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Communicable Disease Surveillance in Somalia, 2012

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Communicable Disease Surveillance in Somalia, 2012

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BS, University of Connecticut 2010

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Abstract

Communicable Disease Surveillance in Somalia, 2012

By Kristina Cordes

Background: A complex humanitarian emergency (CHE) occurs when there is a disintegration of authority and the overwhelmed infrastructure of a society is unable to manage the complications that arise. During CHE there is an increased risk of communicable diseases, resulting in the need for heightened surveillance. In 2011, Somalia experienced the worst drought in 60 years and famine was declared in July of that year. The World Health Organization (WHO)-Somalia collaborated with the U.S. Centers for Disease Control and Prevention (CDC) to evaluate and revise the communicable disease surveillance system in Somalia. The revised system was used for the entire year of 2012 in all four zones of the country.

Methods: Data for 2012 was collected via the Somalia communicable diseases reporting system (CSR). Data quality and disease trends were analyzed using Statistical Analysis Software (SAS) and summarized in the 2012 WHO-Somalia Communicable Diseases Reporting System (CSR) annual surveillance report.

Results: Although a few suspected outbreaks were detected, analysis of priority health events (suspected cholera, suspected shigellosis, suspected measles and confirmed malaria) showed a general decreasing trend in proportional morbidity over the 52 reporting weeks.

Conclusions: Data quality was seen to improve in all four zones after switching from the Excel database to the Epi Info database, and continued use of Epi Info for surveillance purposes is recommended. As with any surveillance system, regular monitoring and periodic evaluations should be conducted.

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Chapter 1 Complex Humanitarian Emergencies

Definition and Characteristics

The Inter-Agency Standing Committee (IASC) of UN and non-UN humanitarian partners defines a complex emergency as "a humanitarian crisis in a country, region or society where there is total or considerable breakdown of authority resulting from internal or external conflict and which requires an international response that goes beyond the mandate or capacity of any single and/or ongoing UN country program." Others emphasize CHE as being human-made crises[1], or open conflict within states resulting in hunger, disease, and population displacement as a result of victimization of specific identity groups[2]. The US Mission to the United Nations (UN) highlights the dependence on humanitarian assistance from outside entities, and possibly even physical protection, to have access to basic needs. CHE are often attributed to internal political conflicts, but may also be caused or exacerbated by natural disasters. There are several characteristics of CHE distinguishing them from other emergencies. If conflict is involved, civilians humanitarian workers are often targeted[3]. Major population displacements are a common feature, resulting in limited access to food, shelter, water and healthcare[3]. People leaving the country may settle in refugee camps, which are often overcrowded and may have unsanitary conditions[3]. However, not all displaced persons leave the country. These internally displaced persons (IDP) may be more difficult to assist since international laws are not specific on the rights of IDP compared with those of refugees when seeking assistance. Humanitarian agencies may not be able to reach IDP to provide resources or aid

and these populations may experience even higher rates of morbidity and mortality from inadequate nutrition and disease, in addition to possible human rights abuses[3].

Patterns of morbidity and mortality may differ among CHE with different sources, as outlined below, and in different regions. Morbidity and mortality during CHE in Europe is typically the result of direct health consequences associated with conflict, such as violent trauma[4]. There may also be increased morbidity and mortality resulting from complications of pre-existing chronic conditions. Morbidity and mortality during CHE in Asian and African communities, however, is often increased by the indirect health consequences of infectious disease and malnutrition[3]. The crude mortality rate is used as an indicator to identify when an emergency is occurring and the scope of its impact[4]. Baseline rates in sub-Saharan Africa and Asian communities are generally near 0.5 deaths per 10,000 people per day[3]. For these regions, a public health emergency occurs when the crude mortality rate reaches 1 death per 10,000 people per day, and a major crisis is declared when the crude mortality rate is at or above 2 deaths per 10,000 people per day[3]. During CHE rates of mortality may be up to 60 times the baseline rates for a given community[3].

Sources of CHE

Although CHE share similar characteristics, there are many sources. One source is decline in incomes, which may lead to relative deprivation or absolute

deprivation[1]. Deterioration in tangible factors, such as living conditions, is more likely to lead to discontent and violence[1]. Absolute deprivation results from general worsening of a state's internal condition, increasing the non-conflict components of CHE, such as displacement, hunger and disease[1]. These non-conflict components may occur when, for example, ecological disasters lead to agricultural failure causing a decline in population income or even widespread famine[2].

Income inequality may also lead to, or even be the result of class and communal economic differences. These inequalities can cause discontent and political instability within a society[5]. Social unrest increases the probability of coups, revolutions and mass violence, in addition to having a negative effect on investment and growth within a country[5]. Political instability is also an important factor in the initiation of conflict. If executive stability is present and the government is well-financed compared with opposition groups, rebellion may be militarily unfeasible, regardless of social unrest and discontent[6]. International Monetary Fund (IMF) and World Bank adjustment and stabilization programs in underresourced countries have been found to have an inverse relationship, reducing a country's vulnerability to CHE[1].

Military centrality, in which the military has more resources and organization than the civilian government, may contribute to the initiation of CHE in several ways. A strong military organization may pose a threat to the civilian government,

or it may support authoritarian political regimes that are more prone to destructive conflict and prolonged repressive rule[1]. Military organizations may also overthrow a democratic government or another authoritarian regime, producing political instability within the country or region. Government spending to strengthen military presence can similarly have adverse effects. These heavy socioeconomic costs may result in discontent among the population, or may even lead to starvation in very poor countries[1]. A history of conflict within a state or region may increase susceptibility to new conflict or components of conflict [1]. Cultural experience also shapes conflict expectations as all societies adapt to what is seen as an acceptable level of internal violence.

Public Health Concerns and Healthcare during CHE

During CHE, there are often limited resources and agencies must prioritize health services, emphasizing disease prevention and health promotion[3]. The Sphere project is a humanitarian charter and standards developed through the collaboration of humanitarian organizations in response to concerns over the quality of humanitarian assistance[7]. These standards focus on five key indicators during response: water supply and sanitation, nutrition, food aid, shelter and site management, and health services[7]. These indicators are set to meet minimum standards. However, different interventions may occur at different times throughout an emergency.

Phases: CHE can be divided into three major phases: acute emergency phase, late emergency phase, and post-emergency phase[4]. The acute phase is the first few weeks of the emergency. This is often characterized by extensive population displacement, poor health, and crowded conditions. Outbreaks of communicable diseases with high case fatality rates are common during the acute phase. This is often exacerbated by malnutrition, particularly among children less than five years of age[4]. Basic morbidity and mortality surveys help determine the magnitude of the emergency, and along with nutrition surveys can identify resources and interventions needed[4]. The acute phase can be shortened by timely public health interventions. Early interventions target particularly vulnerable groups such as children and pregnant or lactating women[3]. There are typically six main interventions during the emergency phase. Top priorities are often the provision of food, water, sanitation and shelter[3,4]. Adequate spacing between shelters, along with environmental care and proper waste management can reduce the risk of communicable diseases[8]. Basic medical care is also provided, along with vaccinations. Vaccine programs usually focus on the delivery of measles vaccines, combined with vitamin A supplementation[3]. Physical safety is often an additional concern during the acute phase of emergencies.

The late emergency phase is characterized by a gradual decrease in mortality rates over approximately the next six months following the acute phase. However, during this phase, the major causes of mortality and morbidity continue to be diarrheal diseases, measles, acute respiratory infections (ARI), malaria and malnutrition[4]. The goal during this phase is to bring the main relief programs up

to standard levels, and to develop ongoing public health programs rather than addressing the acute needs of the population[4].

The final phase is the post-emergency phase. This post-emergency phase is reached once crude mortality rates have approached the baseline rate for the refugee population, or the baseline rate of the host country[4]. The focus of this phase is increased self-sufficiency within the affected population and sustainable public health programs. Other considerations will include pharmaceutical management, access to or development of laboratory services, and a system of referrals for access to higher levels of care or specialized healthcare services[3]. Programs that may be phased in during this time include formal mental health programs and trauma services[3].

Health Concerns: There are several areas of concern when organizing basic medical care within the context of a CHE. It is important to develop standardized case management protocols to make sure all individuals receive an appropriate standard of treatment and care[3]. A list of essential medications and supplies needed is also necessary for resource requests and allocations[3].

Communicable disease control measures are incredibly important during these emergency situations[3]. During CHE, 60%-90% of deaths are due to preventable diseases, primarily diarrheal diseases, measles, ARI, and malaria, all of which may be exacerbated by malnutrition[4]. Outbreaks of communicable diseases during

CHE are attributed primarily to mass population displacement, leading to overcrowding, inadequate sanitation and hygiene, and disruption of public health programs[9]. These factors are compounded with malnutrition. Malnutrition results in a weakened immune system, leaving individuals more susceptible to infection, and increases the severity and duration of disease, particularly in children[8].

Diarrheal diseases are one of the greatest threats to the health of refugees and IDP during CHE. In refugee camps they may account for nearly 40% of deaths during the acute phase of the emergency, with approximately 80% of these deaths occurring in children less than two years of age[8]. The most serious epidemics often result from cholera (*Vibrio cholerae*) and dysentery (*Shigella dysenteriae*, also referred to as shigellosis)[3]. Inadequate quantity and quality of water are the most frequent cause of diarrheal disease outbreaks, while poor hygiene and insufficient sanitation facilities contribute to the spread of disease[8].

Measles is another commonly occurring disease during CHE. Even in countries with established vaccination programs, complex emergencies may disrupt immunization services. In emergency situations involving populations without previous exposure to measles or ongoing vaccination programs, there may be high mortality in older children and adults in addition to the high rates of disease among children less than five[8]. Measles can result in serious complications among malnourished and physically exhausted persons, characteristics often seen among displaced populations[3]. Case fatality rates from measles may be as high as 30%

during CHE, compared with case fatality rates of 1%-5% in more stable environments[8]. Measles depletes an individual's vitamin A levels, which may already be low due to malnutrition. Because of this, vitamin A supplementation often accompanies routine measles vaccination programs during complex emergencies[3,8]. Vaccinations for measles, along with diphtheria and pertussis, have been shown to have a protective effect in preventing ARI[8]. ARI frequently account for 30%-50% of pediatric consultations in complex emergency settings[3]. These high attack rates are the result of overcrowding and inadequate shelter, sometimes combined with other environmental factors such as indoor fires[8].

Another disease of concern during CHE is malaria. Although malaria is vector-borne, malaria-specific mortality rates may be high among displaced populations, particularly in refugees moving from low-endemicity areas to hyper-endemic areas[3]. CHE often impede existing vector control programs and the overcrowded conditions and temporary shelters found in camps may increase bite frequency[8]. Moreover, refugee camps are often located on marginal land that may be ideal vector breeding sites[10]. Microscopy and rapid diagnostic tests are useful for improving case management of malaria and detection of the disease for surveillance purposes[10]. However, the conditions present during complex emergencies, particularly during the acute phase, may lead to missed opportunities for early and appropriate treatment resulting in higher rates of morbidity and mortality, for malaria as well as other infectious diseases[8].

Community health education can have a positive impact in the reduction of communicable disease by increasing knowledge of how these diseases are spread and how to prevent them[3]. In the event of major outbreaks, it is critical that there is a contingency plan in place to prevent additional spread and mitigate adverse health effects[3]. Many agencies focus on decentralization of health services within refugee camps and communities[3]. This allows outreach to more at-risk or difficult to reach population, and individuals within the affected population can be trained as community healthcare workers.

These at-risk populations include children and pregnant women, and there are often programs designed specifically to improve maternal and child health services. Programs for child health include immunizations, such as distribution of measles vaccine, and nutritional programs. During the acute emergency phase there may be supplemental feeding centers to ensure children are receiving adequate nutrition and to help alleviate the effects of acute or chronic malnutrition[4]. Growth monitoring is often included as part of child health services. Programs for maternal and women's health may focus on health education for mothers and the promotion of safe motherhood practices. This includes antenatal, postnatal and obstetric care[3]. Comprehensive reproductive healthcare programs, including family planning and HIV/STI prevention may also be offered[3].

Chapter 2 Surveillance

Simple surveillance systems are also crucial for health services during CHE. This allows healthcare providers and response agencies to not only monitor the health of the population, but to also provide a form of evaluation for programs and interventions that may have been implemented as part of response efforts[3].

Public Health Surveillance

As defined by the US Centers for Disease Control and Prevention (CDC), surveillance is the "ongoing systematic collection, analysis, and interpretation of health-related data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know[11]." The purpose of surveillance is to inform and enable appropriate public health action. Public health surveillance has 12 general uses[12]. The first is to provide estimates of the scope and magnitude of health problems of interest. The second is to depict trends in disease. These allow epidemics to be detected. Continued surveillance during epidemics identifies the distribution and spread of the health event. Surveillance can also be used to facilitate research, whether epidemiologic or laboratory, and to generate and test hypotheses. It allows changes in infectious agents to be monitored, as well as isolation activities. Changes in public health practices resulting from interventions can be detected. Programmatically, surveillance is important for planning public health action and the use of resources, including the allocation of resources to appropriate populations[12].

Surveillance during CHE

Complex emergencies may interrupt public health surveillance, or may occur in areas which do not have a previously existing cohesive system. However, surveillance is very important during CHE and several standardized approaches have been developed for ongoing, routine surveillance in complex emergencies.

