



**Addis Ababa University, College of Health Sciences, School  
of Public Health**

**Ethiopia Field Epidemiology Training Program (EFETP)**

**Compiled Body of Works in Field Epidemiology**

**By: Genet Gebre**

**Submitted to the School of Graduate Studies of the Addis  
Ababa University in Partial Fulfillment for the Degree of  
Master of Public Health in Field Epidemiology**

**June, 2018**

**Addis Ababa**

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**Advisors and Mentors**

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## v. List of Acronyms and Abbreviations

AACAHB	Addis Ababa City Administration Health Bureau
AAU-SPH	Addis Ababa University-School of Public Health
AFP	Acute Flaccid Paralysis
AIDS	Acquired Immunodeficiency Syndrome
ANC	Anti Natal Care
AR	Attack Rate
ART	Anti-Retro-Viral Therapy
ASAR	Age Specific Attack Rate
BCG	Bacilli Calmette Guerin vaccine
BSc	Bachelor of Science
BPR	Business Process Re-engineering
CAR	Contraceptive Acceptance Rate
CDC	Center for Disease Control and Prevention
CEO	Chief Executive Officer
CFR	Case Fatality Ratio
CHW	Community Health Worker
CI	Confidence Intervals
cMYP	comprehensive Multi-Year Plan
CRS	Congenital rubella syndrome
CSA	Central Statistical Agency
DHS	Demographic and Health Survey
EDHS	Ethiopia Demographic Health Survey
EFETP	Ethiopia Field Epidemiology Training Program
EFY	Ethiopian Fiscal Year
EHNRI	Ethiopian Health and Nutrition Research Institute
ELISA	Enzyme-Linked Immuno Sorbent Assay
EPI	Expanded Program on Immunization
EPHI	Ethiopia Public Health Institute
FETP	Field Epidemiology Training Program
FMoH	Federal Ministry of Health
Gov.	Government
GP	General practitioner
GTP	Growth and Transformation Plan
HC	Health Center
HDA	Health Development Army
HEW	Health Extension Worker
HF	Health Facility
HIV	Human Immunodeficiency Virus
HMIS	Health Management and Information System
HP	Health Post
HR	Human Resource
HSDP	Health Sector Development Program

IEC/BCC	Information, Education, Communication and Behavior Change Communication
IDSR	Integrated Diseases Surveillance and Response
IgM	Immunoglobulin M
IMNCI	Integrated Management of New born and Child Illness
IR	Incidence Rate
MAM	Moderate Acute Malnutrition
MCV	Measles-containing Vaccine
MDG	Millennium Development Goal
MMR <sub>v</sub>	Mumps, Measles and Rubella vaccine
MMR	Morbidity and Mortality Ratio
MoH	Ministry of Health
MR	Combine Measles Rubella Vaccine
MSC	Micro and Small Enterprises
NICD	National Institute for Communicable Diseases
NVS	National Vaccine Store
OAU	Organization for Africa Union
OPD	Out Patient Department
OR	Odds Ratio
PAB	Protected at Birth
Penta	Pentavalent
PHEM	Public Health Emergency Management
PITC	Provider Initiated Testing and counseling
PLHIV	People Living with HIV/AIDs
PMCT	Prevention Mother to Child Transmission
Pop.	Population
PPV	Positive Predictive value
PTB	Pulmonary Tuberculosis
RDT	Rapid Diagnostic Test
RHB	Regional Health Bureau
RI	Routine Immunization
RRT	Rapid Response team
SAM	Sevier Acute Malnutrition
SD	Standard Deviation
SIA	Supplementary immunization Activity
SNNPR	Southern Nations and nationalities, and people's region
TB	Tuberculosis
TBA	Traditional Birth Atendance
TFP	Therapeutic Feeding Program
TT	Tetanus Toxoid
TVET	Technical vocational and Educational Training

UNECA	United Nations Economic Commission for Africa
UNICEF	United Nation Children’s Fund
VCT	Voluntary Counseling and Training
Vit. A	Vitamin A
VPD	Vaccine Preventable Diseases
WHA	World Health Assembly
WHO	World Health Organization

## **vi. Executive Summary**

This Document contains a two years Field Epidemiology Training Program output which is equivalent to a thesis submitted to Graduate School of Public Health for fulfillment of Master Degree in Field Epidemiology. It includes reports of diseases outbreak investigations, public health surveillance data analysis, surveillance system evaluation, Descriptive health profile report, scientific manuscripts for a peer review journal, abstracts, Epidemiologic Project Proposal and other additional works. Accordingly, the document is organized in to nine chapters.

The first chapter contains Rubella Outbreak investigation in Arada Sub city, Addis Ababa City Administration which was conducted on March, 2018. The outbreak was confirmed in one woreda of Arada Sub City, a total of 12 children were affected with the overall attack rate of 41/100,000 population and zero CFR. The second outbreak investigation was descriptive study of Rubella Epidemics in Gulele Sub City Woreda 3 on February,2018. A total of 20 children were affected with the overall attack rate of 5.6/10,000population and zero CFR.

Chapter II described measles data analysis of Addis Ababa from January 2012- December 2016. Addis Ababa measles five years' laboratory trend was stated in the document based on the national measles case based surveillance system.

Chapter III describes the Measles surveillance system evaluation conducted in Bole Sub City, Addis Ababa City Administration. In this chapter, purpose and objective of surveillance system, progress towards the objective and also attributes of the surveillance system were discussed.

Chapter IV – is about health profile of Bole Sub City, Addis Ababa City Administration., where health and health related data of the Sub City were reviewed, analyzed and presented.

Chapter V – Scientific Manuscripts for Peer reviewed Journals. The manuscript of Rubella Outbreak investigation in Arada Sub city, Addis Ababa City Administration which was conducted on March, 2018.

Chapter VI – Abstracts on Surveillance Data Analysis of Measles from 2012-2016GC. Addis Ababa City Administration, Ethiopia, 2017.

Chapter VII – Project proposal in title Assessment of full immunization coverage and factors affecting childhood vaccination status in Addis Ababa, Yeka Sub City, Ethiopia was developed for epidemiological project to be submitted to Addis Ababa University School of Public Health.

Chapter VIII Finally, Public Health Emergency weekly bulletins were indicated in weekly bulletins. It was prepared during the two years' field base attachment, I was include only one of them in this document.

# **Chapter I – Outbreak Investigations**

## 1.1 Rubella Outbreak investigation in Arada Sub city, Addis Ababa City Administration-March, 2018.

### Abstract

**Background:** Rubella is a contagious disease, caused by rubella virus and transmitted via the respiratory route. Ethiopia does neither currently have a rubella immunization program nor a congenital rubella syndrome surveillance system. Rubella outbreak investigation was conducted to identify risk factors associated with rubella outbreak in Woreda 2 of Arada Sub City; Addis Ababa City Administration, Ethiopia.

**Method:** Case-control study supported by descriptive study was employed to investigate the outbreak. Unmatched case control study in the ratio of 1:3 (12 cases - 36 controls) was conducted. Case was defined as any person with fever and maculopapular (nonvascular) generalized Rash and Cough, Coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects rubella. Health center records and line lists were reviewed. Furthermore, cases and controls were interviewed using questionnaire appropriate for the purpose, from 27th February 2018 to 3 March 2018. In addition to that, five blood samples were taken for laboratory confirmation Epi Info was used to calculate frequencies, odds ratios and 95% confidence interval. Finally, logistic regression was carried out to identify risk factors for Rubella.

**Results:** A total of 12 cases and zero death (CFR=0) were line listed. The overall AR was 41 per 100, 000 populations. The ASAR was high in less than 5 year of age groups, 38 per 10,000. The mean age was 4 years (range from 2-8 years) and mean age of controls was 4 years, with a range of 9 months -8 years. Sex ratio of male to female were 1:1. Cases were reported from six (85.7%) Ketenas. Forty-two percent of the cases were reported from one Ketena. All five samples were positive for Rubella IgM antibodies. Having contact history with rubella infected person (AOR=5.9; 95%CI:1.03-33.2), and having travel history to rubella affected Kebele/ area (AOR= 6.6; 95%CI: 1.04-41.62) were statically associated with rubella infections.

**Conclusion:** We investigated an outbreak of rubella in which 100 % of the cases were in children aged less than 10 years, with a mean age of four years. Contact with suspected individuals and travel history to affected areas were found to be risk factors. A rubella specific case definition is needed for early case detection since currently the case definition used to detect Rubella is the Measles suspected case definition.

**Key Words:** Rubella outbreak; Congenital Rubella Syndrome, Woreda2, Arada Sub City.

## **Introduction**

Rubella is a vaccine-preventable, mild rash-inducing viral disease with complications that include a spectrum of birth defects in the developing fetus, especially if the infection is acquired in the early months of pregnancy (1). The name "rubella" is from Latin and means little red. Rubella also known as German measles or three-day measles (2). The disease is caused by rubella virus, a togaviridae family that is enveloped and has a single-stranded RNA genome (1,2). It is the only non-arthropod borne virus in the family and the aetiologic agent of rubella (1). Humans are reservoir, the peak incidence in endemic countries occurs during late winter and early spring (2).

Acquired rubella is transmitted person-to-person by direct or droplet contact with infectious nasopharyngeal secretions (2). Congenital rubella syndrome (CRS) occurs through transplacental infection of the fetus during the mother's viremia. Infants with CRS shed large quantities of virus in their pharyngeal secretions and urine for a prolonged time, for a year or longer, and may be a source of infection to their contacts (3,4).

Up to 50% of persons with rubella have either subclinical infections or mild symptoms without a rash (2). Clinical infection is usually mild, characterized by a generalized erythematous maculopapular rash, lymphadenopathy and slight fever (3). Young children generally have little or no prodrome, while adolescents and adults often report 1–5 days of low grade fever, malaise, and anorexia (2,3). The rash starts on the face, becomes generalized within 24 hours, and lasts approximately for three days (3). The rash of acquired rubella typically lasts 3 days and is occasionally pruritic, spreading and fading more quickly than the rash caused by measles [2,3]. Up to 70% of adult females with infections experience rubella joint symptoms which appear about the same time as the rash and may persist for up to one month. Fingers, wrists, and knees are most commonly affected (2). Lymphadenopathy commonly involves the postauricular, posterior cervical and suboccipital nodes and lasts five to eight days (2-3).

Rubella, usually a mild febrile rash illness in children and adults, can cause devastating effects when intrauterine rubella infection occurs during the first trimester of pregnancy. These include, miscarriage, stillbirth, or a constellation of birth defects known as congenital rubella syndrome (CRS) (5). The most common congenital defects associated with CRS are cataracts, heart defects, and hearing impairment (Deafness is the most common birth defect associated with CRS, and is sometimes the only manifestation [2,5,6,]. Infants who are moderately or severely affected by CRS are readily recognizable at birth, but mild CRS (e.g., slight cardiac involvement or deafness) may be detected months or years after birth, or not at all (5). Up to 90% of infants born to mothers infected during the first 11 weeks of gestation will develop CRS (6).

The incubation period for acquired rubella ranges from 12–23 days (typically 16–18 days) (2). People are infectious during the week before and after the appearance of the rash (6). The virus is found in the blood 5 to 7 days after infection and spreads throughout the body (2). Post infection immunity to rubella is lasting and is probably lifelong. However, appears to be long-, as with other viral diseases, re-exposure to natural rubella occasionally leads to reinfection without clinical illness or detectable viremia (5). Most rubella cases develop IgM antibody five days after rash onset. Therefore, a suspected rubella case in which serum collected less than five days after rash onset initially tests IgM negative should have a second serum collected greater than five days after rash onset for IgM retesting (3).

There is no specific treatment for rubella; however, management is a matter of responding to symptoms to diminish discomfort. In many countries, universal immunization has greatly reduced or practically eliminated rubella and CRS (3). Rubella infection is prevented by active immunization programs using live attenuated vaccines and a single dose of the vaccine confers long-lasting immunity in more than 95% of the vaccine recipients (7). There has been a renewed effort by World Health Organization (WHO) to eliminate measles and rubella in most regions of the world. This led to the launching of a new Global Measles and Rubella Strategic Plan by the Measles & Rubella Initiative in April 2012. The plan aims to eliminate measles and rubella in at least five WHO regions by 2020. Part of the ways to achieve this include: vaccination coverage with two doses of measles and rubella-containing vaccines; effective disease surveillance, and

building up public confidence and demand for immunization (8). High coverage with one dose of Rubella containing vaccine (RCV) provides sufficient protection against rubella, although many countries choose the operational advantages of using a combined MR vaccine in their programmes, and deliver two MR doses (8). The WHO recommends the first dose be given at 12 to 18 months of age, with a second dose at 4-6 years (2,5). Immunity is usually permanent after natural infection and believed to be long-term after immunization with rubella-containing vaccine (3). Infants born to immune mothers are usually protected for six to nine months after birth (3).

Since 1995, fewer cases of measles, rubella, and mumps have been reported than at any time since nationwide disease reporting began, and elimination of indigenous transmission appears feasible (5).

Global estimates of the burden of rubella suggest that the number of infants born with CRS in 2008 exceeded 1,100,001 which makes rubella a leading cause of preventable congenital defects (9). The 2008 estimates suggest that the highest CRS burden is in the South-East Asia (approximately 48%) and African (approximately 38%) Regions (9). Rubella virus is circulating widely in Africa and primarily infects young children. Evidence of the CRS burden is limited to date; in 1996, it was estimated that 22,500 infants with CRS are born annually in the WHO African Region (6). The number of rubella cases reported from 2000 to 2014 increased in the African Region (from 865 cases in seven countries to 7402 cases in 44 countries). In Ethiopia, measles laboratory was accredited in September 2005 (10). Rubella tests are done on all cases which are negative for measles specific IgM. In 2009 alone, a total of 3170 suspected measles cases were reported and 223 (19%) of the cases were positive for measles and 50 (4.3%) were positive for rubella specific IgM (10). In 2014, a total of 16,210 suspected measles cases were reported and 13,305 (82%) of the cases were positive for measles; and 213 (10%) out of 2047 “Measles IgM negative” cases were positive for rubella specific IgM (10).

There is no specific treatment for rubella, but the disease is preventable by vaccination. The goal of a rubella vaccination program is to prevent the consequences of rubella infection during pregnancy [1,5]. Although the rubella vaccine has been implemented in many countries since 1969, worldwide coverage is still a distant goal, particularly in Africa, where only a few countries routinely immunize against rubella [6,11]. Many developing countries, including Ethiopia, have

not yet introduced it in their routine immunization system (12). In April 2015, the World Health Organization declared the Americas to be free of rubella transmission (11). It is unacceptable that every day 300 children still enter the world with the disabilities of CRS despite the availability of effective, safe and inexpensive vaccines (8). The Global Measles and Rubella Strategic Plan (2012–2020) included goals to eliminate rubella and CRS in at least two WHO regions by 2015 as well as in at least five WHO regions by 2020. However, in this plan, the African Region does not have a specific target (6).

Since monovalent vaccines containing measles, rubella, and mumps vaccine viruses—and subsequently combined measles-mumps-rubella (MMR) vaccine—were licensed, the numbers of reported cases of measles, mumps, rubella, and congenital rubella syndrome (CRS) have decreased by more than 99%(5). Rubella is preventable with the rubella vaccine with a single dose being more than 95% effective (11). However, rubella infections remain one of the leading causes of globally preventable congenital birth defects (11). As of December 2010, 131 of the 194 WHO Member States included rubella-containing vaccines (RCVs) in their routine immunization programmes, in the form of MR or MMR (8). High coverage with one dose of RCV provides sufficient protection against rubella, although many countries choose the operational advantages of using a combined MR vaccine in their programmes, and deliver two MR doses (8). The national priority areas indicated in the new cMYP introduction of new vaccines such as MR (10), is not yet implemented

Rubella remains endemic in countries where rubella vaccine has not been introduced (3). WHO recommends that countries without rubella vaccination programs should assess the burden of rubella and CRS (6). Integrated case-based surveillance with laboratory testing to detect measles and rubella is recommended in countries with an established measles elimination or rubella control goal. In Africa, several countries have conducted subnational rubella seroprevalence surveys; however, none has established routine surveillance for CRS (6).

