreting the findings, also including the stakeholder's opinions and how they will be using the findings. This portion will also include analysis on whether or not the program is meeting its objectives and properly addressing the public health problem. Recommendations will also be made to try and strengthen those attributes that are weak without adversely affecting the others.

TASK F – ENSURE USE OF EVALUATION FINDINGS AND SHARE LESSONS LEARNED

The findings of the evaluation will be discussed with the staff involved with the program to determine the best course of action to disseminate the conclusion to the appropriate people.

METHODS FOR THE ANALYSIS OF THE DATA FOR THE PEWSS PROGRAM

Data gathered by the expanded PEWSS program were analyzed for descriptive information. Data of the same time period and viruses were requested from the CDC's division of the National Respiratory and Enteric Virus Surveillance system (NREVSS). Also requested, were similar data from the hospital located at Nellis Air Force Base, the Mike O'Callaghan Federal Hospital**,** which is located in Clark County, Nevada, for local comparison. These data were charted in Microsoft Excel and compared visually for common seasonality and trends for all 3 data sets.

CHAPTER 3 - RESULTS OF THE CDC EVALUATION

TASK A - ENGAGE THE STAKEHOLDERS IN THE EVALUATION

INTERVIEWS

The responses to the bulletin, via interviews, were well received with high regard for the program. Negative responses about the program were not reported. Some of the responses included, “I look forward to the bulletins each week” and “I forward the bulletins to all of my employees in the laboratory, so they are kept up to date with the pathogens.”

PUBLIC SURVEY

Nineteen total responses to the public surveywere received and analyzed (Appendix D). There were a variety of professions that responded to the survey, including physicians, nurses, laboratory staff, educators, administration staff and day care providers. The stakeholders were located in different areas of practice settings, such as hospitals, clinics, private offices, and small and large group practices. The majority, 89.5% (n=17), of the stakeholders responded that they have read the PEWSS bulletins (Appendix F), and 64.7% (n=11) responded that they read the bulletin at least every week, and 29.4% read it frequently, but not every week. The information within the PEWSS bulletin was rated high, by greater than 80% of the respondents, in the categories of timely, accurate, relevant and useful. The survey addressed how the stakeholders use the bulletin information. Responses varied for all of the categories, except for general information, which was answered by 100% of the respondents. The majority of respondents (n=12), occasionally or never use the

information to guide clinical diagnosis, 52.9% (n=9) never use the information to guide empirical treatment, and 64.7% (n=11) never use it to guide laboratory testing. Because not all of the respondents were physicians for this survey, higher ratings than expected were seen for "never" were seen when asked how they use the bulletin information. When asked what they felt was the most useful about the bulletin, nine of the respondents were in favor of knowing the current weekly rates of the pathogens which kept them up to date on what is circulating in the community and what to look for. The least useful information determined by the stakeholders, were the age distribution graphs and the weekly positive graphs for each pathogen. As optional questions, the stakeholders were also asked for any improvements that would make for a better bulletin. Ten individuals responded with suggestions. Four liked the current state of the bulletin. The others suggested changes; adding more sentinel sites, changing the graphs, adding national data or more technical information regarding the pathogens. Changes were made to the PEWSS bulletin to accommodate the suggestions (Appendix G). Some of the changes suggested by the stakeholders: age graphs were eliminated, the general update section was shortened. Figure 1 of weekly number of specimens tested added negative to the positive rates. Figure 2 for the weekly positive counts was changed to bar graphs and Table 1, testing results, added an interpretation for the pathogenic activity for the week to show level of activity.

SENTINEL SITE SURVEY

Among the 5 sentinel sites, there were 19 responses received and transposed into Survey Monkey to analyze the results (Appendix E). Most respondents were physicians at 42% (n=8). The majority of the respondents had a very favorable response towards the

PEWSS program. Almost all agreed, or strongly agreed, to all of the first part of the survey, which addressed: prompt responses by SNPHL and the SNHD, easy to complete test requisition forms, having couriers automatically pick up specimens was easier than phone calls, patient reports and the PEWSS bulletin were easy to understand, they felt competent in collecting the specimens, and they would recommend their colleagues to partner with the SNPHL and the SNHD. The sites primarily received their PEWSS bulletins by fax and email directly from the SNHD, with 44% (n=8) reading them every week and 22% (n=4) reading it frequently but not every week. 78% (n=14) of the respondents use the PEWSS bulletins for general information, and 44% (n=8) use the information to guide their clinical diagnoses. Almost all of the respondents thought the information in the PEWSS bulletins were timely, accurate, relevant to them, useful, and easy to read and understand. Only 1 person responded the information was not relevant to them. This survey also revealed that most of the people collecting the PEWSS specimens were the physician, nurse or medical assistant. Wellness checkups were at least 40% or greater of their regular patient visits. Also asked in the survey was what they believed to be most useful about the bulletins. There were a few respondents that use the bulletins to show their patients what is circulating in the community, and to reinforce the idea of not using antibiotics when the cause is viral in nature. When asked what they liked least, a few had responded the reports were too long and there was a need for better graphs.

TASK B - DESCRIBE THE SURVEILLANCE SYSTEM TO BE EVALUATED

TASK B1

Task B1 involved describing the public health importance of the event that is under surveillance. Under examination by the PEWSS program are the respiratory pathogens that continue to circulate. The importance of respiratory pathogens in the community are the illnesses that are produced by them and the ease of transmission among the pediatric population. The introduction portion of this evaluation explored the importance of these public health events in greater detail.

TASK B2

Task B2 involved describing the purpose and operation of the surveillance system being evaluated. Most sections of this task have been described in greater detail in earlier sections of this evaluation. Therefore, for this portion of the task, the sections below will contain brief descriptions. A logic model[1] was created explaining the series of tasks of the program (Appendix H).

PURPOSE

The purpose of the PEWSS program is to compile and track laboratory based data into reports that will inform the community of the circulating seasonal respiratory pathogens in pediatrics year round.

OBJECTIVES

The objectives of the PEWSS program are to monitor and track respiratory viruses, develop seasonal trends and a baseline for Clark County, monitor co-infections, provide weekly reports to inform public, provide early warning of increased activities, and strengthen relationships with the local medical community.

PLANNED USE

The PEWSS program will help inform doctors as to which viruses are circulating to help streamline testing and to inform the public what the SNHD is seeing in the pediatric population of Clark County, Nevada.

COMPONENTS OF THE SURVEILLANCE SYSTEM

Population

The sick, parental care seeking, pediatric population of Clark County, Nevada

Period of time collected

The data are collected year round from participating pediatricians' offices

What data are collected and how

The samples are provided by the sentinel sites. Samples consisting of a nasopharyngeal swab from the child are provided by the sentinel sites. Once collected, a courier from the SNHD will pick up samples three times a week and deliver them to the SNHD laboratory. Once the respiratory panels are performed, the results are relayed back to

the physician. The de-identified results of the respiratory panel are then compiled into a spreadsheet, along with age, gender, date of birth, CDC week and collection date, for the SNHD Office of Epidemiology to analyze.

Reporting sources for data

The data are derived from the samples submitted by the sentinel sites. Data for the PEWSS program bulletins are obtained from the SNPHL common shared Excel spreadsheet.

How the system is managed

The entry of the laboratory confirmed panel results is done by the laboratory personnel. The data are stored on encrypted servers located at the SNHD, which are backed up multiple times a day onsite and offsite. The computers that have access to the information are password protected. If panel results are positive, the pathogen is specified. To identify the virus, the spreadsheet is setup to allow a pull down menu that allows specific entries into the cells for the panel results, to help keep consistency among the data. The other data entered are age, collection data, and CDC week. The data are used in house for informational purposes only, and are not distributed publicly.

How the data are analyzed

The data are analyzed once a week by the personnel at the SNHD, Office of Epidemiology. The results are reformatted and placed into a customized Microsoft Excel spreadsheet to create the bulletin by the personnel of the SNHD Office of Epidemiology. The summary charts and tables are automatically updated in the customized Microsoft Excel

spreadsheet. A small, yet revealing, summation of the past week is created, which contains an overview of any pertinent information found that week. Once completed, it is then distributed weekly to a list of subscribers via e-mail or fax.

Policies and procedures for patient privacy and confidentiality

The data gathered are protected by Nevada Revised Statutes (NRS) 441A.220[21]. To further ensure patient privacy and confidentiality, all of the data are de-identified when given to the SNHD, Office of Epidemiology.

Integration with other systems

The PEWSS program does not currently integrate with any other system.

Does the system comply with applicable records management program?

The data are kept in accordance with the Nevada Local Government Retention Schedule. Therefore, the data are kept until the person reaches the age of 23 or six years from the date of collection, whichever is later. The data, when destroyed, will be done in compliance with HIPAA security regulations and also in a manner in which it cannot be reconstructed, such as shredding.

TASK B3

FUNDING SOURCES

Funding support for the 2010-2011 PEWSS program was provided by the Southern Nevada Health District and by an “Innovations in Quality Public Health Laboratory Practice”

grant provided by the Association of Public Health Laboratories (APHL). The grant funding was provided through the following institutes:

National Center for HIV, Viral Hepatitis, STD and TB Prevention
Coordinating Center for Infectious Diseases
Office of Workforce and Career Development
National Center for Environmental Health
National Center for Zoonotic, Vector-borne, and Enteric Diseases
Coordinating Office of Global Health
Coordinating Office for Terrorism Preparedness and Emergency Response
National Center for Health Marketing

COST ANALYSIS

A cost analysis of the PEWSS program was performed in three segments. Two were for the administration portion of the program, which consisted of the personnel of the SNHD, Office of Epidemiology, and the personnel of the SNPHL. The third analysis was conducted by the SNPHL, for the laboratory supplies of the program.

ADMINISTRATIVE COST ANALYSIS

To calculate the figures for the cost analysis, information regarding time spent on the PEWSS program was needed from the staff of the SNHD, Office of Epidemiology. Requested were the amount of time it took each worker to help in the startup of the PEWSS program and the estimated amount of time they spent per week working on the data and reporting for the PEWSS program. The estimates were gathered and calculated into a yearly cost. Also included in the final cost were the fringe benefits necessary for employment. For the SNHD, Office of Epidemiology sentinel surveillance, the personnel cost for startup was estimated at $9,143, with a yearly upkeep average of $14,691 (Table 1).

TABLE 1 COST ANALYSIS FOR SNHD AND SNPHL PERSONNEL

	SNHD Office of Epidemiology	**SNPHL Personnel**	**Total Cost**
Startup Personnel Cost including Fringe	$9,143	$17,115	$26,258
Yearly Maintenance Cost including Fringe	$14,691	$50,220	$64,911
Grand Total	**$23,834**	**$67,335**	**$91,169**

In the SNPHL, the startup process for the EPIS program was estimated at 280 hours. Using the same calculation, to include fringe benefits, the personnel cost for the SNPHL estimated at $17,115 (Table 1). To determine an estimated yearly personnel cost, the average amount of time for one batch, which can consist of up to 7 samples, to run once a week, for one year, was estimated. The average yearly maintenance for the personnel to analyze one batch every week for one year cost roughly $50,220 (Table 1). This number will fluctuate depending on the quantity of specimens received throughout the year. Not included in the cost of the analysis is the cost of the equipment along with maintenance contracts needed to maintain the instruments, office equipment, or proficiency and competency testing for staff.

LABORATORY SUPPLY COST ANALYSIS

The final part of the cost analysis contained the laboratory equipment cost. The cost of performing the influenza and non-influenza respiratory virus panel is dependent on the number of samples analyzed in each test batch. The severity of respiratory illness in the community is the determining factor of how many batches of samples will be analyzed each week. In high peak seasons, multiple batches will be analyzed each week, whereas in low peak seasons, batches might be analyzed every other week. A batch can consist of one to

seven samples ran at one time. If only 1 sample is analyzed per test batch, the cost of extraction and test analysis at SNPHL for the entire panel is approximately $170.00 per sample.[1] Because the PEWSS program is laboratory based surveillance and not diagnostic testing, sample extraction and analysis was primarily performed in batches of at least 7 samples, to maximize the cost for each batch. The batching of samples lowered the cost per sample and ensured that sufficient funding was available to complete the year long surveillance project. If a batch of 7 samples are extracted and analyzed at the same time, the approximate cost for the panel is $55.00 per sample.[1] The cost includes the price of extraction cartridges, master mix, probe/primer sets, controls, Applied Biosystems Inc. plates and caps.[1] For one batch to run once a week it would cost $385. Using the estimate, one 7 sample batch ran every week for one year would cost $20,020. This number is also subject to change depending on the quantity of specimens received in the laboratory.

Overall, the total startup cost for both the SNPHL and the SNHD, was estimated at a yearly cost of $64,911 (Table 1). The total cost for the personnel for both locations to startup the sentinel surveillance program was estimated at $91,169 (Table 1). The cost of supplies to perform the test will add approximately another $20,020 to produce a final cost of $111,189/year. These are approximate numbers and will fluctuate depending on the quantity of specimens received during the year. The figures are also approximate costs of the time and money needed to start the program with resources readily available. For the PEWSS program, funding for the personnel was not required because they were employed prior to setting up the program. The funding necessary for the PEWSS program was obtained from the grants received to help aid in the cost of supplies.

TASK C- FOCUS THE EVALUATION DESIGN

SPECIFIC PURPOSE OF THE EVALUATION

The PEWSS program is a pilot public health program and therefore needs an evaluation to determine if it is an effective and useful system in relaying pertinent pediatric respiratory information to the community.

IDENTIFYING STAKEHOLDERS WHO WILL RECEIVE THE FINDINGS

The stakeholders, defined in Task A, along with others who may conduct similar programs, will be the recipients of the evaluation findings.

WHAT WILL BE DONE WITH THE INFORMATION GENERATED FROM THE EVALUATION?

The information generated from this evaluation will have multiple uses. One intended use of the findings will be for submission, by way of grant reviews, to the providers of the various grants that have allowed the PEWSS program to operate. Another use will be to publish the findings of this evaluation in peer-reviewed journals, so that others may learn what has been found useful and what has not. The program evaluation and its findings can also be used to help develop a base model program by others who wish to adopt the same design for use in their facility.

SPECIFYING THE QUESTIONS THAT WILL BE ANSWERED BY THE EVALUATION

The questions that will be answered by this evaluation are as follows:

- Does the program flow efficiently and effectively?
- Is the program cost effective?
- Are the data relayed to the public in an effective manner?

DETERMINING STANDARDS FOR ASSESSING THE PERFORMANCE OF THE SYSTEM

Determining standards for assessing the PEWSS program consisted of a literature review to find similar surveillance based programs. Searches for similar programs produced meager results. Nothing was found to be similar in nature to the PEWSS program. The end result showed there were no similar programs to compare standards or performance measures for the PEWSS program. This showed the PEWSS program to be a stand-alone pilot program.

TASK D – GATHER CREDIBLE EVIDENCE

SATISFACTORILY ANSWER QUESTIONS

A system may be considered useful if it satisfactorily addresses at least one question out of six presented in the guidelines. Three of those six questions were adequately answered by this evaluation. Does the system:

1. Detect diseases of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate?

Yes. The program does provide the information of current circulating pathogens that could help to increase the awareness of prevention measures to limit the spread of the pathogen.

2. Detect trends that signal changes in the occurrence of disease, injury or adverse or protective exposure, including detection of epidemics (or outbreaks)?
   Yes. One of the objectives of the program is to develop trends for each pathogen. If there are abnormal occurrences in a disease, it will show an increase on the PEWSS weekly bulletin notifying the Office of Epidemiology of increased seasonal cases or a potential outbreak.

3. Lead to improved clinical, behavioral, social, policy, or environmental practices?
   Yes, the intention of this program is to inform health professionals about the diseases that are circulating to guide them as to which tests to use for clinical diagnosis. This could potentially help in the decrease of performing unnecessary tests and cost to the patients. The weekly bulletins can also be used by physicians to inform their patients of the viral etiology of the disease, which enforces the idea of not using antibiotics for treatment and reduces the improper use of antibiotics. The information provided by the PEWSS bulletins will also remind the physicians about the importance of stressing the need for public health prevention to their patients during heightened times of pathogen occurrence.

4. Provide estimates of the magnitude of morbidity and mortality related to the health related event under surveillance, including the identification of factors associated with the event?
   No

5. Permit assessment of the effect of prevention and control programs?
   No

6. Stimulate research intended to lead to prevention or control?
   No

SYSTEM ATTRIBUTES

SIMPLICITY

Rating: High

This program has been kept simple on different aspects, from specimen collection and handling to the weekly bulletin. The case definition has also been kept universal for all pathogens. Due to the ease of collection of specimens, the training is minimal. The SNPHL has taken on most of the specimen responsibility (i.e. testing and specimen transport), which eases the stress from the physicians and keeps consistency in the testing. There is no follow-up with cases. However, there is follow-up if there are odd occurrences noticed within a

particular site. There is no integration with other systems at this time. The weekly reports that are distributed are also simple and easy to understand, this was corroborated by the information gathered from surveys of the stakeholders.

FLEXIBILITY

Rating: High

This program has the capability to add a new pathogen or an additional physician practice, if needed. Blank spaces for each were built into the system for future expansion. Initially, 4 sites participated in the program. A fifth site was added into the program, which took a minimal time of 1 week to incorporate into the PEWSS bulletins. If a minor change to the case definition were to occur, the program would adapt effortlessly, because it is kept universal between all sites. However, if a complete change to the case definition were to occur, it would provide a challenge for future data comparison. If personnel changed at the SNPHL, SNHD Office of Epidemiology, or any of the sites, it would not affect the functionality of the program, due to cross training at all locations. If funds were to cease for this program, then the program itself would no longer exist. The program could run if funds were reduced, but the detailed analysis of circulating pathogens would also be reduced. Lack of availability of funds is the least flexible area for this program.

DATA QUALITY

Rating: High

The data quality of the PEWSS program is complete and valid. The specimen information is obtained when collected and given to the SNPHL. The SNPHL has trained the pediatric office staff in proper specimen collection. Once testing has occurred, the SNPHL

enter the data into a spreadsheet and checks the data for completeness. This program does not need detailed patient information, other than date of birth and gender, for analysis in reporting, which helps to minimize clerical error.

ACCEPTABILITY

Rating: High

The acceptability of this program, by the stakeholders, sentinel sites, staff of the SNPHL and the staff of the SNHD Office of Epidemiology, would be considered high. The stakeholders expressed their acceptance of the program by the surveys conducted. The pediatrician's offices participate on a voluntary basis only, with the ability to opt out at any time. The original four are still participating in the program and a fifth was added. Each of the sites has also expressed their eagerness in participating in the program and in continued participation in the program. Their continued enthusiasm and dedication earned them the honor of being named the 2011 Public Hero's by the SNHD (Appendix I). In interviews with the SNPHL and the SNHD, they have also expressed their passion for the program and the information it provides to the medical community.

SENSITIVITY AND PREDICTIVE VALUE POSITIVE (PVP)

Rating: Not Applicable

The sensitivity of a system is based on the proportion of detected cases by a system.[14] Sensitivity can also be assessed on the ability to detect outbreaks. Predictive Value Positive (PVP) is the proportion of reported cases that actually have the illness.[14] These values are both calculated based on data that pools from an unbiased sample. The calculation used for

both sensitivity and PVP, involves knowing the true and false positives and negatives of the system. This program uses sentinel surveillance with a specified biased data set. The data being pooled are from a specific population, the sick pediatric population of Clark County, Nevada, visiting their pediatrician; also selected are the first ten that meet the criteria. Providing answers for either sensitivity or PVP would give a misunderstanding of the program. The PEWSS program does not look at sensitivity or PVP rates. Rather, it is more focused on trends, circulation and detection of different pathogens within the community. It is possible for this program to detect outbreaks, which would be seen by a sudden spike of a pathogen, which would in turn serve as a warning for the SNHD, Office of Epidemiology, to investigate and administer public warnings and/or statements as needed.