The WHO African Region adopted the integrated disease surveillance and response (IDSR) strategy in 1998[13]. It has seen been adapted to comply with the WHO International Health Regulation (IHR, 2005) requirements. One component of this system is integrated disease surveillance (IDS) including data management. This includes monitoring priority health events, primarily communicable diseases, and evaluating interventions. IDS additionally provides information for situation assessment, program design and evaluation, developing health policy, and directing resource mobilization[13]. IDS also promotes information sharing on priority conditions between Member States to improve health within the region.

Another system developed for public health surveillance was developed by the United Nations High Commissioner for Refugee Health (UNHCR). The health information system (HIS) is designed to allow rapid detection and response of priority health events, along with continuous monitoring of disease trends and changes in health status[14]. Monitoring trends identifies healthcare priorities that may need to be addressed, and allows for interventions and program coverage

evaluation using program indicators[8,14]. Another important factor of the HIS is the ability to identify high-risk/high-priority groups to ensure they are receiving adequate resources and care. Although this was originally developed for use in protracted refugee camps, this system is being adapted to more acute situations. The UNCHR HIS is being standardized to provide the minimum set of indicators used in complex emergency situations[14]. It also provides recommendations for common tools and methods of collection used for public health surveillance. The final aspect of the UNCHR HIS is providing guidance for coordination, training and support.

A third method for public health surveillance during CHE is the WHO early warning alert and response network (EWARN). This system is designed to enhance existing surveillance during the acute emergency phase, and then be integrated into the national system once the acute phase of the emergency has passed[9]. The two main components of EWARN are immediate alerts for early stages of outbreaks, and a system of weekly reporting of aggregate data from health facilities. Surveillance is initially conducted at facilities with greater capacity and ability to ensure good data quality, but the goal is to move toward a system with universal coverage of all healthcare facilities[9]. EWARN recommends that priority diseases be limited to 8-12 conditions, determined by risk assessment and potential impact[9]. The selected diseases should be accompanied by a case definition for surveillance purposes to ensure that data collection and case counts are consistent across facilities. Priority diseases are typically those that have

epidemic potential and cause severe mortality or death. The availability of prevention and control measures, as well as relevant case definitions or diagnostic ability, is also important when determining which health events to include for surveillance. International surveillance requirements, such as regulations included in the IHR, must also be considered.

Evaluation of Surveillance

To ensure that a surveillance system is operating effectively and efficiently, it must be evaluated. Involving stakeholders is an integral part of evaluation[15,16]. In addition to engaging stakeholders, there are five primary tasks involved in evaluating a surveillance system: describing the system being evaluated, focusing the design of the evaluation, gathering evidence regarding system performance, conclusions and recommendations, and ensuring the use of these results[17]. For the design evaluation to be effective, its purpose and the information being generated by it must be understood by all stakeholders[15]. When system performance is being described, there are nine attributes on which to focus: simplicity, flexibility, data quality, acceptability, sensitivity, positive predictive value, representativeness, timeliness and stability[17]. Recommendations following evaluation should be specific and based on justified conclusions[15]. These recommendations may include modifications to the system, or continuation of the current system. Evaluations of surveillance systems should be conducted periodically, and it is important that the results are used to improve the system and also disseminated appropriately[16].

Chapter 3 Background

Geography and Government of Somalia

Somalia is a coastal country located at the "Horn of Africa" in East Africa. It shares a border with Djibouti to the northwest, Ethiopia to the west and north, and Kenya to the west and south. Somalia consists of four zones including the autonomous regions of Somaliland and Puntland, as well as the Central and Southern Zones. These four zones consist of 18 regions. The 2012 WHO estimate of the total population is 8.7 million[18]. The estimated populations of Somaliland and Puntland are 3.5 million and 3.9 million, respectively[19,20]. The remainder of the population lives in the Central and Southern Zones. However, the transient population and large number of IDP and refugees makes it difficult to obtain a current, accurate census of the population. The country of Somalia has not had a central government since 1991 when the Siad Barre regime ended[21]. Since then there has been ongoing conflict between the Transitional Federal Government (TFG) and the Islamic Courts Union (ICU), and later the militant group of Al-Shabaab[21].

The landscape of Somalia is mostly plateaus, plains and highlands, with the Karkaar Mountains running east-west in the northern area. Most of Somalia is semiarid to arid and experiences little rainfall or seasonal variation in temperature. The average annual rainfall in the northeast is less than four inches, and the average annual rainfall in the central plateaus ranges from eight to twelve inches. In contrast, the northwest and southwest areas of the country receive and

average of 20 to 24 inches of rain annually[22]. Somalia experiences four seasons. The main rainy season (*Gu*) lasts from April to June. There is another rainy season (*Dayr*) lasting from October to December. The *Jilal* is the main dry season occurring between December and March. Another dry season (*Xagaa*) occurs begins in June and lasts until September[22]. The geography of Somalia combined with the seasonal patterns in rainfall result in regular droughts, dust storms and floods.

Famine and Humanitarian Emergency

In 2011, Somalia experienced the worse drought in 60 years. This occurred on top of global increases in food prices, which greatly affect countries like Somalia relying heavily on food imports[21]. In July 2011, the UN declared a famine in the southern part of Somalia[23]. The conflict in the region restricted humanitarian access in response to the famine, and these combined factors led to a CHE for the country. Food shortages and conflict increased population displacement within Somalia, and into neighboring countries like Kenya, further complicating the emergency.

Public Health Surveillance

Previously, multiple disease surveillance systems existed in the Southern and Central Zones of Somalia, including the Communicable Disease Surveillance and Response system (CSR), the IDSR, measles, malaria, and the polio acute flaccid paralysis (AFP) surveillance. Due to the increased risk of infectious disease

transmission during this humanitarian crisis, WHO-Somalia asked the US CDC for assistance in evaluating these surveillance systems. Following this evaluation in 2011, the numerous systems were standardized and developed into a cohesive national surveillance system[24].

This revised system was used for the entire year of 2012. Surveillance was conducted at selected healthcare facilities within the four zones of Somalia, including hospitals, maternal and child healthcare (MCH) centers, and other healthcare facilities. This report will review the results of the newly implemented surveillance system. Trends in cases of confirmed malaria, suspected cholera, suspected shigellosis, suspected measles, and other vaccine preventable diseases will be analyzed. The result of this analysis is included in the 2012 WHO-Somalia Communicable Diseases Reporting System (CSR) annual surveillance report.

Chapter 4 Methods

Data Collection

Data for 2012 were collected via the Somalia communicable diseases reporting system (CSR) over the course of 52 weeks. Weekly reports were obtained from district hospitals, maternal and child healthcare (MCH) centers, and other healthcare facilities. Case information was entered into standardized registries located at healthcare facilities. These registries include demographic information such as age and gender, symptoms, diagnosis and treatment. Providers at healthcare facilities then enter summary surveillance data into weekly tally sheets (Appendix, Figure A1). Data collected included the number of male and female cases for each health event, cases of priority health events among individuals under 5 years of age and 5 years of age and older, total cases, deaths from priority health events among individuals under 5 years of age and 5 years of age and older, and total deaths. Priority health events for weekly surveillance as defined in the CSR Field Manual Appendices, v2, 2013 were suspected cholera, suspected shigellosis, suspected measles, acute flaccid paralysis (an indicator of polio), suspected hemorrhagic fever, suspected diphtheria, suspected pertussis, confirmed malaria, neonatal tetanus, and all other consultations (Appendix, Table A1). The weekly tally sheets were picked up by regional health workers and delivered to the zonal level for entry into surveillance databases. For this report, zonal trends in suspected cholera, suspected measles, suspected shigellosis, and confirmed malaria were analyzed because they were the most commonly reported of all the health events, not including other consultations. Total cases of other

vaccine preventable diseases (VPD) (acute flaccid paralysis, suspected diphtheria, suspected pertussis, and neonatal tetanus) with more than 10 cases for two or more zones were also calculated by region within the zones.

Compiled data from the reporting facilities were available for post hoc analysis. Data for each zone consisted of two datasets. Data for the first part of the year were entered in Microsoft Excel (Central Zone weeks 1-13, Southern Zone weeks 1-13, Puntland weeks 1-24, Somaliland weeks 1-23), while data for the latter part of the year were available in a Microsoft Access file that was developed by the Centers for Disease Control and Prevention as an Epi Info™ 7 database (CDC, Atlanta, GA). The two files for each zone were merged for cleaning and analysis using Statistical Analysis Software (SAS, Cary, NC, USA) version 9.3.

Assessing Data Quality

The merged data were assessed to determine potential quality issues. Duplicate records were identified by examining all reporting weeks within each facility to measure internal consistency of reporting facilities. Duplicate weekly records (same week and case counts recorded more than once) were identified and removed. Weeks in which facilities had zero patients reported were considered missing. Multiple weeks in which disease reports of four or more cases were identical, and weeks in which there were duplicates in the number of total cases and total deaths greater than or equal to four were classified as duplicates, based on methods developed for the 2011 analysis[24]. Facilities with 10% or more of

reporting weeks classified as duplicates were not included in the final analysis. Facilities with fewer than 10% of reporting weeks classified as duplicates, but in which duplicate weeks in the Excel data led to a concern over data reliability had weeks recorded in the Excel database removed, but not the facility in the final analysis (for example, some facilities had duplicate first and last weeks, as well as multiple other weeks with identical case counts). The proportion of facilities accepted per zone was compared from those accepted by a similar process in 2011[24]. Two-tailed Fisher exact was used for those cells less than 5 cases.

Weekly counts of suspected measles, suspected cholera, and confirmed malaria cases in individuals under 5 years of age, and rare health events (i.e. diphtheria and neonatal tetanus) in children under 5 years of age were examined for outlier detection. Case counts for these health events were considered extreme outliers if case counts within a given week were greater than the 99th percentile of all weekly case reports of respective health events for that facility. Weeks in which extreme outliers were identified were considered missing for that facility. In addition to checking the consistency of all weeks reported within facilities, weekly reports were also assessed for internal consistency. Weekly reports in which the sum of cases for under 5 years and 5 years and older did not equal the total number of cases, or the sum of under 5 years and 5 years and older deaths did not equal the total number of deaths were considered as missing for that week. Invalid reports, such as neonatal tetanus in the older age group, were also considered missing.

Missing disease-specific reports within weeks were identified and summarized by zone.

Total weeks reported were summarized for each facility. Facilities reporting less than 40% of the 52 weeks (less than 21 weeks) were not included for analysis. Facilities with zero total case reports over all reporting weeks were also not included for analysis.

Detecting Increased Patterns

Trends in disease and proportional morbidity for suspected measles, suspected cholera, suspected shigellosis, and confirmed malaria were assessed using graphical analysis. Proportional morbidity for a specific health event was calculated as the number of cases of an event for one week divided by the total number of cases presenting that week, per 1000 case reports. Trends in proportional morbidity were also graphed for hospitals within the four zones. Regional trends in cases were graphed for other VPD with more than 100 cases reported over 52 weeks in a specific region.

Chapter 5 Results

Data Quality

The number of facilities accepted and dropped for analysis in the 2012 in each zone was summarized by facility type (Table 1). In Central Zone and Southern Zone, 77.8% of 81 facilities and 69.2% of 52 facilities were accepted for analysis, respectively. Puntland had 46 facilities reporting, 95.7% of which were included in the final analysis, and Somaliland received reports from 55 facilities, of which 96.4% were accepted for analysis.

Table 1. Number and proportion of facilities accepted for analysis by facility type, Somalia, 2012

		Central	Southern	Puntland	Somaliland
Accepted	**Facility Type**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
	Hospital	18 (81.8)	4 (66.7)	6 (75.0)	7 (87.5)
	MCH*	42 (77.8)	31 (68.9)	38 (100.0)	45 (97.8)
	Other	3 (60.0)	1 (100.0)	0 (100.0)	1 (100.0)
	Total	**63 (77.8)**	**36 (69.2)**	**44 (95.7)**	**53 (96.4)**
Dropped	Hospital	4 (18.2)	2 (33.3)	2 (25.0)	1 (12.5)
	MCH	12 (22.2)	14 (31.1)	0 (0.0)	1 (2.2)
	Other	2 (40.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Total	**18 (22.2)**	**16 (30.8)**	**2 (4.3)**	**2 (3.6)**
Total		**81**	**52**	**46**	**55**

* MCH, Maternal and Child Health Center; Other, other facilities not including health posts

Facilities were checked for internal consistency before being included in analysis. For the 2012 data, facilities were dropped for reporting zero total cases, or for reporting fewer than 40% of 52 weeks. No facilities were dropped for duplicate week greater than 10%, or for other reasons. The results are summarized by zone in Table 2.

Table 2. Reasons for removing facilities from analysis, Somalia, 2012

	Central		Southern		Puntland		Somaliland	
Reason Dropped	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Zero Cases	6	35.3	4	25	0	0	2	100
Too few reporting weeks (<21 weeks)	12	64.7	12	75	2	100	0	0
>10% Duplicates	0	0	0	0	0	0	0	0

These accepted facility results compared with the facility results for 2011 showed minimal improvement (Table 3).