Surveillance for rubella or CRS does not exist in Ethiopia; however, the measles case-based surveillance system, established in 2004 [12,13], includes laboratory testing for the detection of measles specific and rubella-specific antibodies. The incidence of rubella infection is unmasked for the first time in 2011(10). In addition to the increase in cases, a large rubella outbreak in the

Benshangul-Gumuz region in late 2012 increased recognition of rubella disease in Ethiopia (10). The measles case-based surveillance system has helped greatly in terms of documenting the epidemiology of measles in Ethiopia. However, little is known of the magnitude and distribution of Rubella cases. In African countries, including Ethiopia, CRS is widely under-recognized as a public health problem, and information on rubella and CRS epidemiology is very limited. Outbreak investigations, laboratory confirmation of suspected cases and detailed analysis of available measles/rubella surveillance data help to characterize the outbreak and ensure the global measles & rubella strategic plan (8). On average, there were 18 annual outbreaks of rubella in Ethiopia and more than 63% of confirmed cases and 52% of confirmed outbreaks occurred in 2012 and 2013 (12).

In the study in Addis Ababa, CRS incidence was estimated at 0.3 cases per 1000 live births (13). Epidemiological study done from 2009-2015, shows that the number of confirmed rubella cases was higher from the highly populated central region (near to national laboratory) and Western part of the country, 89% of all confirmed rubella cases were from these four regions with the highest proportion of positives (22.9%) from Addis Ababa and the lowest (10.6%) from Oromia (12). These regions are the four most populous regions in the country.

On February 27, 2018 the Arada Sub City PHEM notified the Regional PHEM of 7 suspected measles cases from epi week 4-7 report from woreda 2. The Region deployed a team of investigators on February 27, 2018 to undertake possible investigations and intervention measures. The Team was deployed to the field by developing questionnaires and equipped with necessary materials.

## **Objectives**

### **General Objective**

- To investigate rubella outbreak and identify risk factors associated with rubella outbreak in Woreda2 of Arada Sub City; Addis Ababa City Administration; Ethiopia

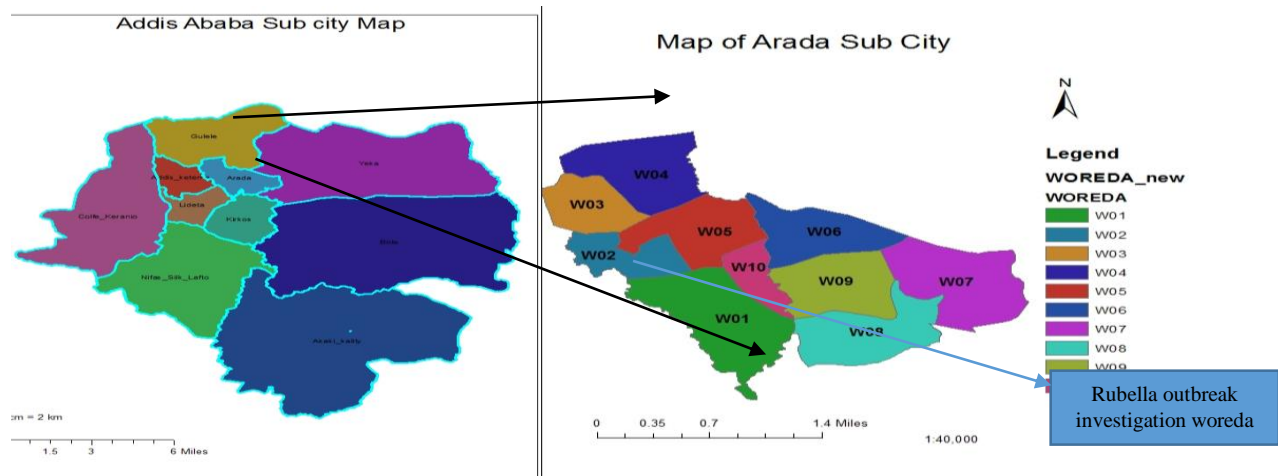
### **Specific objectives**

- To confirm/verify the existence of the outbreak in woreda2, Arada Sub City. From February27-March 3,2018.
- To describe the outbreak by person, place and time.
- To identify potential risk factors of disease transmission.
- To respond for the outbreak

## **Materials and Methods**

### **Background of Woreda2**

Arada Sub City is one of the ten Sub Cities in Addis Ababa and covers an area of 950 hectares. About 212,009 people live in the Sub City with have an average population density of 223 people per hectare. It is situated in the central part of the City, and is one of the early developed parts of the City. The Sub City is divided in to 10 woredas and 31 sub woreda and 100 Seferes and 316 blocks. Woreda2 is one of the ten woredas of Arada Sub City. Administratively the Woreda is divided into 7 ketenas/Gotes. The Woreda is found at East of the Sub City. It shares a boundery with Woreda3 North; woreda1 and Lideta Sub City in South; Addis Ketema Sub City in East and Woreda 6 in the West. Total population of Woreda2 was estimated to be 29,343 (projection based on 2007 census). Of these population; male 14,085 (48%) and female 15,258 (52%); children under 5 years of age 2101 (7.16%); numbers of women of reproductive age (15-49) 10,164 (34.64%). Regarding the Health service coverage, the Woreda has 1 Health Center and 8 private clinics which gives a potential health coverage about 95%.



**Figure 1. Map of Addis Ababa City Administration, and Woreda2 of Arada Sub City 2018.**

Note: - Woreda (01/02), 2, 3, (04/05), 6 and 7 were Rubella outbreak affected Ketenes

### Study Design

Descriptive study followed by Case-control study was employed to investigate Rubella outbreak.

### Study Period

The case control study was done from 27, February to 10, March 2018.

### Source of Population

Total population of Woreda 2 was the source population, it was estimated to be 29,343 (projection based on 2007 census).

### Study Population:

- **Cases:** acute onset of generalized maculopapular rash; AND temperature greater than 99.0 F(greater than 37.2° C), if measured AND arthralgia/arthritis or lymphadenopathy or conjunctivitis (12 cases) during the study period(2) .
- **Control:** Any person in the woreda3 and who was a neighbor to a case without sign and symptoms of rubella (36 controls). at the time of the study

## **Operational definition**

- **Suspected Rubella outbreak:** is defined as occurrence of five or more reported suspected cases in one month in a defined geographic area, like, kebele, woreda or health facility catchment area.
- **Confirmed measles outbreak:** is defined as occurrence of five or more laboratory confirmed cases in one month in a defined geographic area, like, kebele, woreda or health facility catchment area (12).
- **Index case:** The case that is first reported to public health authorities

## **Inclusion and Exclusion criteria**

### **Inclusion Criteria**

- **Case:** any resident of Woreda2 during the study who had maculopapular (nonvascular) generalized Rash and fever and /or Cough, Coryza or arthralgia/arthritis or lymphadenopathy or conjunctivitis (red eyes), any person in whom a clinician suspects rubella (20 Cases) during the study period.
- **Control:** Any person in the woreda3 and who was a neighbor to a case without sign and symptoms of rubella (36 Controls) at the time of the study and agreed to participate were included.

### **Exclusion criteria**

- **Controls:** Those who refused to participate were excluded

### **Sampling Procedure**

The sample size was calculated using Stat Calc function of Epi-info version 7. Using the confidence level of 95%, power of 80%, and with 1:3 cases to controls a total of 12 cases and 36 controls. in regard to variables house hold size, recent travel history to areas with active Rubella cases, contact with rubella case, housing condition, knowledge of transmission, vaccination status, and occupation and literacy level.

Vaccination history was obtained from care givers' recall and by observing the immunization cards

All 12 cases sent through line list were included in the study. The sampling was conducted without replacement and if more than one eligible in the family member the youngest child was taken as

control with nearest house hold to the case was given priority until the sample size was reached. Controls were neighbors of cases who did not suffer from Rubella during the period of the study. Only three controls for one case per household were selected from the neighbors of cases.

### **Case Definition**

**Suspected case:** Any generalized maculopapular (Non vesicular) rash illness of acute onset

**Probable:** a case that meets the clinical case definition, has no serologic/ virologic testing, and is not epidemiologically linked to a laboratory-confirmed case.

**Confirmed:** a case that is laboratory confirmed (with or without symptoms) or that meets the clinical case definition and is epidemiologically linked to a laboratory-confirmed case

**Epidemiologically linked case** is a suspected case, which has contacts (possibly got the virus) with laboratory confirmed case or another epidemiologically confirmed case.

**A confirmed rubella outbreak** was defined as a cluster of 5 or more IgM confirmed rubella cases occurring within a month period within a district (12).

### **Data Collection Method**

Surveillance data of the Woreda PHEM were reviewed retrospectively to observe similar outbreak from the woredas and to set background status of the disease. Structured questionnaire was used to interview cases and controls to collect data on factors associated with contracting Rubella, community knowledge and practices on measles for both cases and controls. Cases were identified using WHO standard measles case definitions. Data were collected by principal investigator and co-investigator including HEWs upon giving 30-60 minutes on how to identify cases and controls from the community, giving attention on exclusion and inclusion criteria. Questioners was pre tested. Data collectors were health professionals and they were translating English in to Amharic for study participant. Active search was conducted using line listing of cases. In addition to that, we conducted formal discussions with different stakeholders about the overall outbreak situation and the control and prevention efforts undertaken in the Woreda.

## **Data quality control**

To assure the quality of data, the data was primarily collected by principal investigator and well trained co-investigator. Prior to entering the data in to the computer the missing variables and consistency of filling of questionnaires and completeness of data was checked out cautiously.

## **Data Entry and Analysis**

Collected quantitative data were checked and entered on a computer and analyzed using Microsoft office Excel and Epi Info excel version 2016 software were employed. Descriptive statistics were used to determine the frequency of different variables. Microsoft Excel and Epi Info version 7.1 was used to describe the disease and analyze associated risk factors. The significance of risk factors for the outbreak was determined through bivariate analysis by calculating Odds Ratio and 95% Confidence Interval.

## **Descriptive**

Medical records were reviewed and active case search were done at government health center. Data were analyzed by using Ms-excel version 2016 and descriptive analysis was done by time, person and place. Age, sex and district specific Attack Rate (AR), Case fatality rate (CFR), distribution of cases by date of onset was presented by tables and figures.

## **Rapid Response Team**

Addis Ababa Regional PHEM case team received report on 27th February 2018, from woreda2, Arada Sub City, 7 suspected measles cases were reported from Epi week 4-7. The Regional Rapid Response team (RRT) and EFETP residents were deployed to the area to investigate and confirm the outbreak.

## **Laboratory Investigation**

Blood specimens were collected from five suspected rubella patients and sent to EPHI

## **Environmental Investigation**

General housing condition sleeping rooms, housing ventilation and hygienic conditions of the cases and controls were observed.

**Ethical issue**

Informed verbal consent was taken from all respondents before interviews and all agreed to take part. Kept data by password and excluded patient name to assure confidentiality.

**Dissemination of Findings**

Findings of this investigation in both soft and hard copies were communicated to the Addis Ababa Regional PHEM, Arada Sub City, woreda2 PHEM and the Addis Ababa University. Additionally, soft copies of the document were sent to FETP Resident Advisors, Mentors, Co-coordinators and Field Supervisors.

## Results

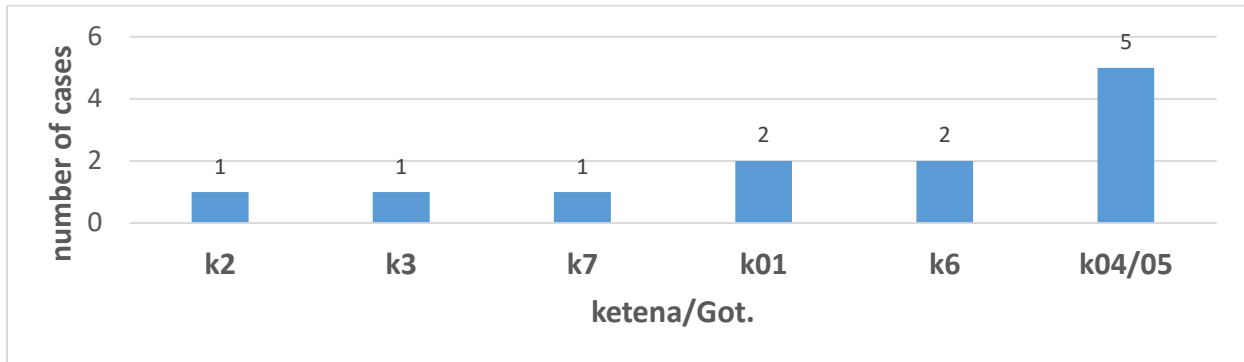
### Descriptive Epidemiology

A total of 12 rubella cases (5 confirmed and 7 Epi-linked) without death (CFR=0) were reported from six ketenas of Woreda2 since 29/1/2018 – 10/3/2018. Sixty-seven percent of the cases were less than 5 years, and (4)33 % were in 5-9 years. Mean age of cases was 4 years (ranges from 2 years to 8 years. None of cases were lower than one year and above 10 years of age. Of the total affected cases male to female ratio were 1:1; Sex specific AR were (4.3 per 10,000 populations) and (3.9 per 10,000 population) in males and females respectively Age specific attack rate were high in under five years 38.1/10,000 population compared to 5-9 years which accounts for 9.4/10,000 population. The overall attack rate was 4 per 10,000 populations (Table 1).

**Table 1. Rubella distribution by Age group from 29<sup>th</sup> Jan to 10<sup>th</sup> Mar 2018 in Woreda2; Arada Sub City of AACAA; March 2018**

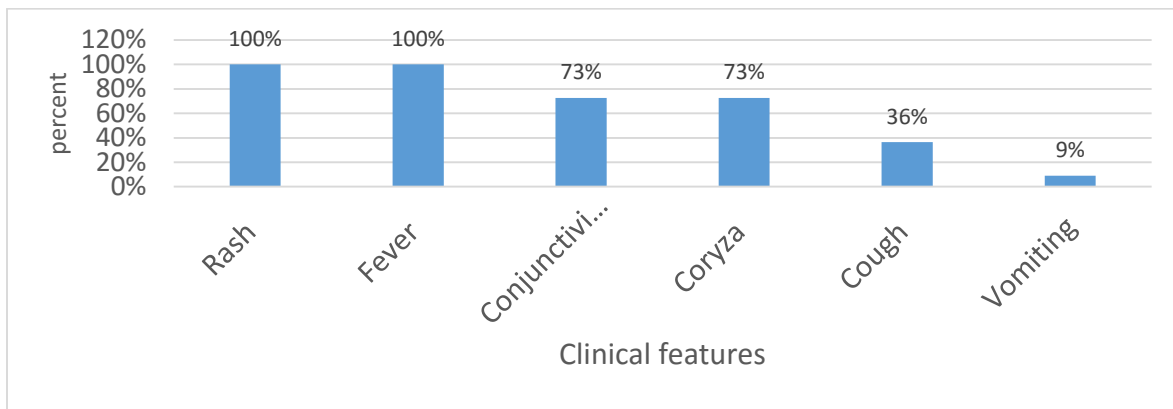
Variable		Population	cases	Percent	Age Specific A/R per 10,000
Age Group	<1yr	657	0	0	
	1-4yr.	2101	8	66.7	38.1
	5-9yr	4275	4	33.3	9.4
Sex	F	15,285	6	50	3.9
	M	14,085	6	50	4.3

The outbreak started in Ketena 6, but quickly spread to neighboring five Ketenas. The number of reported cases ranged from 1 to 5 cases per Ketena. Out of 7 Ketenas; six (86%) Ketenas were affected. From the total cases five 41.7% were reported from Ketena 04/05. Ketena 1 and 6 reported two (16.7%) each. The remaining 3(25%) cases were reported from the rest of the three Ketenas (Figure 2).



**Figure 2 Distribution of Rubella cases by ketene/Gote, Woreda2, Arada Sub City, from January29-March10,2018.**

The common sign and symptoms manifested in rubella cases are listed below; rash and fever (100%), cough (36.4%), and Conjunctivitis (72.7%); Coryza (72.7%) and vomiting (9%) (Figure 3).