REPRESENTATIVENESS

Rating: Medium

This program uses 5 separate sentinel sites to gather data. The sites were chosen by the volume of patients and by the mix of financial status of their patients. By choosing the sites this way, the program can get a small, yet respectable, representation of children. However, using sentinel surveillance does not allow the results to be generalized to the entire population of pediatrics in the community[2], because the sample is already biased. This program is limited to only those families who have the ability to take their children to the doctor. This program does not include pediatrics seen in clinic's, emergency department visits, small clinics, etc. located around town. However, knowing that most children visit their pediatricians office as their regular place of health care[2], gives a comparable representation to the other locations visited.

TIMELINESS

Rating: High

Timeliness can consist of different factors. Specimens for analysis are collected three times a week. Laboratory testing is performed once a week, unless there are too few specimens, in which case the specimens would be processed the following week. If too few specimens are collected, the results for those specimens will be delayed, taking up to 14 days. This would occur during non-peak times of the year. Treatment of the patient is not delayed waiting for results; therefore, this is not a major concern for the physician. The data are analyzed and distributed once a week, regardless of the amount of specimens collected during the prior week. According to both surveys, the sentinel site surveys and stakeholder surveys, the PEWSS program reports the information in a timely manner.

STABILITY

Rating: High

The PEWSS program is an extremely stable and reliable system. Machines are routinely maintained and serviced in the laboratory. The computer equipment used by the SNPHL and the SNHD, Office of Epidemiology, are maintained by the Information Technology (IT) office, which includes the computer systems, printers, and servers. Down time, due to computers or laboratory equipment, is at a very minimal level, due to the maintenance by the IT department. Couriers are at the physician's office routinely three times a week. If there is an inability by a courier to pickup samples at a location, there is a backup courier. The reports are always compiled and sent by the SNHD, Office of Epidemiology. If the primary person is unavailable, there are backups in place to ensure they

are distributed. The program is operational 5 days a week, every year. The data are collected, tested and reported by the end of the week.

TASK E - JUSTIFY AND STATE CONCLUSIONS AND MAKE RECOMMENDATIONS

The conclusion of this evaluation is, with the few known weaknesses, that the positive attributes are more than enough to show that the PEWSS pilot program is an efficient and effective program for accurately capturing and relaying the information to the stakeholders. The purpose and the objectives of the PEWSS pilot program have been fully met by the program. This evaluation has shown that the PEWSS program has the ability to keep the public informed in a timely manner about the currently circulating pathogens and that the program can and does create new relationships, as well as strengthen current relationships within the medical community. All of the stakeholders involved have expressed their ongoing interest in the program. The surveillance methods utilized by the SNPHL and the SNHD have shown to be cost effective, efficient, and preferred by the physicians, as demonstrated by their continued voluntary commitment to the program. The strongest attributes of the PEWSS program are the acceptability by all of the stakeholders, simplicity of the program, flexibility, stability and timeliness. Representativeness was rated at a medium level because sentinel surveillance does not allow results to be generalized to the population. However, knowing most children visit a pediatrician, it can be implied to be a good representation for the pediatric population. The cost of the program, if a laboratory and administrative office are already in place, is very feasible. The highest cost is for the supplies used to create the kits for the physicians and the supplies to analyze the specimens.

Utilizing grants aid in the cost of the supplies. Minimal time is used by both locations, sample batches are processed once a week and analysis of the specimen data is performed once a week. The only limitations determined, were the attributes of sensitivity and predictive value positive, because they were not able to be calculated. This is expected, using sentinel surveillance. The PEWSS program does not look at the sensitivity or the positive predictive value. The PEWSS program was generated with the intent to inform about circulating pathogens in the community and developing trends. Therefore, sensitivity and the positive predictive value would not be a weak point of the program, rather not applicable to the PEWSS program.

The operation of the PEWSS program has been streamlined by the personnel at the SNPHL and the SNHD, Office of Epidemiology. There are no recommendations needed for the operation of the program. The flow between the pediatrician's office, the SNPHL and the SNHD, Office of Epidemiology, has been adjusted since the inception of the program. The stakeholders did offer suggestions for the PEWSS bulletins. Those suggestions were reviewed and implemented. The bulletin was reorganized and restructured to include some of the suggestions (Appendix G). For instance, an interpretation of the pathogen activity was added to Table 1. The age tables were eliminated, the weekly positive counts were modified so they were easier to read, and data gathered in previous years was included. These changes were an accumulation of the stakeholder suggestions and the ideas from the staff at the SNHD, Office of Epidemiology.

Task C asked for questions that would be answered by this evaluation. The questions were, does the program flow efficiently and effectively, is it cost effective and does it relay

the data back to the community in an effective manner? The answer is yes, it does all of the above. The evidence gathered from the various tasks illustrates the efficiency and usefulness of this program. The creators of this program have shown tremendous teamwork and collaboration to put together a one of a kind program that has gone beyond traditional surveillance not yet seen in this country. Not only is the program very informative, but it has also been organized in an easily understandable manner to allow any person, not just those in the medical community, to understand what pathogens are circulating in the community.

TASK F - ENSURE USE OF EVALUATION AND FINDINGS AND SHARE LESSONS LEARNED

Determining who would do which tasks and when and where the specimens would come from were challenges. Each department, and every person, had their own hurdles to overcome. Some of these obstacles were which site to obtain samples from, train in the collection of samples, format weekly reports and who would write them every week. These were all conquered, over time, to result in the currently smooth running system that works best for the SNPHL and the SNHD, Office of Epidemiology.

The next question was what to do with the evaluation results. For some of the grants used in the development of the program, a review is necessary to ensure effective and efficient use of the grant funds. This evaluation will be part of those reviews. Also, since this is a unique pilot program, the findings will also be submitted to a peer-reviewed journal for publication. Lastly, other agencies will be able to review what has been done and to use this system as a base model for a similar program.

CHAPTER 4 - RESULTS OF THE PEWSS PROGRAM DATA ANALYSIS

The first data set collected was during the time period of May 1st, 2009 through May 31st, 2010. Initially, these were collected for the EPIS program and tested for influenza. Once the program expanded to the PEWSS program, these nasal swab samples were retested, all at once, for the other pathogens. There were 618 samples collected for analysis. Eight of the samples were deleted from the data set. One, was rejected due to being tested twice within a week time frame and the others were rejected due to being age 18 or over. These deletions resulted in a sample set of 610 specimens (Appendix J). Table 2 lists the demographics for the first year EPIS program data set. Out of the 610 samples, 352 were positive (57.7%) for at least one pathogen. Of those positive samples, 55.1% were male and 44.9% were female. The average age of patients with positive specimens, for the first data set, was 5.6 years, 5.9 years for females and 5.3 years for males. Children aged 10 years and less accounted for 87.0% (n=306) of the positive specimens. There were 10 co-infections found for the sample set (Table 3). Eight of the ten were found to be males within one location. The other two were female from two separate locations. All ten were of age 10 years and under. Other than influenza H1N1 involved in 6 of the 10 co-infections, there were no other patterns of pathogens found within the co-infections.

TABLE 2 DEMOGRAPHICS OF DATA FROM EPIS PROGRAM, 05/01/09 TO 05/31/10

	Female	Male	Total
Total Specimens Collected (n,%)	259(42.5)	351(57.5)	610
Total Positive Specimens (n,%)	158(44.9)	194(55.1)	352(57.7)
Average Age of Positive Patient (years)	5.9	5.3	5.6
Virus Distribution			
Adenovirus (n,%)	15(44.0)	19(56.0)	34(9.7)
HMPV (n,%)	4(40.0)	6(60.0)	10(2.8)
HPIV1 (n,%)	14(39.0)	22(61.0)	36(10.2)
HPIV2 (n,%)	1(50.0)	1(50.0)	2(0.57)
HPIV3 (n,%)	7(44.0)	9(56.0)	16(4.54)
Influenza A	111	130	241
Influenza AH1	0	0	0
Influenza H1N1 (n,%)	111(54.0)	130(46.0)	241(68.5)
Influenza H3	0	0	0
Influenza B (n,%)	0	1(100.0)	1(0.28)
RSV (n,%)	9(39.0)	14(61.0)	23(6.53)

TABLE 3 CO-INFECTIONS OF 1ST YEAR DATA SET FOR EPIS PROGRAM, 05/01/09 TO 05/31/10

Specimen Number	Age (years)	Gender	Location	CDC Week	Virus 1	Virus 2
1	10	Male	1	2009-23	Influenza H1N1	HMPV
2	2	Male	1	2009-25	Influenza H1N1	HPIV3
3	1	Male	1	2009-27	Adenovirus	HPIV3
4	2	Male	1	2009-28	Influenza H1N1	HPIV1
5	<1	Male	1	2009-35	Influenza H1N1	RSV
6	9	Female	3	2009-42	Influenza H1N1	HPIV1
7	2	Male	1	2009-45	Influenza H1N1	Adenovirus
8	3	Male	1	2009-49	Adenovirus	RSV
9	6	Female	2	2010-06	HMPV	RSV
10	1	Male	1	2010-20	Adenovirus	HPIV3

Each pathogen was analyzed for virus trends (Appendix J). Out of the positive specimens tested, influenza H1N1 accounted for the highest amount at 68.5% (n=241), of which 54.0% were male (n=130) and 46.0% female (n=111), with an average age of 6.7

years, and 82.0% were 10 years and younger (n=198). HPIV1 and adenovirus were next in prevalence with 10.2% and 9.7%, respectively. Influenza A, excluding H1N1, had no positive samples for the year. Influenza B had 1 positive sample, 0.28% of the positive specimens; a male aged 3 years. RSV, 6.53% (n=23) of the positive specimens; 61.0% were male (n=14) and 39% were female (n=9) with an average age of 2.3 years. Adenovirus, with an average age of 2.9 years, accounted for 34 positive specimens; 56.0% were male (n=19) and 44.0% were female (n=15). HPIV-1,with an average age of 3.9 years, had 36 total positive specimens; 61.0% were male (n=22) and 39.0% were female (n=14). HPIV-2, 0.57% (n=2) of the total positive specimens, with an average age of 7 years; one male and one female, both aged 7 years. HPIV-3, 4.54% (n=16) of the total positive specimens, with an average age of 1.5 years, 56.0% were male (n=9) and 44.0% female (n=7). HMPV, 2.8% (n=10) of the total positive specimens, with an average age of 5.4; 60.0% were male (n=6) and 40.0% female (n=4).

The second data set, was collected June 1st, 2010 through May 31st, 2011. The demographic information is summarized in Table 4. The data set (Appendix K) consisted of 872 samples collected with 54.2% (n=473) that resulted in a positive test for at least one pathogen; females had 48.8% (n=231) positive specimens and males had 51.2% (n=242) positive specimens. Influenza A and RSV were the highest amount captured at 24.7% (n=117) and 21.1% (n=100), respectively. Influenza B and HPIV-3 were next with 16.7% (n=79) and 16.3% (n=77), respectively. The average age of positive specimens in the second data set was 4.4 years, with an average age of 4.5 years for females and 4.3 years for males. Children aged 10 years or less accounted for 89.9% (n=425) of the total positive specimens. There were 29 co-infections seen for this season, located throughout all 5 locations (Table 5).

RSV and influenza were the primary co-infections seen, and 10 of the 18 RSV co-infections also involved influenza. RSV and influenza were involved in 62.1% (n=18) and 58.6% (n=17), respectively, of the co-infections.

TABLE 4 DEMOGRAPHICS OF PEWSS DATA FROM 06/01/10 TO 05/31/11

	Female	**Male**	**Total**
Total Specimens Collected (n,%)	412(47.2)	460(52.8)	872
Total Positive Specimens (n,%)	231(48.8)	242(51.2)	473(54.2)
Average Age of Positive Patients (years)	4.53	4.33	4.43
Virus Distribution			
Adenovirus (n,%)	30(50.9)	29(49.2)	59(12.5)
HMPV (n,%)	16(55.2)	13(44.8)	29(6.1)
HPIV1 (n,%)	7(43.8)	9(56.3)	16(3.4)
HPIV2 (n,%)	15(57.7)	11(42.3)	26(5.5)
HPIV3 (n,%)	42(54.6)	35(45.5)	77(16.3)
Influenza A (n,%)	55(23.8)	62(13.1)	117(24.7)
Influenza AH1	0	0	0
Influenza H1N1 (n,%)	30(46.9)	34(53.1)	64(13.5)
Influenza H3 (n,%)	25(47.2)	28(52.8)	53(11.2)
Influenza B (n,%)	36(45.6)	43(54.4)	79(16.7)
RSV (n,%)	44(44.0)	56(56.0)	100(21.1)

TABLE 5 CO-INFECTIONS OF 2ND YEAR DATA SET FOR PEWSS PROGRAM, 06/01/10 TO 05/31/11

Specimen Number	Age (years)	Gender	Location	CDC Week	Virus 1	Virus 2
1	2	Female	1	2010-24	HPIV3	RSV
2	<1	Male	1	2010-27	HPIV3	RSV
3	1	Male	2	2010-52	Flu B	RSV
4	2	Male	1	2011-01	H1N1	Adeno
5	<1	Female	2	2011-02	H1N1	RSV
6	<1	Female	3	2011-02	HPIV3	RSV
7	1	Male	2	2011-03	AH3	RSV
8	10	Male	1	2011-03	H1N1	RSV
9	2	Male	1	2011-05	Flu B	RSV
10	8	Female	2	2011-06	Flu B	RSV
11	<1	Female	2	2011-06	H1N1	RSV
12	1	Male	1	2011-06	HPIV1	RSV
13	7	Female	2	2011-07	H1N1	RSV
14	11	Male	4	2011-08	Adeno	RSV
15	1	Male	4	2011-08	Adeno	RSV
16	6	Male	4	2011-08	H1N1	RSV
17	2	Male	4	2011-09	HPIV3	Flu B
18	<1	Female	5	2011-09	Flu B	RSV
19	<1	Male	2	2011-11	HPIV3	AH3
20	11	Female	4	2011-11	HPIV3	Flu B
21	<1	Male	3	2011-11	HPIV3	H1N1
22	3	Female	1	2011-12	Flu B	HMPV
23	3	Male	4	2011-13	Adeno	HMPV
24	1	Female	1	2011-14	HPIV3	Adeno
25	1	Female	1	2011-14	Adeno	RSV
26	<1	Female	5	2011-15	Adeno	HMPV
27	8	Male	1	2011-15	HMPV	RSV
28	12	Male	3	2011-16	Adeno	HMPV
29	5	Female	4	2011-17	HPIV3	Flu B

The PEWSS second year data set was analyzed for virus trends (Appendix K). Influenza A showed positive tests for H1N1 and H3; there were no positives for AH1 (Table 4). Influenza H1N1 had 64 positive samples; 53.1% (n=34) were male and 46.9% (n=30) were female. Influenza AH3 resulted in 53 positive samples; 52.8% (n=28) were male and

47.2% (n=25) were female. Influenza B had 79 positive samples; 54.4% (n=-43) were male and 45.6% (n=36) were female. RSV totaled 100 positive specimens; 56.0% (n=56) were male and 44.0% (n=44) were female. Adenovirus, was 12.5% (n=59) of the positive specimens; 50.9% (n=30) were female and 49.2% (n=29) were male. HMPV, 6.1% (n=29) of the positive specimens; 55.2% (n=16) were female and 44.8% (n=13) were male. HPIV-1 resulted in 16 positive samples, 3.4% of the total positive specimens; 56.3% (n=9) were male and 43.8% (n=7) were female. HPIV-2 had 26 positive samples, 5.5% of the total positive specimens; 57.7% (n=15) were female and 42.30% (n=11) were male, and HPIV-3 appeared in 77 positive samples; 54.6% (n=42) were female and 45.5% (n=35) were male (Table 4).

The data collection process of the CDC consisted of individual laboratories, across the country, sending weekly data, that contained the information of all of respiratory tests conducted for the week. The CDC recommends using the nasopharyngeal and oropharyngeal swabs for outpatient settings. The specimen collection process of the PEWSS program and the recommended process of respiratory specimen collection by the CDC are similar methods. The data provided by the CDC, division of NREVSS, were collected from May 1st, 2009 through April 30, 2011. Their data set did not include demographic data, other than the region in which the specimen was collected. The data set provided national and regional data for all the pathogens except for human metapnuemovirus. Human metapnuemovirus is a recently discovered virus and is still under research at the CDC; therefore there are no data for comparison. For the analysis, the data from the western region was used. The western region contained data submitted from the states of California, Oregon, Washington, Montana, Idaho, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico and Alaska.[7]

Nellis Air Force Base (Nellis AFB) also contributed a data set from May 1st, 2009 through April 30, 2011. Not all of the respiratory pathogens collected by the PEWSS program were collected by Nellis Air Force Base. Nellis AFB used the International Statistical Classification of Diseases and Related Health Problems **(**ICD) 9/10 codes when entering patient data into their database. These codes do not provide detailed data on subtypes of the pathogens. Therefore, not all pathogens can be compared to the PEWSS data sets when subtypes are involved. Testing for other than RSV and influenza were not mandatory; any additional pathogens were not tested by physicians. The data set provided included multiple entries for the same patient, due to multiple visits to a hospital/physician within the same day to a few days time. All entries, for the same patient, within 2 weeks of the original date were deleted from the data set. This was done to avoid duplicating the same admission or pathogen. Two weeks were used as a cutoff date due to the average cycle length of time of the pathogens. The similar pathogens collected to the PEWSS program were RSV and influenza A.

To plot all 3 data sets together (i.e., CDC, PEWSS, Nellis), the PEWSS data and the Nellis Air Force base data were date adjusted (Appendix L). The PEWSS data set and the Nellis Air Force base data set were reformatted to coincide with the CDC weeks and the CDC data set. Once the data sets were reformatted, all three were plotted on a Microsoft Excel graph together for comparison. The CDC data were plotted on a second axis to accommodate the large number set. All data sets were formatted similarly, with the exception of adenovirus, because both data sets were small in numbers. The PEWSS program data and the Nellis AFB data were plotted together, on separate charts for influenza and RSV, for local data comparison.

Overall, when examining the graphs (Appendix L), the data from the PEWSS program showed that the specimens collected accurately captured the data when compared to the CDC data and the data from Nellis Air Force Base. Adenovirus (Appendix L-1) showed the sporadic nature of the pathogen during the two years shown for both the CDC and the PEWSS program. Appendices L-2 and L-3, showed the comparison of RSV for all 3 locations and the local comparison, respectively. The first graph showed peak activity within similar time frames of all 3 data sets. The second graph showed the local comparison of the data provided by the PEWSS program and data provided by Nellis AFB. The peaks of activity coincide in the same time frame, which showed both locations were observing similar activity during the same time frame. HPIV 1/2/3 (Appendix L-4 through L-6) have 3 separate seasonality's, with sporadic occurrences expected throughout the year. However, for all three pathogens, when the CDC showed increased activity, so did the PEWSS program for all three HPIV pathogens. Influenza A, subtypes not included, included all three locations (Appendix L-7). The heightened peaks of activity occurred during the same time frame. The local comparison of the PEWSS program and Nellis AFB for influenza A (Appendix L-8) showed very similar activity. However, the PEWSS program activity showed earlier activity than the Nellis AFB. While the two seasons depicted for influenza H1N1 (Appendix L-9) are similar in nature, the PEWSS program does show a slightly earlier detection than the CDC data for both seasons. Influenza B (Appendix L-10) showed similar findings of peak activity.