Table 3. Number and proportion of facilities accepted for analysis by facility type, Somalia, 2011 and 2012

	Number of facilities accepted % (n/N)		
Zones	**2011**	**2012**	**p-value**
South and Central[a]	66.5% (139/209)	74.4% (99/133)	0.15
Puntland	100% (45/45)	95.7% (44/46)	0.50
Somaliland	76.9% (40/52)	96.4% (53/55)	0.003
	Hospitals accepted		
South and Central	71.4% (20/28)	78.6% (22/28)	0.76
Puntland	100% (1/1)	75.0% (6/8)	1.00
Somaliland	85.7% (6/7)	87.5% (7/8)	1.00

a. South and Central Zones were grouped for analysis in 2011, 2012 results have been grouped for comparison

The number of facilities in which weeks were dropped due to concerns over data quality were also summarized by zone (Table 4). Southern Zone had eight facilities in which the weeks reported in the Excel data were dropped due to duplicate weeks (less than 10%) and four facilities in which weeks were dropped to remove extreme outliers for priority health events (greater than the 99th percentile). For Central, Puntland and Somaliland, the remaining weeks from specific facilities were also dropped to remove priority health events extreme outliers.

Table 4. Number of weeks for specific facilities dropped due to outliers and other quality concerns, Somalia, 2012

Central		Southern		Puntland		Somaliland	
Specific Facilities	Weeks Dropped	Specific Facilities	Weeks Dropped	Specific Facilities	Weeks Dropped	Specific Facilities	Weeks Dropped
2	1	4	1	1	1	1	2
1	3	1	9	-	-	-	-
-	-	1	10	-	-	-	-
-	-	2	11	-	-	-	-
-	-	4	12	-	-	-	-

Summary statistics for the number of weeks included for analysis by zone are included in Table 5. Central Zone had facilities reporting the fewest number of weeks, compared with the other three zones. Southern Zone had the lowest maximum number of weeks reported and the lowest median number of weeks reported per facility overall. Puntland and Somaliland both had a median of 51 weeks reported by facilities within those two zones. The total number of weeks reported by the facilities included for analysis within the four zones were also summarized (Appendix, Table A2).

Table 5. Summary statistics for weeks reported by zone, Somalia, 2012

	Central	Southern	Puntland	Somaliland
Min[a]	22	31	44	42
Max[b]	52	47	52	52
Median[c]	47	39	51	51

a. Minimum number of weeks reported by one or more facilities
b. Maximum number of weeks reported by one or more facilities
c. Median number of weeks reported by facilities in the zone

Missing disease-specific counts were summarized for the final data included in analysis (Table 6). Neonatal tetanus was the health event with the greatest number of missing values for all zones except Southern Zone. Counts for neonatal

tetanus were not included in the Puntland and Somaliland data until week 3 and week 4, respectively. Invalid cases of neonatal tetanus in individuals 5 years of age or older were recoded as missing (10 cases in Central Zone).

Table 6. Missing disease-specific counts per week, Somalia, 2012

Health Event	Central	Southern	Puntland	Somaliland
Acute Flaccid Paralysis	0	2	0	0
Suspected Cholera	0	2	0	0
Suspected Diphtheria	0	2	0	0
Suspected Hemorrhagic Fever	1	2	0	1
Confirmed Malaria	0	2	1	0
Suspected Measles	0	2	0	0
Other Consultations	0	2	0	1
Suspected Shigellosis	0	2	0	0
Neonatal Tetanus	11	0	105	538
Suspected Pertussis	0	2	0	0

Priority Health Events in 2012

Case counts of priority health events were summarized by zone (Table 7). Central Zone had the greatest number of health events reported. In Central Zone, confirmed malaria and suspected cholera were the most commonly reported health events (17,586 cases and 12,357 cases, respectively). High numbers of suspected measles, suspected shigellosis, and suspected pertussis were also seen. The most common report received in Southern Zone was confirmed malaria (9,682 cases), followed by suspected cholera (4,925 cases), and suspected shigellosis (3,520 cases). There were also greater than 1,000 reports for suspected measles and suspected pertussis. In Puntland, cholera was the most commonly reported health event, with 4,899 suspected cases but suspected shigellosis was

also frequently reported (1,343 cases). Somaliland had the fewest number of health events reported; suspected measles, suspected shigellosis, and suspected cholera all had more than 1,000 cases but less than 1,300 cases reported for 2012 (1,288 cases, 1,200 cases, and 1,002 cases, respectively). Suspected hemorrhagic fever (20 total cases), acute flaccid paralysis (20 total cases), and suspected diphtheria (25 total cases) were the least reported health events in all the zones.

Table 7. Cases of priority health events by zone, Somalia, 2012

Health Event	Central	Southern	Puntland	Somaliland
Acute Flaccid Paralysis	12	4	2	2
Suspected Cholera	12,357	4,925	4,899	1,002
Suspected Diphtheria	4	16	3	2
Suspected Hemorrhagic Fever	16	4	0	0
Confirmed Malaria	17,586	9,682	23	21
Suspected Measles	5,338	1,984	957	1,200
Suspected Shigellosis	2,684	3,520	1,343	1,288
Neonatal Tetanus	199	3	0	1
Suspected Pertussis	1,707	1,609	13	43
Other Consultations	710,137	284,249	233,619	214,587

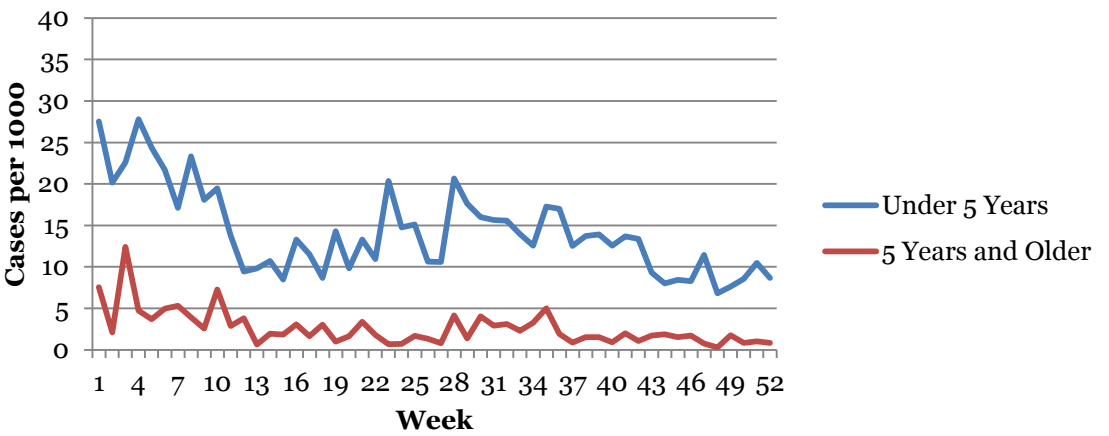
Trends in Proportional Morbidity for Priority Health Events

Trends in suspected measles, confirmed malaria, suspected cholera and suspected shigellosis are shown below. Proportional morbidity for those less than 5 years of age, and those 5 years of age or older was calculated using the number of cases per age group for a specific health event per 1000 total cases reported for the respective age group.

Suspected Measles

Trends in proportional morbidity of suspected measles for Central Zone are shown in Figure 1. The proportional morbidity remained similar or decreased slightly over the 52 weeks for both age groups (less than 5 years, and 5 years or older), but was consistently higher throughout the year among the younger age group.

Figure 1. Proportional Morbidity of Suspected Measles by Age Group - Central Zone, Somalia, 2012



The proportional morbidity of suspected measles in Southern Zone shows a similar trend to the proportional morbidity of suspected measles in Central Zone, decreasing over the year (Figure 2a). Data for Southern Zone is missing prior to week 4. There is a decrease in the number of facilities available for analysis in week 5 and week 13; this decrease reduced the total number of reports for each age group by approximately half from the previous week, leading to an increase in proportional morbidity for week 5 and week 13. The actual number of cases in week 5 is consistent with an increasing trend in weeks 4 through 6 (5, 9, and 18

cases of suspected measles, respectively), as is week 13 compared to the trend in weeks 12 through 14 (27, 42, and 57 cases of suspected measles, respectively). Due to the small number of facilities reporting for week 5 and week 13, these weeks were removed when analyzing the overall trend in proportional morbidity of measles in Southern Zone (Figure 2b).

Figure 2a. Proportional Morbidity of Suspected Measles by Age Group - Southern Zone, Somalia, 2012

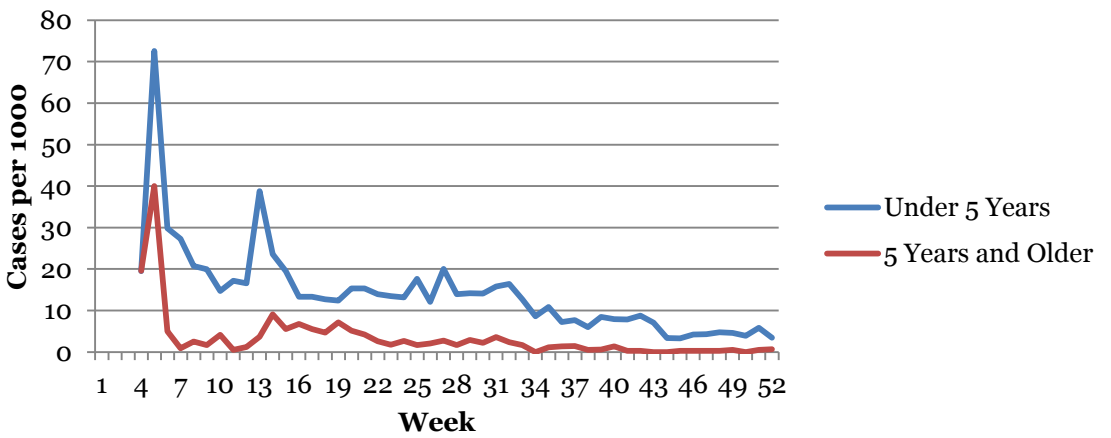
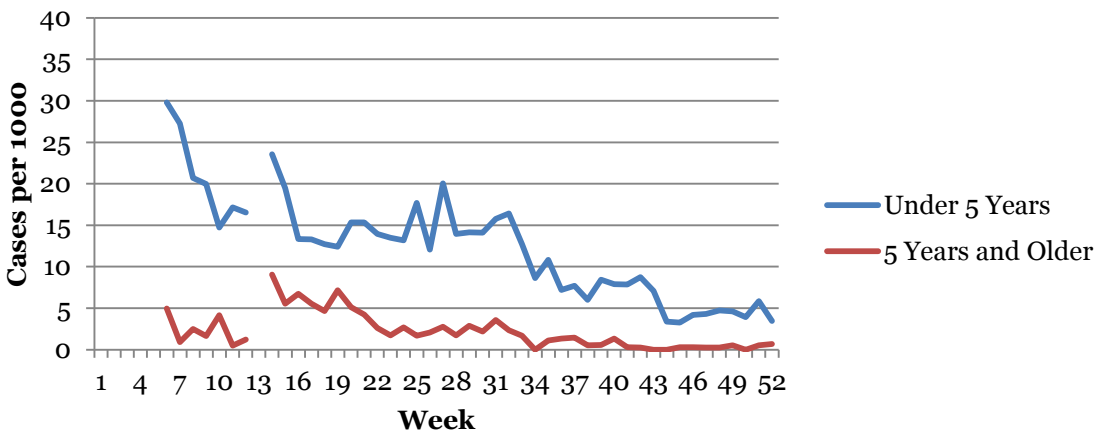
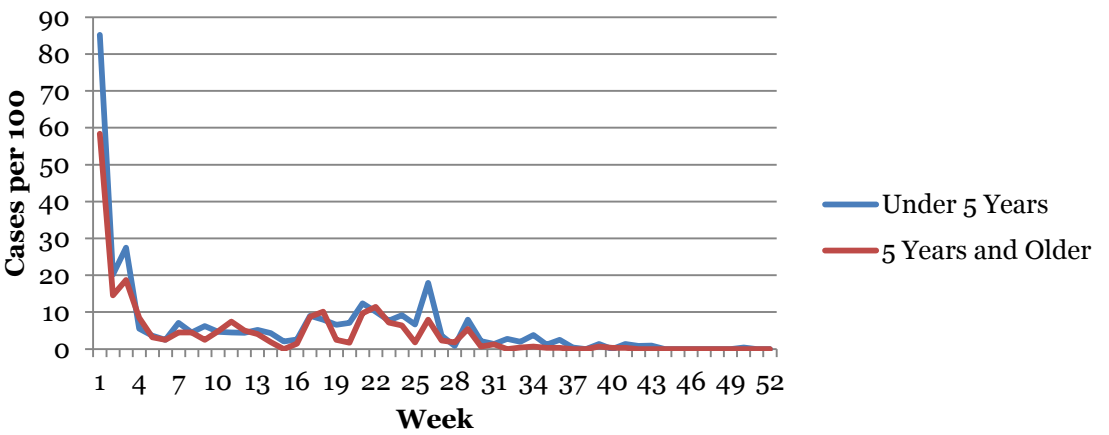


Figure 2b. Proportional Morbidity of Suspected Measles by Age Group - Southern Zone, Somalia, 2012