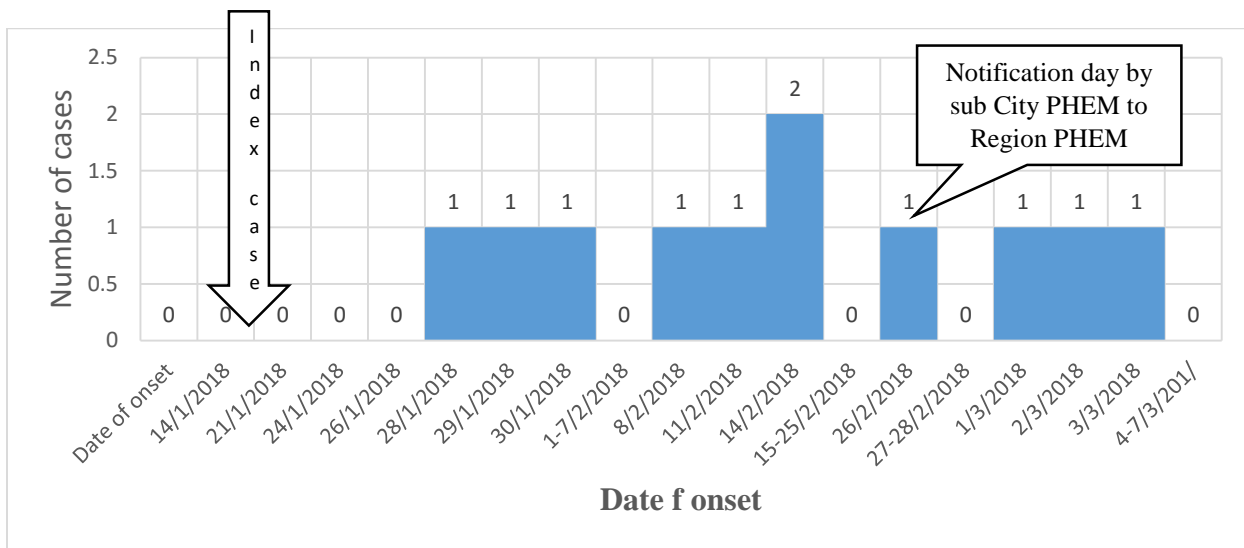


**Figure 3. Presenting sign and symptoms of Rubella patient from 28th January to 3rd March, 2018 in Woreda2, Arada Sub City of Addis Ababa City Administration**

Hundred percent of children less than 5 years reported have been vaccinated against measles while none had been vaccinated against rubella. All cases were treated as outpatients and there was no death. All Cases and controls nutritional status were normal.

### Laboratory Investigation

To identify the etiologic agent of the outbreak five specimens were collected and sent to EPHI. Five out of five were IgM positive for Rubella. Therefore, the Positivity rate was 100% for Rubella IgM. Subsequently, a total of 12 rubella cases were line listed. The peak of the outbreak occurred in 29<sup>th</sup> January to 4<sup>th</sup> February (Epi week5) and in 12-17<sup>th</sup> February 2018(Epi week 7). The last case occurred on March 3, 2018(WHO Epi week – 9 of 2018). The first case was reported to the woreda health office on January 29, 2018 and subsequently additional cases were being reported on 30<sup>th</sup> January, 2018 and progressively cases were increased (Figure 4).



**Figure .4. Rubella cases reported by date of onset from 28<sup>th</sup> January to 3 March 2018, in wored2, Arada Sub City, Addis Ababa city Administration, March 2018.**

### Public Health Intervention

The investigation team identified and characterized the rubella outbreak. Technical assistance was given for health workers on case management, recording and reporting situation. Cases were treated to prevent complication and further spread. Routine surveillance was enhanced. Health education was given for the community members to prevent the transmission of the disease, to motivate health seeking behavior and treatment if there is sign and symptoms of rubella. The Sub City PHEM started closely working with the affected districts and the entire neighboring districts to prevent/control the outbreak from spreading to these areas. Encouragingly the community,

health extension workers and community leaders were implemented to strength the local surveillance system.

### Analytical Epidemiology

Unmatched case control study was conducted with 7 suspected and 5 confirmed cases of Rubella and 36 controls. The median age for cases was 4 years and 4 years for controls. Contact history with rubella cases (AOR=5.9; 95%CI:1.03-33.2); Travel history to rubella affected Kebele/ area (AOR= 6.6; 95%CI: 1.04-41.62) and estimated area of the house <8m<sup>2</sup> (AOR: 5.5; 95% CI: 1.01 –29.5) were statically associated with the rubella infection Further, family size above 4 (AOR: 3.7; 95% CI: 0.7 – 18.7) were not significantly associated with the rubella infections

**Table 2. Bivariate analysis for different exposures 29th Jan to 3<sup>rd</sup> Mar 2018, in Woreda2; Arada, Addis Ababa, City Administration; March 2018**

Risk Factory	Exposure	Case (n=12)	Control (n=24)	COR	95% CI	AOR	95% CI
Estimated area of the house	<8m <sup>2</sup>	8(67 %)	10(28 %)	5.2	1.33-21.18	<b><u>5.5</u></b>	<b><u>1.01-29.5</u></b>
	>=8m <sup>2</sup>	4(33 %)	26(72%)	1			
Family size	>4	8(67 %)	11(31%)	6.2	1.5-30.2	3.7	0.7-18.7
	<=4	4(33 %)	25(69%)	1			
Travel history to active Rubella area	<b>Yes</b>	9(75 %)	14(39 %)	4.7	1.1-20.5	<b><u>6.6</u></b>	<b><u>1.04-41.6</u></b>
	<b>No</b>	3(25%)	22(61%)	1			
Contact with rubella cases 2-3wk	<b>Yes</b>	9(75 %)	11(31%)	6.8	1.5-30.2	<b><u>5.9</u></b>	<b><u>1.03-33.2</u></b>
	<b>No</b>	3(25 %)	25(69%)	1:00			
Mother/care taker educational level	<b>Elementary and below</b>	5(42%)	19(58%)	1.6	0.4-5.8	--	--
	<b>Secondary and above</b>	7(58%)	17(42%)	1:00			
Age Group	<b>&lt;5 years</b>	8(67%)	26(72%)	0.8	0.2-3.13	--	---
	<b>&gt;=5 years</b>	4(33%)	10(28%)	1:00			
Sex	<b>Male</b>	6(50%)	24(67%)	1:00			
	<b>Female</b>	6(50%)	12(33%)	0.5	0.13-1.9	--	

## Discussion

Rubella vaccination is not part of the routine vaccinations in Ethiopia (8,12). There has not been any attention on rubella as it is not considered a childhood killer disease. The major clinical concern for rubella is the risk of congenital rubella syndrome. However, CRS surveillance was not established in the national program (6).

Rubella virus is circulating widely in Africa and primarily infects young children (6). Our finding revealed that children aged <10 years were affected in woreda2. A retrospective epidemiologic analysis of the epidemiology of rubella during 2009-2015 in Ethiopia revealed rubella was endemic throughout Ethiopian and children below the age of 10 years were the most affected (12). In some countries in Africa, the proportion of cases was highest among children <5 years of age, suggesting the possibility of infection at a younger age (6). Similarly, in our finding in <5 years' children had highest age specific attack rate. In another study done in Kyrgyzstan the highest age specific incidence rate was among children aged 3–6 years (9). The possible reason may be due to rubella infection occurring at younger age in areas with high population density and contact rates. Underreporting of milder rubella cases among adults is a potential reporting bias because the measles-rubella surveillance system is primarily focused on detection and reporting of suspected measles cases that generally occur among children (9). In our analyses both sexes were equally likely to have rubella, similar to findings elsewhere in Ethiopia (10).

The epidemic curve has two peaks typical of a propagated outbreak, suggestive of person to person transmission. We attributed this outbreak to the fact that our country does not currently provide RCV in the National Immunization Program; therefore; most of the children were susceptible to this disease. The results of the investigation revealed that of the total number of rubella (12), 100% had never been vaccinated against rubella infection. Studies in other countries not providing RCVs have also demonstrated widespread transmission and rubella outbreak [4,9].

Contact with rubella case during illness, thereby spreading the rubella infection to others in contact through sneezing and coughing. This finding is therefore, biologically plausible considering that rubella is spread through respiratory secretions. Contact with rubella cases was a significant risk factor for rubella outbreak in Woreda2 of Arada Sub City and. thus was highlighted to be the driver of the current outbreak. Children who contracted rubella from their village were spreading the

disease to their School mate. This was consistent with the study finding with significant risk factor for contracting rubella unpublished document in Benishangule- Gumze in 2016(14).

Having >4 family size in a household was a significant risk factor for contracting rubella, similar study done in Beneshangule Gumze shows that above four family size risk for rubella (14). This may be related to the higher population density in cities that favors increased transmission.

Although; the health center and woreda PHEM daily line listed of cases were done; information, education and communication materials on rubella for community for sensitization was not available. This implies that community education was not adequate.

## **Strength and Limitation of the Study**

### **Strength of the Study**

- Arada Sub City and Woreda 2 PHEM officer were deployed to the outbreak site and sensitized the health center staffs prior to the Regional PHEM deployed.

### **Limitation of the Study**

- The sensitivity of this case definition is likely not to be sensitive enough to identify all rubella cases. Case definition used to detect the rubella cases was designed for the measles case-based surveillance system.
- There was a possibility that controls could have been infected with rubella virus but not yet developed signs and symptoms of rubella during the investigation period. This could have introduced ascertainment bias which might have reduced the strength of associations;

## **Conclusions**

- Rubella outbreak was confirmed in Arada Sub City, woreda 2.
- All cases mainly affects < 10 children.
- Ketena 04/05 was more affected Kebele.
- We conclude that the type of this outbreak propagated type of outbreak (lead to multiple waves of infection).

## **Recommendations**

- Sub City PHEM should strengthen sensitization of health care provider and health extension workers on Rubella prevention.
- Health care providers should continue Health Education at health center and Health extension workers to the community on ways of transmissions and prevention activities.
- EMOH may consider adopting a comprehensive approach to surveillance, including a more inclusive case definition for measles and rubella, establishing sentinel surveillance for CRS,

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## 1.2 Rubella Outbreak Investigation in worda 3, Gulele Sub City, Addis Ababa City Administration, Ethiopia, February 2018.

### Abstract

**Background:** Rubella is a common mild rash illness caused by rubella virus. The majority of infections occur in children and young adults. The infection is the cause of a serious birth defect known as Congenital Rubella Syndrome (CRS) when a woman acquires infection early in pregnancy. Ethiopia has not yet established rubella virus surveillance and has not yet introduced rubella vaccine into the routine immunization program. We investigated the event to confirm the outbreak, identify magnitude of the outbreak in Woreda.3, Gulele Sub City, Addis Ababa, Ethiopia.

**Methods:** A descriptive analysis was made to investigate the outbreak. The Measles case definition was used to capture potential Rubella cases. A suspected measles case was a person with generalized rash and fever with cough, or coryza or conjunctivitis in Worda3, Gulele Sub City from January 15 to March 17, 2018. Health center records and line lists were reviewed. In addition to that, ten blood samples were taken for laboratory confirmation. Epi Info version 7 used to enter and analyze data.

### Result

A total of 20 cases and no death were line listed. Of the total 20 cases, 12 (60%) were females. Eleven (55%) were under five years, while the mean age was 5 (2years to 15years), +5.3 SD. Age specific attack rate of 94 per 100,000 populations in 5-14 years but decreased rate to 4/100,000 in  $\geq 15$  years was documented. The overall attack rate was (AR 56 per100,000population). Out of ten blood samples sent to EPHI, six become positive for Rubella IgM. Out of 7 ketenas in woreda3, six (85.7%) were affected by outbreak. Nineteen (95%) of cases were vaccinated for Measles specific vaccine, while all cases were not vaccinated for Rubella. Case management, active case search, and health education were some of the activities carried out to curb the outbreak.

### Conclusion:

An outbreak of Rubella was confirmed in Gulele Sub City, Woreda3, affecting primarily those <5 years of age. No RCV in routine EPI in Ethiopia likely contributed to the outbreak. Enhancing Health education to the community to prevent the rubella disease. A rubella specific case definition should be needed for early case detection.

**Keywords:** Rubella, Outbreak, Woreda3, Gulele Sub City, Ethiopia, 2018

## **Introduction**

Rubella, usually a mild febrile rash illness in children and adults, can cause devastating effects when intrauterine rubella infection occurs during the first trimester of pregnancy. These include miscarriage, stillbirth, or a constellation of birth defects known as congenital rubella syndrome (CRS)(1). The most common congenital defects associated with CRS are cataracts, heart defects, and hearing impairment (1,2,3). Up to 90% of infants born to mothers infected during the first 11 weeks of gestation will develop CRS (1).

The infection is vaccine preventable, the goal of a rubella vaccination program is to prevent the consequences of rubella infection during pregnancy (4). The efficacy of the vaccine is approximately 95%, without significant side effects programs (4). Both vaccine and natural infection result in life long immunity (1). Although rubella is vaccine preventable and an effective single dose vaccine is available, many developing countries, including Ethiopia have not yet introduced it in their routine immunization system (1,5).

Rubella virus is a member of the Rubivirus genus in the family Togaviridae, which replicates in the mucus (nose and throat) of infected persons and spreads by direct contact with susceptible hosts through droplet sprays during coughing and sneezing (1,4,6).

Rubella occurs worldwide in non-vaccinated population with varying incidences of outbreaks (1). Worldwide, over 100 000 babies are born with CRS every year (2). It is estimated that 110,000 CRS cases occur each year in developing countries (2). In African countries, including Ethiopia, information on rubella epidemiology is very limited (1). In Ethiopia, rubella surveillance has not yet been established (5).

Measles case based surveillance has been in place in Ethiopia since 2003, which was supplemented by laboratory surveillance starting from 2004(7). However, CRS surveillance was not established and rubella vaccine was not included in the national vaccination program (1,5). The measles surveillance platform is also used to identify rubella cases, and as a result of the intensive case based surveillance for measles, which includes laboratory testing for the detection of rubella-specific IgM antibody in “measles IgM negative” cases (7), following the WHO African Regional Office (AFRO) measles-surveillance guidelines (3). The incidence of rubella infection is unmasked for the first time in 2011. In addition to the increase in cases, a large rubella outbreak

in the Benshangul-Gumuz region in late 2012 increased recognition of rubella disease in Ethiopia (7). Therefore, the effort is focused within the context of endemic transmission and with significant progress required to reach levels of population immunity to interrupt transmission in most areas of Ethiopia. Though measles surveillance has identified outbreaks and cases each year and major surveillance indicators are achieved nationally, surveillance indicators are below target (7).

The Global Measles and Rubella Strategic Plan (2012–2020) included goals to eliminate rubella and CRS in at least two WHO regions by 2015 as well as in at least five WHO regions by 2020(8). However, in this plan, the African region does not have a specific target. The number of rubella cases reported from 2000 to 2014 increased in the African region (from 865 cases in seven countries to 7402 cases in 44 countries) (2).

. Although the rubella vaccine has been implemented in many countries since 1969, worldwide coverage is still a distant goal, particularly in Africa, where only a few countries routinely immunize against rubella (2).

On average, there were 18 annual outbreaks of rubella in Ethiopia and more than 63% of confirmed cases and 52% of confirmed outbreaks occurred in 2012 and 2013(7). This was demonstrated by a large rubella virus outbreak reported from Benshangul-Gumuz Regional state of Ethiopia that affected 7,269 people in 2012 and 2013(7). Seasonal distribution of cases occurred each year and peaked from March through June (5). In the study in Addis Ababa, CRS incidence was estimated at 0.3 cases per 1000 live births (5). A minimum of 127 rubella virus outbreaks were identified by laboratory confirmation in Ethiopia during 2009–2015(1).

On Feb.21,2018 the Addis Ababa City Administration PHEM Office informed that there were five suspected Measles cases reported from Gulele Sub City, worda 3 case based from epi Week 2-7. After having received this report organized team that consisted EFETP residents were deployed to the epidemic site. We investigated the epidemic to confirm the outbreak, identify risk factors, magnitude of the outbreak and to undertake prevention and control measures.