CHAPTER 5 - DISCUSSION

Previous and ongoing research has provided the medical community with valuable information about respiratory illnesses, especially those which afflict pediatrics. Respiratory illness is the second leading cause of death worldwide in children less than 5 years old.[32] The pathogens are easily spread by person-to-person contact, airborne droplets, or inanimate objects.[6] The influenza outbreak of 2009 caused over 1,000 deaths and 274,000 hospitalizations as estimated by the CDC.[5] Seasonality, demographics, signs and symptoms, prevention measures, and pathogenicity are just a few measures that have been greatly expanded over the years. This knowledge has been of tremendous help to the medical community in identifying respiratory illnesses. Coupled with surveillance, knowledge of pediatric respiratory illnesses that are circulating will be expanded, especially for the local public health community.

The Pediatric Early Warning Sentinel Surveillance (PEWSS) program was begun in May 2009 by the Southern Nevada Health District (SNHD), Office of Epidemiology and the Southern Nevada Public Health Laboratory (SNPHL). Using sentinel surveillance, they began collecting local data with the intent of giving the information back to the medical community to allow them to see what respiratory illnesses are currently circulating within the community. This form of surveillance was the ideal method for the PEWSS program, since not all of the pathogens are mandated as reportable events.[4] Sentinel surveillance also uses fewer resources than other systems and can give greater design flexibility.[4] The PEWSS program provides the information on different respiratory pathogens, such as adenovirus,

respiratory syncytial virus (RSV), human parainfluenza 1, 2 &3, influenza A (with subtypes), influenza B, and human metapneumovirus.

This study used the CDC "Updated guidelines for evaluating public health surveillance systems" to determine if this program was an effective and useful program and to streamline the goals and objectives of the program and also to improve the operation of the program.[1] In the guidelines, it is mentioned that not all aspects of these guidelines will fit every program and that they should be tailored to the program being evaluated. The rationale for the set of guidelines for this evaluation was to show the highlights of a program but also show portions that may need improvement. This evaluation used all of the aspects described in the guidelines and also included additional items to further show different aspects not listed in the guidelines.

Following the CDC guidelines, the strengths and weaknesses of the PEWSS program were emphasized. In the guidelines, the goal was to find the opinions and thoughts of the stakeholders that receive the information, their attitude towards the program and the uses for the information provided by the bulletins. Surveys were conducted from both types of stakeholders, those that only read and use the information provided by the weekly bulletins, and those that provide the information for the weekly bulletins. Both sides showed their high acceptance of the PEWSS program. The sites that provide the samples are the base of the program. The original four sites have continued their participation in the third year of the PEWSS program, along with the fifth site that was added this year. The five sentinel sites were recognized as public health hero's by the SNHD, Office of Epidemiology and the SNPHL, for their continued dedication to the PEWSS program and the community

(Appendix I). The SNPHL and the SNHD, Office of Epidemiology, also made the specimen collection and testing process as easy as possible on the busy pediatrician offices. SNPHL provided couriers and testing kits free of charge for the sites and the patients. All the site had to do was collect the specimen and the SNPHL took care of the rest. This provided convenience for the site and consistency for testing and handling of the specimens. Task B asked for a cost analysis to show that the funds were being used effectively and efficiently. With people and equipment already in place, the cost analysis showed that minimal cost is needed to run the PEWSS program and grants were primarily used for the supplies needed.

Task D, in the guidelines, looked at different components of the program and was divided into two parts. The first part was the ability of the program to answer at least one of six questions outlined by the CDC guidelines. The PEWSS program could answer three of the six. The second part of task D contained nine separate aspects targeted by the guidelines. This section highlighted some of the features of the PEWSS program; six of the nine components had a high rating. The program rated high in simplicity, in the ease of the operation and structure, flexibility when needed, timeliness, high data quality, and high acceptance by multiple stakeholders and operators. The program and the machinery needed to operate the program are very stable, with minimal downtime. One component was rated medium, representativeness. For routine surveillance, an unbiased sample is ideal. That is not the case for this program; the sample population is preselected. This is expected, using sentinel surveillance. Sentinel surveillance, for the PEWSS program, selects those already sick to discover what illnesses are circulating in the community. This is the basis for the program. Therefore, representativeness is not a true weakness of the program. The last two components, sensitivity and predictive value positive (PVP), were not rated for this program.

Both were not able to be calculated based on the program using sentinel surveillance and using a biased population.

Another aspect not addressed by the CDC guidelines, was how accurate the PEWSS program was at capturing data within the community. Extensive research has given us the knowledge of seasonality, trends, transmission, and etiologies of a variety of the respiratory illnesses, with the exception of the human metapneumovirus, which is a more recently discovered virus. For this portion of the evaluation, data gathered by the CDC and Nellis Air Force Base were used for comparison. Graphs were created and explored for the accuracy of the PEWSS program. Using 2 separate scales, one for PEWSS and Nellis data set and the other for the CDC data set, time frames were compared.

When examining the trends between the PEWSS program, the CDC data and the data gathered from Nellis Air Force Base, activity was very similar throughout the two years of data collected. RSV showed peak activity in all three data sets to occur at similar times during the two years (Appendix L-2). Influenza A showed similar peak local activity (Appendix L-8), and both showed similar peak activities to the CDC national data (Appendix L-7). Analogous results were seen for influenza H1N1 and influenza B, (Appendix L-9 and L-10 respectively). The similar seasonal nature of all the respiratory pathogens shows the accuracy of the data gathered by the PEWSS program. The local comparison between the PEWSS data and the Nellis AFB data showed similar seasonal activity between both locations, which further enforces the accuracy of the PEWSS program.

One of the limitations of the program is the method used for surveillance. Sentinel surveillance is not representative of the general public.[4] The program represents those

children which visit the pediatrician office. Excluded, are those who are slightly sick which do not visit the pediatrician's office, those who cannot afford to visit a pediatrician's office, or those who are extremely sick and visit an emergency room or clinic. In 2008, 91.5% of children, under 18 years of age, had a visit with a doctor, compared to 82.5% of adults. [2,24] Knowing that approximately three quarters of children visit a pediatrician's office[2] and 95.2% have a usual place of health care[2], the PEWSS program data from pediatrician's offices can be better representative of activity than an emergency room or clinic. Another limitation of study was the time frame allowed for responses for the public PEWSS bulletin survey. Two weeks was given to allow for responses. Another limitation was that the specimens for the first year of the EPIS program were retroactively tested for all of the additional pathogens. Originally, they were tested for H1N1 and then frozen. Later, they were thawed and then retested for the additional pathogens. Possible sample destruction during the process may have occurred, leading to false negative results. Improper specimen collection, also could lead to false negative results.

Throughout the evaluation and data analysis, the Pediatric Early Warning Surveillance System has proven that it is an effective and useful program in that it accurately captures current trends in the community and also relays the information captured by the program in a timely and efficient manner. All of the people involved with the program have shown passion in continuing their involvement in the PEWSS program and its continued existence. The CDC evaluation guidelines have shown that the positive attributes far outweigh the foreseen weaknesses due to the type of surveillance used to conduct the program. The additional data analysis reinforces the conclusion of the evaluation, the

PEWSS program is a brilliant program that accurately captures the data of the community and also does an exceptional job in relaying the information back to the community.

LIST OF ACRONYMS AND ABBREVIATIONS

AFB

Nellis Air Force Base

APHL

Association of Public Health Laboratories

CDC

Centers for Disease Control and Prevention

EPIS

Enhanced Pediatric Influenza Surveillance project

FDA

Food and Drug Administration

HMPV

Human Metapneumovirus

HPIV

Human Parainfluenza Virus

ICD

International Statistical Classification of Diseases and Related Health Problems

ILI

Influenza Like Illness

IRB

Institutional Review Board

IT

Information Technology

MMWR

Morbidity and Mortality Weekly Report

N/A

Not Applicable

NAC

Nevada Administrative Code

NREVSS

National Respiratory and Enteric Virus Surveillance Program

NRS

Nevada Revised Statutes

PEWSS

Pediatric Early Warning Sentinel Surveillance System

PVP

Predictive Value Positive

RSV

Respiratory Syncytial Virus

RT-PCR

Reverse Transcriptase Polymerase Chain Reaction

SNHD

Southern Nevada Health District

SNPHL

Southern Nevada Public Health Laboratory

VTM

Viral Transport Medium

WHO

World Health Orginization

Appendix A.

Checklist for Evaluating Public Health Surveillance Systems

Tasks for evaluating a surveillance system*	Page(s) in this report
□ Task A. Engage the stakeholders in the evaluation	4
□ Task B. Describe the surveillance system to be evaluated	4–11
□ 1. Describe the public health importance of the health-related event under surveillance	4– 5
□ a. Indices of frequency	
□ b. Indices of severity	
□ c. Disparities or inequities associated with the health-related event	
□ d. Costs associated with the health-related event	
□ e. Preventability	
□ f. Potential future clinical course in the absence of an intervention	
□ g. Public interest	
□ 2. Describe the purpose and operation of the surveillance system	5–10
□ a. Purpose and objectives of the system	
□ b. Planned uses of the data from the system	
□ c. Health-related event under surveillance, including case definition	
□ d. Legal authority for data collection	
□ e. The system resides where in organization(s)	
□ f. Level of integration with other systems, if appropriate	
□ g. Flow chart of system	
□ h. Components of system	
□ 1) Population under surveillance	
□ 2) Period of time of data collection	
□ 3) Data collection	
□ 4) Reporting sources of data	
□ 5) Data management	
□ 6) Data analysis and dissemination	
□ 7) Patient privacy, data confidentiality, and system security	
□ 8) Records management program	
□ 3. Describe the resources used to operate the surveillance system	10–11
□ a. Funding source(s)	
□ b. Personnel requirements	
□ c. Other resources	
□ Task C. Focus the evaluation design	11–12
□ 1. Determine the specific purpose of the evaluation	
□ 2. Identify stakeholders who will receive the findings and recommendations of the evaluation	
□ 3. Consider what will be done with the information generated from the evaluation	
□ 4. Specify the questions that will be answered by the evaluation	
□ 5. Determine standards for assessing the performance of the system	
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□ 1. Indicate the level of usefulness	13–14
□ 2. Describe each system attribute	14–24
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□ b. Flexibility	
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□ d. Acceptability	
□ e. Sensitivity	
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□ h. Timeliness	
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□ Task E. Justify and state conclusions, and make recommendations	24
□ Task F. Ensure use of evaluation findings and share lessons learned	25

* Adapted from *Framework for Program Evaluation in Public Health* [CDC. Framework for program evaluation in public health. MMWR 1999;48(RR-11)] and the original guidelines [CDC. Guidelines for evaluating surveillance systems. MMWR 1988;37(No. S-5)].

Appendix B.

Cross-reference of Tasks and Relevant Standards

Tasks for evaluating a surveillance system*	Relevant standards†
Task A. Engage the stakeholders in the evaluation.	***Stakeholder identification.*** Persons involved in or affected by the evaluation should be identified so that their needs can be addressed. ***Evaluator credibility.*** The persons conducting the evaluation should be trustworthy and competent in performing the evaluation to ensure that findings from the evaluation achieve maximum credibility and acceptance. ***Formal agreements.*** If applicable, all principal parties involved in an evaluation should agree in writing to their obligations (i.e., what is to be done, how, by whom, and when) so that each party must adhere to the conditions of the agreement or renegotiate them. ***Rights of human subjects.*** The evaluation should be designed and conducted in a manner that respects and protects the rights and welfare of human subjects. ***Human interactions.*** Evaluators should interact respectfully with other persons associated with an evaluation so that participants are not threatened or harmed. ***Conflict of interest.*** Conflict of interest should be handled openly and honestly so that the evaluation processes and results are not compromised. ***Metaevaluation.*** The evaluation should be formatively and summatively evaluated against these and other pertinent standards to guide its conduct appropriately and, on completion, to enable close examination of its strengths and weaknesses by stakeholders.
Task B. Describe the surveillance system to be evaluated.	***Complete and fair assessment.*** The evaluation should be complete and fair in its examination and recording of strengths and weaknesses of the system so that strengths can be enhanced and problem areas addressed. ***System documentation.*** The system being evaluated should be documented clearly and accurately. ***Context analysis.*** The context in which the system exists should be examined in enough detail to identify probable influences on the system. ***Metaevaluation.*** The evaluation should be formatively and summatively evaluated against these and other pertinent standards to guide its conduct appropriately and, on completion, to enable close examination of its strengths and weaknesses by stakeholders.
Task C. Focus the evaluation design.	***Evaluation impact.*** Evaluations should be planned, conducted, and reported in ways that encourage follow-through by stakeholders to increase the likelihood of the evaluation being used.

Cross-reference of Tasks and Relevant Standards

Tasks for evaluating a surveillance system*	Relevant standards†
Task C. (*Continued*) Focus the evaluation design.	***Practical procedures.*** Evaluation procedures should be practical while needed information is being obtained to keep disruptions to a minimum. ***Political viability.*** During the planning and conducting of the evaluation, consideration should be given to the varied positions of interest groups so that their cooperation can be obtained and possible attempts by any group to curtail evaluation operations or to bias or misapply the results can be averted or counteracted. ***Cost-effectiveness.*** The evaluation should be efficient and produce valuable information to justify expended resources. ***Service orientation.*** The evaluation should be designed to assist organizations in addressing and serving effectively the needs of the targeted participants. ***Complete and fair assessment.*** The evaluation should be complete and fair in its examination and recording of strengths and weaknesses of the system so that strengths can be enhanced and problem areas addressed. ***Fiscal responsibility.*** The evaluator's allocation and expenditure of resources should reflect sound accountability procedures by being prudent and ethically responsible so that expenditures are accountable and appropriate. ***Described purpose and procedures.*** The purpose and procedures of the evaluation should be monitored and described in enough detail to identify and assess them. The purpose of evaluating a surveillance system is to promote the best use of public health resources by ensuring that only important problems are under surveillance and that surveillance systems operate efficiently. ***Metaevaluation.*** The evaluation should be formatively and summatively evaluated against these and other pertinent standards to guide its conduct appropriately and, on completion, to enable close examination of its strengths and weaknesses by stakeholders.
Task D. Gather credible evidence regarding the performance of the surveillance system.	***Information scope and selection.*** Information collected should address pertinent questions regarding the system and be responsive to the needs and interests of clients and other specified stakeholders. ***Defensible information sources.*** Sources of information used in the system evaluation should be described in enough detail to assess the adequacy of the information.

Cross-reference of Tasks and Relevant Standards

Tasks for evaluating a surveillance system*	Relevant standards†
Task D. (*Continued*) Gather credible evidence regarding the performance of the surveillance system.	***Valid information.*** Information-gathering procedures should be developed and implemented to ensure a valid interpretation for the intended use. ***Reliable information.*** Information-gathering procedures should be developed and implemented to ensure sufficiently reliable information for the intended use. ***Systematic information.*** Information collected, processed, and reported in an evaluation should be systematically reviewed and any errors corrected. ***Metaevaluation.*** The evaluation should be formatively and summatively evaluated against these and other pertinent standards to guide its conduct appropriately and, on completion, to enable close examination of its strengths and weaknesses by stakeholders.
Task E. Justify and state conclusions, and make recommendations.	***Values identification.*** The perspectives, procedures, and rationale used to interpret the findings should be carefully described so that the bases for value judgments are clear. ***Analysis of information.*** Information should be analyzed appropriately and systematically so that evaluation questions are answered effectively. ***Justified conclusions.*** Conclusions that are reached should be explicitly justified for stakeholders' assessment. ***Metaevaluation.*** The evaluation should be formatively and summatively evaluated against these and other pertinent standards to guide its conduct appropriately and, on completion, to enable close examination of its strengths and weaknesses by stakeholders.
Task F. Ensure use of evaluation findings and share lessons learned.	***Evaluator credibility.*** The persons conducting the evaluation should be trustworthy and competent in performing the evaluation to ensure that findings from the evaluation achieve maximum credibility and acceptance. ***Report clarity.*** Evaluation reports should clearly describe the system being evaluated, including its context and the purposes, procedures, and findings of the evaluation so that essential information is provided and easily understood. ***Report timeliness and dissemination.*** Substantial interim findings and evaluation reports should be disseminated to intended users so that they can be used in a timely fashion.

Cross-reference of Tasks and Relevant Standards

Tasks for evaluating a surveillance system*	Relevant standards†
Task F. Ensure use of the findings of the evaluation and share lessons learned.	***Evaluation impact.*** Evaluations should be planned, conducted, and reported in ways that encourage follow-through by stakeholders to increase the likelihood of the evaluation being used. ***Disclosure of findings.*** The principal parties of an evaluation should ensure that the full evaluation findings with pertinent limitations are made accessible to the persons affected by the evaluation and any others with expressed legal rights to receive the results. ***Impartial reporting.*** Reporting procedures should guard against the distortion caused by personal feelings and biases of any party involved in the evaluation so that the evaluation reflects the findings fairly. ***Metaevaluation.*** The evaluation should be formatively and summatively evaluated against these and other pertinent standards to guide its conduct appropriately and, on completion, to enable close examination of its strengths and weaknesses by stakeholders.

* Adapted from *Framework for Program Evaluation in Public Health* [CDC. Framework for program evaluation in public health. MMWR 1999;48(RR–11)] and the original guidelines [CDC. Guidelines for evaluating surveillance systems. MMWR 1988;37(No. S-5)].

† Adapted from *Framework for Program Evaluation in Public Health* [CDC. Framework for program evaluation in public health. MMWR 1999;48(RR-11)].

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Appendix C
Biomedical IRB – Exempt Review
Deemed Exempt

DATE: February 28, 2011

TO: **Dr. Mark Buttner,** Environmental and Occupational Health

FROM: Office of Research Integrity – Human Subjects

RE: Notification of review by /Cindy Lee-Tataseo/Ms. Cindy Lee-Tataseo, BS, CIP, CIM
Protocol Title: Evaluation of the Pilot Program, the Pediatric Early Warning Surveillance System (PEWSS), and It's Efficacy in Monitoring Pediatric Illness in Clark County, Nevada
Protocol # 1102-3726M

This memorandum is notification that the project referenced above has been reviewed as indicated in Federal regulatory statutes 45CFR46 and deemed exempt under 45 CFR 46.101(b)4.

PLEASE NOTE:
Upon Approval, the research team is responsible for conducting the research as stated in the exempt application reviewed by the ORI – HS and/or the IRB which shall include using the most recently submitted Informed Consent/Assent Forms (Information Sheet) and recruitment materials. The official versions of these forms are indicated by footer which contains the date exempted.

Any changes to the application may cause this project to require a different level of IRB review. Should any changes need to be made, please submit a **Modification Form**. When the above-referenced project has been completed, please submit a **Continuing Review/Progress Completion report** to notify ORI – HS of its closure.

If you have questions or require any assistance, please contact the Office of Research Integrity - Human Subjects at IRB@unlv.edu or call 895-2794.