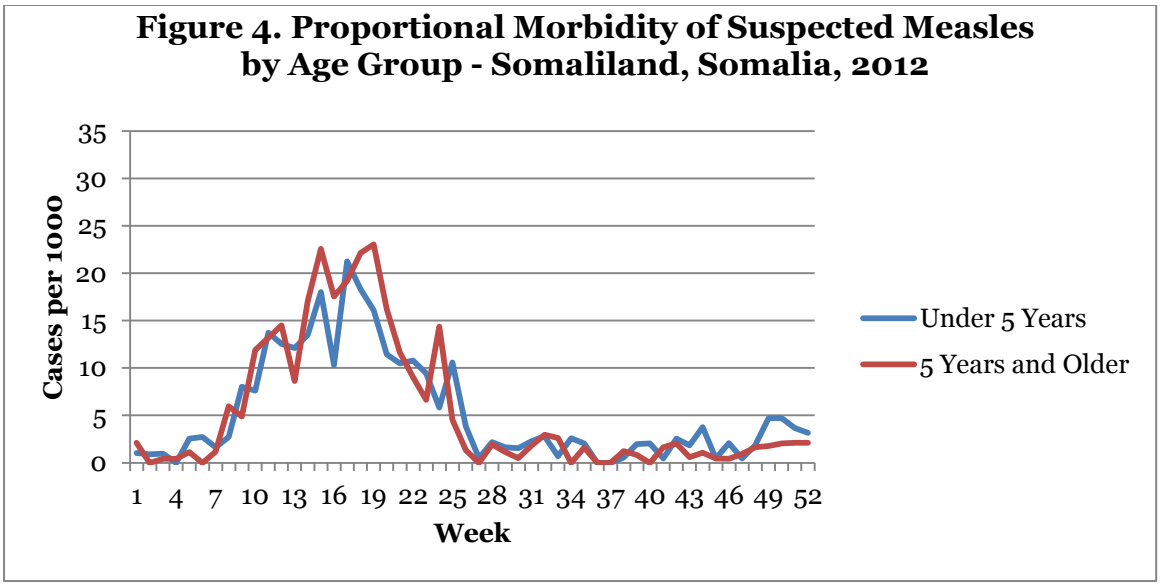


Trends in proportional morbidity of suspected measles within Puntland are similar for both age groups (Figure 3). There was a high proportional morbidity during the first few weeks, which might be because of poor quality of data that was not determined by methods outlines. Trends throughout the rest of the year were fairly consistent at low levels.

Figure 3. Proportional Morbidity of Suspected Measles by Age Group - Puntland, Somalia, 2012

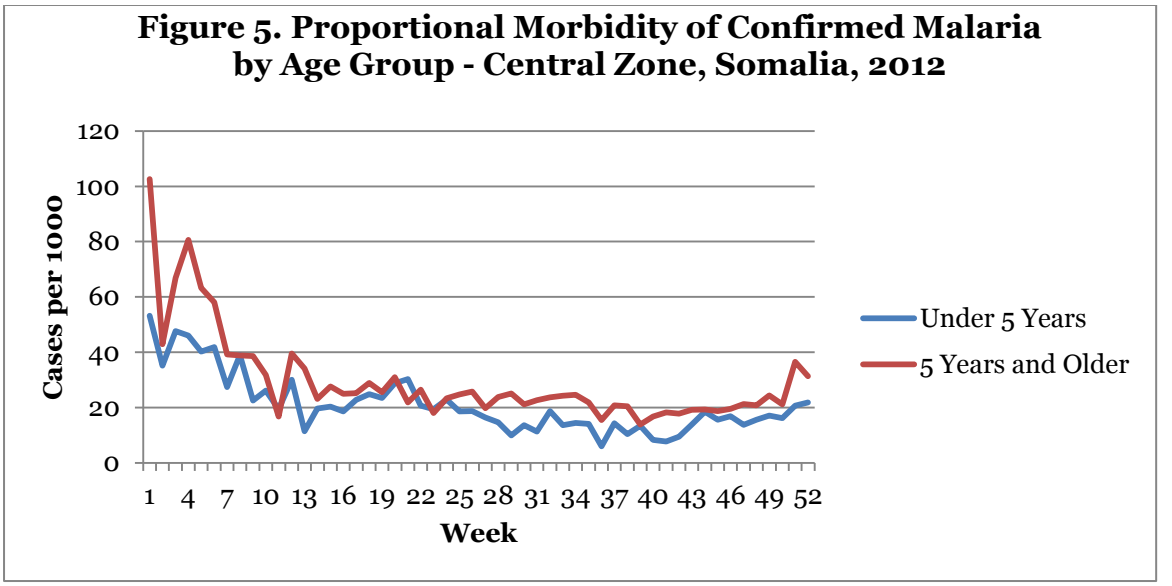


Trends in proportional morbidity of suspected measles in Somaliland were also similar for both age groups (Figure 4). An increase in proportional morbidity was seen beginning around week 5, and peaking near week 18 or 19. These trends likely show an outbreak of measles within Somaliland, beginning near week 5 and ending near week 27. Proportional morbidity of suspected measles remained at low levels for the rest of the year.

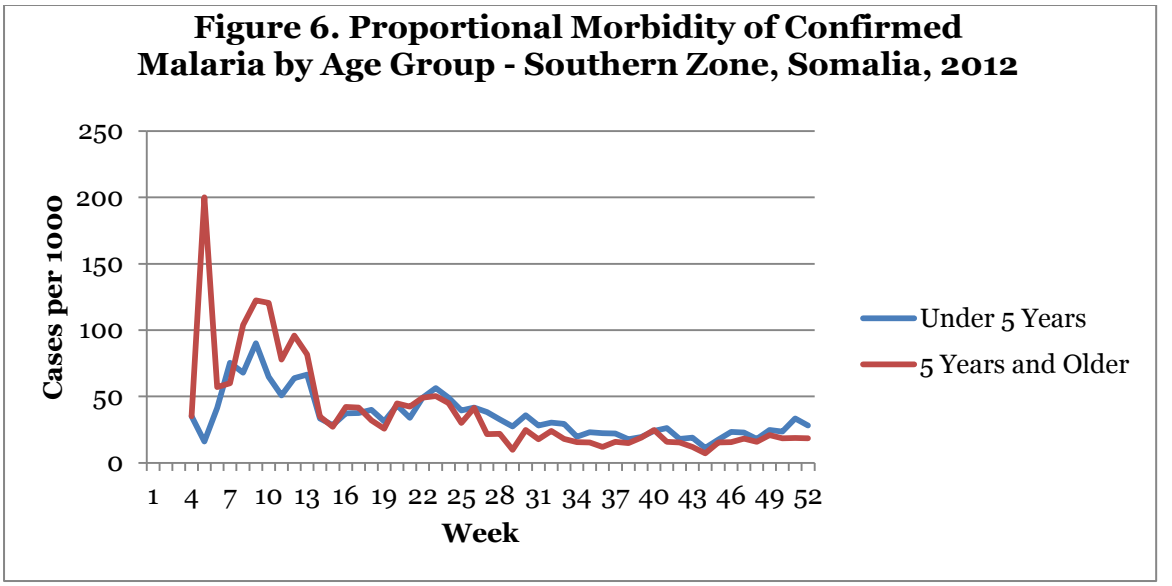


Confirmed Malaria

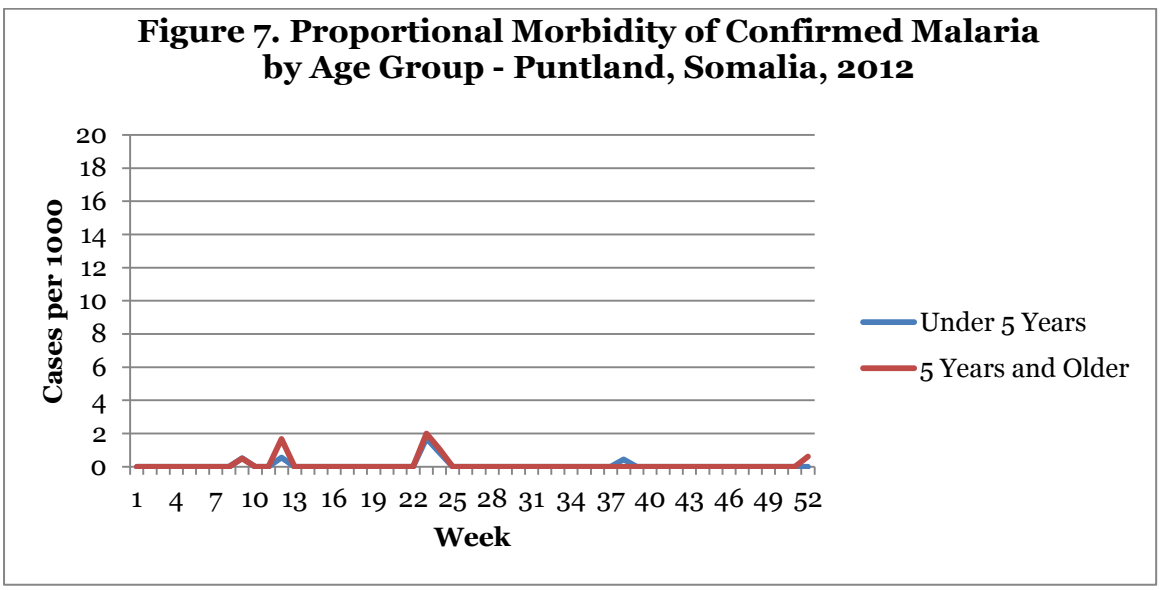
Reports of confirmed malaria were also analyzed by age group for trends in proportional morbidity. The proportional morbidity of confirmed malaria in Central Zone was slightly higher among the older age group (Figure 5). Reports from one hospital, SZBN18, account for the high number of cases in the beginning of the year. Proportional morbidity of confirmed malaria across the entire 52 reported weeks by age groups showed similar levels or an overall decrease with a slight increase toward the end of the year.

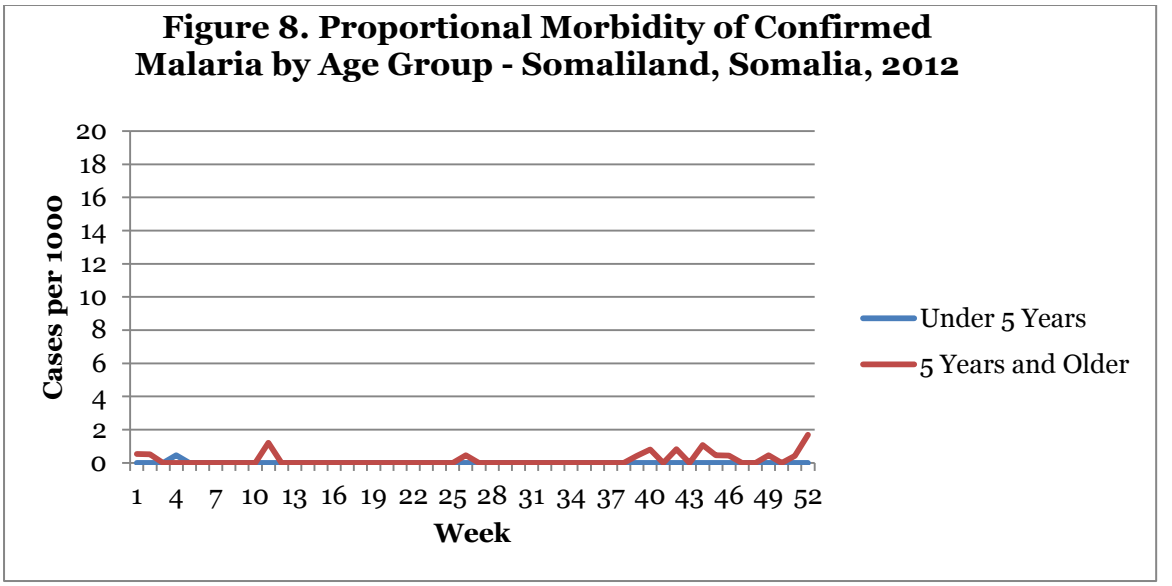


Proportional morbidity of confirmed malaria in Southern Zone was also higher among the older age group at the beginning of the reported weeks (Figure 6). After week 13 proportional morbidity was fairly level for the remainder of the year, but slightly higher at times among the younger age group. As with suspected measles, only one facility reporting for week 5 led to a spike and trough in proportional morbidity of confirmed malaria for the older and younger age groups, respectively.



Few cases of malaria were reported in Puntland (Figure 7) and Somaliland (Figure 8). These zones reported zero cases of confirmed malaria for the majority of weeks, with only periodic cases reported. Of the few cases reported in Somaliland, most occurred in individuals 5 years of age or older.