## **Objectives**

### **General Objective**

- To investigate and describe Rubella outbreak for the prevention and control of future outbreaks in Gulele Sub City, Woreda 3

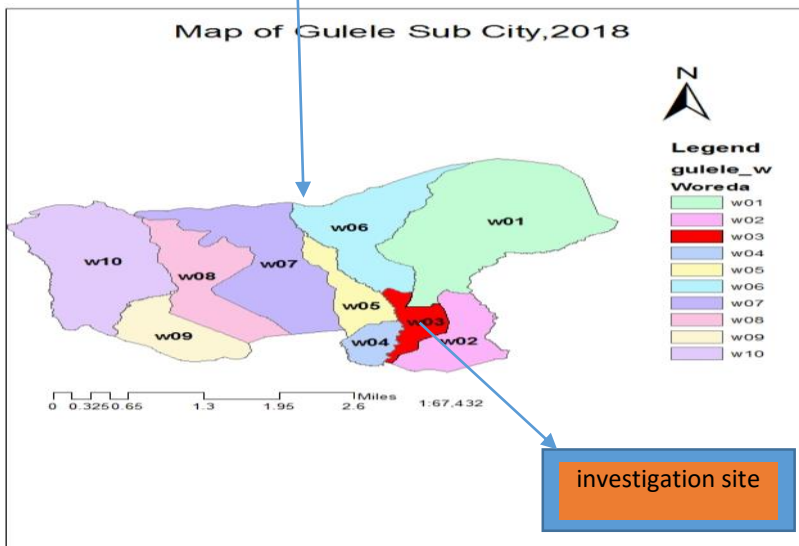
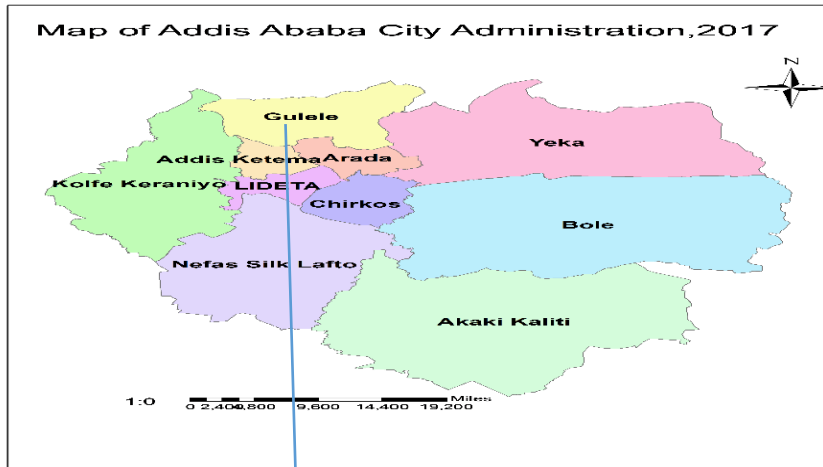
### **Specific Objectives**

- To confirm the existence of the outbreak in the woreda.
- To describe the outbreak by person, place and time.
- To strengthen active case search and case management of measles during this outbreak.
- To institute prevention and control measures to stop further spread of the disease.

## **Materials and Methods**

### **Study area and period**

The Investigation was conducted in Woreda3, Gulele Sub City, Addis Ababa City Administration. Based on the information we got from the local authority, the District has 35,679 populations, over half 18,447(51.1%) were Females and 2555 (13.5%) under five years, 12,359(34%) (15-49 females). The District has one health centers which delivery health care service to the community. According to the administrative report, the 2017 coverage of measles immunization was 75%. The Gulele Sub City is administratively classified into 10 woreda and woreda 3 is one of the ten woredas in which the current outbreak occurred. Woreda3 is bordered in the north woreda 1 and6, in the east woreda4, to the south Arada Sub City, woreda 6 and to the west by woreda2. This investigation was from conducted February 21 to March 17, 2018.



**Figure 5: Location of Rubella outbreak conducted in Gulele Sub City, 2018**

**Study design**

Descriptive epidemiologic study design

**Source of Population**

Total population of Woreda 3 was the source of the population, it estimated to be 35,679 (projection based on 2007 census).

## **Study population**

The study population was selected from source population. All rubella affected Ketenas (six Ketenas) were included.

## **Sample size**

We include all 20 Rubella confirmed and epidemiological linked cases

## **Data Collection Tools and Procedures**

The following procedures and tools were applied to collect data during the investigation.

**A. Document Review-** We reviewed the IMNCI, Outpatient medical logbooks and medical record of cases and HMIS data at Sheromeda and worda 3 Health Center. We also reviewed the laboratory findings of the first ten cases at the national reference laboratory.

**B. Discussion with Key Informants-** Using a semi structured checklist we interviewed and discussed with key informants which includes health professionals which attended medical care of cases, Woreda health officials and families of cases.

**C. Visits KGs, Schools** to create awareness about the outbreak and assess additional cases

**D. Produced line list** – Using line list, cases were identified and contacts were traced.

## **Case definition**

**A suspected measles case** was defined as any patient who presented with fever, generalized maculopapular rash, and either cough, or coryza, or conjunctivitis regardless of age and sex.

Suspect measles cases with sera negative for measles IgM antibody are further tested for rubella.

**Laboratory confirmed rubella** Blood specimens were collected from ten suspected rubella patient and sent to EPHI

**A confirmed rubella** outbreak was defined as a cluster of 5 or more IgM confirmed rubella cases occurring within a month period within a district

## **Diagnostic Methods**

**for measles** Usually diagnosis is done using blood serum to confirm the presence of IgM; thus in this outbreak blood samples were taken from the 1<sup>st</sup> five cases.

### **Data Analysis procedures**

Data was entered and summarized using Microsoft Excel and Epi info version 7.1 software. Epi-curve, magnitude and frequency of the disease were presented in figure and table forms.

### **Environmental Assessment**

During this investigation, environmental factors that may contribute for the occurrence of measles outbreak and its magnitude were examined.

### **Coordination**

As soon as suspected measles cases report was received from the Addis Ababa City Administration PHEM focal person on 21 February 2018, outbreak investigation and response team were established by the Addis Ababa PHEM. The Team has five members including EFETP residences. We communicated with concerned bodies about the disease and how to investigate it. EFETP residents with the Team were mobilized to the area for investigation. The Team discussed with Gulele Sub City Health Department MCH head and PHEM focal person on issues of the outbreak before the arrival to the outbreak site(Woreda2). At woreda level, there was discussion with woreda 3 PHEM Officer, Sheromeda Health Center Medical Director and surveillance focal person on possible causes of the outbreak, magnitude of the disease, number of affected Ketena, undertaking interventions and the way forward. Finally, the Team departed to the affected ketena from February 21,2018 for investigation of the outbreak and to implement control activities.

### **Dissemination of results**

Findings of this investigation in both soft and hard copy was communicated with Addis Ababa regional PHEM, Gulele Sub City PHEM, woreda 3PHEM, and Addis Ababa University. Additionally, soft copy of the document was sent to EFETP Resident Advisors, Mentors, Co-coordinators and Field Supervisors

## Results

### Description of Rubella outbreak

A total of 20 Rubella cases (6 laboratory confirmed and 14 Epidemiological linked cases) and no death were reported from 16<sup>th</sup> January to 17<sup>th</sup> March 2018 in Wored3. Six out of ten laboratory sent blood sample were Positive for Rubella IgM. The overall attack rate of the disease per 10,000 populations was 5.6 and the CFR was 0%. The attack rate was lower in males 4.6/10, 000 than female 6.6/10,000. Of the total 20 cases, 12 (60%) were females and 8 (40%) were males(Table.1).

**Table 3. Distribution of Rubella cases by Sex, Woreda 3, Gulele Sub City, Addis Ababa City Administration, January 15, 2018 – March17,2018.**

Sex	Population	No of cases	Percent%	A/R per 10,000 population
Female	18232	12	60	6.6
Male	17,232	8	40	4.6
<b>Total</b>	<b>35679</b>	<b>20</b>	<b>100</b>	<b>5.6</b>

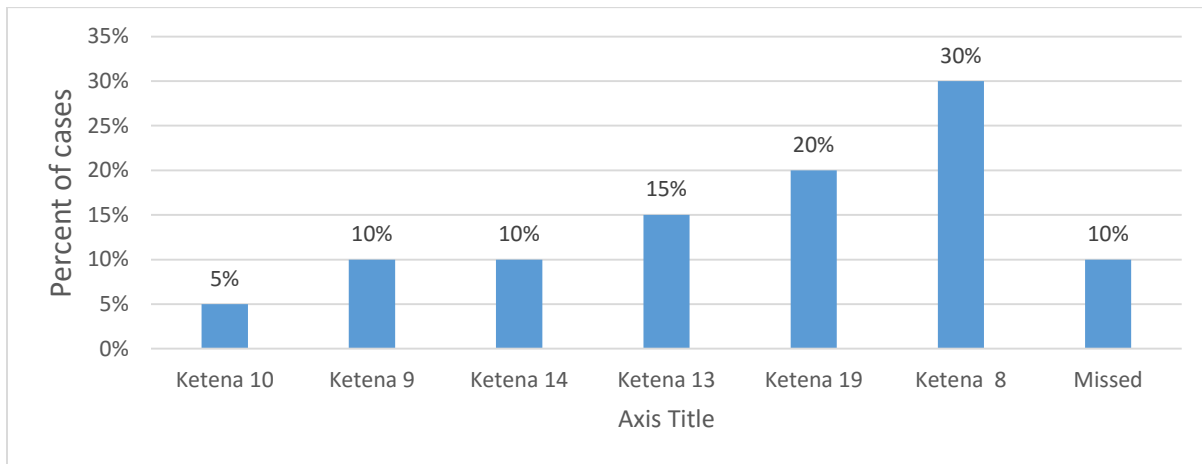
Among the 20 cases,11(55%) of cases were aged below five years. The age-specific attack rates vary and were 4/100,000 and 94/100,000 populations for the age group  $\geq 15$  year and 5-14 years respectively, among  $< 5$  years were 4.0/10,000population, while the overall attack rate was 5.6/10,000 population. The mean age for cases was 5, +5.3 SD. The lowest case (1, 5%) and age specific Attack rate 0.4/10,000 population seen in fifteen and above years (Table 2).

**Table 4. Rubella cases by Age, Woreda 3, Gulele Sub City, Addis Ababa City Administration, January15, 2018 – March17,2018.**

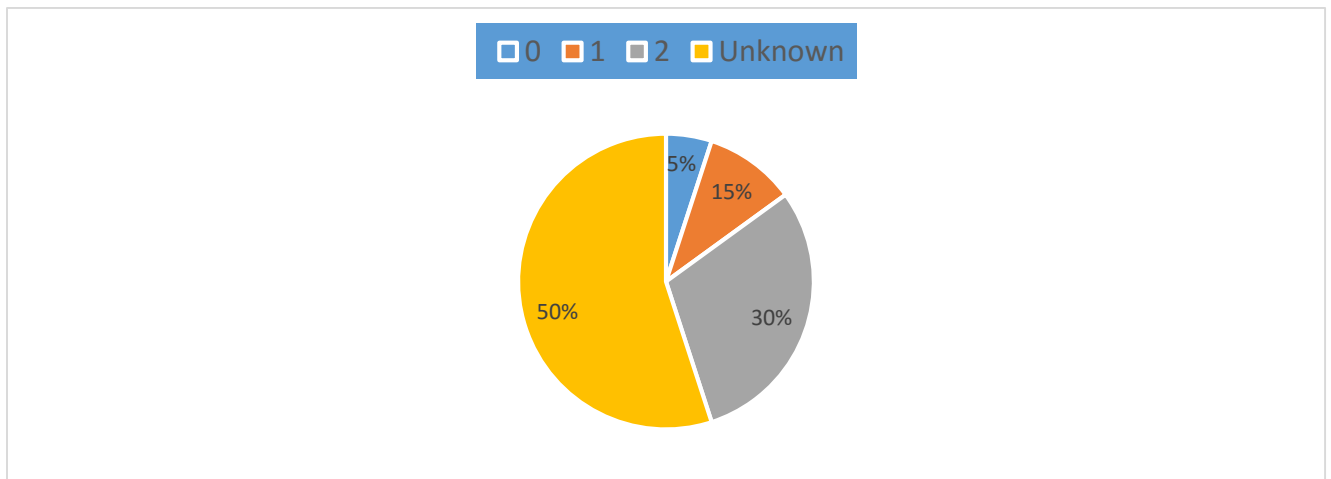
Age group	population	cases	A/R per 10,000population
<5	2555	11(55%)	4.0
5-14	8477	8(40%)	9.4
$\geq 15$	23847	1(5%)	0.4
<b>Total</b>	<b>35679</b>	<b>8(40)</b>	<b>56</b>

Of the total 7 ketenas of the woreda 6(85.7%) were affected by this outbreak. The most affected ketena in this outbreak was ketena 8,(30%). Out of the 20 measles cases in the four ketenas: ketena 8 (6,30%), ketena 19(4,20%), ketena 13(3,15%) and ketena 14(2,10%) cases occurred between Jan.15-March17,2018(Figure 2).

**Figure2. Distribution of Rubella cases by places in Woreda 3, Gulele Sub City, Addis Ababa City Administration, January15, 2018 – March17,2018.**



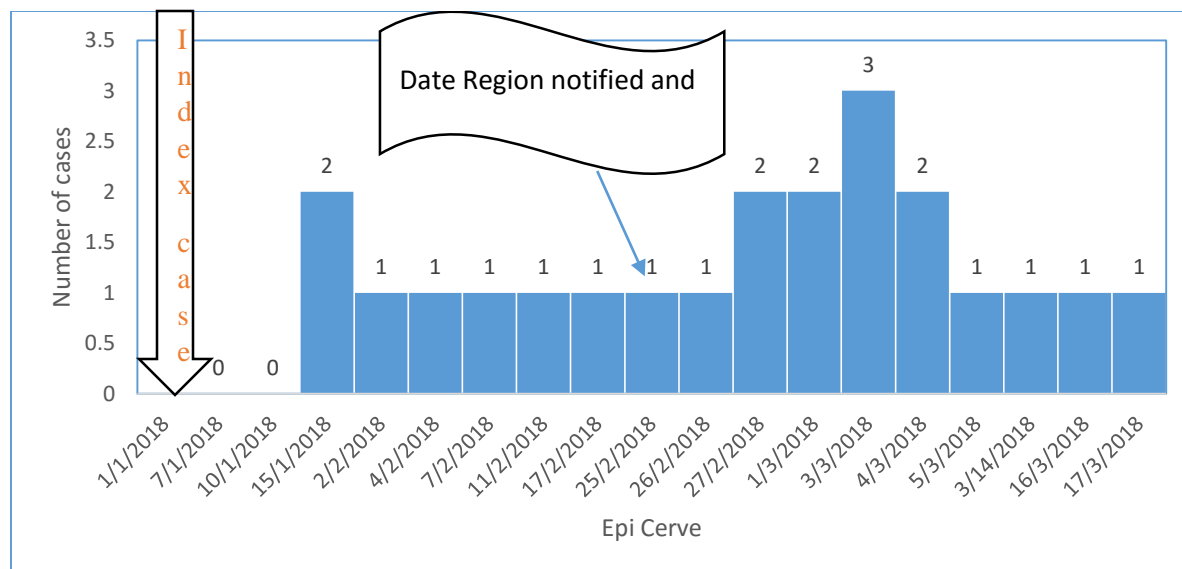
Nine (45%) of the cases were vaccinated for measles among them, 6(30%) and 3(15%) received 2doses and 1dose respectively. Eleven (50%) did not know their vaccine dose. Only one case was not vaccinated (Figure 3).



0= Not vaccinated

**Figure 6. Measles vaccination status of Rubella cases in woreda3, Gulele Sub City, Addis Ababa Sub City, January15, 2018 – March17, 2018.**

Cases reached its peak in the fourth week of February 2018 and first week of March and then it started to decline in the same month until March 2018(Figure 2)



**Figure 7. Number of Rubella cases by date of onset of rash, Woreda 3, Gulele Sub City from January 15, 2018 to March 17, 2018.**

All of the cases developed fever and rash, 8(40%) coryza, 9(45%) cough and 11(55%) redness of eyes. Among the total cases, no cases had complications. (Table 5).

**Table 5. : Clinical manifestation and treatment of Rubella cases, Gulele Sub City, Woreda 3, from 15, January/2018-17 March 2018.**

Variables	Yes	No
<b>Clinical manifestations/Sign and Symptoms</b>		
Rash	20(100%)	0
Fever	20(100%)	0
Coryza /runny nose	8(40%)	12(60%)
Cough	9(45%)	11(55%)
Redness of the eye/conjunctivitis	11(55%)	9(45%)
Antibiotics	6(30%)	14(70%)

### Public Health Interventions

Active Rubella case search and management were conducted in all affected ketenas of the woreda.. Tracing of vaccination defaulters were conducted in all ketena. Woreda Health Office and Health center professionals were sensitized on Rubella case detection and management. Communities were taught and mobilized on Rubella prevention and control measures.