PEWSS Bulletin Users Survey Appendix D SurveyMonkey

1. How often do you receive the PEWSS bulletin:

	Response Percent	Response Count
Every Week	**73.7%**	**14**
Frequently, but not every week	26.3%	5
Sporadically (from time to time)	0.0%	0
answered question		**19**
skipped question		**0**

2. How do you receive the PEWSS bulletin? (check all that apply)

	Response Percent	Response Count
Directly from SNHD emails	**89.5%**	**17**
From the SNHD website	5.3%	1
Email that was forwarded	0.0%	0
Faxed from SNHD	5.3%	1
Faxed from someone else	0.0%	0
answered question		**19**
skipped question		**0**

3. Do you forward the PEWSS bulletin to others?

	Response Percent	Response Count
Yes	36.8%	7
No	**63.2%**	**12**
	answered question	**19**
	skipped question	**0**

4. To how many people do you forward it?

	Response Percent	Response Count
1-4	**42.9%**	**3**
5-9	0.0%	0
10-19	14.3%	1
20+	**42.9%**	**3**
	answered question	**7**
	skipped question	**12**

5. Have you ever read the PEWSS weekly bulletin?

	Response Percent	Response Count
Yes	**89.5%**	**17**
No	10.5%	2
	answered question	**19**
	skipped question	**0**

6. How often do you read the PEWSS bulletin?

	Response Percent	Response Count
Every Week	**64.7%**	**11**
Frequently, but not every week	29.4%	5
Sporadically (from time to time)	5.9%	1
	answered question	**17**
	skipped question	**2**

7. Do you feel that the information in the PEWSS bulletins is:

	Very	Somewhat	Not at all	Rating Average	Response Count
Timely	**88.2% (15)**	11.8% (2)	0.0% (0)	1.12	17
Accurate	**88.2% (15)**	11.8% (2)	0.0% (0)	1.12	17
Relevant to you	**82.4% (14)**	17.6% (3)	0.0% (0)	1.18	17
Useful	**88.2% (15)**	11.8% (2)	0.0% (0)	1.12	17
Easy to read/understand	**76.5% (13)**	23.5% (4)	0.0% (0)	1.24	17
			answered question		**17**
			skipped question		**2**

8. Do you use the PEWSS bulletin in the following ways:

	Frequently	Occasionally	Never	Rating Average	Response Count
To guide clinical diagnosis	29.4% (5)	**35.3% (6)**	**35.3% (6)**	2.06	17
To guide empirical treatment	23.5% (4)	23.5% (4)	**52.9% (9)**	2.29	17
To order laboratory testing	17.6% (3)	17.6% (3)	**64.7% (11)**	2.47	17
For general information	**100.0% (17)**	0.0% (0)	0.0% (0)	1.00	17
			answered question		**17**
			skipped question		**2**

9. What do you find most useful about the PEWSS bulletin?

	Response Count
	11
answered question	**11**
skipped question	**8**

10. What do you find least useful about the PEWSS bulletin?

	Response Count
	10
answered question	**10**
skipped question	**9**

11. What (if any) improvements would you suggest be made to the bulletin?

	Response Count
	10
answered question	**10**
skipped question	**9**

12. What is your clinical practice setting (check all that apply)?

	Response Percent	Response Count
Hospital	12.5%	2
Urgent Care	6.3%	1
Private Office	18.8%	3
Small Group Practice	12.5%	2
Large Group Practice	6.3%	1
Not Applicable	**31.3%**	**5**
Other	18.8%	3
	Other	2
	answered question	**16**
	skipped question	**3**

13. What is your profession?

	Response Percent	Response Count
Physician	**37.5%**	**6**
Physician Assistant	0.0%	0
Nurse (LPN/RN/APN etc.)	12.5%	2
Other medical staff	0.0%	0
Front office staff	0.0%	0
Laboratory Staff	12.5%	2
Administration Staff	6.3%	1
Public health Staff	0.0%	0
Educator	12.5%	2
Student	0.0%	0
Other (please specify)	18.8%	3
	answered question	**16**
	skipped question	**3**

14. What is your specialty or primary area of practice?

	Response Count
	7
answered question	**7**
skipped question	**12**

15. Are you part of the SNHD PEWSS distribution list?

	Response Percent	Response Count
Yes	87.5%	14
No	12.5%	2
answered question		16
skipped question		3

16. If you would like to become a part of the SNHD PEWSS bulletin, please leave us your preferred choice of contact, fax or e-mail. For distribution purposes, please leave your name, e-mail address and/or fax number so we can add you to our weekly list.

	Response Count
	0
answered question	0
skipped question	19

17. If there are any comments you would like to make regarding the information contained in the PEWSS bulletin, please provide them here.

	Response Count
	5
answered question	5
skipped question	14

Page 6, Q1. What do you find most useful about the PEWSS bulletin?		
1	Knowing the currently circulating respiratory viruses in the community	Apr 28, 2011 7:50 AM
2	The virus report	Apr 27, 2011 2:44 PM
3	Testing results (table 1) and weekly positivity rates (fig. 2)	Apr 25, 2011 3:06 PM
4	The ages of the children that have tested for the specific illnesses.	Apr 25, 2011 10:11 AM
5	Table 1- Testing Results etc.	Apr 21, 2011 10:36 AM
6	current information	Apr 21, 2011 7:00 AM
7	Frequency	Apr 20, 2011 9:20 PM
8	Informative and lets me know what to look out for and pass the info to my parents	Apr 20, 2011 8:22 PM
9	Helps me deteime what viruses are currently prevailing in the community	Apr 20, 2011 4:11 PM
10	Specificly identified viral agents.	Apr 20, 2011 3:49 PM
11	Provides information on viruses that are circulating in the community	Apr 20, 2011 3:19 PM

Page 6, Q2. What do you find least useful about the PEWSS bulletin?		
1	the graphs	Apr 28, 2011 7:50 AM
2	Small number of clinic sites	Apr 27, 2011 2:44 PM
3	Age distribution data	Apr 25, 2011 3:06 PM
4	Figure 2- Weekly Positivity Rates for Organisms Tested.	Apr 25, 2011 10:11 AM
5	Figure 2 Weekly Graph Just do not need it in my program	Apr 21, 2011 10:36 AM
6	never thought about that	Apr 21, 2011 7:00 AM
7	Nothing	Apr 20, 2011 9:20 PM
8	nothing	Apr 20, 2011 8:22 PM
9	n/a	Apr 20, 2011 3:49 PM
10	Does not contain additional information on treatment or testing. Age breakdown is not useful	Apr 20, 2011 3:19 PM

Page 6, Q3. What (if any) improvements would you suggest be made to the bulletin?		
1	connect the data to national data.	Apr 28, 2011 7:50 AM
2	Add more offices if able.	Apr 27, 2011 2:44 PM
3	The graphs in figure 2 could be made more legible by expanding the y-axis and making the line plot thinner, but this would require extra space and lenghten the report	Apr 25, 2011 3:06 PM
4	Provide explinations of each chart to help us better understand the figures.	Apr 25, 2011 10:11 AM
5	Would like more VPD results, how about cases in the neighboring states?	Apr 21, 2011 10:36 AM
6	nothing it fits my needs	Apr 21, 2011 7:00 AM
7	Keep up the good work	Apr 20, 2011 9:20 PM
8	none	Apr 20, 2011 8:22 PM
9	None. The bulletin assists in keeping abreast of what viral agents are out in the community.	Apr 20, 2011 3:49 PM
10	Include technical information regarding recommended antiviral treatment; testing capabilities; relevant websites	Apr 20, 2011 3:19 PM

Page 7, Q1. What is your clinical practice setting (check all that apply)?		
1	Pharmaceutical representative	Apr 27, 2011 2:44 PM
2	Child Care Facility	Apr 25, 2011 10:12 AM

Page 7, Q2. What is your profession?		
1	ICP	Apr 21, 2011 7:00 AM
2	home day care	Apr 20, 2011 8:22 PM
3	Day care provider	Apr 20, 2011 7:32 PM

Page 8, Q1. What is your specialty or primary area of practice?		
1	Pediatrics	Apr 27, 2011 2:44 PM
2	med surg,rehab	Apr 27, 2011 12:07 PM
3	Peds	Apr 20, 2011 9:21 PM
4	Pediatrics	Apr 20, 2011 4:12 PM
5	Preventive medicine.	Apr 20, 2011 3:50 PM
6	Family Medicine	Apr 20, 2011 3:10 PM
7	pediatrics	Apr 20, 2011 2:42 PM

Page 11, Q1. If there are any comments you would like to make regarding the information contained in the PEWSS bulletin, please provide them here.		
1	none	Apr 27, 2011 12:07 PM
2	Excellent job, thanks!	Apr 25, 2011 3:07 PM
3	no	Apr 20, 2011 8:23 PM
4	I print the bulletin and post it on the door to keep my parents informed.I recently discovered them.i used to delete them not knowing who it was from.They are precious .Thank you.	Apr 20, 2011 4:04 PM
5	Provides timely information regarding the multiple types of viruses that are circulating. The weekly reports are good, but an additional technical bulletin provided on periodic basis would provide more information	Apr 20, 2011 3:22 PM

PEWSS Laboratory Survey

Appendix E

SurveyMonkey

1. Which location are you at?

		Response Percent	Response Count
Southwest Medical Pediatrics		26.3%	5
Lake Mead Pediatrics		15.8%	3
Foothills Pediatrics (S. Eastern)		15.8%	3
Foothills Pediatrics (Maryland Parkway)		10.5%	2
Fremont Childrens Clinic		**31.6%**	**6**
		answered question	**19**
		skipped question	**0**

2. What is your profession?

	Response Percent	Response Count
Physician	**42.1%**	**8**
Physician Assistant	5.3%	1
Nurse (LPN/RN/APN, etc.)	15.8%	3
Front Office	5.3%	1
Laboratory Staff	0.0%	0
Administration Staff	5.3%	1
Public Health Staff	0.0%	0
Other Medical Staff	15.8%	3
Educator	0.0%	0
Student	0.0%	0
Other	15.8%	3
	Other (please specify)	3
	answered question	**19**
	skipped question	**0**

3. Please Answer

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable	Response Count
SNHD and SNPHL have responded promptly to any request made to them by our facility staff	**55.6% (10)**	27.8% (5)	5.6% (1)	0.0% (0)	0.0% (0)	11.1% (2)	18
SNHD and SNPHL staff members are courteous and professional	**68.4% (13)**	26.3% (5)	5.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	19
SNPHL test requisition forms are easy to complete	**68.4% (13)**	26.3% (5)	5.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	19
Having SNPHLY couriers come on Monday, Wednesday and Friday for specimen pickup is easier then calling for pickup	**78.9% (15)**	21.1% (4)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	19
Patient laboratory reports provided by SNPHL are easy to understand and interpret	**73.7% (14)**	26.3% (5)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	19
PEWSS bulletins provided by SNHD Office of Epidemiology are easy to understand and interpret	**63.2% (12)**	36.8% (7)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	19
Our facility staff feels competent in collecting patient specimens	**63.2% (12)**	31.6% (6)	5.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	19
My overall satisfaction with SNHD and SNPHL service is high	**68.4% (13)**	31.6% (6)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	19
Our facility would recommend partnering with SNHD and SNPHL to colleagues	**68.4% (13)**	31.6% (6)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	19
It is useful for the office to be notified of interesting/unusual results by the SNHD Office of Epidemiology	**68.4% (13)**	26.3% (5)	5.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	19
						answered question	**19**
						skipped question	**0**

4. Which staff members (doctor, nurse, medical assistant, etc.) in your facility collect nasal swabs for the PEWSS program?

	Response Count
	19
answered question	**19**
skipped question	**0**

5. Approximately what percent of patient visits to the facility are wellness checkups?

	Response Count
	18
answered question	**18**
skipped question	**1**

6. How do you receive the PEWSS bulletin?

	Response Percent	Response Count
SNHD emails	**52.9%**	**9**
Email that was forwarded	17.6%	3
Faxed from someone else	17.6%	3
SNHD website	5.9%	1
Faxed from SNHD	**52.9%**	**9**
SNPHL courier	47.1%	8
Other	5.9%	1
answered question		**17**
skipped question		**2**

7. To how many people do you forward the PEWSS bulletin

	Response Percent	Response Count
0	**52.9%**	**9**
1-4	23.5%	4
5-9	17.6%	3
10-19	0.0%	0
20+	5.9%	1
	answered question	**17**
	skipped question	**2**

8. How often do you read the PEWSS bulletin

	Response Percent	Response Count
Every week	**44.4%**	**8**
Frequently but not every week	22.2%	4
Sporadically (from time to time)	27.8%	5
Never	5.6%	1
	answered question	**18**
	skipped question	**1**

9. Do you use the PEWSS bulletins in the following ways

		Response Percent	Response Count
To guide clinical diagnosis		44.4%	8
To guide emperical treatment		27.8%	5
To order laboratory testing		5.6%	1
For general information		**77.8%**	**14**
Not Used		11.1%	2
Other		5.6%	1
		Other (please specify)	1
		answered question	**18**
		skipped question	**1**

10. Do you think the information in the PEWSS bulletins are:

		Response Percent	Response Count
Timely		83.3%	15
Accurate		83.3%	15
Relevant to you		77.8%	14
Useful		**88.9%**	**16**
Easy to read/understand		**88.9%**	**16**
Not timely		0.0%	0
Not accurate		0.0%	0
Not relevant to you		5.6%	1
Not useful		0.0%	0
Not easy to read/understand		0.0%	0
		answered question	**18**
		skipped question	**1**

11. What do you find most and/or least useful about the PEWSS bulletin?

	Response Count
	8
answered question	**8**
skipped question	**11**

12. What (if any) improvements would you suggest be made to the bulletin?

	Response Count
	8
answered question	8
skipped question	11

13. Are there any SNHD service areas that need improvement? Please identify the area and explain the specific problem(s)below, giving as much detail as possible and suggestions for improvement?

	Response Count
	8
answered question	8
skipped question	11

Page 1, Q2. What is your profession?

1	medical assistant	Jun 16, 2011 1:48 PM
2	medical assistant	Jun 16, 2011 1:44 PM
3	Medical assistant	Jun 16, 2011 1:13 PM

Page 1, Q4. Which staff members (doctor, nurse, medical assistant, etc.) in your facility collect nasal swabs for the PEWSS program?		
1	Doctor, nurse	Jun 17, 2011 10:27 AM
2	doctor, medical assistants	Jun 16, 2011 1:48 PM
3	medical assistant	Jun 16, 2011 1:47 PM
4	Nurse	Jun 16, 2011 1:46 PM
5	medical assistant, sometimes Dr. Duddy will do it	Jun 16, 2011 1:44 PM
6	MA's	Jun 16, 2011 1:29 PM
7	medical assistants	Jun 16, 2011 1:13 PM
8	medical assistant	Jun 16, 2011 1:11 PM
9	all nursing staff	Jun 16, 2011 1:09 PM
10	myself, 2 other nurses, 2 doctors	Jun 16, 2011 1:09 PM
11	the physicians and all 3 nurses (LPN's and RN's)	Jun 16, 2011 1:07 PM
12	physicians, residents, nursing staff	Jun 16, 2011 1:04 PM
13	Nurse	Jun 16, 2011 1:02 PM
14	Dr. Taguha, Jose Lopez	Jun 16, 2011 1:00 PM
15	Doctor, Medical Assitant	Jun 16, 2011 12:59 PM
16	medical assistant, MD	Jun 16, 2011 12:58 PM
17	medical assistant	Jun 16, 2011 12:56 PM
18	Medical assistant	Jun 16, 2011 12:54 PM
19	medical assistant	Jun 16, 2011 12:52 PM

Page 1, Q5. Approximately what percent of patient visits to the facility are wellness checkups?		
1	depends on time of year, 60%	Jun 17, 2011 10:27 AM
2	60	Jun 16, 2011 1:48 PM
3	50	Jun 16, 2011 1:47 PM
4	40	Jun 16, 2011 1:46 PM
5	75	Jun 16, 2011 1:44 PM
6	40	Jun 16, 2011 1:29 PM
7	50%	Jun 16, 2011 1:13 PM
8	50%	Jun 16, 2011 1:11 PM
9	unknown	Jun 16, 2011 1:09 PM
10	50% or more	Jun 16, 2011 1:07 PM
11	50	Jun 16, 2011 1:04 PM
12	45	Jun 16, 2011 1:02 PM
13	60-70	Jun 16, 2011 1:00 PM
14	70	Jun 16, 2011 12:59 PM
15	70	Jun 16, 2011 12:58 PM
16	this time of year 75%	Jun 16, 2011 12:56 PM
17	75%, during this time of year	Jun 16, 2011 12:54 PM
18	50	Jun 16, 2011 12:52 PM

Page 2, Q9. Do you use the PEWSS bulletins in the following ways		
1	help in discussion with parents	Jun 16, 2011 1:08 PM

Page 2, Q11. What do you find most and/or least useful about the PEWSS bulletin?		
1	Influenza presence. Also, I can show to patients to convince when antibiotic not needed	Jun 17, 2011 10:29 AM
2	informative	Jun 16, 2011 1:47 PM
3	too long	Jun 16, 2011 1:29 PM
4	everything is very helpfull and understanding	Jun 16, 2011 1:14 PM
5	the one sentence/paragraph summary... positive tests for xyz virus have been detected	Jun 16, 2011 1:08 PM
6	the direct statement of what was found	Jun 16, 2011 1:04 PM
7	reinforces ability to inform parents of viral etiology vs. bacteria	Jun 16, 2011 1:03 PM
8	it is easy to read and understand	Jun 16, 2011 12:56 PM

Page 2, Q12. What (if any) improvements would you suggest be made to the bulletin?		
1	n/a	Jun 16, 2011 1:47 PM
2	none	Jun 16, 2011 1:46 PM
3	list positive	Jun 16, 2011 1:29 PM
4	none:)	Jun 16, 2011 1:14 PM
5	n/a	Jun 16, 2011 1:09 PM
6	better graphs	Jun 16, 2011 1:04 PM
7	none	Jun 16, 2011 12:56 PM
8	I wasn't aware of pediatric early warning surveillance	Jun 16, 2011 12:53 PM

Page 2, Q13. Are there any SNHD service areas that need improvement? Please identify the area and explain the specific problem(s)below, giving as much detail as possible and suggestions for improvement?		
1	Advocate for our community with respect to non-vaccinators. People "lie and tell CCSD they are religiously opposed." Use lortab in community. Advocate for "medical home"	Jun 17, 2011 10:29 AM
2	n/a	Jun 16, 2011 1:47 PM
3	seems fine	Jun 16, 2011 1:46 PM
4	no	Jun 16, 2011 1:45 PM
5	none:)	Jun 16, 2011 1:14 PM
6	n/a	Jun 16, 2011 1:09 PM
7	I am pleased with SNHD	Jun 16, 2011 1:01 PM
8	none at this time	Jun 16, 2011 12:56 PM

Appendix F

SNHD Pediatric Early Warning Sentinel Surveillance (PEWSS) Report: June 22, 2011

All Reporting Sites, Through the Week Ending June 18, 2011

General Update

The Southern Nevada Health District (SNHD) Pediatric Early Warning Sentinel Surveillance (PEWSS) has detected Human Metapneumovirus and Parainfluenza 1 for the week ending June 18, 2011.

The low number of patients who met testing criteria (fever >100°F accompanied by a cough and/or sore throat) and were able to provide specimens for testing this surveillance period (Fig. 1), coupled with the low variety of viruses detected (Table 1), suggest that both the types of respiratory viruses circulating in our community and their levels of circulation are low.

The PEWSS reports are disseminated weekly to the medical community by email, fax, and online at http://www.southernnevadahealthdistrict.org/stats-reports/influenza.php. For questions about PEWSS, please contact the SNHD Office of Epidemiology at 702.759.1300.