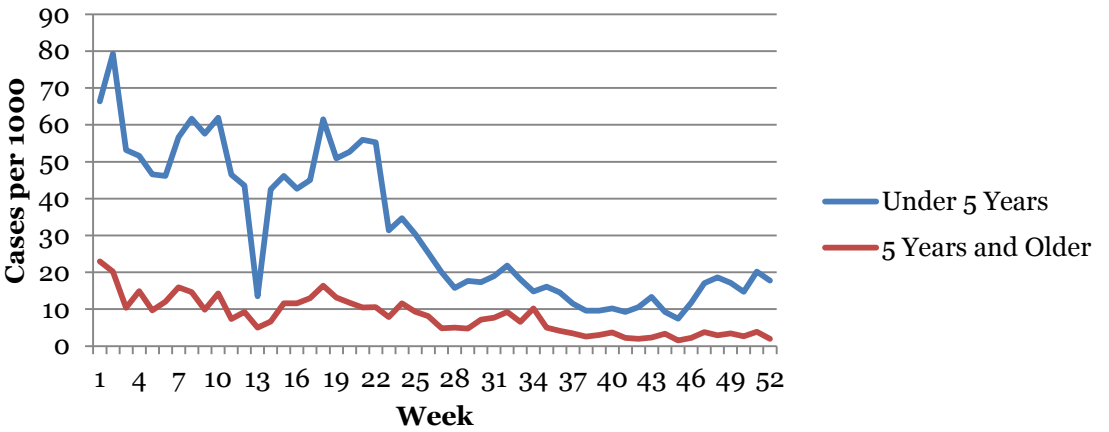


Suspected Cholera

The proportional morbidity of suspected cholera was higher among the younger age group for all zones. Suspected cholera in Central Zone had a decreasing trend throughout the year, with a greater decrease in proportional morbidity among the younger age group (Figure 9). Graphical analysis reveals a noticeable decrease in the trend of proportional morbidity of suspected cholera among the younger age group in week 13. One facility (SZBN18) reported 64% of the suspected cholera cases in Central Zone (7,939 of 12,357). Reports for this facility are missing for week 13. This resulted in a decrease in the total number of cases reported by almost half (5,187 cases to 2,444 cases), but a decrease of 85% in the number of cholera cases in individuals less than 5 years of age for week 13 compared to week 12 (226 cases to 33 cases). There was also a 75% decrease in the number of cholera cases in individuals 5 years of age or older for week 13 compared to week 12 (61

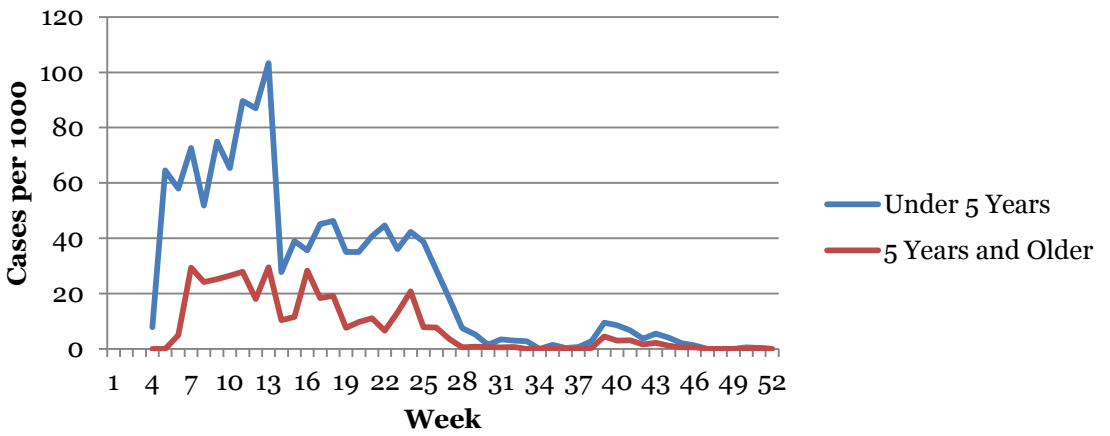
cases to 16). However, this difference is not as noticeable due to the much lower proportional morbidity among the older age group.

Figure 9. Proportional Morbidity of Suspected Cholera by Age Group - Central Zone, Somalia, 2012



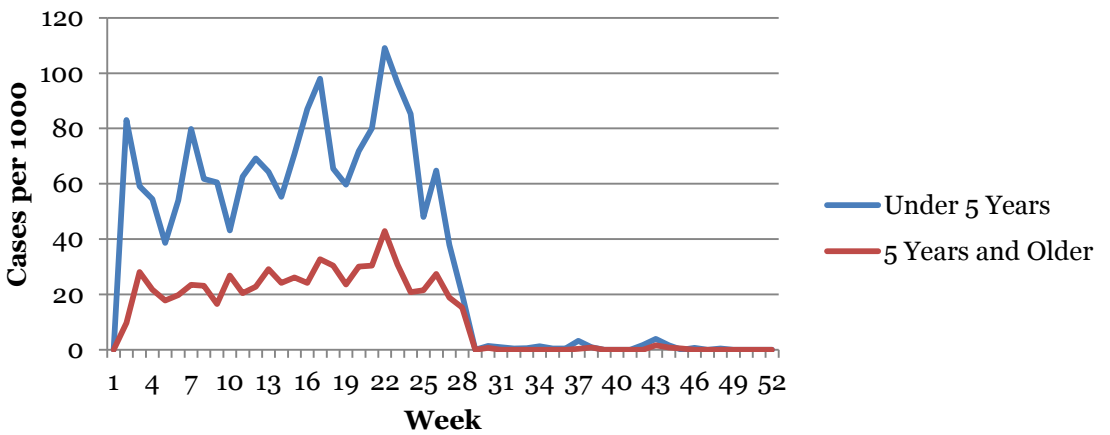
Suspected cholera in Southern Zone also had a much higher proportional morbidity among the younger age group for week 4 to week 13 (Figure 10). After week 13, there was a sudden decrease in the proportional morbidity among the younger age group. Prior to week 13 there were concerns over data quality and weeks 1 through 13 were excluded from analysis for several facilities. The smaller number of total reports analyzed in weeks 4 through 13 resulted in a higher proportional morbidity overall. After week 13 data were entered into the Epi Info database. Improved quality of data following the switch to the Epi Info database resulted in more facilities being included for analysis and a greater number of total cases, reducing the proportional morbidity compared to prior weeks. After week 28, there were many fewer reports of suspected cholera for both age groups.

Figure 10. Proportional Morbidity of Suspected Cholera by Age Group - Southern Zone, Somalia, 2012



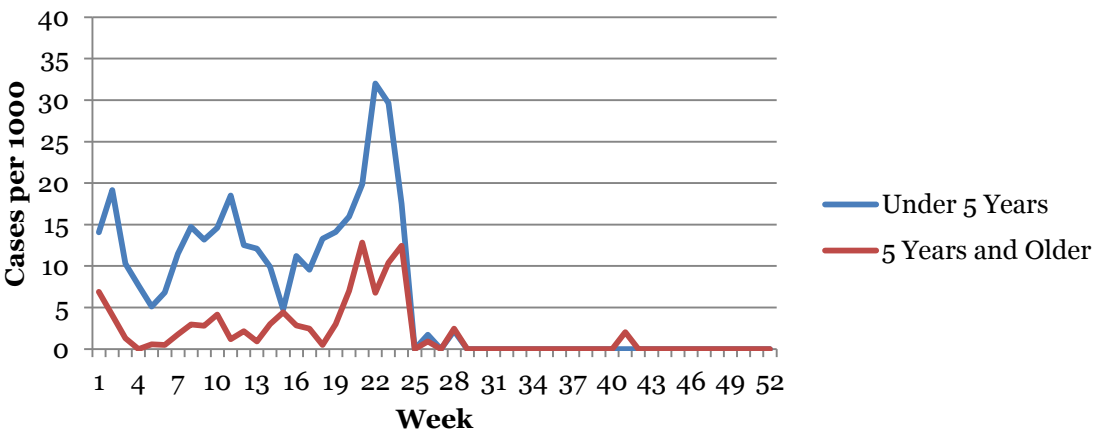
Puntland also reported very few cases of suspected cholera after week 28 (Figure 11). For the first part of the year, the proportional morbidity of suspected cholera was much higher among the younger age group. Of note, the data for Puntland were collected in the Excel spreadsheet for weeks 1 through 24.

Figure 11. Proportional Morbidity of Suspected Cholera by Age Group - Puntland, Somalia, 2012



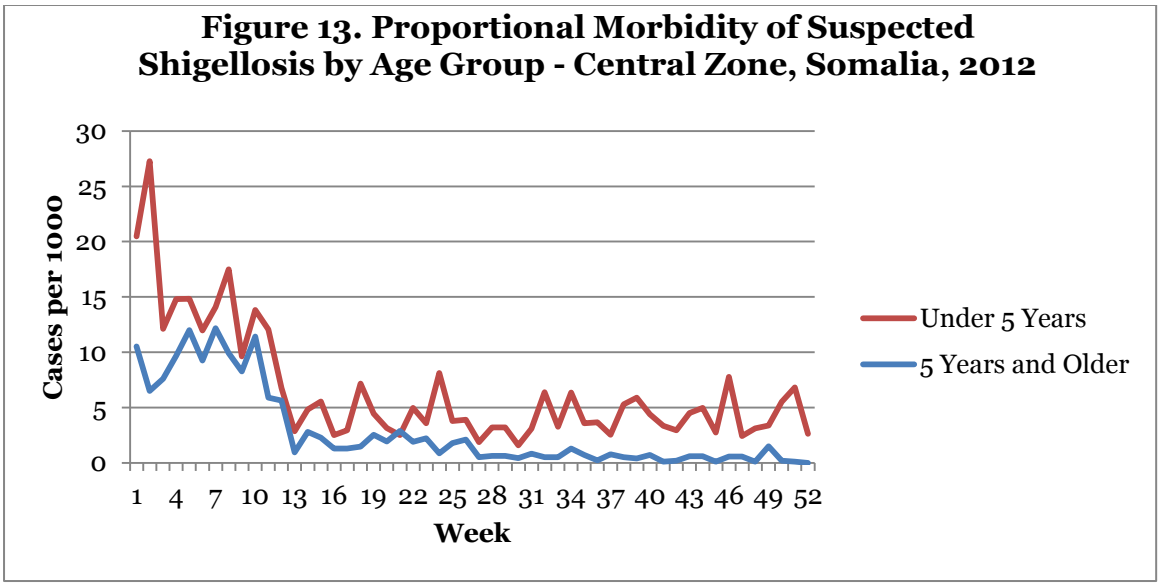
Somaliland saw a sudden decrease in the proportional morbidity of suspected cholera in week 23 and week 24, after which few cases were reported (Figure 12). Prior to week 24, the proportional morbidity was greater among the younger age group, similar to the other three zones. The data were entered into the Excel spreadsheet through week 23.

Figure 12. Proportional Morbidity of Suspected Cholera by Age Group - Somaliland, Somalia, 2012



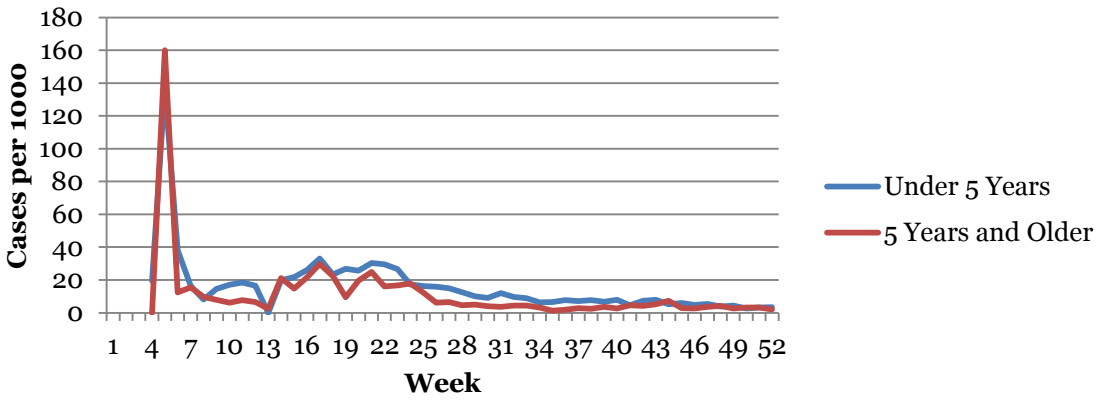
Suspected Shigellosis

Trends in proportional morbidity of suspected shigellosis were similar among both age groups. In Central Zone the proportional morbidity was slightly higher among the older age group (Figure 13). Both age groups showed a decrease in proportional morbidity prior to week 13, after which it remained fairly constant at lower levels.



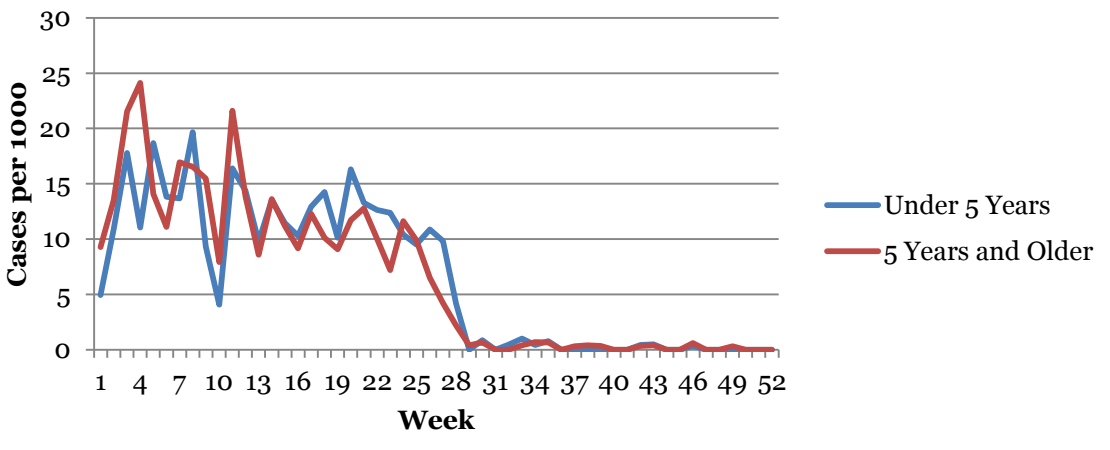
Trends in proportional morbidity of suspected shigellosis in Southern Zone were similar for both age groups (Figure 14). Again, the peak in week 5 is due to the lack of facilities reporting data for that week and the small number of total case reports for all visits to healthcare facilities, but there was not a large change in the total number of cases reported.