## Discussion

Our outbreak investigation showed that more females children were affected than males, and also more <5 years of age were primarily affected by the outbreak. In Europe and the Americas, the age distribution of cases was similar to that in Africa, and rubella was primarily a childhood disease that occurred mainly among 5- to 9-year-olds (1) In some countries in Africa, the proportion of cases was highest among children < 5 years of age, suggesting the possibility of infection at a younger age (3).

The outbreak affected less than 15 years, Similar finding in Ethiopia reported by Getahun et al. (1) which may indicate that rubella is mainly an illness of childhood. The significantly younger mean age of reported cases in urban settings compared with that of rural settings in Africa may be due to rubella infection occurring at younger age in areas with high population density and contact rates (3). Similar study done by Kassahun et al. (5). the majority (94.7%) of the cases were in individuals <15 years of age, and 54% of the patients were female. The low incidence of rubella cases in persons older than 15 years is likely due to natural infection and development of immunity against rubella at earlier ages (1).

The majority of cases were vaccinated for measles, while none of cases received rubella containing vaccine. A key strategy for preventing rubella and CRS is ensuring sufficient population immunity through natural disease or through vaccination programs that achieve high coverage (14).

The outbreak peaked in March with five rubella case-patients reported. Similar Study done in Kyrgyzstan (9). Study finding in all over Ethiopia, shows that peaks in the hot dry months (January to June) of Ethiopia (12).

These results are subject to several limitations. First, the case definition used to detect the rubella cases was designed for the measles case-based surveillance system and is specific for measles. Many individuals with rubella cases may not have any significant fever, and up to 50% of individuals with rubella cases may present without a rash or have subclinical illness (6). The sensitivity of this case definition is likely not high enough to identify all rubella cases.

## **Limitation**

- Since we implement descriptive Study design which may have hampered further understanding of the outbreak.
- We use Measles case definition which is not sensitive enough to detect Rubella.

## **Conclusion**

An outbreak of Rubella confirmed in woerda 3, Gulele Sub City, affecting primarily those <5 years of age. Females were more affected. Ketena 8 were more affected. Not vaccinated for rubella likely contributed to the outbreak.

## **Recommendation**

- Woreda 3 Health extension health works should improve health education at community.
- Woreda PHEM officers and health extension workers should continue active search for contact tracing, specially prevent pregnant mother not contracting rubella in the community.

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# **Chapter II – Surveillance Data Analyses**

## 2.1 Surveillance Data Analysis of Measles from 2012-2016GC. Addis Ababa City Administration, Ethiopia

### Abstract

**Background:** Measles is one of the communicable diseases causing preventable morbidity and mortality in Ethiopia. Epidemiological surveillance of measles is a major public health strategy to prevent and control disease.

**Objective:** To review measles surveillance data and describe magnitude and trends of measles and its distribution in Addis Ababa from 1, January 2012 to 31<sup>st</sup> December 2016GC.

**Methods:** We reviewed retrospectively national measles case-based surveillance system data base reported from the Addis Ababa City Administration, January 2012 to 31<sup>st</sup> December 2016. We entered all laboratory confirmed measles cases using Standard case definition in to Microsoft Excel 2016. We utilized check list to clean, edit, for validation and analyzed data. We calculated incident rate of confirmed measles cases and described it by place, person, and time, then presented data in tables and figures.

**Result:** We identified 2764 suspected measles cases and two deaths (CFR 0.07%). Between 2012 and 2016, a total of 2708 (98 %) serum/plasma samples were collected and tested for measles IgM antibody and 734 (27%) were found positive. A total of 1907(70%) measles IgM negative and 67(3%) indeterminate samples were tested for rubella virus IgM and 451 (17%) were found positive during the same period. Of 734 confirmed Measles cases, 326(44%) were females, 283(39%) male and 17% missed information. The age of confirmed cases ranged from one month to 33 years with a mean age of 11 years. Annual incidence rate ranged from 1.2 to 8.4 per 100,000 populations. The median age was 11year and 15.5 inter quartile range. Three-fourth of all confirmed Measles cases were aged less than 15 years. The majority of the cases, 430(58.5%) cases had unknown vaccination status and 83(11.3%) did not have information. We found out that 156 (21.5%) were not vaccinated. The number of laboratory confirmed cases linearly increased from 36 in 2012 to 237 and 268 in 2013 and 2014 respectively but dropped to 68 in 2015 then again doubling in 2016. Higher number of cases occurred in the hot dry season (January through

June). In general, a minimum of 64 Measles outbreaks were identified by laboratory confirmations in the study period. We identified high incidence rate, 11.8/100,000 population in Kolfe Keranio Sub City in 2014.

**Conclusion and recommendation:** Based on our analysis, Measles was found to be endemic throughout Addis Ababa City Administration of Ethiopia. Children below the age of 15 years were the most affected. The burden of Measles cases varied from year to year but had a seasonal peak in March. The highest incidence rate was reported in 2014 in Kolfe Kerano Sub City. In the majority of the cases vaccination status were unknown or no information. To reduce the incidence of measles, it is important that the Region and health facilities should improve routine immunization, and conduct Supplementary Immunization Campaign and improve the surveillance system. Additional research to evaluate genotyping of the circulating measles virus strain appears to be of a paramount importance.

**Keywords:** Measles Incidence Rate, Laboratory Confirmed Measles, Addis Ababa City Administration.

## **Introduction**

Measles is an acute, contagious viral disease caused by measles virus. It is a member of the genus Morbillivirus of the Paramyxoviridae family (1). The virus appears to be antigenically stable and there is no evidence that the viral antigens have significantly changed over time. Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons (2WHO AFRO). Common source outbreaks associated with airborne transmission of measles virus have been documented (2). When considered along with epidemiological information, identification of a specific virus genotype can suggest the origin of an outbreak.

In a non-immune person exposed to measles virus, after an incubation period of about 10 to 12 days (range 7-18 days), prodromal symptoms of fever, malaise, cough, coryza (runny nose), and conjunctivitis appear (2). The rash usually appears 14 days after exposure and spreads from head to trunk to lower extremities (3). Individuals with measles are infectious 2 - 4 days before through 4 days after rash onset (2). The risk factors for measles virus infection include: infants who lose passive antibody before the age of routine immunization, children with vitamin A deficiency and immunodeficiency due to HIV or AIDS, leukemia, alkylating agents, or corticosteroid therapy, regardless of immunization status and children who travel to areas where measles is endemic or contact with travelers to endemic areas (1). Measles is usually a mild or moderately severe illness. However, it can result in complications, such as pneumonia, encephalitis and death (3). Malnourished and young children are at higher risk of developing complications and mortality from measles infection (1).

In 2014, there were 114, 900 measles deaths globally – about 314 deaths every day or 13 deaths every hour (4). Even in highly developed countries, measles kills approximately 3 of every 1,000 persons infected (5). Despite the significant global morbidity and mortality of measles, considerable progress is evident. Since 2010, global measles incidence has decreased by 21% from 50 cases per million to 39.3 in 2015, which is substantially higher than the global 2015 target of fewer than five cases per million populations (6).

From 2014 to 2015, the number of reported measles cases increased in 3 of 6 WHO regions: by 33% in the African Region (AFR), 18% in the Eastern Mediterranean Region (EMR), and 83% in

the European Region (EUR), primarily because of outbreaks in several countries (7). Measles continues to be a major public health problem in Africa, causing an estimated 28,000 deaths each year and case fatality rate ranges from 3 to 5 %, reaching up to 30 % during severe outbreaks and outbreaks in closed communities such as refugee camps (8).

Measles has been one of the major causes of death and sickness of children in Ethiopia. Measles accounts for 5% of child hood mortality (9). Epidemiology of measles in Ethiopia and burden of disease estimated that more than 1.5 million cases of measles (all age) and 70,000 deaths (assuming 4% case fatality ratio) would occur annually (9). In 2013, measles incidence was 7.2 cases per 100,000 populations (9). In Ethiopia, the expected case-fatality rate is between 3% and 6%; the highest case-fatality rate occurs in infants 6 to 11 months of age, with malnourished infants being at greatest risk (1).

While no treatment exists for measles, prevention in the form of vaccination has been available since the 1960's (4). In 2010, the World Health Assembly (WHA) established 3 milestones for measles control by 2015: (1) increased routine coverage with the first dose of measles-containing vaccine (MCV1) for children aged 1 year to  $\geq 90\%$  nationally and  $\geq 80\%$  in every district; (2) reduction in global annual measles incidence to  $< 5$  cases per million populations; and (3) reduction in global measles mortality by 95% from the 2000 estimate (7). All 194 World Health Organization (WHO) Member States remain committed to reduce measles deaths by 95% by 2015(10). The number of countries with  $\geq 90\%$  MCV1 coverage increased from 84 (44%) in 2000 to 129 (66%) in 2012, then decreased to 119 (61%) in 2015. Since 2003, countries also have reported the number of districts with  $\geq 80\%$  MCV1 coverage (7). During this period, annual reported measles incidence declined by 75%, from 146 to 36 cases per million populations, and annual estimated measles deaths declined by 79%, from 651 600 to 134 200. From 2012 – 2014, 4.25 million measles deaths are estimated to have been averted relative to no measles vaccination at all (11). During 2015, approximately 184 million persons received MCV during mass immunization campaigns, known as supplementary immunization activities (SIAs), implemented in 41 countries, with 32 (78%) providing one or more additional child health interventions during the SIA (5). Nonetheless, none of the 2015 milestones or elimination goals were met (7).

The National Immunization Program in Ethiopia was established in the 1980s, and currently delivers service through static and outreach sites nationwide (1). The current routine immunization schedule recommends measles vaccination at 9 months of age. Among the estimated 20.8 million

infants who did not receive MCV1 through routine immunization services in 2015, approximately 11 million (53%) were in 6 countries, Ethiopia's share being 0.7 million (7). In 2005 EFY measles vaccine coverage and full immunization coverage increased from 79.5% to 83.2% and from 71.4% to 77.7%, respectively (12). In another survey done by DHS 2016 fifty-four percent of children 12-23months have received measles vaccination and Addis Ababa accounts for 93.1% (13).

Measles outbreaks have occurred in numerous countries – a result of sub-optimal immunization coverage through both routine services and campaigns, along with increased susceptibility in older age groups (10). The country is committed to achieve the elimination of measles by 2020 in line with African Region resolution AFR/RC61/R1(9). Beginning 2010, outbreaks became more frequent with visible age shift affecting infants and children and or youngsters above the age of 5 to 20 years (9). In Ethiopia, a seasonal pattern of occurrence of measles outbreak has been observed over the years, with increased number of measles cases during the late-early part of the year (December to February) (9).

In Ethiopia, in 2014, widespread outbreaks occurred with 16,028 cases of measles reported from all 11 regions (9). Routine analysis of surveillance data is a key function for detecting/identifying outbreaks, monitoring disease trends, and evaluating the effectiveness of disease control programs and policies. We conducted a descriptive Measles data analysis in Addis Ababa City Administration to assess the burden, distribution and to see the trend and to make possible recommendation in an attempt to improve future interventions against the disease.

#### **+ Rational of the analysis**

Routine analysis of surveillance data is a key function for detecting/identifying outbreaks, monitoring disease trends, and evaluating the effectiveness of disease control programs and policies. Results from data analysis can trigger public health action when incidence of diseases is increasing. In relation to this, Measles is one of the epidemic prone diseases tracked by PHEM surveillance system. Hence, this surveillance data analysis was conducted to review the epidemiology of measles in Addis Ababa from 2012-2016 in order to see the trend and seasonality, to assess the burden and distribution, and to make possible recommendation in an attempt to improve future interventions against the disease.

## Objective

### General objective

To review measles surveillance data and describe magnitude and trends of measles and its distribution in Addis Ababa City.

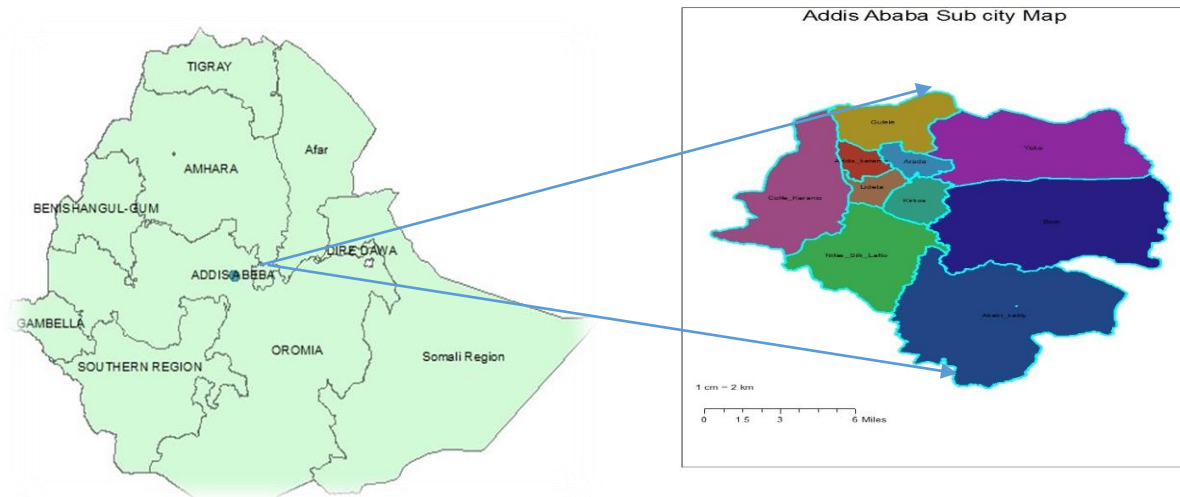
### Specific objectives

- To assess the extent of measles in Addis Ababa City Administration
- To describe the distribution of measles cases by person, place and time

## Materials and Methods

### Study area

We analyzed measles cases from the national measles case-based surveillance system data base between 2012-2016 GC. The study was conducted in the Addis Ababa City Administration, the Capital City of Ethiopia, with population density 5607.96/Km<sup>2</sup>. The City is located at the heart of the country, and divided in to ten Sub Cities which are the second administrative units next to the City Administration. According to CSA 2017 population projection, Addis Ababa has a population of 3,273,001, where 1,551,000(47.4%) are males, while 1,722,001(52.6%) are females (14).



**Figure 8.** Map of Ethiopia showing the relative location of Addis Ababa City Administration and its Sub City.

## **Study periods**

Secondary data reported from January 1,2012- Dec.31, 2016 from the Addis Ababa City Administration to National PHEM measles and laboratory data base.

## **study design**

We conducted a retrospective record review of the National Measles case-based surveillance dataset and described data by person, place and time.

## **Source of data**

We obtained data by requesting from Aggregated data of National measles case based surveillance reported from Addis Ababa City Administration during the study period.

## **Study unit**

All patients regardless of age and sex that, confirmed measles IgM during the study period (2012–2016) in Addis Ababa City Administration, were included in this analysis.

## **Sample size and sampling method**

We included all laboratory confirmed epidemiological linked measles cases reported from the study area during 2012-2016 to the data base.

## **Data collection procedures**

A descriptive analysis was made. All suspected measles cases that were filled in case based reporting format obtained from all Sub Cities of Addis Ababa City Administration reported to the Region and the Ethiopian Public Health Institute (EPHI) for laboratory confirmation and those that were epidemiologically linked from the year 2012-2016 were used for analyses. We utilized checklist for validation. Data were consolidated, edited, cleaned and entered data using Excel 2016 software and analyzed. Demographic characteristics of reported cases and trends in cases reported over time were assessed. We will disseminate the information to stake holders for action.

## **Case definition**

**Suspected measles case:** Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects

measles. Blood samples are collected on suspected cases and all sera are tested for the presence of measles IgM antibody.

**Confirmed measles case:** A suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases in an outbreak.

**Epidemiologically linked case:** A suspected measles case that has not had a specimen taken for serologic confirmation and is linked (in place, person and time) to a laboratory confirmed case; i.e., living in the same or in an adjacent district with a laboratory confirmed case where there is a likelihood of getting the same disease.