Table 1 - Testing Results, Current Week and Previous Four Weeks

	Week Ending										Project to Date	
	5/21		5/28		6/4		6/11		6/18		Since 5/26/10	
PCR Testing Results	n	%	n	%	n	%	n	%	n	%	n	%
All negative	5	45	5	38	7	64	9	64	2	33	417	46
Influenza A Positive*	0	0	0	0	0	0	0	0	0	0	117	13
Influenza A 2009 H1N1	0	0	0	0	0	0	0	0	0	0	64	7
Influenza A H1 Positive	0	0	0	0	0	0	0	0	0	0	0	0
Influenza A H3 Positive	0	0	0	0	0	0	0	0	0	0	53	6
Influenza B Positive	0	0	1	8	0	0	0	0	0	0	77	9
Adenovirus Positive	0	0	1	8	2	18	0	0	0	0	61	7
Human Metapneumovirus Positive	3	27	4	31	0	0	4	29	3	50	36	4
Parainfluenza 1 Positive	1	9	0	0	1	9	0	0	1	17	18	2
Parainfluenza 2 Positive	0	0	0	0	0	0	0	0	0	0	26	3
Parainfluenza 3 Positive	2	18	1	8	1	9	1	7	0	0	83	9
RSV Positive	0	0	1	8	0	0	0	0	0	0	100	11
Coinfections	0	0	0	0	0	0	0	0	0	0	30	3
Specimens Tested	11		13		11		14		6		905	

* Includes Influenza of all subtypes

Figure 1 - Weekly Number of Specimens Tested

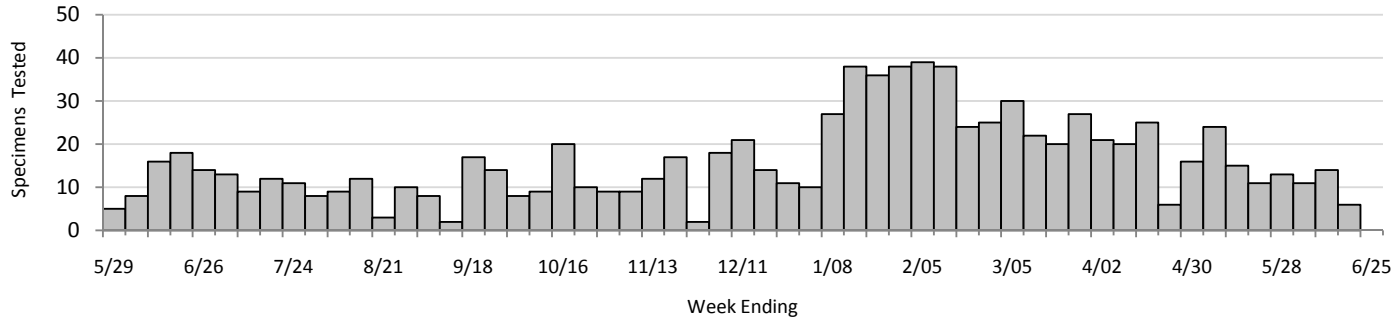


Figure 2 - Weekly Positivity Rates for Organisms Tested

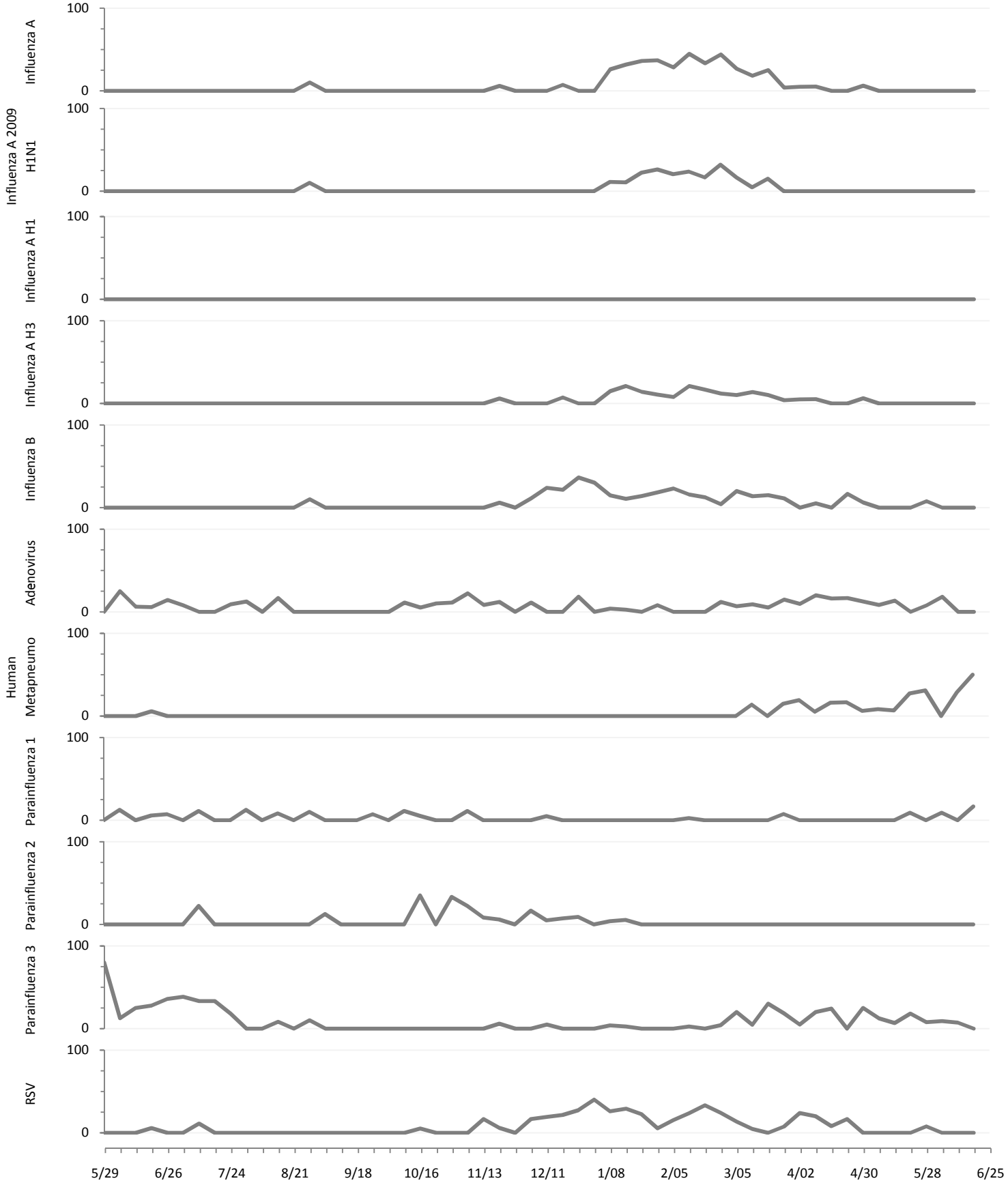
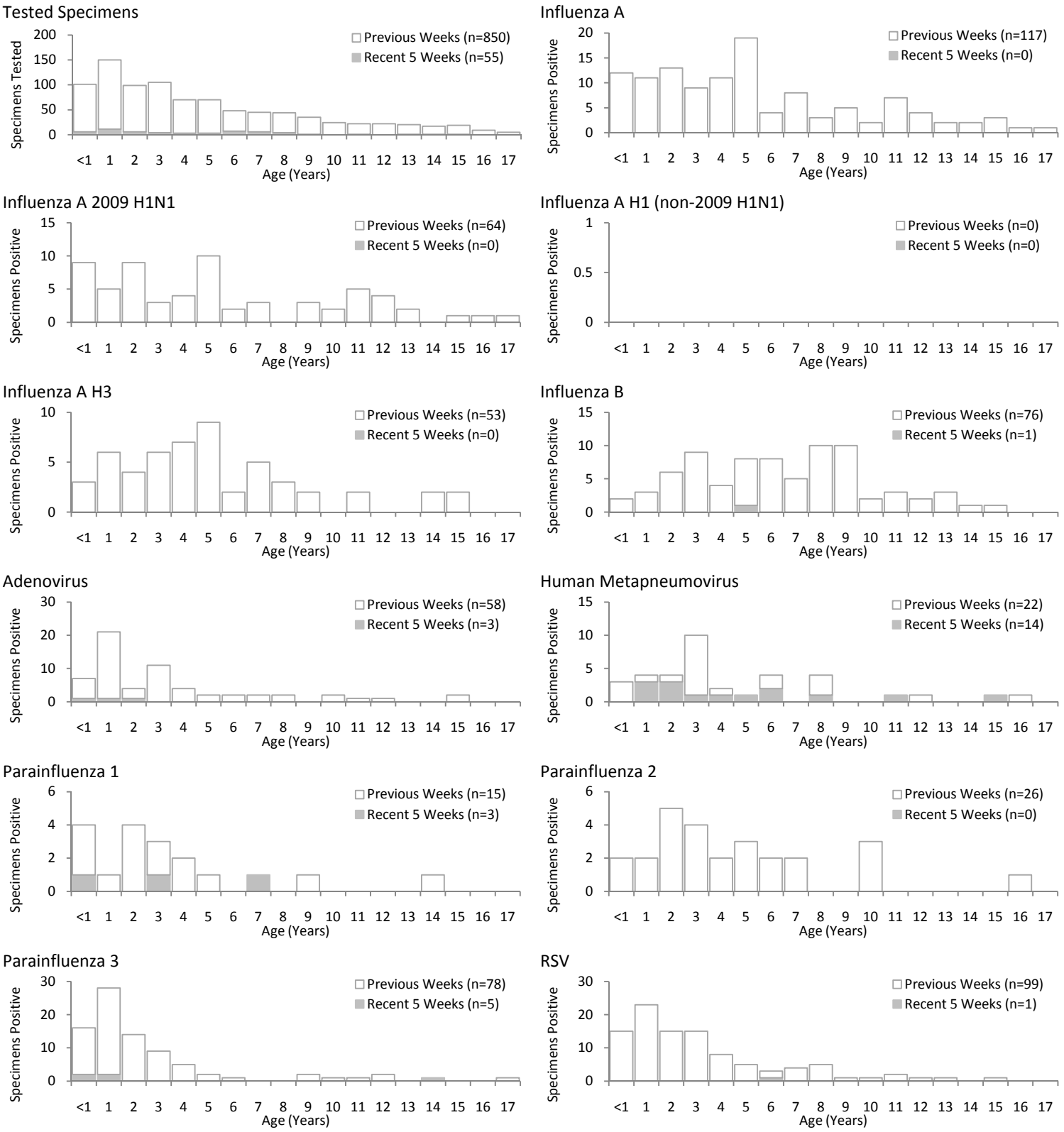


Figure 3. Age distributions of patients from whom specimens were tested and who tested positive



Appendix G

SNHD Pediatric Early Warning Sentinel Surveillance (PEWSS) Report: June 29, 2011

All Reporting Sites, Through the Week Ending June 25, 2011

The PEWSS reports are disseminated weekly by email, fax, and online at http://www.southernnevadahealthdistrict.org/stats-reports/influenza.php. For questions about PEWSS, please contact the SNHD Office of Epidemiology at 702.759.1300.

General Update

During the week ending June 25, 2011, the following viruses were identified with a low volume of testing: Adenovirus, Human Metapneumovirus and Parainfluenza 3.

Over the past five weeks:
Human Metapneumovirus and Parainfluenza 3 have been circulating in the community at low levels.
Influenza B, Adenovirus and Parainfluenza 1 have been sporadically identified in the community.
Influenza A and Parainfluenza 2 have not been identified in the communuity.

Table 1 - Testing Results, Current Week and Previous Four Weeks

	Week Ending										
	5/28		6/4		6/11		6/18		6/25		
PCR Testing Results	n	%	n	%	n	%	n	%	n	%	Interpretation
All negative	5	38%	7	64%	9	64%	2	33%	4	44%	
Influenza A Positive	0	0%	0	0%	0	0%	0	0%	0	0%	Not Detected
Influenza B Positive	1	8%	0	0%	0	0%	0	0%	0	0%	Sporadic
Adenovirus Positive	1	8%	2	18%	0	0%	0	0%	1	11%	Sporadic
Human Metapneumovirus Positive	4	31%	0	0%	4	29%	3	50%	2	22%	Low
Parainfluenza 1 Positive	0	0%	1	9%	0	0%	1	17%	0	0%	Sporadic
Parainfluenza 2 Positive	0	0%	0	0%	0	0%	0	0%	0	0%	Not Detected
Parainfluenza 3 Positive	1	8%	1	9%	1	7%	0	0%	2	22%	Low
RSV Positive	1	8%	0	0%	0	0%	0	0%	0	0%	Sporadic
Coinfections	0	0%	0	0%	0	0%	0	0%	0	0%	
Specimens Tested	13	-	11	-	14	-	6	-	9	-	Low Volume

Table 2 - Influenza A Typing, Current Week and Previous Four Weeks

	Week Ending										5-Week Totals	
	5/28		6/4		6/11		6/18		6/25			
Influenza A Typing (% of influenza A)	n	%	n	%	n	%	n	%	n	%	n	%
Influenza A 2009 H1N1	0	-	0	-	0	-	0	-	0	-	0	-
Influenza A H1	0	-	0	-	0	-	0	-	0	-	0	-
Influenza A H3	0	-	0	-	0	-	0	-	0	-	0	-

Figure 1 - Weekly Number of Specimens Tested

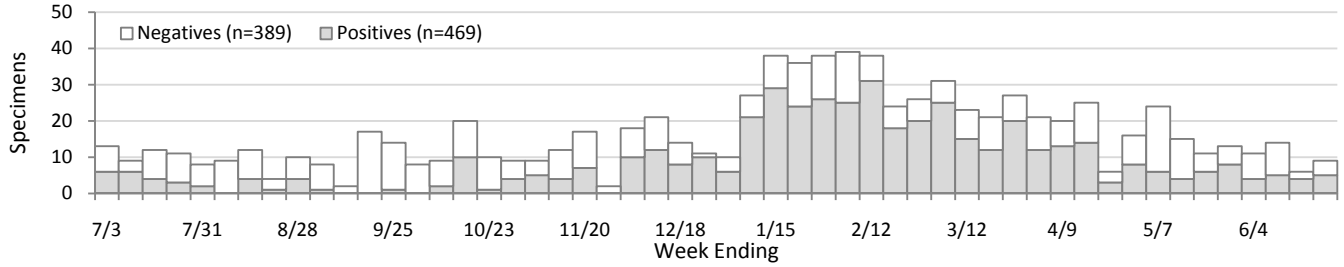
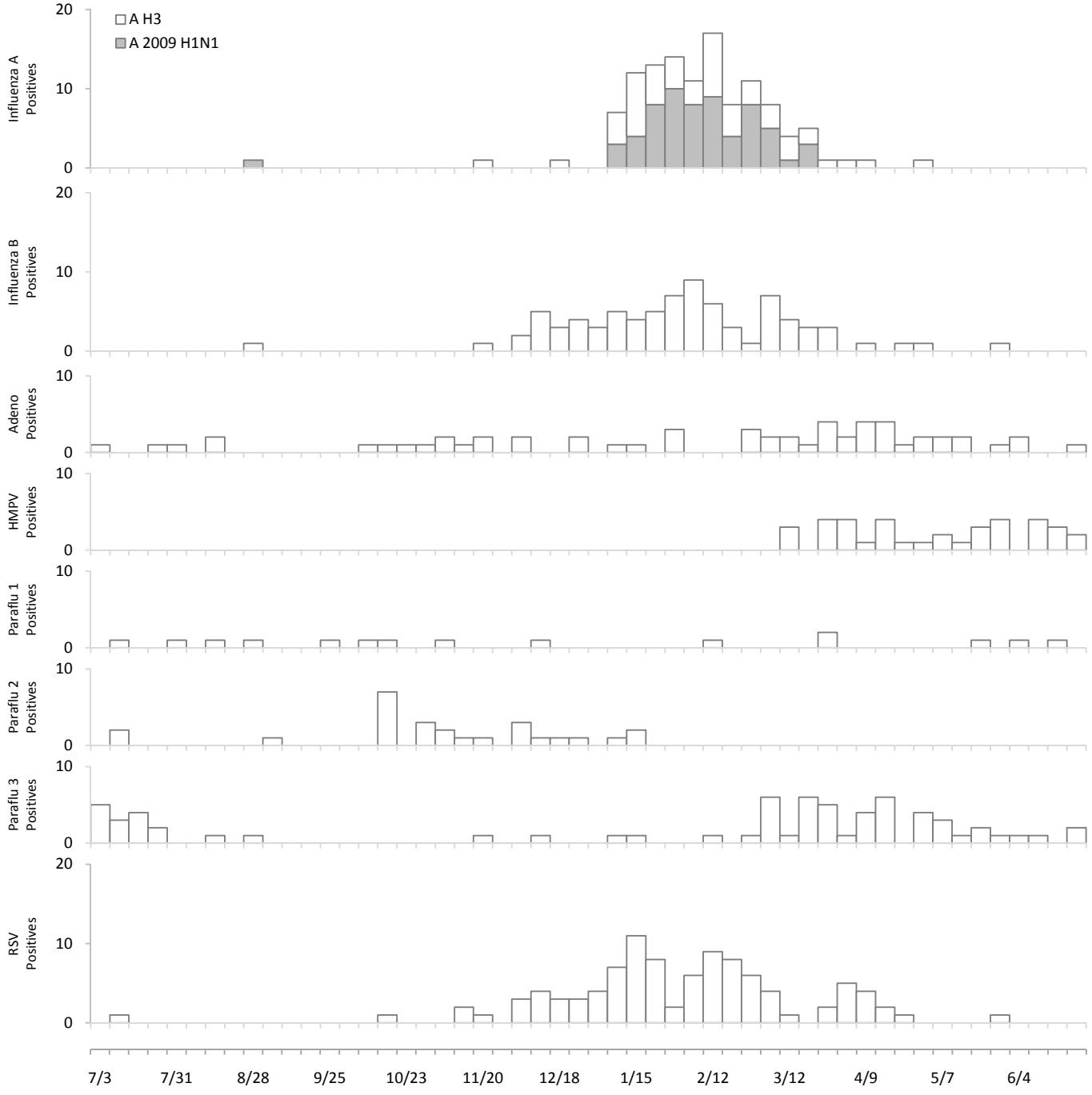


Figure 2. Weekly Positive Counts for Organisims Tested



Other News and Information

The format for the PEWSS weekly bulletins has been updated to display surveillance data from the previous year, and in response to replies from user surveys.

Program: Pediatric Early Warning Sentinel Surveillance (PEWSS) Logic Model
Situation: Surveillance for laboratory confirmed cases of influenza and Respiratory Syncytial Virus (RSV) has been conducted for several years but passive systems are dependent on healthcare providers' index of suspicion and their decisions to test. Sentinel site pediatric surveillance for these pathogens is superior for early detection of emergence of influenza and would likely be superior for surveillance and for detection of emergence of other respiratory pathogens, potentially establishing seasonality for these pathogens.