Figure 14. Proportional Morbidity of Suspected Shigellosis by Age Group - Southern Zone, Somalia, 2012



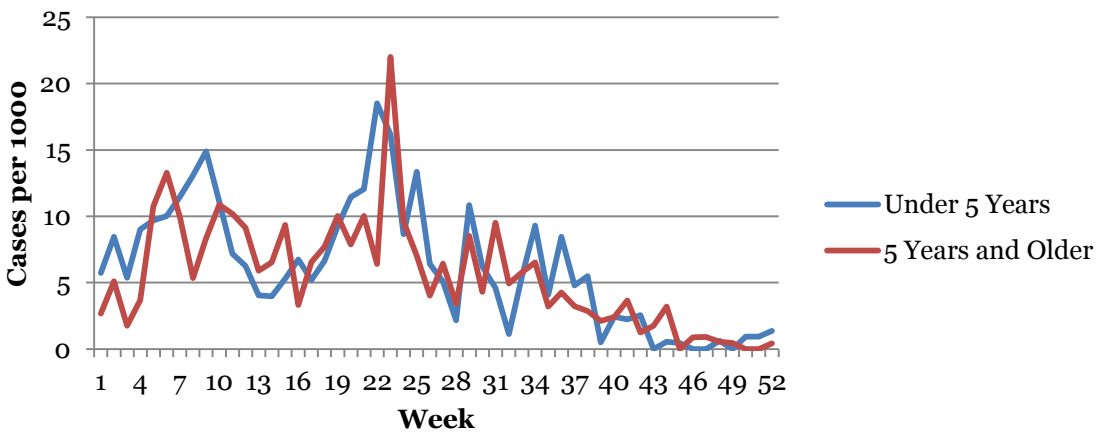
Proportional morbidity of suspected shigellosis in Puntland is also similar for both age groups (Figure 15). It decreases suddenly prior to week 28, after which the data were entered into the Epi Info database and few cases of suspected shigellosis are reported.

Figure 15. Proportional Morbidity of Suspected Shigellosis by Age Group - Puntland, Somalia, 2012



In Somaliland, proportional morbidity of suspected shigellosis was variable over the first half of the year, but similar for both age groups (Figure 16). There was a decreasing trend in proportional morbidity during the second half of the year for those less than age five, and those 5 years of age and older. At week 23, the data entry changed from the Excel to the Epi Info database.

Figure 16. Proportional Morbidity of Suspected Shigellosis by Age Group - Somaliland, Somalia, 2012



Vaccine Preventable Diseases

VPD with 10 or more cases in two or more zones were summarized by zone, region, and age group. Regional trends for VPD with greater than 100 cases per region were also assessed.

The Central Zone had 63 facilities included in the final analysis (Table 8). The majority of VPD reported in the Central Zone were from two regions, Banadir and Lower Shabelle. Suspected pertussis was the most commonly reported VPD. Due to the higher number of cases, trends in suspected pertussis were analyzed for

Banadir (Figure 17) and Lower Shabelle (Figure 18), and trends in neonatal tetanus were analyzed for Banadir (Figure 19). Cases of neonatal tetanus in individuals over age 5 in Banadir are due to data entry error or non-adherence to case definition.

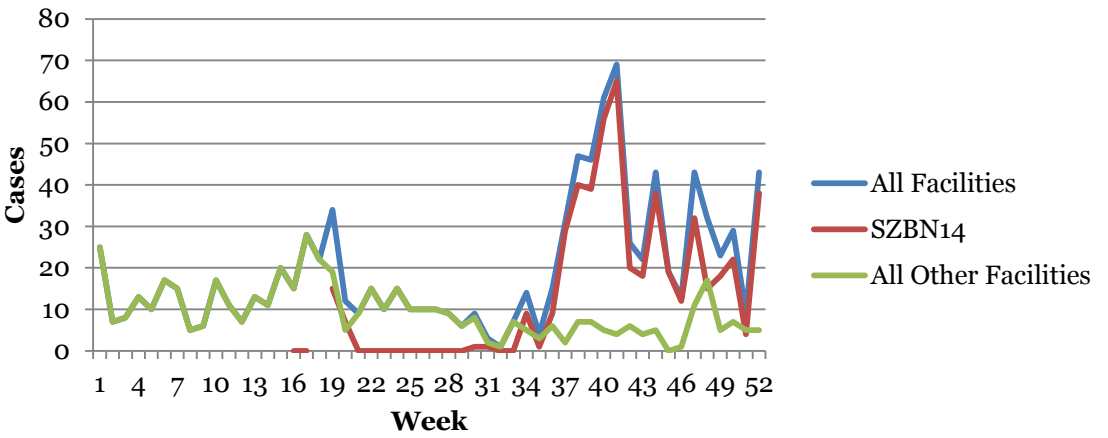
Table 8. Number of facilities reporting and cases of vaccine preventable diseases, by region, Central Zone, Somalia, 2012

Region	Facilities[a]	Suspected diphtheria		Neonatal Tetanus		Suspected pertussis	
		Total	< 5[b]	Total	< 5[b]	Total	< 5[b]
Banadir	24	3	2	176[c]	176	999	836
Galgadud	7	1	1	0	0	67	48
Hiraan	3	0	0	0	0	19	18
Lower Shabelle	25	0	0	5	5	534	449
Middle Shabelle	4	0	0	0	0	88	67

a. Total number of facilities reporting from each region
b. Age less than 5 years
c. Erroneous entries for 10 cases of neonatal tetanus in individuals 5 years or older were removed (facility SZBN01: 4 cases, facility SZBN18: 5 cases, facility SZBN28: 1 case)

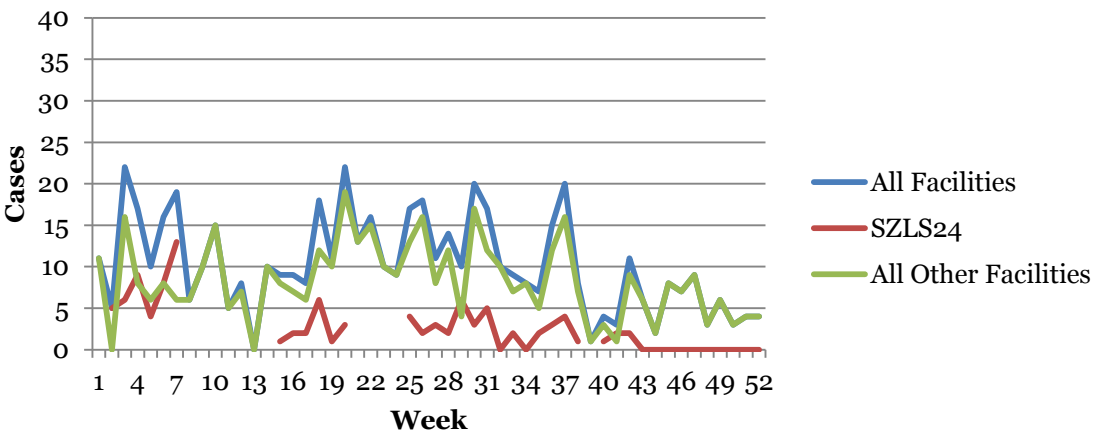
Banadir reported the highest number of cases of suspected pertussis (999). Approximately half of the suspected pertussis cases for this region were reported from one hospital, facility SZBN14 (508 suspected cases), even though reports for this facility are missing prior to week 16. Trends in the total number of reported cases of suspected pertussis within the region closely mirror the number of cases reported from facility SZBN14 for the latter part of the year.

Figure 17. Suspected Pertussis Cases - Banadir Region, Central Zone, Somalia, 2012



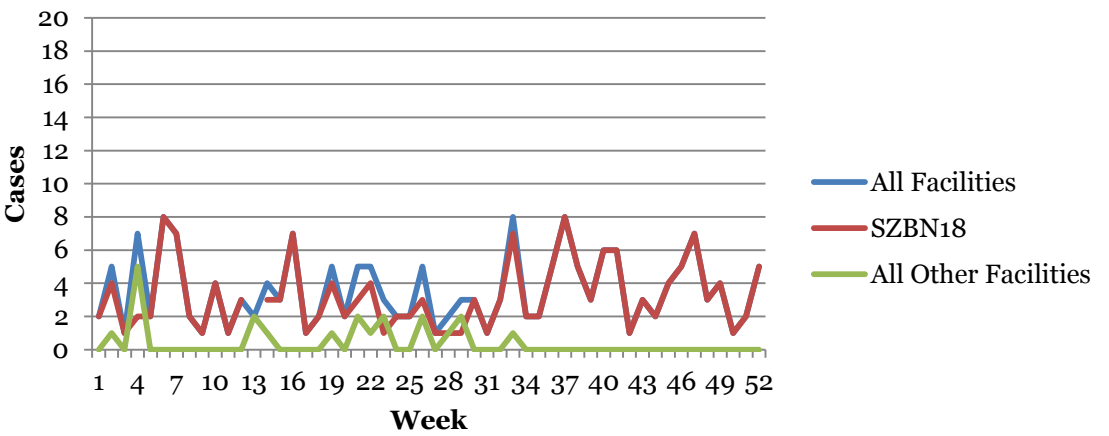
Lower Shabelle reported 534 total cases of suspected pertussis over 52 reporting weeks. One hospital (SZLS24) reported the highest number of suspected cases among all facilities (104 suspected cases). However, no single facility seemed to be responsible for driving the overall trend in reported suspected pertussis cases.

Figure 18. Suspected Pertussis Cases - Lower Shabelle Region, Central Zone, Somalia, 2012



Banadir was also the region with the highest number of suspected neonatal tetanus (176 reported cases among those under 5 years of age). One hospital (SZBN18) reported 165 cases of suspected neonatal tetanus, of which 160 were less than 5 years of age, over the 51 total reporting weeks (data for week 13 was missing for this facility). As seen in figure 17, facility SZBN18 accounts for most of the weekly reported cases of suspected neonatal tetanus among those less than 5 years of age.

Figure 19. Cases of Suspected Neonatal Tetanus - Banadir Region, Central Zone, Somalia, 2012



The Southern Zone had 36 facilities included in the final analysis (Table 9). As in the Central Zone, suspected pertussis was the most commonly reported VPD. High numbers of suspected pertussis were seen in four of the five regions in the Southern Zone (Bakool, Bay, Lower Juba, and Middle Juba). Due to the higher number of cases, trends in suspected pertussis for Bakool (Figure 20) and Bay (Figure 21) regions were analyzed.

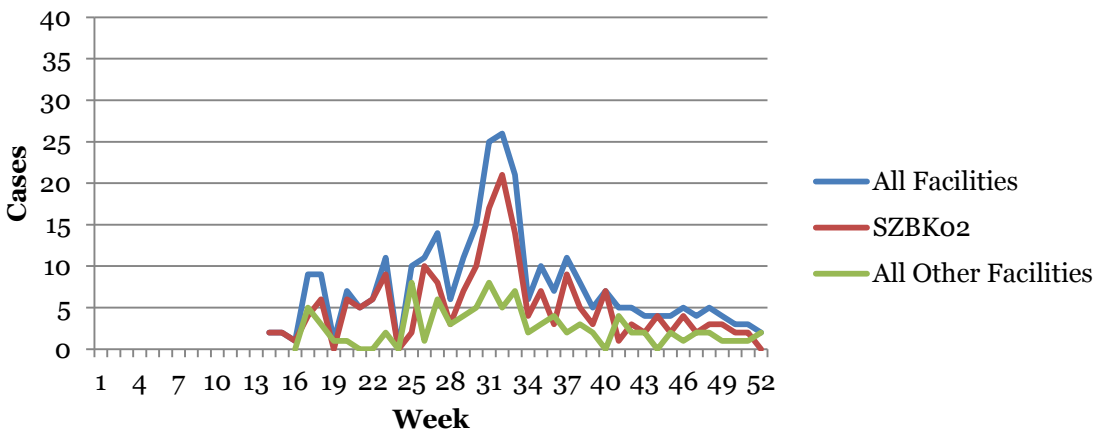
Table 9. Number of facilities reporting and cases of vaccine preventable diseases, by region, Southern Zone, Somalia, 2012

Region	Facilities[a]	Suspected diphtheria		Neonatal Tetanus		Suspected pertussis	
		Total	< 5[b]	Total	< 5[b]	Total	< 5[b]
Bakool	3	0	0	0	0	294	227
Bay	7	13	7	3	3	916	672
Gedo	11	2	2	0	0	79	69
Lower Juba	12	1	0	0	0	166	163
Middle Juba	3	0	0	0	0	154	136

a. Total number of facilities reporting from each region
b. Age less than 5 years

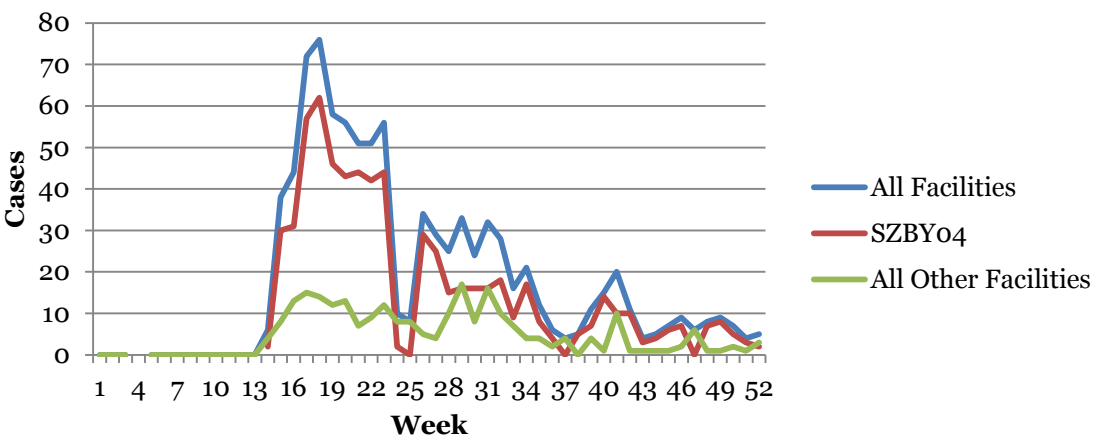
Reports for Bakool are missing prior to week 14. Of the 294 cases of suspected pertussis reported, 199 were reported from SZBK02, an MCH facility. The number of suspected pertussis cases reported from all facilities, and the number of suspected pertussis cases reported from this specific facility peak in week 32 but was showing an increasing rate for the two weeks prior and remaining elevated for one week after.