**Laboratory-confirmed case** is a suspected case which has laboratory results indicating infection (measles IgM positive or isolation of a measles virus).

- **Suspected measles outbreak:** Occurrence of five or more reported suspected measles cases in one month in a defined geographic area, such as a kebele, woreda or health facility catchment area
- **Confirmed measles outbreak:** Occurrence of three or more laboratory confirmed measles cases in one month in a defined geographic area such as a kebele, woreda or health facility catchment area of transmission; onset of rash of the two cases being within 30 days of each other.

**Measles death:** For surveillance purposes, a measles death is defined as any death from an illness that occurs in a confirmed case or epidemiologically linked case of measles within one month of the onset of rash.

### **Sample collection**

Blood samples were collected from all suspected measles cases during 01 January 2012–31 December 2016. Demographic and clinical information about the patient was captured through the case based reporting form. For measles testing, samples were transported in a cold box to Ethiopian National Measles and Rubella Laboratory located at the Ethiopian Public Health Institute (EPHI), Addis Ababa, Ethiopia.

**Data analysis procedure**

Data was entered and analyzed using Microsoft excel. After data consolidated cleaning and descriptive analysis were under taken. Results were presented using graphs, tables and incidence rate was calculated.

**Ethical issues**

Permission to proceed with the study was obtained from the Addis Ababa City Administration PHEM. Names of patients and addresses were omitted from the analysis; data were kept in password. Confidentiality was assured and maintained

**Data dissemination**

Data were cleaned and analyzed using Excel software. Finally, the findings were shared with, Addis Ababa City Administration PHEM, AAU/SPH, mentors, supervisors, and program coordinators of AAU/SPH/EFETP.

## Results

The Addis Ababa City Administration case-based surveillance report shows that between January 1<sup>st</sup>, 2012 and December 31<sup>st</sup>, 2016, there were 2764 suspected measles cases and 2 deaths with CFR (0.07%). A total of 2708 samples were received and tested for measles IgM antibody. Of these samples, 734(27%) were found positive for measles IgM; 1907 and 67 were found to be negative and indeterminate respectively. Of the total 1974 negative and indeterminate samples tested for rubella virus specific IgM, 125(17%) were positive. The percentage of specimens tested for Measles 100% every year except in 2014, 93%. The number of Measles cases identified and the positivity rate increased from 36 (6.5%) in 2012 to 268 (38%) in 2014 (Table 7).

**Table 6. Number of Specimens Tested for Measles (Ig) M Antibodies and Results, Addis Ababa City Administration, Ethiopia, 2012–2016**

Year	Specimens tested for Measles IgM	Test Results for Measles IgM					
		Negative		Positive		Indeterminate	
	No	No	Percentage	No	Percentage	No	Percentage
<b>2012</b>	552	514	27%	36	15%	2	3%
<b>2013</b>	649	401	21%	235	32%	13	20%
<b>2014</b>	650	362	19%	266	37%	19	29%
<b>2015</b>	544	454	24%	69	9%	21	32%
<b>2016</b>	312	177	9%	125	17%	10	15%
<b>Total</b>	2708	1907	69%	734	27%	65	2%

The highest (65%) Measles IgM positivity rate and the highest number of positive cases (272) were among peoples aged  $\geq 15$  years. Of the confirmed measles cases, 326(44%) were females and 125(17%) missed information. The age distribution of confirmed cases ranged from one month to 33 years with a mean age of 11 years and (15 age and 5month interquartile range(IQR)). Three-fourth of all confirmed Measles cases were aged less than 15 years. The number of laboratory confirmed Measles cases rises with increasing age (Table 8)

**Table 7. Distribution of Suspected Measles cases by sex and Age group, Addis Ababa City Administration, , 2012-2016.**

Age Group	Male		Female		Missed		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
<1	49	17.3%	44	13%	16	7.1%	109	15%
1-4	47	16.6%	45	14%	37	16%	129	18%
5-14	87	30.7%	106	33%	31	13.7%	224	30%
>=15	100	35%	131	40%	41	18.2%	272	37%
<b>Total</b>	<b>283</b>	<b>100%</b>	<b>326</b>	<b>100%</b>	<b>225</b>	<b>100%</b>	<b>734</b>	<b>100%</b>

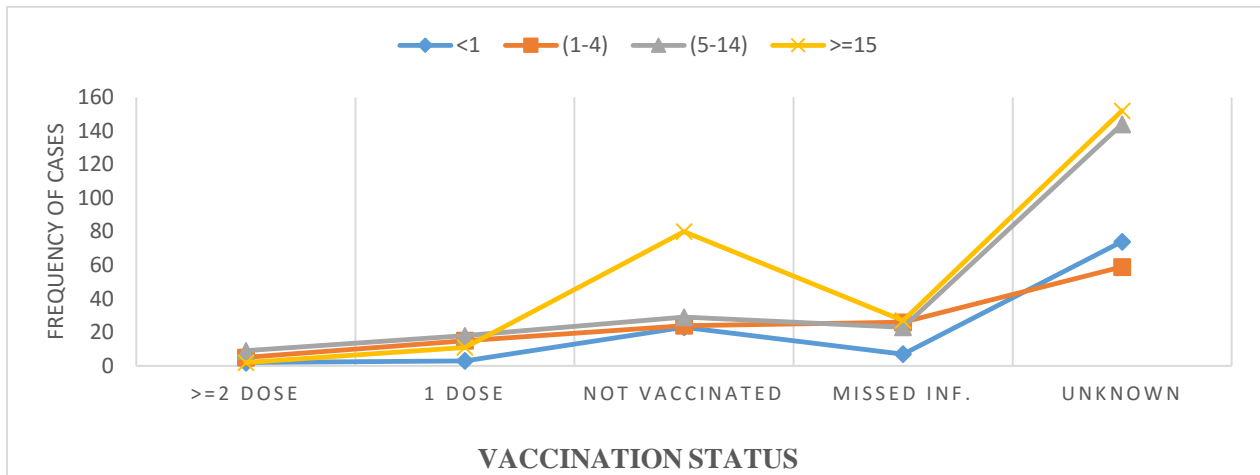
Between 2012 and 2016 the cumulative Measles incidence rate was 5/100,000 populations. The median age 11years (range from one month to 33years) and 15 Inter quartile range. The age specific incidence rate in under one year children was high 109(30.4/100,000 populations) and followed 1-4yrs. age group 16.4 cases per 100,000 populations. The lowest IR 0.1cases per100,000 populations in above 25 years. It showed the magnitude of measles case decreasing trend with age increments (Table 9).

**Table 8. Distribution of Confirmed Measles incidence rate by age group, Addis Ababa City Administration, Ethiopia, 2012-2016**

Age group	Cumulative population	Cases	IR/100,000population
<1	358,190	109(14.9%)	30.4
1-4	786,739	129(17.6%)	16.4
5-14	2,688,025	224(30.5%)	8.3
15-24	4,622,892	196(26.7%)	4
25-35	6,712,868	76(10.3%)	0.1
<b>Total</b>	<b>14,868,714</b>	<b>734(100%)</b>	<b>4.9</b>

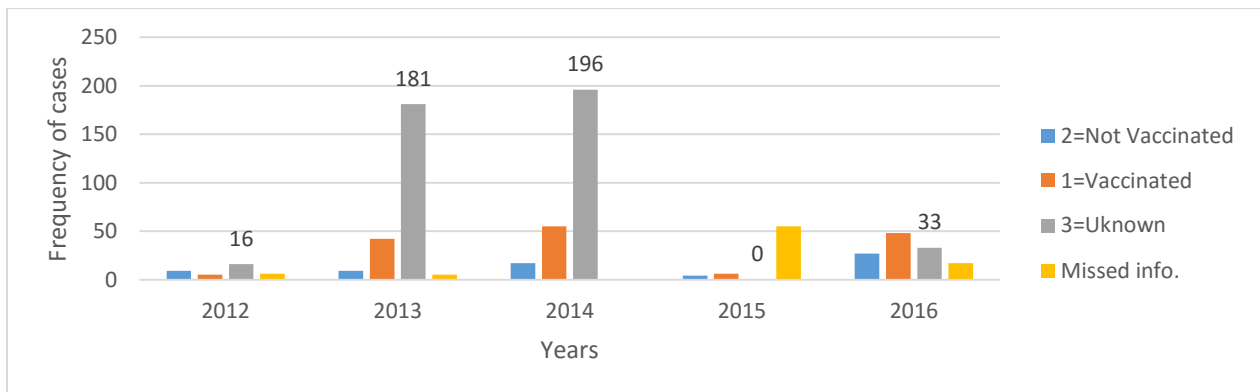
### Vaccination status

Overall, 156 cases (21%) were unvaccinated, 47(6%) had received one dose of measles-containing vaccine and cases 18(3%) had received two and above doses and 512(70 %) cases have unknown their vaccination status. (Figure 9).



**Figure 9 . Distribution of Measles Vaccination status by age group, Addis Ababa City Administration, 2012-2016**

In 2013 and 2014, majority of confirmed measles cases 25% and 27% were unknown their vaccination status respectively. Of the confirmed Measles cases in 2015, vaccination status was not specified for 55 cases (Figure 10).

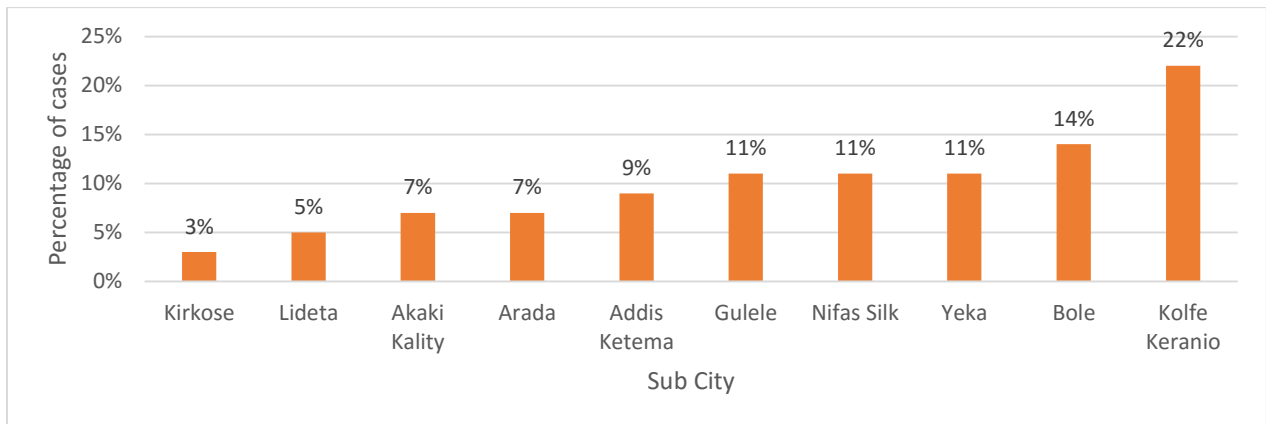


**Figure 10. Distribution of cases by Vaccination Status and year, in Addis Ababa City Administration, from 2012-2016**

### Distribution by place

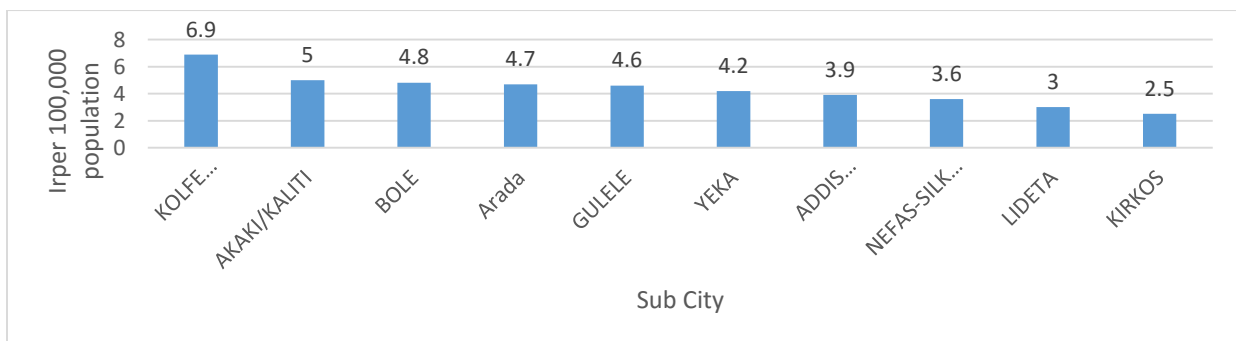
The majority of the lab-confirmed Measles cases were detected from all part of the Sub City and was highest from Kolfe Keranio Sub City 158(22% of all confirmed cases) followed by Bole sub

City103 (14%), Gulele, Yeka and Nifase Silk Sub Cities accounts 83(11%) each, 69% of all confirmed Measles cases were from these five Sub Cities with the highest proportion of positives (46%) from Bole sub city and the lowest (23%) from Gulele. These sub Cities are the five most populous Sub Cities in the City Administration. The lowest number of cases were reported from Kirkos and Lideta Sub Cities 25(3%), 35(5%) respectively. (Figure 11).



**Figure 11. Distribution of confirmed Measles case, by Sub City, Addis Ababa City Administration, Ethiopia, 2012-2016.**

We found out the incidence varying from 2.5 per 100,000 populations to 9.6 per 100,000 populations. The highest incidence rates 9.6/100000 was reported from Kolfe Keranio. Akaki Kality, Bole, Arada and Gulele Sub Cities incidence were accounts 5 per100,000 Population for each Sub City. We identified the lowest incidence rate 3 per100,000 populations in both, Kirkose and Lideta Sub Cities (Figure 11).



**Figure 12 Distribution of Confirmed Measles Incidence Rates per 100,000population by Sub City, Addis Ababa City Administration, from 2012-2016.**

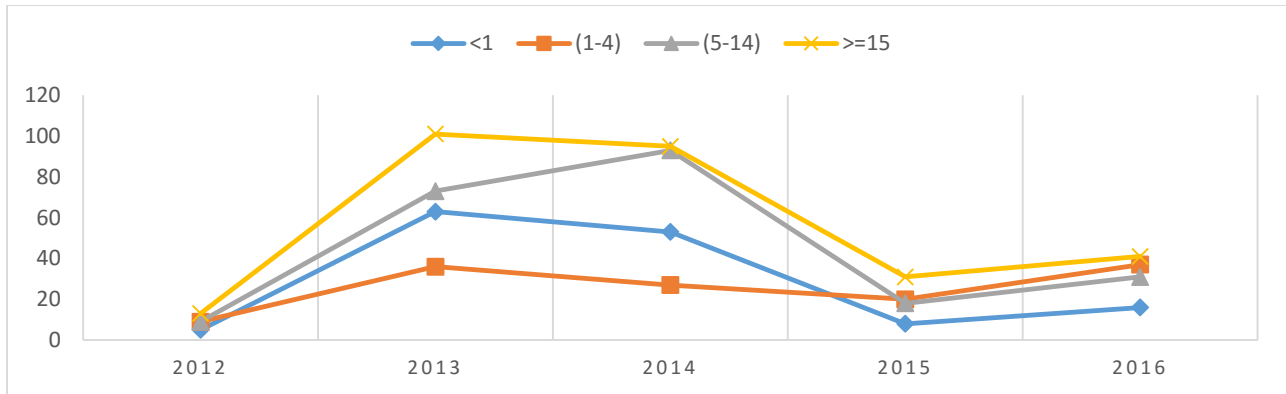
## Distribution by Time

The number of suspected measles cases steadily increased from 553 in 2012 to a peak of 706 in 2014, following which there was a decline to 312 cases in 2016. Between 2012 and 2014, suspected Measles incidence increased by 82%, from 181 to 221 per 1,000,000, while 2014-2016, decreased from 221 to 93 per 1,000,000. Two deaths were reported in 2013 with CFR 0.07%. Out of 2708(98%) laboratory tested cases 734(27%) were Measles IgM positive. The highest number of confirmed cases 268(41%) out of 650 cases reported in 2014. Among suspected cases non measles febrile rash ranged from 5.3 to 16.8/100000populations Annualized rate of investigation (with blood specimens) of suspected measles cases ranged from 9-21 cases per 100,000 populations. (Table 10).