Resources	Activities	Outputs	Outcomes -- Impact		
			Short	*Medium*	*Long*
• Funding to support program • Purchasing services • Clinical Laboratory Scientist • Epidemiologist • Courier services • Long term sample storage • 6 Pediatric Sentinel Sites • Laboratory Supplies • Laboratory reagents • Laboratory Equipment • Written Procedures • Validated testing methods • Trained and competent laboratory staff • Biannual proficiency testing material Evaluation tool for sentinel sites • Evaluation tool for OOE and SNPHL	• Secure Funding • Recruit Sentinel Sites • Train sentinel sites on program procedures, specimen collection and storage • Encouraging program compliance through direct contact with sentinel site staff • Collection of up to 10 respiratory samples at each sentinel site per week • Transport of up to 60 respiratory samples per week from the 6 sentinel sites • Laboratory accessioning, extraction and analysis of up to 60 samples per week • Participation in biannual proficiency testing • Perform initial, 6 months and annual technical staff competency • Provide storage of samples for possible future testing • Perform evaluation of sentinel sites by OOE and SNPHL • Perform evaluation of PEWSS process and reporting by sentinel sites	• Final individual test reports are provided to sentinel sites • Final individual test reports are provided to Epidemiology for data analysis • Data is analyzed for trends • Data is reported at least monthly and up to weekly if specific disease trends are increasing • Quarterly and annual reports developed and distributed • Assessment of evaluations performed by sentinel sites, OOE and SNPHL	• Early detection of seasonal emergence of respiratory pathogens • Trending of respiratory pathogens • Availability of samples for additional characterization at CDC	• Trending for more respiratory pathogens (besides influenza and RSV)	• Potential for understanding the seasonality of respiratory pathogens besides influenza and RSV • Potential for assisting in determining cause of respiratory illness spikes seen in syndromic surveillance systems • Potential to identify emerging respiratory virus • Potential to strengthen community partnerships • Potential for development of standardized process for laboratory based surveillance of community infectious diseases

Assumptions
Pediatric patients are uniquely susceptible to respiratory pathogens
Parents are more likely to seek healthcare for ill children than for themselves if ill with respiratory symptoms
Pediatricians do not routinely collect laboratory specimens on sick children
Identification of these viruses does not usually provide information critical to management of the child's illness
Knowledge of virus activity in the community provides valuable information for public health prevention
Charging patients for the testing is not appropriate

External Factors
Sentinel site selection and participation
Availability of courier services to transport collected samples
Availability of validated laboratory tests to detect viruses
Availability of trained and competent laboratory staff
Availability of proficiency material for test method
Availability of funding

Rev. 3/10

Appendix I

FOR IMMEDIATE RELEASE
April 28, 2011

Health District names Public Health Heroes

LAS VEGAS – The Southern Nevada Health District announced its annual Public Health Heroes, recognition given to individuals or organizations whose efforts positively affect the health and well-being of the community. This year's winners were honored at the April 28 Southern Nevada District Board of Health meeting.

The 2011 Public Health Heroes are:

Patrick Fogerty and Michael Schultz
New York New York Hotel & Casino/ARK Restaurant Corporation
Patrick Fogerty and Michael Schultz serve as the liaison between New York New York Hotel and Casino and ARK Restaurant Corporation and the health district. Fogerty and Schultz were named for their diligence regarding health district policies and regulations that impact their permitted establishments - whether they are leased outlets or hotel-owned food facilities. Both work closely with health district staff when they are obtaining new equipment or implementing new property practices to make sure they remain in compliance with health district permits, regulations and policies. Fogerty and Schultz maintain on-the-job training for all staff to ensure food handlers have an in-depth understanding of safe food handling practices. The two developed mock food inspection programs to support ARK Restaurant Corporation and property-owned food safety practices and public health policies, all of which ensure that the public and New York New York's customers are protected.

Pediatric Early Warning Sentinel Surveillance Sites:
Foothills Pediatrics (2 clinics) – Henderson and Maryland Parkway clinics
Fremont Children's Clinic
Lake Mead Pediatrics
Southwest Medical Associates

The Pediatric Early Warning Sentinel Surveillance System (PEWSS) was initiated in response to the 2009 H1N1 influenza outbreak. It was developed to identify and track influenza in the community and in mid-2010, the system was expanded to cover the most common viral respiratory illnesses.

PEWWS has been successful in providing an up-to-date picture of respiratory illness in Southern Nevada, and has provided valuable information to both the medical and public health communities. The success of this system is based on the voluntary participation of the five physician's offices that make up the network, all of whom have maintained their commitment to the system.

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The surveillance system information is reported to the medical community on a weekly basis. Information about the viral activity in the community can aid a physician in assessing the treatment options for patients. Through the hard work and dedication of the surveillance sites, the PEWSS system has provided (and continues to provide) valuable insight into disease patterns in our community.

Candice Nichols, Executive Director
Gay & Lesbian Center
Candice Nichols has worked closely with the health district's office of HIV/AIDS/STDs since 2004. Recently, Candice made the Gay & Lesbian Center available as an outreach site where anyone in the community can access HIV or STD testing. Candice and the Gay & Lesbian Center serve as a critical piece of the health district's HIV/STD testing and counseling program. In addition to testing, at-risk individuals who visit the Center can also receive hepatitis A and B vaccinations. The goal of this outreach is to empower people with knowledge about their own health and disease status, and allows them to take control of their lives.

Aurora Wong, Coordinator
Hepatitis B Free Las Vegas
Aurora Wong has created the Hepatitis B Free Las Vegas coalition to address the high rates of chronic hepatitis B infection among Asian Americans and Pacific Islanders in Southern Nevada, who have higher rates of infection than the general population.

Since September, Wong has put together a coalition of 20 community partners, including the Southern Nevada Health District, and 100 stakeholders to develop an approach to educate and contain infection among the local Asian-American community. Her goal is to prevent new infections, to encourage testing and to help people who are infected with chronic hepatitis B become connected with resources and an appropriate system of care.

This year's awardees have shown tremendous initiative to ensure the conditions necessary to protect the health of Southern Nevada residents and visitors. All are well-deserving recipients of the Public Health Hero Awards.

Public Health Heroes are nominated by health district staff members for their efforts in supporting one or more of the 10 Essential Public Health Services:

1. **Monitor** the health status to identify and solve community health problems.
2. **Diagnose and investigate** health problems and health hazards in the community
3. **Inform, educate and empower** people about health issues.
4. **Mobilize** community partnerships and action to identify and solve health problems.
5. **Develop policies and plans** that support individual and community health efforts.
6. **Enforce laws and regulations** that protect health and ensure safety.
7. **Link** people to needed personal health services and assure the provision of health care when otherwise unavailable.
8. **Assure** competent public and personal health care workforce.
9. **Evaluate** effectiveness, accessibility and quality of personal and population-based health services.
10. **Research** for new insights and innovative solution to health problems.

Updated information about the Southern Nevada Health District can be found on Facebook www.facebook.com/SouthernNevadaHealthDistrict, on YouTube www.youtube.com/SNHealthDistrict or Twitter: www.twitter.com/SNHDinfo.

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Table 1
Age distribution of **all samples** collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	12	40	52
1	30	37	67
2	28	33	61
3	14	30	44
4	18	29	47
5	19	28	47
6	24	23	47
7	16	30	46
8	19	21	40
9	13	19	32
10	13	18	31
11	9	6	15
12	8	8	16
13	13	7	20
14	7	9	16
15	5	4	9
16	7	3	10
17	4	6	10
Total	259	351	610
Average of Age	6.4	5.4	5.9

Table 2
Age distribution of **all positive samples** collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	9	17	26
1	21	18	39
2	18	18	36
3	7	22	29
4	14	16	30
5	14	16	30
6	15	16	31
7	9	21	30
8	11	15	26
9	4	10	14
10	7	8	15
11	5	5	10
12	5	3	8
13	8	3	11
14	5	2	7
15	1	1	2
16	4	1	5
17	1	2	3
Total	158	194	352
Average of Age	5.9	5.3	5.6

Table 3
Age Distribution of **Influenza H1N1** Samples Collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	4	6	10
1	9	5	14
2	9	10	19
3	5	14	19
4	9	7	16
5	11	12	23
6	11	12	23
7	7	16	23
8	8	15	23
9	4	10	14
10	7	7	14
11	4	5	9
12	5	3	8
13	7	3	10
14	5	1	6
15	1	1	2
16	4	1	5
17	1	2	3
Grand Total	111	130	241
Average of Age	7.0	6.4	6.7

Table 4
Age Distribution of **Influenza B** Samples Collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	0	0	0
1	0	0	0
2	0	0	0
3	0	1	1
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
Grand Total	0	1	1
Average of Age	0.0	3.0	3.0

Table 5
Age Distribution of **RSV** Samples Collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	0	5	5
1	2	2	4
2	5	2	7
3	0	2	2
4	0	1	1
5	0	0	0
6	2	2	4
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
Grand Total	9	14	23
Average of Age	2.7	2.0	2.3

Table 6
Age Distribution of **Adenovirus** Samples Collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	2	4	6
1	5	3	8
2	1	3	4
3	1	4	5
4	1	2	3
5	1	2	3
6	1	0	1
7	0	1	1
8	2	0	2
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	1	0	1
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
Grand Total	15	19	34
Average of Age	3.6	2.4	2.9

Table 7
Age Distribution of **HPIV-1** Samples Collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	1	2	3
1	3	4	7
2	1	2	3
3	1	2	3
4	3	5	8
5	1	2	3
6	0	1	1
7	1	3	4
8	1	0	1
9	1	0	1
10	0	1	1
11	1	0	1
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
Grand Total	14	22	36
Average of Age	4.3	3.7	3.9

Table 8
Age Distribution of **HPIV-2** Samples Collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	1	1	2
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
Grand Total	1	1	2
Average of Age	7.0	7.0	7.0

Table 9
Age Distribution of **HPIV-3** Samples Collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	2	1	3
1	2	5	7
2	1	3	4
3	0	0	0
4	1	0	1
5	1	0	1
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
Grand Total	7	9	16
Average of Age	1.9	1.2	1.5

Table 10
Age Distribution of **HMPV** Samples Collected of 1st year data set for PEWSS program, 05/01/09-05/31/10

Age	Female	Male	Grand Total
0	0	0	0
1	0	1	1
2	1	1	2
3	1	0	1
4	0	1	1
5	0	0	0
6	2	1	3
7	0	0	0
8	0	0	0
9	0	0	0
10	0	1	1
11	0	0	0
12	0	0	0
13	0	0	0
14	0	1	1
15	0	0	0
16	0	0	0
17	0	0	0
Grand Total	4	6	10
Average of Age	4.3	6.2	5.4

Table 1
Age distribution of **all samples** collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	43	51	94
1	63	80	143
2	47	47	94
3	45	58	103
4	33	34	67
5	28	42	70
6	21	24	45
7	23	17	40
8	24	19	43
9	17	17	34
10	8	16	24
11	9	13	22
12	9	13	22
13	11	8	19
14	11	6	17
15	10	8	18
16	6	3	9
17	4	4	5
Grand Total	411	458	872
Average Age	6.4	5.4	5.9

Table 2
Age distribution of **all positive samples** collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	24	25	49
1	36	46	82
2	31	27	58
3	29	37	66
4	22	15	37
5	14	26	40
6	11	12	23
7	14	6	20
8	14	7	21
9	11	8	19
10	3	7	10
11	5	8	13
12	4	6	10
13	3	3	6
14	2	3	5
15	3	4	7
16	2	1	3
17	2	0	2
Total	230	241	471
Average Age	4.5	4.3	4.4

Table 3
Age distribution of all **influenza H1N1** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	6	3	9
1	2	3	5
2	4	5	9
3	0	3	3
4	3	1	4
5	4	6	10
6	0	2	2
7	1	2	3
8	0	0	0
9	2	1	3
10	0	2	2
11	2	3	5
12	2	2	4
13	1	1	2
14	0	0	0
15	1	0	1
16	1	0	1
17	1	0	1
Total	30	34	64
Average Age	5.8	5.3	5.5

Table 4
Age distribution of all **influenza AH1** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
Total	0	0	0
Average Age	0.0	0.0	0.0

Table 5
Age distribution of all **influenza AH3** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	0	3	3
1	2	4	6
2	3	1	4
3	2	4	6
4	4	3	7
5	2	7	9
6	1	1	2
7	3	2	5
8	2	1	3
9	2	0	2
10	0	0	0
11	1	1	2
12	0	0	0
13	0	0	0
14	1	1	2
15	2	0	2
16	0	0	0
17	0	0	0
Total	25	28	53
Average Age	6.2	4.2	5.2

Table 6
Age distribution of all **influenza B** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	1	1	2
1	2	1	3
2	3	3	6
3	6	3	9
4	2	2	4
5	2	6	8
6	2	6	8
7	3	2	5
8	7	3	10
9	3	7	10
10	0	2	2
11	2	1	3
12	0	2	2
13	2	1	3
14	0	1	1
15	0	1	1
16	0	0	0
17	0	0	0
Total	35	42	77
Average Age	6.3	7.1	6.7

Table 7
Age distribution of all **RSV** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	8	7	15
1	6	17	23
2	9	6	15
3	5	10	15
4	4	4	8
5	2	3	5
6	2	1	3
7	4	0	4
8	3	2	5
9	1	0	1
10	0	1	1
11	0	2	2
12	0	1	1
13	0	1	1
14	0	0	0
15	0	1	1
16	0	0	0
17	0	0	0
Grand Total	44	56	100
Average Age	3.1	3.3	3.2

Table 8
Age distribution of all **adenovirus** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	3	4	7
1	10	10	20
2	0	3	3
3	7	4	11
4	3	1	4
5	2	0	2
6	1	1	2
7	2	0	2
8	1	1	2
9	0	0	0
10	1	1	2
11	0	1	1
12	0	1	1
13	0	0	0
14	0	0	0
15	0	2	2
16	0	0	0
17	0	0	0
Total	30	29	59
Average Age	3.0	3.8	3.4

Table 9
Age distribution of all **HPIV-1** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	1	2	3
1	0	1	1
2	2	2	4
3	0	3	3
4	2	0	2
5	0	1	1
6	0	0	0
7	0	0	0
8	0	0	0
9	1	0	1
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	1	0	1
15	0	0	0
16	0	0	0
17	0	0	0
Total	7	9	16
Average Age	5.0	2.1	3.4

Table 10
Age distribution of all **HPIV-2** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

Age	Female	Male	Grand Total
0	1	1	2
1	0	2	2
2	4	1	5
3	1	3	4
4	2	0	2
5	2	1	3
6	2	0	2
7	2	0	2
8	0	0	0
9	0	0	0
10	1	2	3
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	1	1
17	0	0	0
Grand Total	15	11	26
Average Age	4.3	4.9	4.6

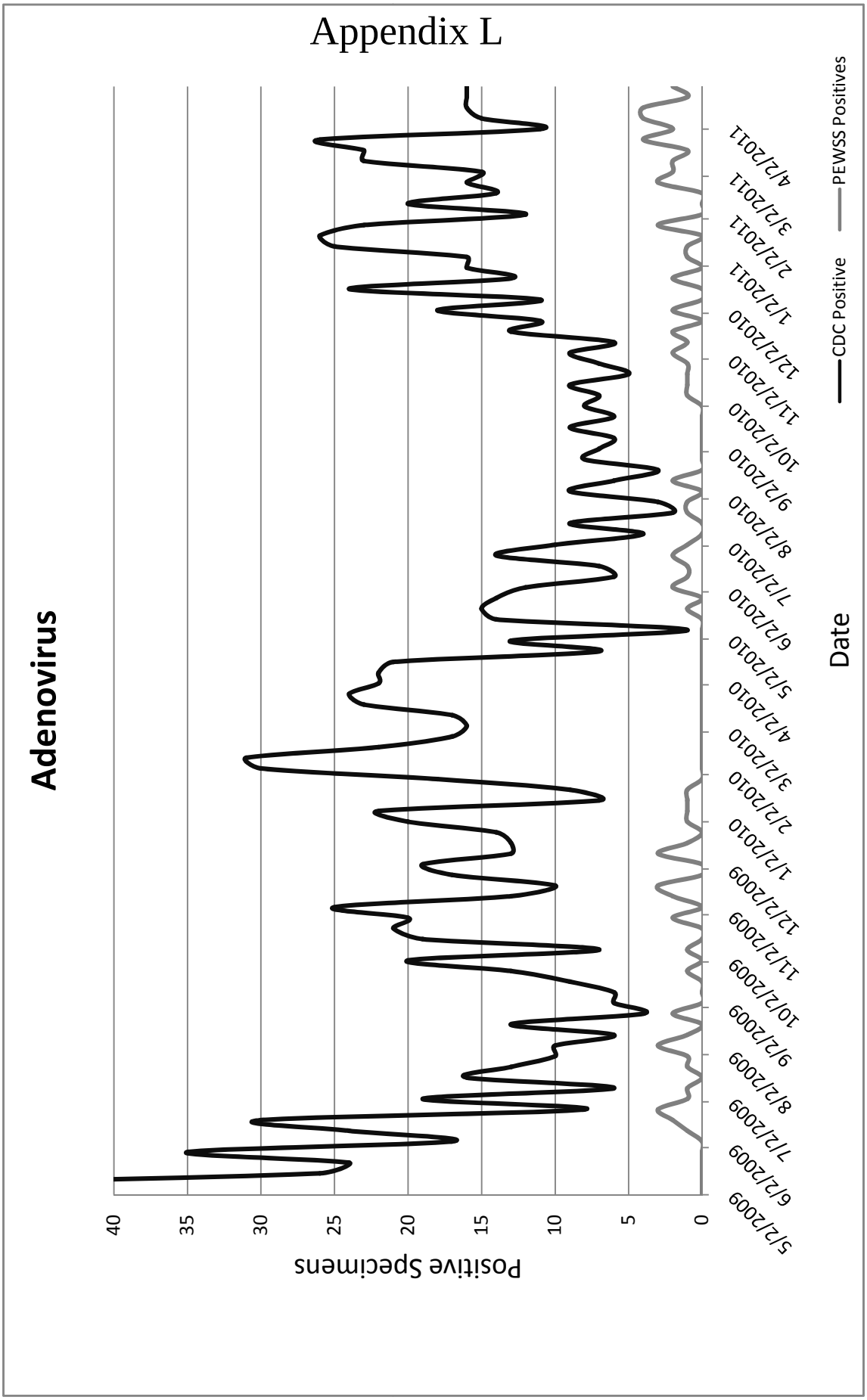
Table 11
Age distribution of all **HPIV-3** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