Figure 20. Suspected Pertussis Cases - Bakool Region, Southern Zone, Somalia, 2012



A total of 916 cases of suspected pertussis were reported in Bay over the 52 weeks. Cases of suspected pertussis are first seen in week 14, when facility SZBY04 (an MCH facility) reports are first available for analysis. Facility SZBY04 reported 667 of the 916 cases of suspected pertussis. There is a decrease in the number of cases of suspected pertussis reported by SZBY04 in weeks 24 and 25, resulting in a decrease in the total number of suspected pertussis cases reported for the region, with a subsequent increase in cases in week 26. This decrease in weeks 24 and 25 is inconsistent with the trend of suspected pertussis cases seen in the data, which might be because of poor quality of data that was not determined by methods outlines.

Figure 21. Suspected Pertussis Cases - Bay Region, Southern Zone, Somalia, 2012



Puntland (Table 10) and Somaliland (Table 11) reported few cases of VPD and no disease-specific regional trends were analyzed for these zones.

Table 10. Number of facilities reporting and cases of vaccine preventable diseases, by region, Puntland, Somalia, 2012

Region	Facilities[a]	Suspected diphtheria		Neonatal Tetanus		Suspected pertussis	
		Total	< 5[b]	Total	< 5[b]	Total	< 5[b]
Bari	6	0	0	0	0	0	0
Cayn	1	0	0	0	0	0	0
Karkaar	8	0	0	0	0	3	2
Mudug	7	0	0	0	0	0	0
Nugaal	12	3	2	0	0	9	7
Sanaag	4	0	0	0	0	1	1
Sool	6	0	0	0	0	0	0

a. Total number of facilities reporting from each region
b. Age less than 5 years

Table 11. Number of facilities reporting and cases of vaccine preventable diseases, by region, Somaliland, 2012

Region	Facilities[a]	Suspected diphtheria		Neonatal Tetanus		Suspected pertussis	
		Total	< 5[b]	Total	< 5[b]	Total	< 5[b]
Awdal	8	0	0	0	0	8	8
Maroodijeh	16	0	0	1	1	20	16
Sahil	5	1	1	0	0	9	6
Sanag	6	0	0	0	0	10	8
Sool	8	0	0	0	0	0	0
Togdheer	10	1	1	0	0	4	4

a. Total number of facilities reporting from each region
b. Age less than 5 years

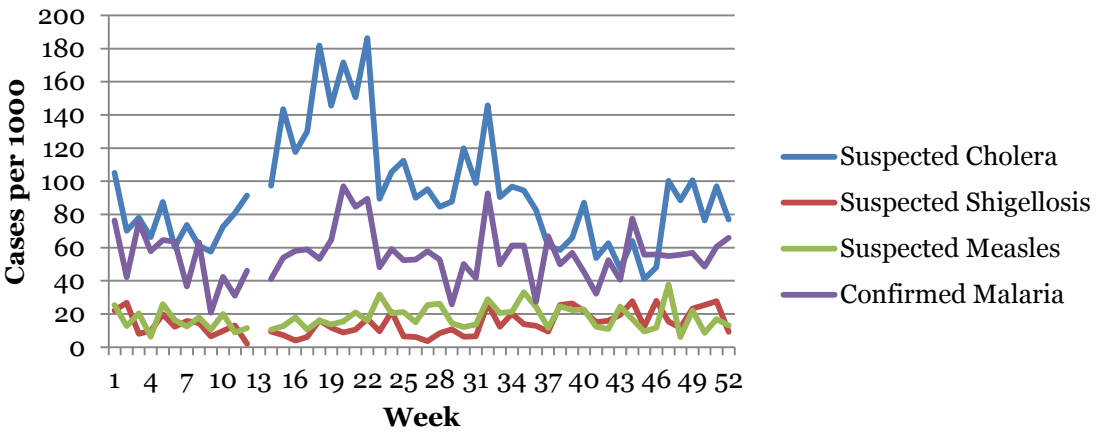
Facility-specific Disease Trends

Hospitals within the four zones were selected to examine facility-specific trends for priority health events. Trends in proportional morbidity of suspected cholera and suspected shigellosis were graphed, as well as trends in suspected measles and confirmed malaria with greater than 100 cases at the hospital level.

Central Zone

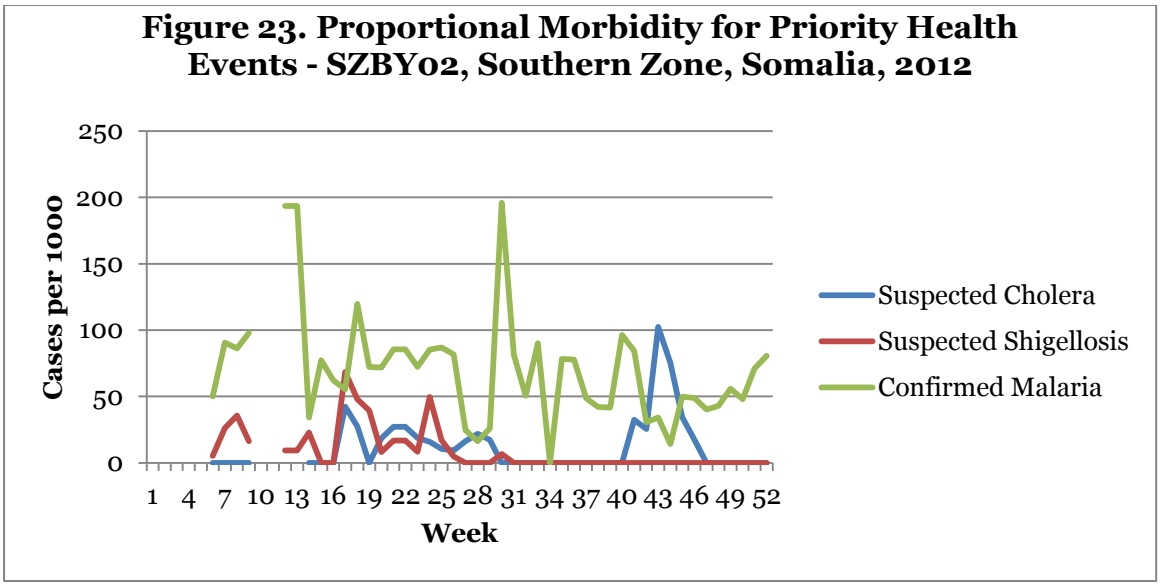
Trends in cases of suspected cholera, suspected shigellosis, suspected measles and confirmed malaria for facility SZBN18 in Central Zone are shown in Figure 22. Suspected cholera accounted for the greatest number of cases per 1,000 reports, followed by confirmed malaria. Proportional morbidity of confirmed malaria, suspected shigellosis and suspected measles was fairly consistent throughout the year. Reports from week 13 were missing for this facility.

Figure 22. Proportional Morbidity for Priority Health Events- SZBN18, Central Zone, Somalia, 2012



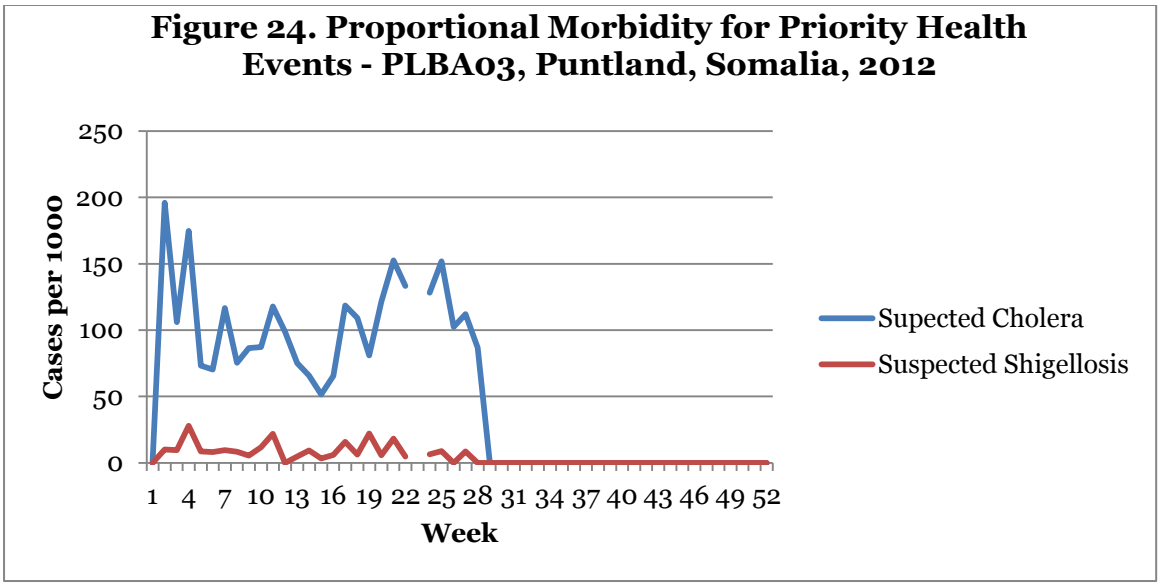
Southern Zone

Facility SZBY02 received more than 100 reports of suspected cholera, suspected shigellosis and confirmed malaria. Confirmed malaria had the highest proportional morbidity among the priority health events (Figure 23). Reports from SZBY02 are missing for weeks 1-5, as well as weeks 10, 11 and 13.

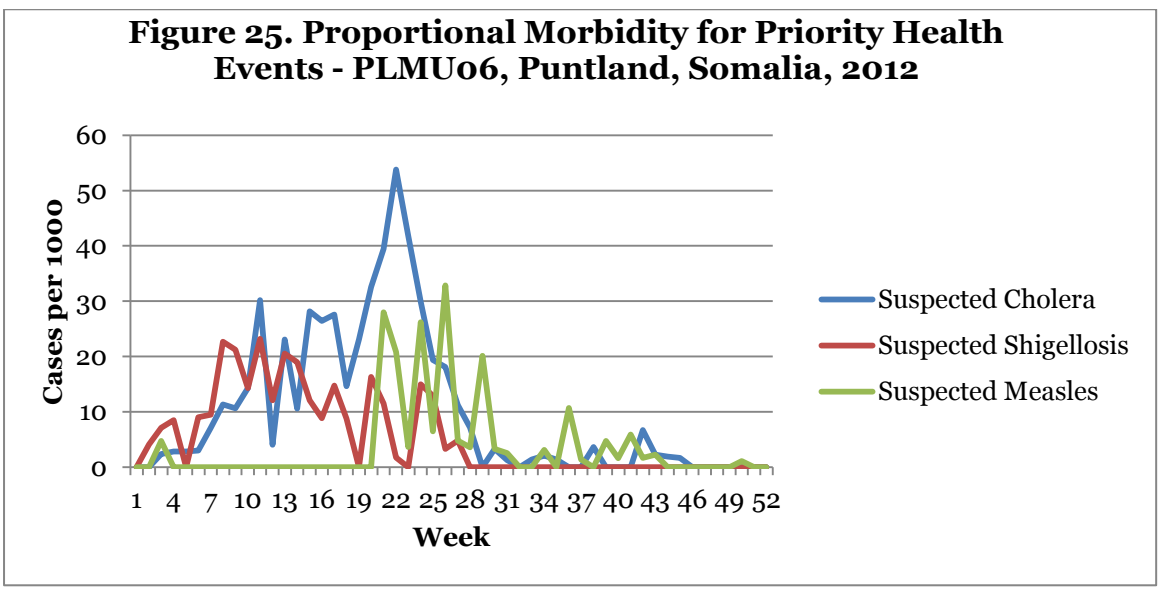


Puntland

Trends in proportional morbidity for priority health events for two facilities, PLBA03 (Figure 24) and PLMU06 (Figure 25), were graphed. Facility PLBA03 received 554 reports of suspected cholera, and 49 reports of suspected shigellosis. All reports for these health events were prior to week 29. Data for week 23 is missing for this facility and the data were entered into the Epi Info database only after week 24.