**Table 9. Measles Surveillance data reported through Measles Case-Based Surveillance, Addis Ababa City Administration, Ethiopia, 2012–2016.**

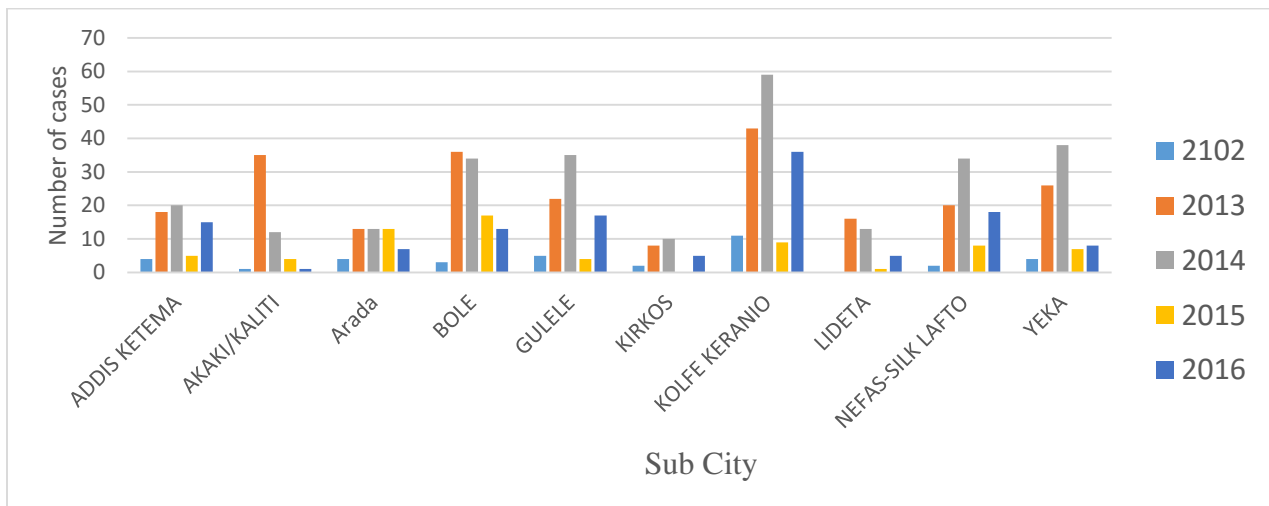
Indicator	2012	2013	2014	2015	2016	Total
No. suspected measles cases	553	653	706	540	312	2764
No. suspected measles deaths	-	2(CFR=0.07%)	-	-	-	2
Suspected measles incidence per 1,000,000 <sup>a</sup>	181	209	221	165	93	
No. confirmed measles cases	36	237	268	68	125	734
Lab-confirmed	36	237	268	68	125	734
Clinically compatible	-	-	56	-	-	56
No. lab-confirmed Rubella cases	171	59	52	154	15	451
Non-measles febrile rash per 100,000 <sup>b</sup>	16.8	12.9	11.4	13.8	5.3	11.9
<p><b>a</b> Calculated by dividing the number suspected measles cases reported annually by the estimated annual population from MOPH and multiplying by 1,000,000; target: &lt;5 per 1,000,000</p> <p><b>b</b> Calculated by dividing the number of suspected measles cases reported annually that were discarded as non-measles due to negative measles IgM test result by the annual estimated population from and multiplying by 100,000; target: ≥2 per 100,000</p>						

The number of Measles cases increased among all age groups from 2012 to 2014 and decreased in 2015 (Fig. 10). Highest



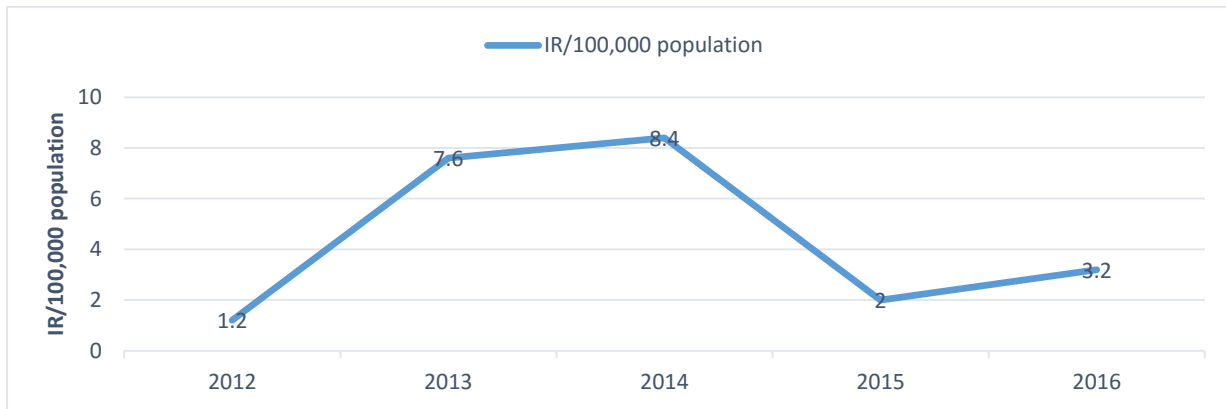
**Figure 13 laboratory confirmed Measles cases by year and age group, 2012-2016, AACA Ethiopia**

We identified that highest proportion of Measles suspected cases 706(26.5%) in 2014. Of this Kolfe keranio, Gulele, Nifas Silke, Bole and Yeka Sub Cities were accounts 109(15.4%), 101(14.3%), 98(13.9%), 94(13.3%) and 93(13.2%) respectively. In 2015 the highest proportion of cases were reported from Nifas Silke and Gulele Sub Cities, 91(16.9%) and 90(16.7%) respectively. The lowest number of cases two (0.6%) were reported from Akaki Kality Sub City in 2016(Figure 12).



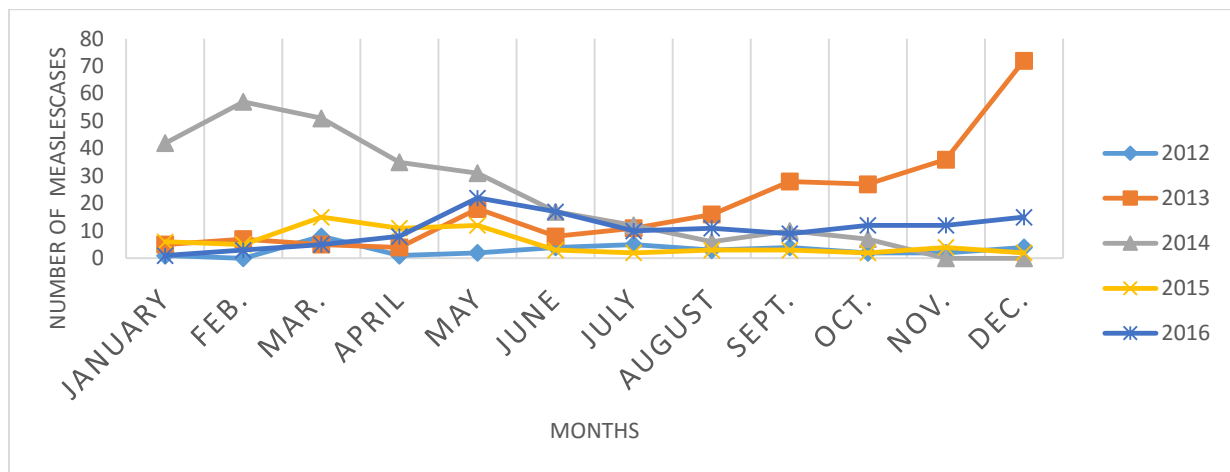
**Figure 14. Distribution of confirmed measles Cases by Sub City and Year, Addis Ababa City Administration, 2012-2016.**

The reported annual incidence rate of confirmed Measles ranged between 1.2 and 8.4 per 100,000 populations. We detected the highest incidence rate in 2013 (7.6/100,000population) and in 2014 (8.4/100,000population). We noticed the incidence rate slightly increasing by year, but reached its peak (8.4/100,000 population) in 2014. The proportion of measles IR decreased by 75% (2/100,000 population) in 2015(Figure 13).



**Figure 15. trends of confirmed measles IR per 100,000 populations by Years, Addis Ababa City Administration, 2012-2016**

Figure 15. Shows three gross and slightly other small peaks were occurred during the five years, the first highest peak was observed between January and February 2014, the second peak was occurred during December, 2013 and the third was during May, 2012/13. The two peaks were occurred during the dry season while the third peak is during wet season.

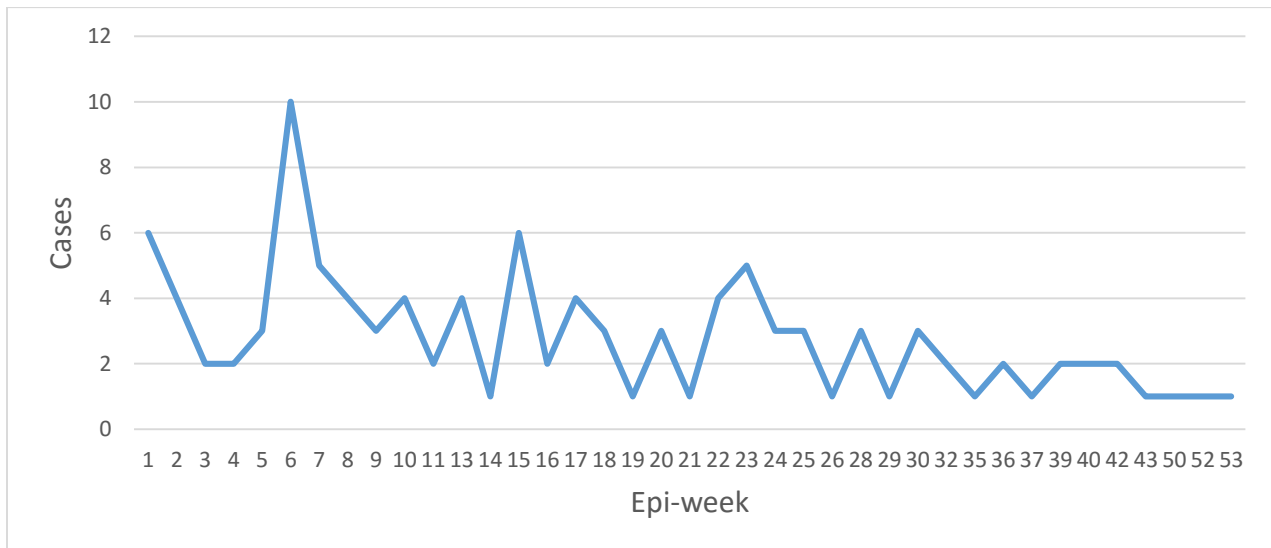


**Figure 16. Trends of Confirmed Measles Cases by Months and Years, Addis Ababa City Administration, 2012-2016**

**Table 10. Measles Outbreaks by sub city and year in Addis Ababa, 2012-2016**

Sub City	Frequency of outbreaks					
	2012	2013	2014	2015	2016	Total
<b>Addis Ketema</b>	1	2	2	1	2	8
<b>Akaki Kaliti</b>	0	2	2	0	0	4
<b>Arada</b>	2	3	2	1	1	9
<b>Bole</b>	1	1	3	2	0	7
<b>Chirkos</b>	1	2	1	0	1	5
<b>Gulele</b>	1	1	2	1	0	5
<b>Kolfe Keraniyo</b>	2	4	1	3	1	11
<b>Lideta</b>	1	1	2	1	0	5
<b>Nefas Silk Lafto</b>	1	1	1	1	1	5
<b>Yeka</b>	1	2	2	1	0	6
<b>Total</b>	11	19	17	11	6	64

We identified 64 measles outbreaks in the City of different Sub Cities within different time.30% (19) of the outbreak was occurred in 2014 and touch all Sub Cities (Table 11). Measles cases were reported throughout the year in Kolfe Keranio Sub City with peaks epi week (6<sup>th</sup>) and two additional peaks in the 15<sup>th</sup> and 22<sup>th</sup>-23<sup>rd</sup> weeks. The trend of measles showed the outbreak occurred during dry season (Figure 15).



**Figure 17. Trends of measles by Epidemiological weeks, Kolfe Keranio Sub City, Addis Ababa City Administration ,2014**

## Discussion

The finding of this analysis showed that, the cumulative annual incidence rate of measles has been high over the five calendar years', slightly lower than the earlier analysis done in Ethiopia (11), while in 2015-2016 the incidence rate decreased three times. However, it did not meet the target of <5 per 1,000,000 populations (1).

This study demonstrated that majority of affected age groups were the under 15 years. Similar study done in Ethio -Somalia Region and all over Ethiopia indicated that most affected age were below 15 years (15,17). This may reflect low immunization coverage in the region in previous years. As a result, more susceptible accumulated in these age groups, which created a favorable condition for measles outbreaks to occur and measles to circulate in these age groups. All children who were vaccinated for measles did not develop immunity for lifelong since only 85% of children can develop immunity with good condition of the vaccine (2). This age groups, remain a risk population, contracting measles and need strengthening vaccination to be targeting this age group. The age specific attack rate was high in under one year children. Our finding is similar with another study conducted in Ethiopia (68.5 cases per 100,000Population) were among children aged <1 years (15). The magnitude of measles cases decreased with age increase. Similar finding was seen in another study done in Ethiopia, while Cumulative incidence decreased with increasing age to low levels (0.1/100,000) in person's  $\geq 45$  years (15).

We found out that about one-fourth of cases did not receive vaccine. The majority of unvaccinated cases were fewer than one year. Our finding is similar with study done in Ethiopia in which 510(36.7%) of under one year did not vaccinated (15). This may be due to the fact that most 106(97%) of cases were below the current routine National immunization schedule, which recommends measles vaccination at nine months of age (2).

We found unknown and missing vaccination status of the majority of cases. This is similar to the finding in Democratic Congo where there were 2,168 (51%) among individuals with unknown or missing vaccination status (16). This may partly be since parents or care givers may not differentiate what type of vaccine the child received or not at all.

Measles cases were detected in all Sub Cities in the study period. There were variabilities among Sub Cities. Incidence varied greatly among Sub Cities, and factors such as local epidemiology and accumulation of susceptible groups, but also underreporting, may account for these differences. Highest number of cases and cumulative incidence rate were found from Kolfe Keranio Sub City. Possible reasons for this include the fact that this Sub City have a high densely population. The lowest cases and incidence rate identified from Kirkos and Lideta Sub Cities.

As calculated according to the national measles surveillance guideline definition of outbreak, during the five years there were 64 outbreaks in all sub cities and 30% of the outbreaks were occurred in 2014. From total outbreaks the highest number occurred in Kolfe and Arada sub cities.

We also noted a fluctuation of laboratory confirmed measles cases in the study years, high incidence of cases following a low incidence period detected in the area. This was a similar finding to a study in Amhara Region (18). It was revealed from the result that there were a lower number of lab confirmed cases in 2015 relative to 2013 and 2014. This might be related to the high measles vaccination coverage (100+%) achieve during the SIA in the Regional state during 2014 (12). This finding was similar to the findings in Amhara Region and D. Congo [16,18]. During 2012-2016 annualized rate of investigation (with blood specimens) of suspected measles cases in line with WHO Target  $>2/100000$ (1). Proportion of lab confirmed measles cases was high 26.5% compared to the WHO Target of  $< 10\%$  of investigated cases confirmed to be measles by serological investigation. Proportion of annualized detection rate of non-measles febrile rash illness is similar to WHO (Target  $>2$  case non-measles febrile rash cases per 100,000 populations per year) (1). The analysis also indicated that a high proportion (69 %) of suspected measles cases reported and tested in this surveillance system had negative results for measles IgM throughout the study years. This finding was similar to the findings in Amhara Region (18). This high IgM negativity rate may be a good sign for the laboratory surveillance system.

Measles cases (suspected, confirmed) and outbreaks are increasing from year to year in the region. However, still there is no genotype data available to map circulating strain of the measles virus. Virus isolation and genotyping of measles virus to identify source of infection is one of the strategies recommended by WHO AFRO to achieve the measles elimination goal by 2020 [18].