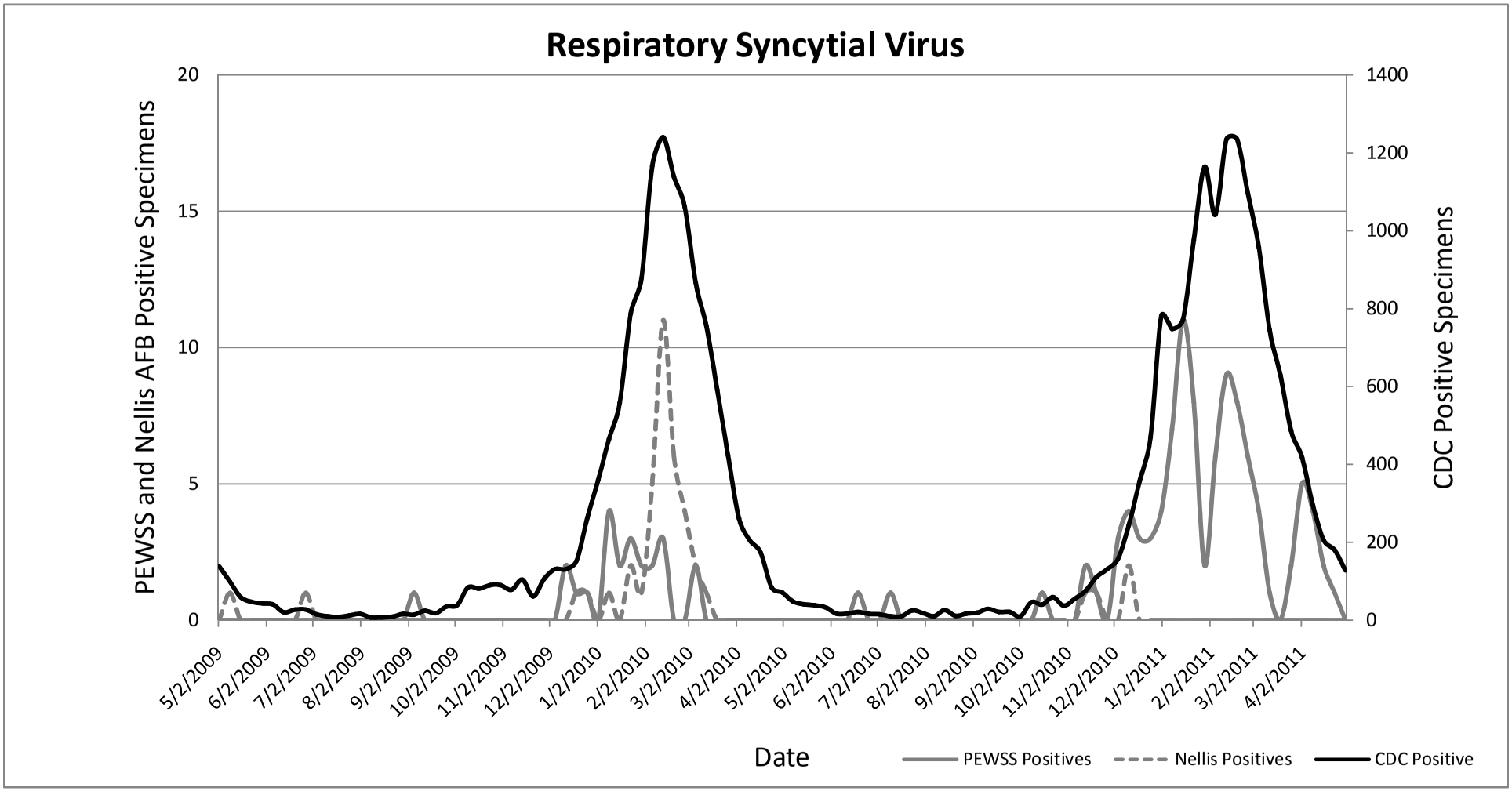
Age	Female	Male	Grand Total
0	7	6	13
1	16	11	27
2	5	9	14
3	3	5	8
4	2	2	4
5	1	1	2
6	1	0	1
7	0	0	0
8	0	0	0
9	2	0	2
10	1	0	1
11	1	0	1
12	2	0	2
13	0	0	0
14	0	1	1
15	0	0	0
16	0	0	0
17	1	0	1
Total	42	35	77
Average Age	3.2	2.0	2.7

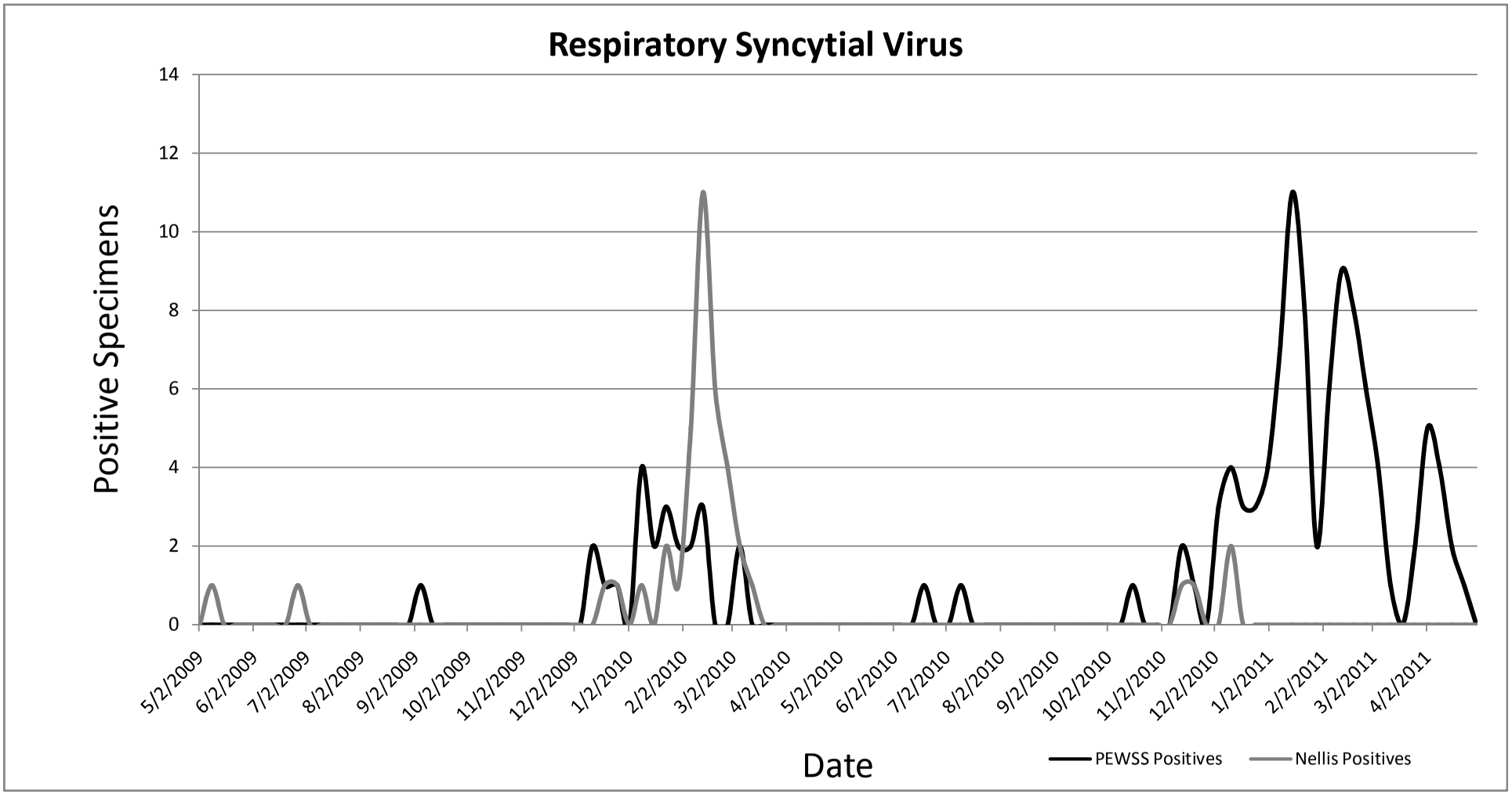
Table 12
Age distribution of all **HMPV** samples collected of 2nd year data set for PEWSS program, 06/01/10-05/31/11

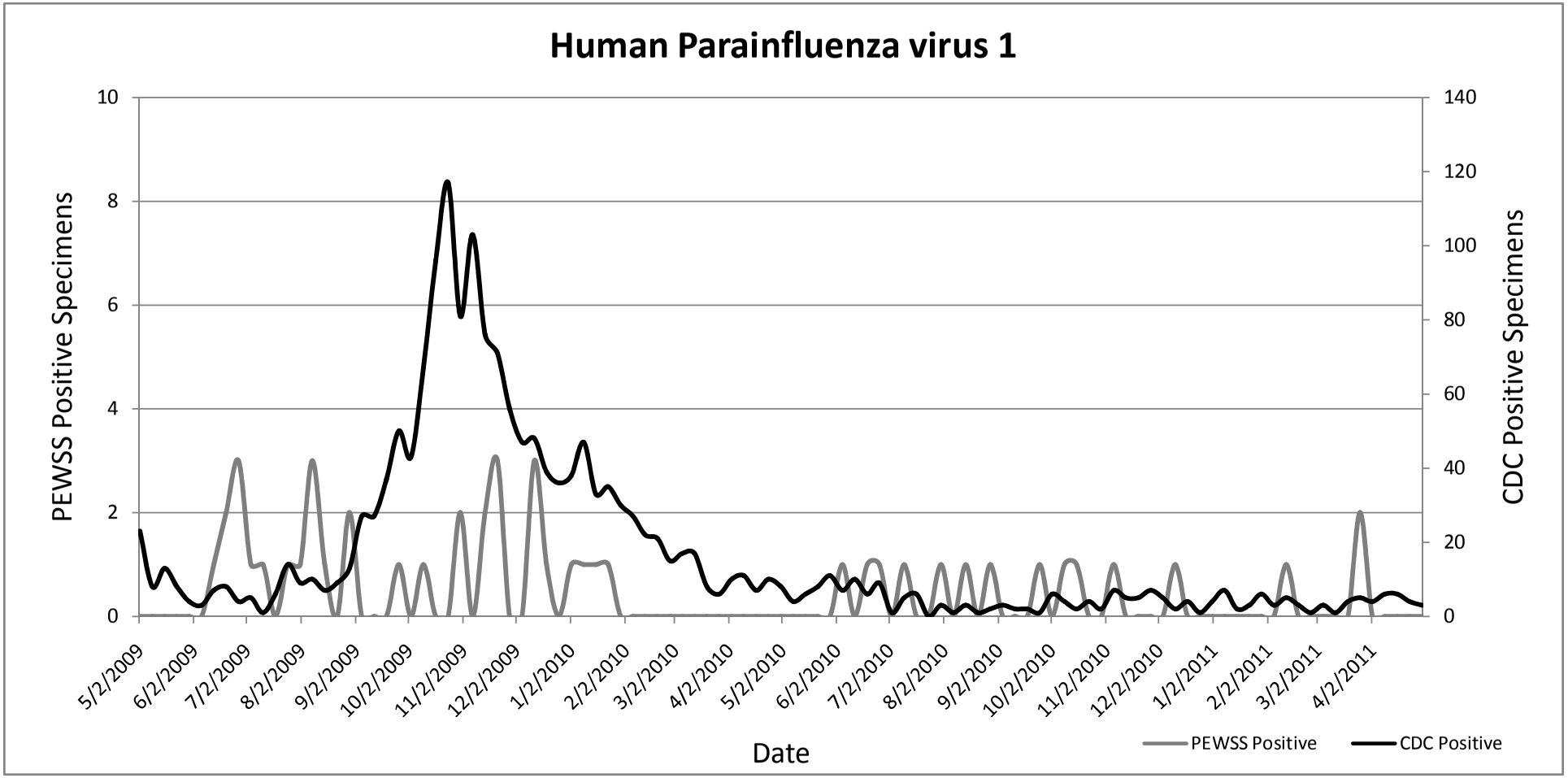
Age	Female	Male	Grand Total
0	2	1	3
1	0	1	1
2	2	0	2
3	7	3	10
4	0	2	2
5	0	1	1
6	2	2	4
7	0	0	0
8	2	1	3
9	0	0	0
10	0	0	0
11	0	1	1
12	0	1	1
13	0	0	0
14	0	0	0
15	0	0	0
16	1	0	1
17	0	0	0
Total	16	13	29
Average Age	4.3	5.1	4.7

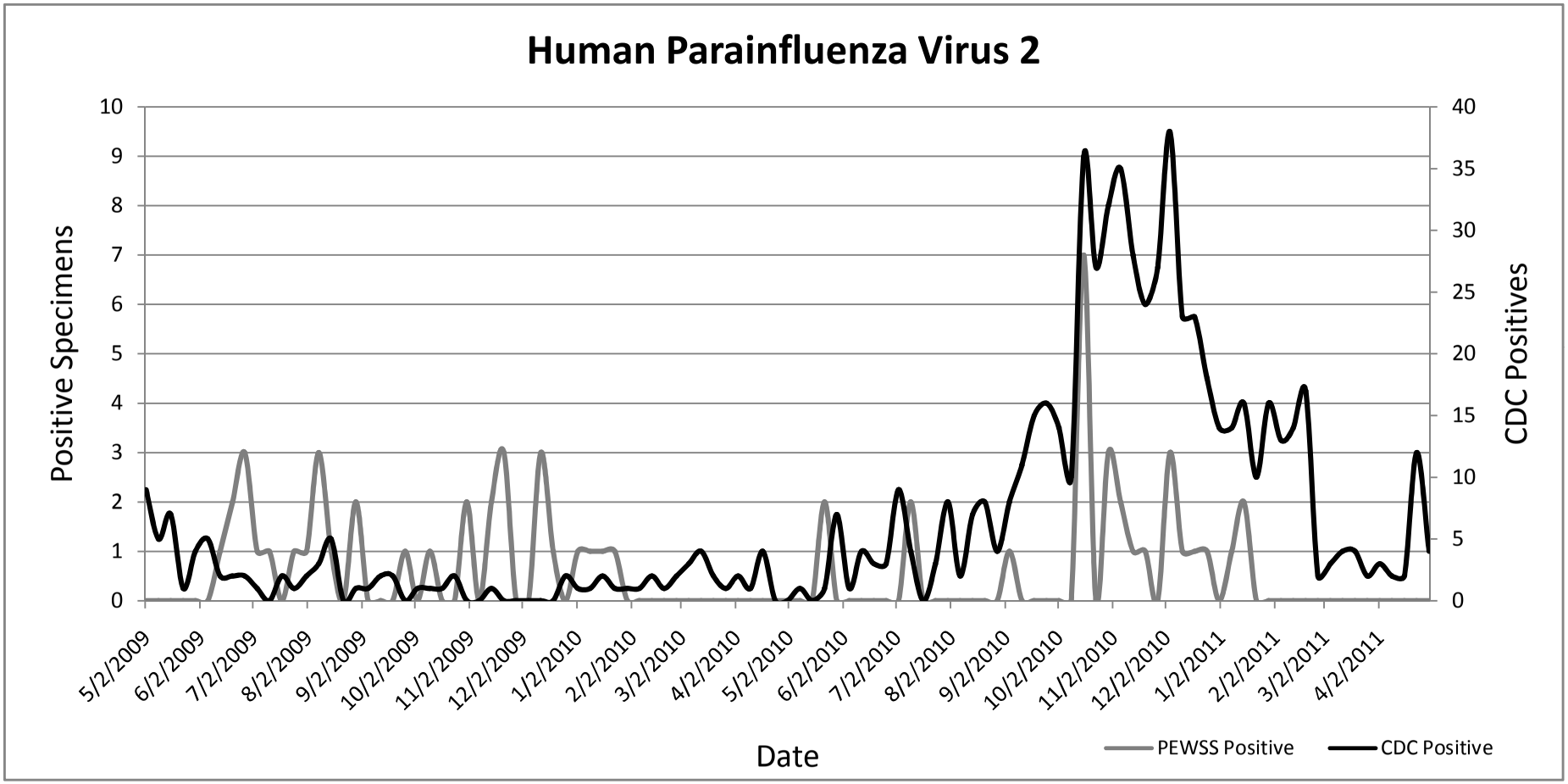
Appendix L

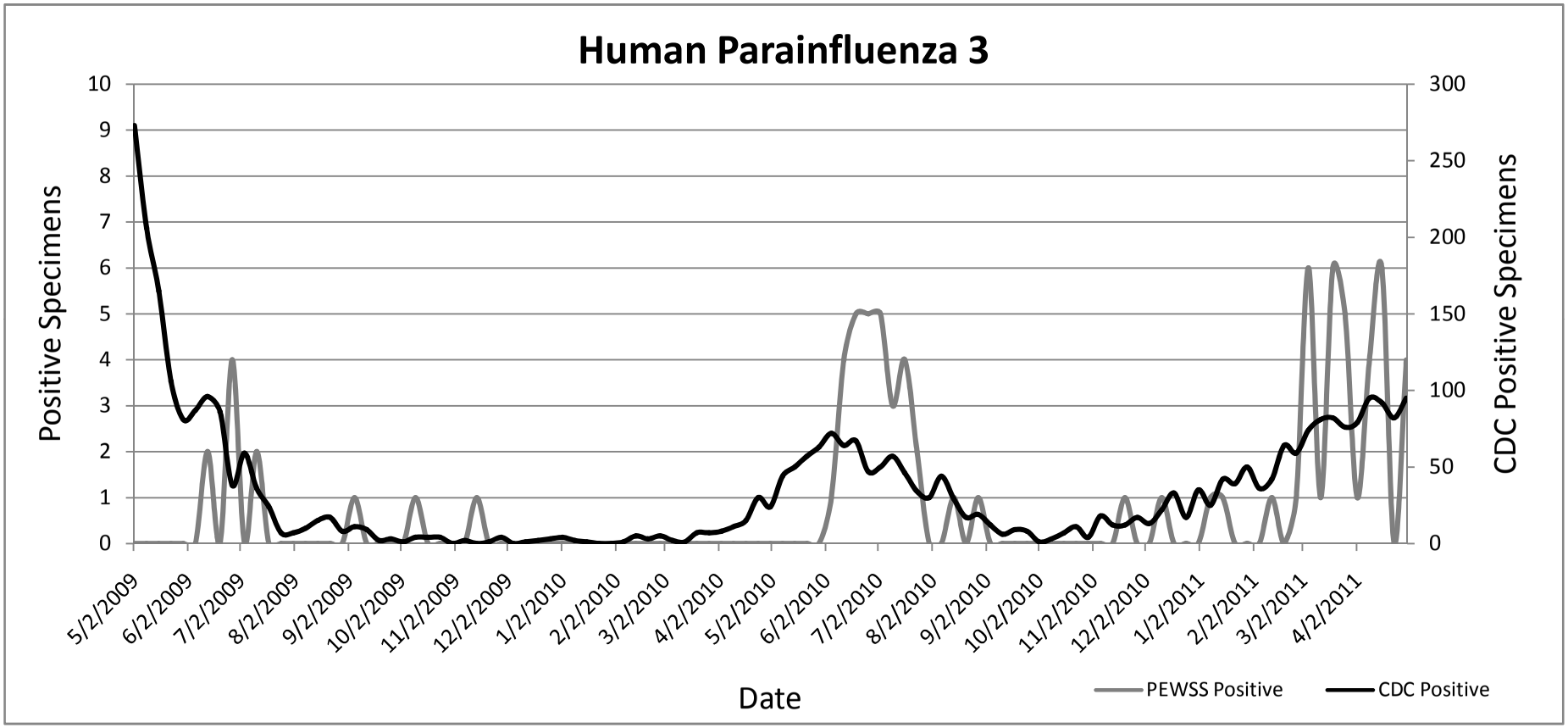

Adenovirus
Positive Specimens
0
5
10
15
20
25
30
35
40
5/2/2009
6/2/2009
7/2/2009
8/2/2009
9/2/2009
10/2/2009
11/2/2009
12/2/2009
1/2/2010
2/2/2010
3/2/2010
4/2/2010
5/2/2010
6/2/2010
7/2/2010
8/2/2010
9/2/2010
10/2/2010
11/2/2010
12/2/2010
1/2/2011
2/2/2011
3/2/2011
4/2/2011
Date
CDC Positive
PEWSS Positives