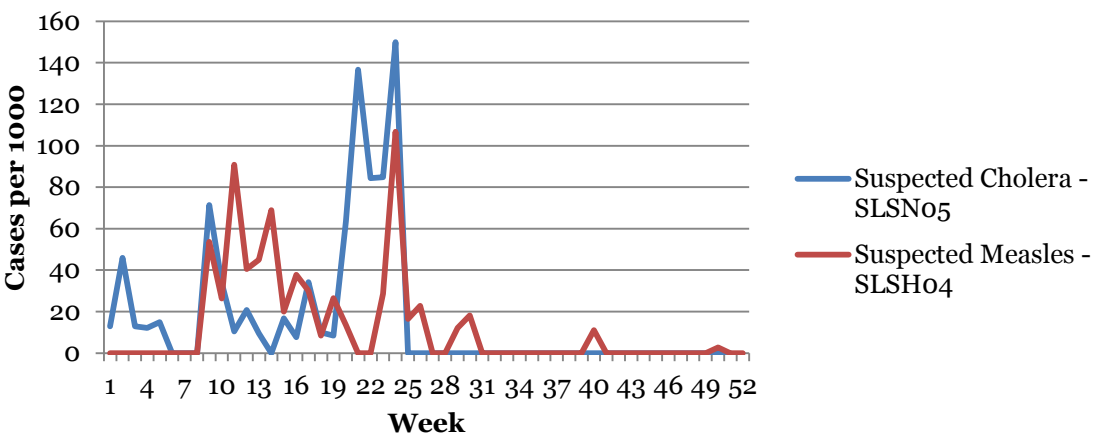
Facility PLMU06 received 264 reports of suspected cholera, 118 reports of suspected shigellosis, and 117 cases of suspected measles.



Somaliland

Few cases of priority health events were seen at individual facilities in Somaliland. Two hospitals were selected for analyzing trends in priority health events (Figure 26). Facility SLSN05 reported 91 cases of suspected cholera and 0 cases of suspected shigellosis. Trends in proportional morbidity of suspected measles were also graphed for facility SLSH04, which reported 57 cases of suspected measles, 3 cases of suspected shigellosis, and 0 cases of suspected cholera. Again of note, the Epi Info database began being used in week 24.

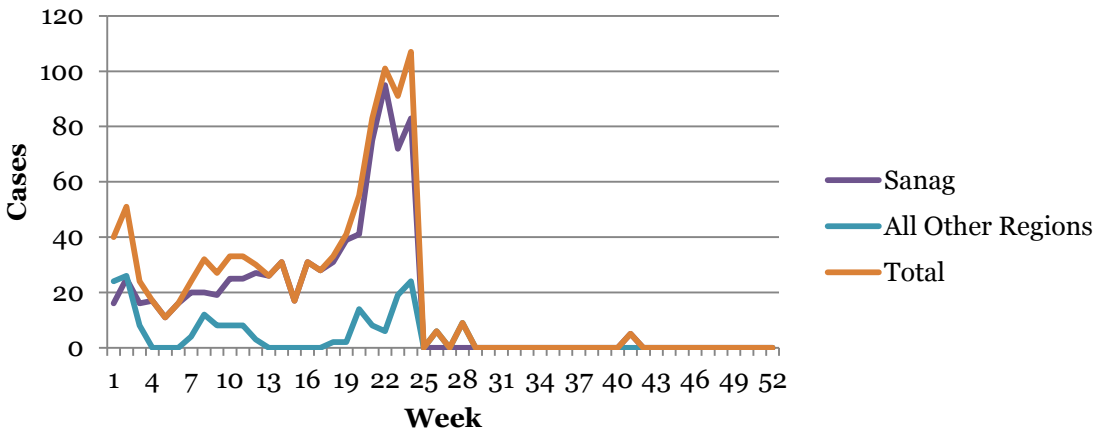
Figure 26. Proportional Morbidity for Priority Health Events - Select Hospitals, Somaliland, Somalia, 2012



When analyzing trends in reported suspected cholera cases in Somaliland, a peak is seen in weeks 22 through 24 during the transition between the Excel and Epi Info databases. Further examination revealed that most cases for these weeks were reported in Sanag Region. Trends in suspected cholera cases for this region were compared with other regions in Somaliland, as well as the total number of

suspected cholera cases reported per week (Figure 27). Few cases of suspected cholera were reported in Somaliland after week 24 once the Epi Info database began being used.

Figure 27. Cases of Suspected Cholera by Region - Somaliland, Somalia, 2012



Chapter 6 Discussion

Overall, there was not a significant improvement in the percent of facilities accepted for analysis from 2011 to 2012, with the exception of Somaliland which showed more overall improvement than other zones (an external evaluation conducted in March 2014 found similar results). All the facilities within the four zones dropped for reporting zero cases were recorded in the Excel database, but not the Epi Info database. Additionally, many of the weeks classified as missing for facilities in the four zones leading to removal from analysis occurred prior to the use of the Epi Info database. The high proportional morbidity seen during the first few weeks is likely due to sparse data from facilities and poor data quality in the Excel database. Trends for many priority diseases saw a decrease in proportional morbidity following the change from the Excel to Epi Info database, after which patterns were more stable. This indicates that switching from the Excel to Epi Info database may result in improved data quality.

Generally, the burden of disease was much higher in Central and Southern Zones than in Puntland and Somaliland. Trends in priority health events showed a general decrease across the 52 reporting weeks in all zones, with the exception of detected outbreaks. The increase in suspected pertussis cases detected via analysis of the surveillance data resembled possible outbreaks. However, the occurrence of outbreaks could not be verified. Several outbreaks noted by providers in Somalia went undetected by the surveillance system (A. Ajanga, personal communication, 7 April 2014). Many of these outbreaks occurred in areas where sentinel

surveillance sites are not located, or in areas where conflict makes access difficult. There are concerns over adherence to the case definition for suspected cholera (individuals less than 2 years old were included in the under 5 age group, whereas the case definition restricts it to individuals ages 2 to 4), and also for suspected shigellosis. Trainings were held in May and June, during which the case definitions were reviewed. The decrease in reported cases of suspected cholera and shigellosis in some zones can be seen to correlate with the trainings (A. Ajanga, personal communication, 7 April 2014).

Limitations

The greatest limitations in this analysis include uncertainty over data quality. Due to the discrepancies seen in the data, the validity of data included for analysis may remain in question. Additionally, removing facilities from analysis leads to a loss of information, which may bias the results of the analysis. However, the overall trends identified during the analysis of surveillance data from sentinel sites are consistent with the trends observed by physicians in the country.

Conclusions

The quality of data improved after switching from the Excel database to the Epi Info database and the continued use of Epi Info for maintaining the communicable disease surveillance database is recommended. Further analysis of the 2013 data, in which the Epi Info database was used for the entire year, will confirm if the improvement in data quality has been sustained.

As with any surveillance system, regular monitoring and periodic evaluations should be conducted. This will help ensure adherence to case definitions and give regular oversight of the functionality and effectiveness of the surveillance system.

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Appendix

Figure A1. WHO-Somalia CSR weekly reporting form

La Socodka Cudurrada Faafa iyo Wax Ka Qabashada (CSR) - Communicable Disease Surveillance and Response (CSR)

Foomka Warbixinta Todobadlaha Cudurada Faafa iyo Dhimashada - Weekly Morbidity (disease) and Mortality (death) Reporting Form

Gobolka *(Region)*..... Tuulo/Degsiimo *(Village/Settlement)*..... Laga billabo Isniinta *(From)*...../...../20.....

Degmada *(District)*..... Goobta Caafimaadka *(Health Facility)*..... Ilaa Axadda *(To)*...../...../20.....

Hay'adda/NGO- Taageeraya *(Supporting organization/NGO)*.....

Magaca Qofka buuxiyey Foomka *(Name of person filling the form)*..... Taariikhda uu heley wakiilka zoonka *(Date form received)*

Lambarka telefoonka *(Phone)*..... E-mailka *(e-mail)*..... ...../...../20.....

Saxiixa qofka buuxinaya foomka *(Signature of person filling the form)*.....

	Cudurrada/Dhacdooyinka la sahminayo *(Health Events Under Surveillance)*	Xaalad kasta oo caafimaad u kala qaybi tirada wadarta lab/dheddig *(For each health event, enter total number of male/female for cases includes deaths)*		Bukaanada Cusub *(Cases include Deaths)*		Dhimashada *(Deaths)*	
		RAG *(MALE)*	DUMAR *(FEMALE)*	< 5 sano *(yrs)*	≥ 5 sano *(yrs)*	< 5 sano *(yrs)*	≥ 5 sano *(yrs)*
1	Daacuun aan la hubin *(Suspected cholera)*						
2	Shuban dhiig aan la hubin *(Suspected shigellosis)*						
3	Jadeeco aan la hubin *(Suspected Measles)*						
4	Cudurka dabaysha aan la hubin *(Acute Flaccid Paralysis)*						
5	Gawracato aan la hubin *(Suspected Diphtheria)*						
6	Xiiqdheer aan la hubin *(Suspected Whooping Cough)*						
7	Duumo la-xaqiijiyey *(Confirmed Malaria)*						
8	Kojiyaha ilmaha dhashey *(Neonatal tetanus)*						
9	DHAMMAAN booqashooyinka kale *(ALL OTHER consultations)*						
10	Wadarta Booqashooyinka *(TOTAL consultations)*						

ALERT S SECTION: Indicate any alerts or suspected outbreaks reported during this epidemiological week:

_____

FIIRO GAAR AH

- Fadlan qor keliya dadka yimid goobta caafimaadka toddobaadka sahanka. Xaalad kasta waa in mar keliya la xisaabaa.
- Qor "0" (eber) haddii aanu jirin bukaan ama qeexi la xiriirta Dhacdooyinka Caafimaadka ee laqu taxay foomka
- Dhammaan la-tashiyada kale, waxaa uu macnahoodu yahay dhammaan kuwa aan ahayn 8 cudur eek or ku xusan, iyo dhammaan booqashooyinka kale
- Wadarta booqashoyinka, waxaa ku jira dhammaan booqashooyinka hore iyo soo noqoshada,oo ay ka mid yihiin 8 da cudur.

Hotline Contact: +(254) 736-100177; Somali Health Cluster Information Portal: http://www.healthsomalia.org

Table A1. Surveillance case definitions for weekly reporting from sentinel sites

Suspected or Confirmed Diseases	Case Definition
Suspected cholera	- Person aged 5 years or more with severe dehydration OR death from 3 or more acute watery diarrhea per day (24 hours), with or without vomiting - Child aged 2-4 years with severe dehydration OR death from acute watery diarrhea, with or without vomiting
Suspected shigellosis (dysentery)	- Person with 3 or more loose stools (diarrhea) per day (24 hours) with visible blood OR any person in whom a clinician suspects shigellosis (NOT just bloody diarrhea)
Suspected measles	- Person with fever AND generalized, spotty (maculopapular, non-vesicular) rash AND ONE of the following: cough, runny nose (coryza) or red eyes (conjunctivitis) OR any person in whom a clinician suspects measles
Acute flaccid paralysis	- Child younger than 15 (14 or less) with acute sudden of weakness or inability to move an arm or leg (flaccid paralysis) OR any person in whom a clinician suspects polio
Suspected diphtheria	- Person with hoarse or complete loss of voice (laryngitis) or sore throat (pharyngitis or tonsillitis) AND non-removable coating (adherent membrane) of back of throat (tonsils or pharynx), and/or nose
Suspected whooping cough (pertussis)	- Person with cough lasting at least 2 weeks AND ONE of the following signs: o Fits of coughing (paroxysms) o Making whooping sound when breaking in (inspiratory whooping) o Vomiting immediately after coughing without other cause (post-tussive vomiting)
Confirmed malaria	- Person with fever or history of fever (>38.0°C) in last 48 hours and/or other symptoms AND positive laboratory confirmation by microscopy or rapid diagnostic test
Neonatal tetanus	- Neonate aged 3 to 28 days with normal sucking and crying for first 2 days of life AND now cannot suck normally OR becomes stiff with jerking of muscles

Table A2. Total number of facilities[a] reporting given number of weeks, by zone, 2012

Weeks[b]	Central	Southern	Puntland	Somaliland
22	1	-	-	-
26	1	-	-	-
27	1	-	-	-
28	1	-	-	-
29	1	-	-	-
31	-	1	-	-
34	1	1	-	-
35	-	1	-	-
36	1	1	-	-
37	3	2	-	-
38	1	4	-	-
39	-	10	-	-
40	3	3	-	-
41	3	-	-	-
42	2	1	-	1
43	3	2	-	-
44	4	3	1	1
45	-	1	-	-
46	3	3	-	-
47	5	3	-	1
48	5	-	1	2
49	5	-	3	2
50	9	-	5	13
51	8	-	19	11
52	2	-	15	22
Total Facilities	**63**	**36**	**44**	**53**

a. Number of facilities in each zone reporting given number of total weeks
b. Total number of weeks reported