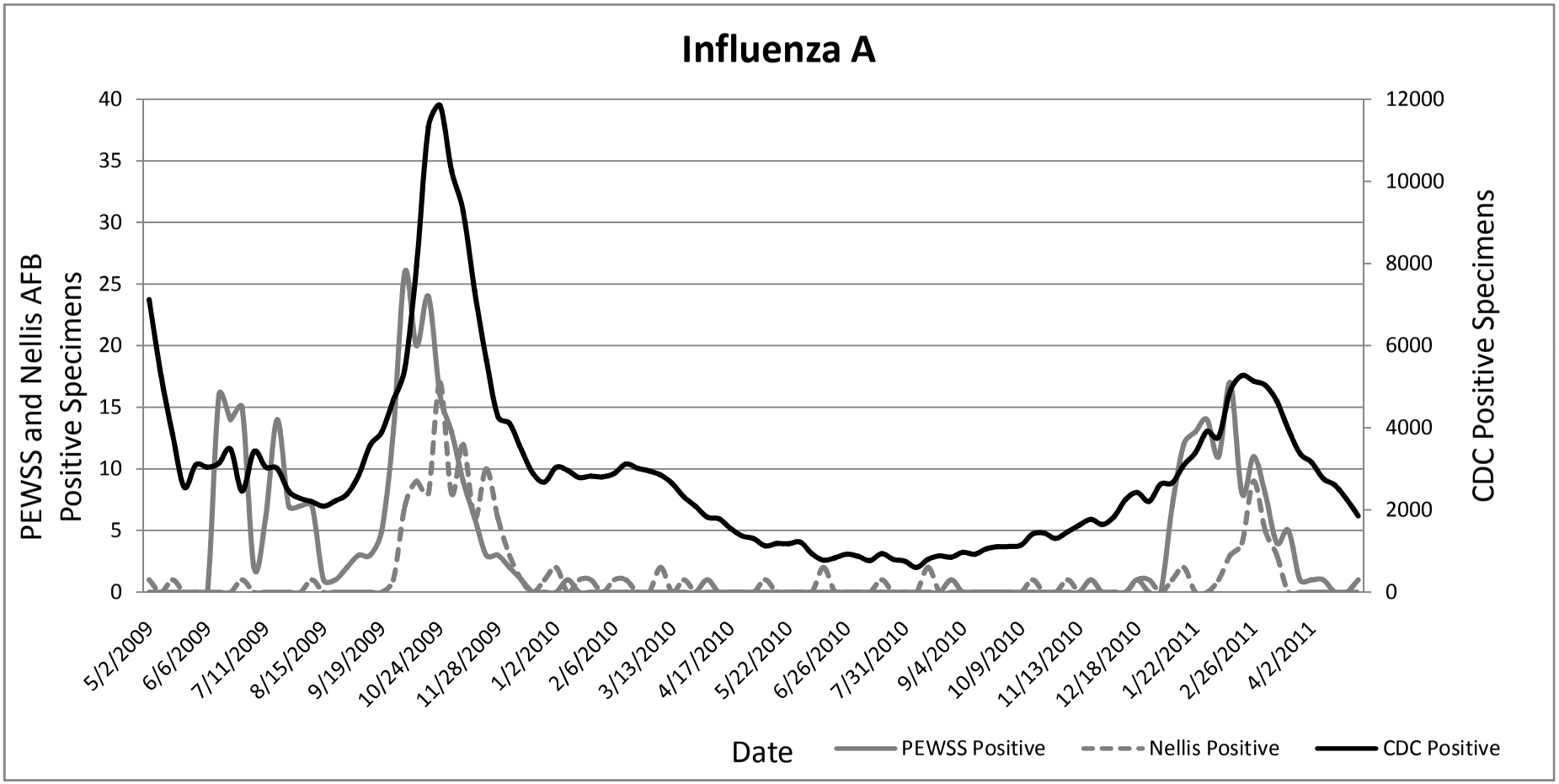

Respiratory Syncytial Virus
PEWSS and Nellis AFB Positive Specimens
CDC Positive Specimens
20
15
10
5
0
1400
1200
1000
800
600
400
200
0
5/2/2009
6/2/2009
7/2/2009
8/2/2009
9/2/2009
10/2/2009
11/2/2009
12/2/2009
1/2/2010
2/2/2010
3/2/2010
4/2/2010
5/2/2010
6/2/2010
7/2/2010
8/2/2010
9/2/2010
10/2/2010
11/2/2010
12/2/2010
1/2/2011
2/2/2011
3/2/2011
4/2/2011
Date
PEWSS Positives
Nellis Positives
CDC Positive

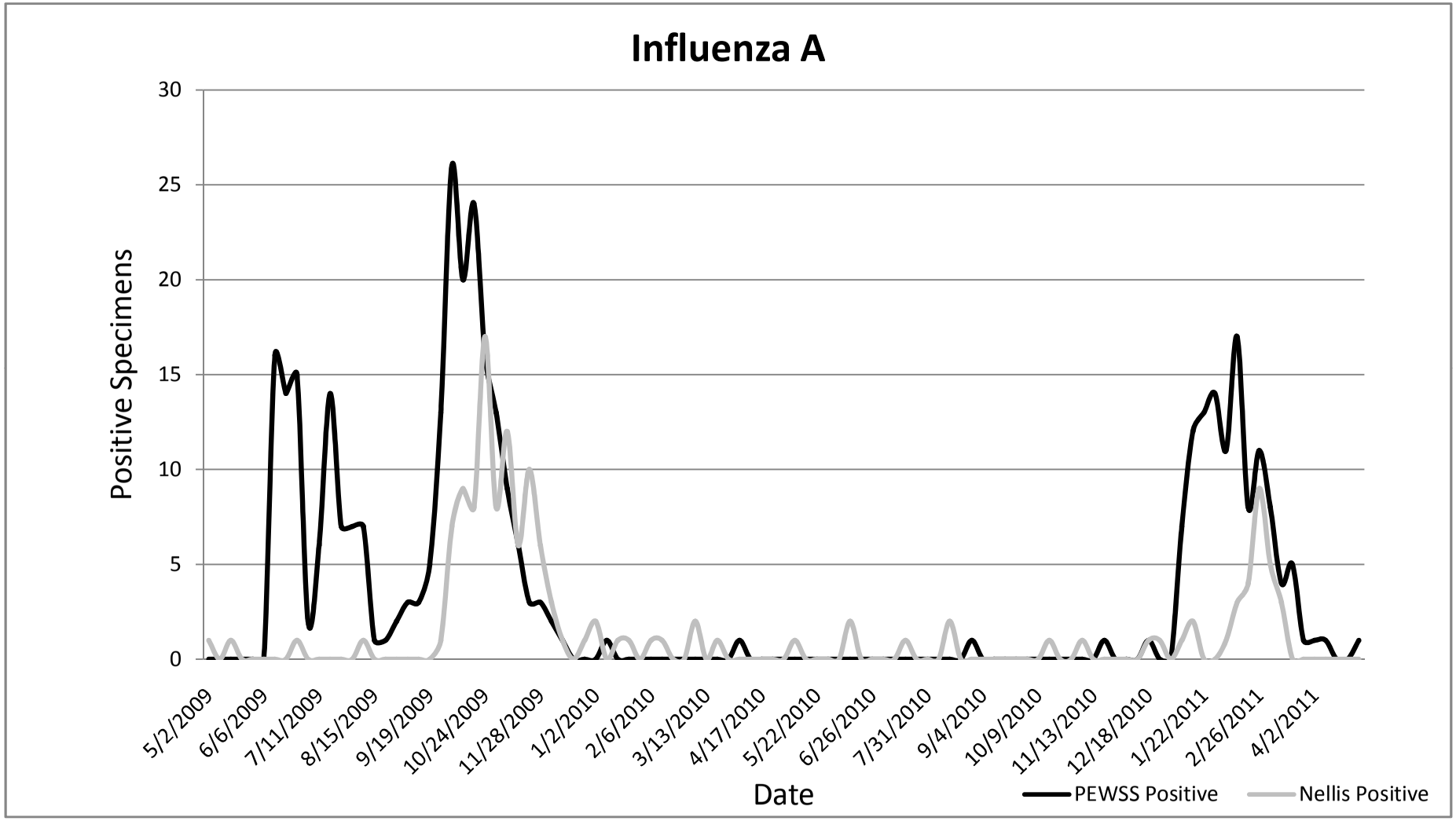

Respiratory Syncytial Virus
Positive Specimens
14
12
10
8
6
4
2
0
5/2/2009
6/2/2009
7/2/2009
8/2/2009
9/2/2009
10/2/2009
11/2/2009
12/2/2009
1/2/2010
2/2/2010
3/2/2010
4/2/2010
5/2/2010
6/2/2010
7/2/2010
8/2/2010
9/2/2010
10/2/2010
11/2/2010
12/2/2010
1/2/2011
2/2/2011
3/2/2011
4/2/2011
Date
PEWSS Positives
Nellis Positives

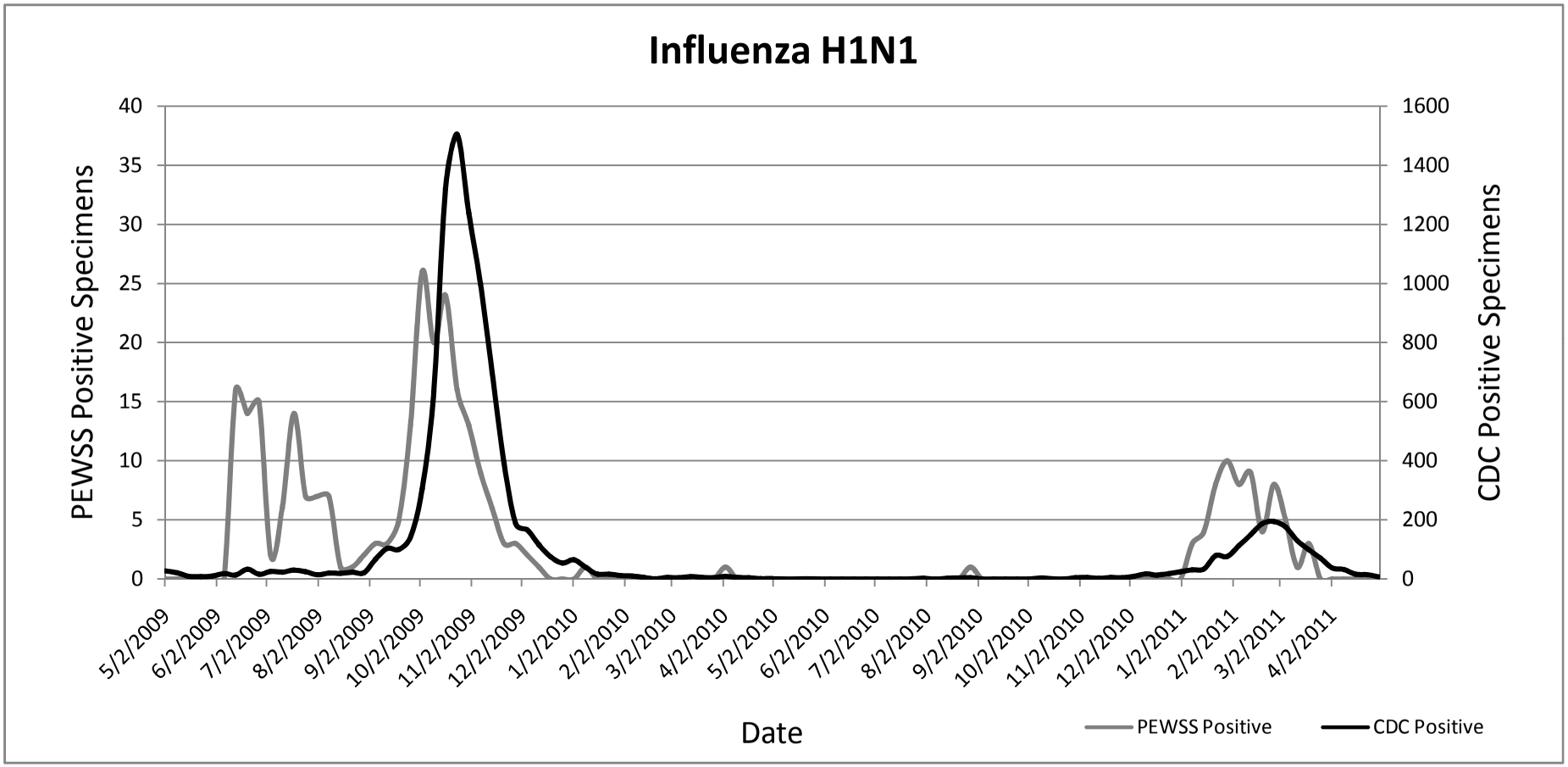

Human Parainfluenza virus 1
PEWSS Positive Specimens
CDC Positive Specimens
Date
PEWSS Positive
CDC Positive
0
2
4
6
8
10
0
20
40
60
80
100
120
140
5/2/2009
6/2/2009
7/2/2009
8/2/2009
9/2/2009
10/2/2009
11/2/2009
12/2/2009
1/2/2010
2/2/2010
3/2/2010
4/2/2010
5/2/2010
6/2/2010
7/2/2010
8/2/2010
9/2/2010
10/2/2010
11/2/2010
12/2/2010
1/2/2011
2/2/2011
3/2/2011
4/2/2011

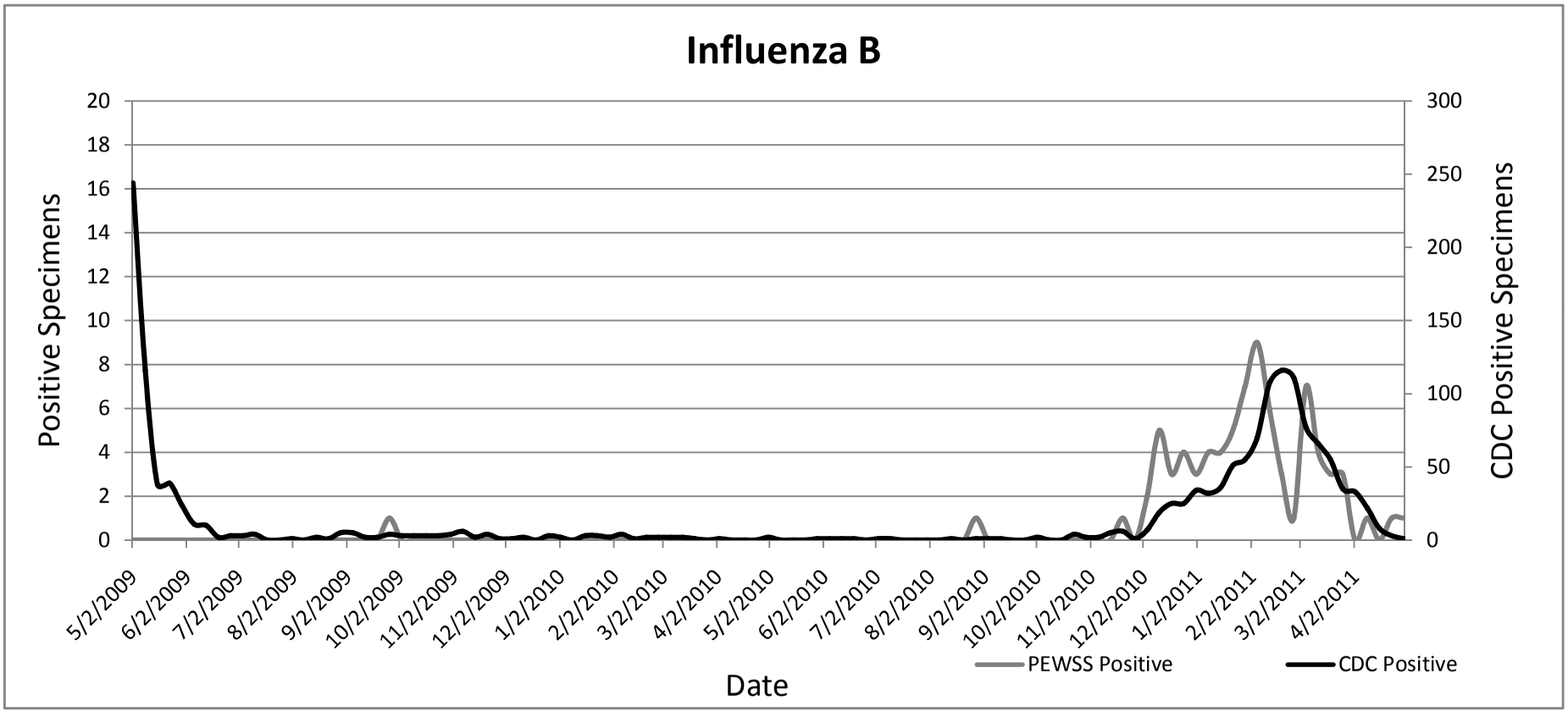

Human Parainfluenza Virus 2
Positive Specimens
CDC Positives
Date
PEWSS Positive
CDC Positive
0
1
2
3
4
5
6
7
8
9
10
0
5
10
15
20
25
30
35
40
5/2/2009
6/2/2009
7/2/2009
8/2/2009
9/2/2009
10/2/2009
11/2/2009
12/2/2009
1/2/2010
2/2/2010
3/2/2010
4/2/2010
5/2/2010
6/2/2010
7/2/2010
8/2/2010
9/2/2010
10/2/2010
11/2/2010
12/2/2010
1/2/2011
2/2/2011
3/2/2011
4/2/2011


Human Parainfluenza 3
Positive Specimens
CDC Positive Specimens
Date
PEWSS Positive
CDC Positive
0
1
2
3
4
5
6
7
8
9
10
0
50
100
150
200
250
300
5/2/2009
6/2/2009
7/2/2009
8/2/2009
9/2/2009
10/2/2009
11/2/2009
12/2/2009
1/2/2010
2/2/2010
3/2/2010
4/2/2010
5/2/2010
6/2/2010
7/2/2010
8/2/2010
9/2/2010
10/2/2010
11/2/2010
12/2/2010
1/2/2011
2/2/2011
3/2/2011
4/2/2011


Influenza A
PEWSS and Nellis AFB Positive Specimens
CDC Positive Specimens
40
35
30
25
20
15
10
5
0
12000
10000
8000
6000
4000
2000
0
5/2/2009
6/6/2009
7/11/2009
8/15/2009
9/19/2009
10/24/2009
11/28/2009
1/2/2010
2/6/2010
3/13/2010
4/17/2010
5/22/2010
6/26/2010
7/31/2010
9/4/2010
10/9/2010
11/13/2010
12/18/2010
1/22/2011
2/26/2011
4/2/2011
Date
PEWSS Positive
Nellis Positive
CDC Positive


Influenza A
Positive Specimens
30
25
20
15
10
5
0
5/2/2009
6/6/2009
7/11/2009
8/15/2009
9/19/2009
10/24/2009
11/28/2009
1/2/2010
2/6/2010
3/13/2010
4/17/2010
5/22/2010
6/26/2010
7/31/2010
9/4/2010
10/9/2010
11/13/2010
12/18/2010
1/22/2011
2/26/2011
4/2/2011
Date
PEWSS Positive
Nellis Positive


Influenza H1N1
PEWSS Positive Specimens
CDC Positive Specimens
Date
PEWSS Positive
CDC Positive
0
5
10
15
20
25
30
35
40
0
200
400
600
800
1000
1200
1400
1600
5/2/2009
6/2/2009
7/2/2009
8/2/2009
9/2/2009
10/2/2009
11/2/2009
12/2/2009
1/2/2010
2/2/2010
3/2/2010
4/2/2010
5/2/2010
6/2/2010
7/2/2010
8/2/2010
9/2/2010
10/2/2010
11/2/2010
12/2/2010
1/2/2011
2/2/2011
3/2/2011
4/2/2011


Influenza B
Positive Specimens
CDC Positive Specimens
Date
PEWSS Positive
CDC Positive
0
2
4
6
8
10
12
14
16
18
20
0
50
100
150
200
250
300
5/2/2009
6/2/2009
7/2/2009
8/2/2009
9/2/2009
10/2/2009
11/2/2009
12/2/2009
1/2/2010
2/2/2010
3/2/2010
4/2/2010
5/2/2010
6/2/2010
7/2/2010
8/2/2010
9/2/2010
10/2/2010
11/2/2010
12/2/2010
1/2/2011
2/2/2011
3/2/2011
4/2/2011

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Thesis Examination Committee:

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