Low sub national routine measles coverage, prevailing poor nutritional conditions, accumulation of unvaccinated children in highly populated areas accompanied by seasonal hot weather between December and February have contributed for the frequent measles outbreaks occurring in different parts of the country [9]. Similarly, a seasonal pattern of occurrence of measles has been observed over the years, with increased number of measles cases during early part of the year (February to March)2014. Study done in Amhara Region show higher number of cases during February–March (hot dry season) and lower numbers in the rainy season of the region (July-September) and elsewhere in Ethiopia (9,18).

### **Limitation/Gaps**

- The nature of study design in that we were relying on already collected data and could not come up with definitive reasons as to why there were certain trends and anomalies in our findings, our study revealed a number of important findings.

## **Conclusion**

In conclusion, measles incidence rate has been increasing from year to year in the study area. Measles is widely circulating in the Region primarily affecting age groups <15 years. Highest number of cumulative incidence rate were reported from Kolfe keranio, Gulele, Arada and Bole Sub Cities. The lowest cumulative incidence rate being in Lideta Sub City. Although, in our finding 156 (21.4%) had not been vaccinated before, this may be due to the fact that most of cases were among age below the current routine National immunization schedule recommends for measles vaccination, while the remaining confirmed cases had unknown and missing information on vaccination status.

We also noted a seasonal peak during February-March in 2014. Based on this finding, measles will remain a public health problem in the Addis Ababa City Administration of Ethiopia unless concerted efforts are made in the Region and implemented to increase the vaccination coverage and continuing sensitive case based surveillance performance. All cases of measles were not reported with case based only three to five cases reported for laboratory confirmation at a time and place. So this study does not include all Addis Ababa City Administration cases of measles.

## **Recommendation**

- We recommend strengthening health education and routine and catch up immunization programs activities by the districts health office.
- We also recommend conducting a wide age group vaccination campaign in the region as there is more case in the age group <15 years.
- Additional study is needed in the Region to better understand the knowledge, attitude and practices of the general population and health care professionals about measles infection and vaccination.
- As Ethiopia gets closer to measles elimination targets, it will be important to introduce genotyping to determine circulating measles virus strains.
- Sub Cities health offices and PHEM should make specific efforts to improve case-based surveillance and completeness of the data. and increase vaccination coverage.

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# **Chapter III – Evaluation of Surveillance System**

### 3.1 Measles Surveillance System Evaluation, Bole Sub City, Addis Ababa Administration, Ethiopia

#### Abstract

**Background:** In Africa, approximately 13 million cases of measles and 650,000 deaths occur annually, with Sub-Saharan Africa having the highest morbidity and mortality. In Ethiopia, an estimated more than 1.5 million cases of measles (all ages) and 70,000 deaths occur annually. Despite reported Measles vaccination coverage of 83.2%, the frequency of Measles outbreaks in Addis Ababa prompted the need for the evaluation of the Measles case-based surveillance system.

**Objective:** To assess key attributes of measles surveillance system and to determine whether the objectives of the system are being met to generate evidence based information for the improvement of the surveillance system.

**Materials and Methods:** We adapted the updated CDC guidelines on surveillance evaluation to assess the system's usefulness, representativeness, simplicity, timeliness, stability and acceptability. A cross-sectional descriptive study was conducted from May 21- June 24, 2017. The evaluation was carried out in 11 sites with purposive and conveniently selected health offices and health centers by their highest reported cases. Primary data were collected using standard Semi-structured questionnaire and interviews were conducted with representatives from the Sub City and woreda PHEM officers, focal persons of HCs. Secondary data were reviewed from case based and weekly reports. Data were manually cleaned initially, then entered and analyzed using the Microsoft Excel work sheet of 2016. The qualitative data were summarized to supplement the quantitative findings.

**Results:** In all visited health facilities and Woreda health offices, the surveillance of measles exists and was functioning with limitations. Case definition was acceptable to all stakeholders and the flow of data were clearly indicated. Our study found that woredas surveillance sites kept their weekly reports (93% and 100%) timely and in completeness respectively. No surveillance site received feedback from higher levels. We found out no data analyzed in all facilities. The system is useful, simple, acceptable, flexible, and representative. The epidemic preparedness of the Sub City and woreda did only planning with no financial and /or logistics support. Besides, the epidemic committees did not review their action plans and did not learn from their experiences.

## **Conclusion and Recommendation**

The system is useful, simple, acceptable, flexible, and representative. Surveillance is threatened by lack of feedback and no data analyzed in all facilities. Measles surveillance data should be analyzed and interpreted for decision making. Provide frequent supportive supervision and increase sensitization to improve data quality. We highly recommend staff training, improving data quality and management and periodic reviewing, to ensure proper feedback flow.

***Keywords:* Measles, evaluation, surveillance, Bole sub city.**

## **Introduction**

Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health (1). This information is used for planning, implementing, and evaluating public health interventions and programs. Surveillance data are used both to determine the need for public health action and to assess the effectiveness of programs. (1). The evaluation of surveillance systems should promote the best use of public health resources by ensuring that only important problems are under surveillance and that surveillance systems operate efficiently. Most importantly, an evaluation should assess whether a system is serving a useful public health function and is meeting the system's objectives (2).

Before 1998 the nation implemented multiple surveillance systems which included surveillance for each disease. From 1998 – 2009, there was approach shift, which was integrated disease surveillance and response (IDSR) for the selected 23 diseases (3). Since 2009 the nation has been implementing Public Health Emergency Management (PHEM) (4). Currently in Ethiopia, 19 high priority diseases and 2 conditions are selected to be included in the routine surveillance system (see table 12). Diseases were selected based on public importance, epidemic potential, international concern and diseases under eradication and elimination which were under surveillance [4,5].

Measles is one of the communicable diseases causing preventable mortality and morbidity in the Country. Measles is an acute, highly contagious viral disease caused by measles virus. Measles is transmitted primarily by respiratory droplets or airborne spray to mucous membranes in the upper respiratory tract or the conjunctiva (6). Initial symptoms, which usually appear 8 to 12 days after infection include high fever, malaise, cough, and runny nose (coryza), blood shot eye, tiny white spots on the inside of mouth, prior to rash onset (5,6). Rash appear two to four days after the prodrome symptoms begin, a characteristic rash made up of large, blotchy red areas initially appears behind the ears and on the face. At the same time a high fever develops. The rash peaks in two to three days and becomes most concentrated on the trunk and upper extremities. The density of the rash can vary. The rash typically lasts from three to seven days and then fades in the same pattern as it appeared and may be followed by a fine desquamation. Conjunctivitis and bronchitis

are commonly present. Common source outbreaks associated with airborne transmission of measles virus have been documented ( 6).

Globally Measles is a wide spread killer, ranked number fifth, and 139,300 deaths were reported due to measles in 2012(5). A highly effective vaccine has been available since 1960s. Despite this, measles remains the leading Cause of vaccine-preventable deaths in the world. Measles is endemic virtually in all parts of the world. It tends to occur in epidemics when proportion of susceptible children reach about 40% (7). When the disease is introduced into a virgin community more than 90 % of that community will be infected (7). In 2012, the WHA endorsed the Global Vaccine Action Plan 4 with the objective to eliminate measles in 4 WHO regions by 2015. Member States in all 6 WHO regions have adopted measles elimination goals. Significant gains toward measles elimination have been made in the past 15 years with an estimated 79% reduction in global measles mortality between 2000 and 2014, resulting in over 17 million measles-related deaths averted (8). However, eradication (complete elimination of the global spread and transmission) of measles appears to be unlikely as modeling studies suggest that herd immunity of approximately 95% or greater is required to eliminate persisting measles endemicity (9).

In Africa, approximately 13 million cases of measles and 650,000 deaths occur annually, with Sub-Saharan Africa having the highest morbidity and mortality (10). In Ethiopia, the number of cases reported in EFY 2005 was 11,721 suspected measles cases with a peak in February (CFR=0.4%) (9). The Country is committed to achieve the elimination of measles by 2020 in line with African Region resolution AFR/RC61/ R1 (9). Through implementation of the recommended strategies including strengthening routine immunization activities and accelerated measles control since 2002, there was steady progress in reducing morbidity and mortality from measles (11).

Disease surveillance is a critical component of measles control and elimination efforts and is used in the assessment of progress and in making adjustments to programs as required. Tremendous progress has been made towards both measles and rubella elimination since 2001. In Ethiopia on 2013, measles vaccine coverage and full immunization coverage increased from 79.5% to 83.2% and from 71.4% to 77.7%, respectively (7,11).

Measles is an immediately reportable disease under the national PHEM system (4,11). One of the four important strategies to quickly identify cases and respond to suspect outbreaks involves case-

based measles surveillance. A case-based means that the surveillance system collects a core data set at national level on each case, including but not limited to, information on age, gender, vaccination status, date of last vaccination received, place of residence, travel history, date of rash onset, disease outcome, etc. (6). In 2003, Ethiopia began application of case-based surveillance system that requires investigation exact and detailed data collection and analysis for each case reported with taking a blood sample or oral fluid to confirm the case and urine sample and throat swab to isolate the virus in order to take appropriate timely action. The case should be investigated with serum specimen collection at first contact with the health worker, but within 28 days of rash onset (4,12). The number of reported suspected measles cases has increased through the years and this might be partly due to the increased sensitivity of the surveillance system, rather than a failure of the control efforts (8, 12).

In order to achieve regional measles elimination goals, one of the important strategies is establishing effective surveillance for measles, including laboratory confirmation of cases and outbreaks and an opportunity to assess the population immunity profile through the vaccination status of cases. The primary objectives of measles surveillance are to detect continuing measles transmission in an area; Identify, investigate, and manage outbreaks; Predict outbreaks by identifying geographic areas and age groups at high-risk; and Evaluate vaccination strategies in order to improve measles control (8,10).

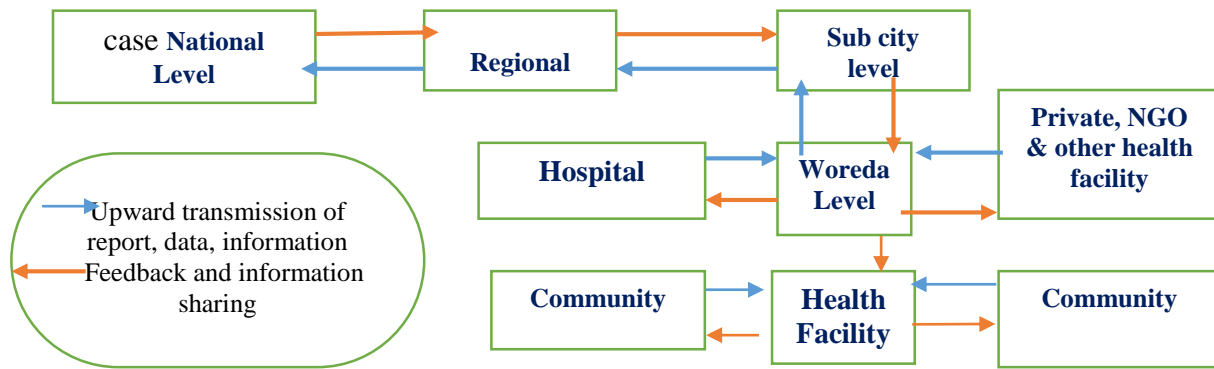
The overall purpose of surveillance of these diseases is to monitor the trend against the expected tolerance limits and to evaluate effectiveness and efficiency of surveillance system attributes and core activities. In Bole Sub City surveillance system evaluation was not done before. Therefore, this study was conducted to evaluate public health surveillance systems in Addis Ababa City Administration of Bole Sub City to determine how well they operate to meet their stated purpose and goal; and, to provide specific recommendation for improving surveillance quality, efficiency and usefulness of the system.

**Table 11. Priority diseases and Conditions reported through public health surveillance activities; Ministry of Health**

<b>Immediately Reportable Diseases</b>	<b>Weekly Reportable Diseases</b>
1. Acute Flaccid Paralysis(AFP)/ Polio	15. Dysentery
2. Anthrax	16. Malaria
3. Avian human influenza	17. Meningococcal meningitis
4. Cholera	18. Relapsing fever
5. Dracunculiasis /Guinea worm	19. Typhoid fever
6. Maternal Death*	20. Typhus
7. Measles	21. Severe Malnutrition*
8. NNT	
9. Pandemic influenza A	
10. Rabies	
11. SARS	
12. Smallpox	
13. VHF	
14. Yellow fever	

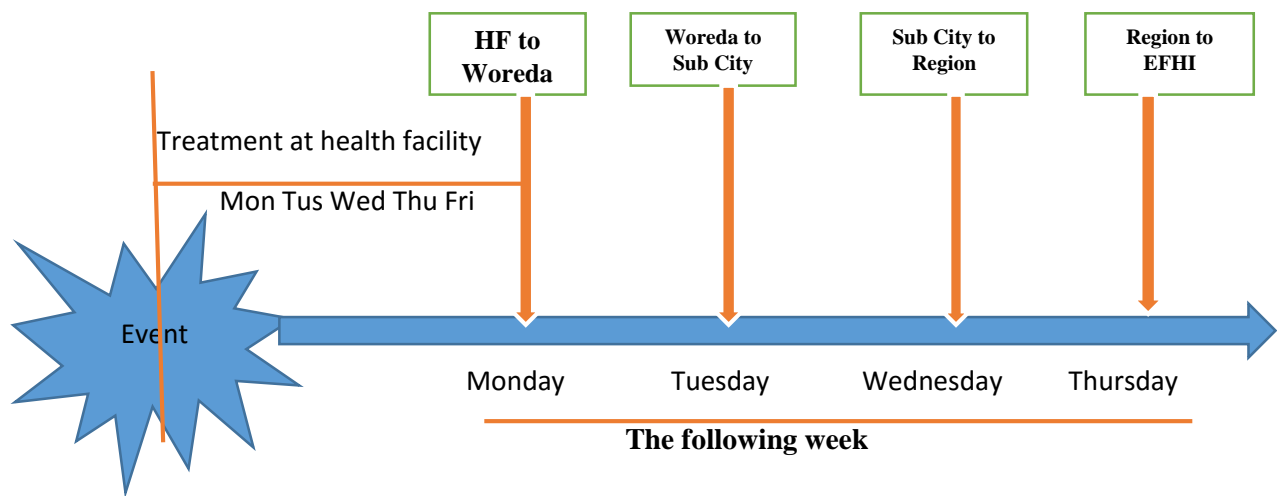
\* Recently added (since 2008 EFY PHEM system or surveillance and response)

The data and information flows routinely from the peripheral (community) up to the higher and central level to the EPHI. This starts from health posts (community) to health centers, then to Woreda Health Office and followed by Sub City Health Department; to Regional Health Bureau PHEM team. Then, RHBs sends the compiled data and information to the EPHI (Figure 19).



**Figure 18. Flow of surveillance data and information across national line**

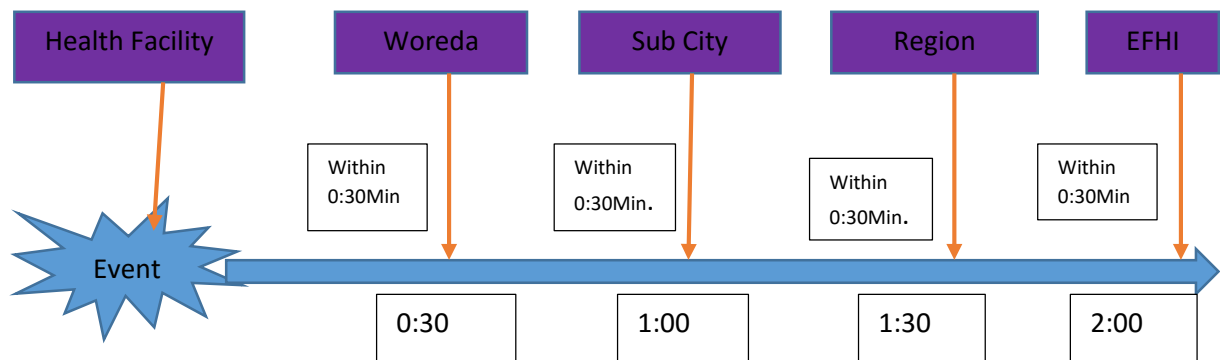
The total number of cases and deaths seen within a week (Monday to Sunday) is reported to the next level as follows: Health facilities report data from Monday to Sunday to woreda every Monday till midday; Woredas reports to Sub City every Tuesday till midday; Sub City reports to Region every Wednesday till midday; Region report to EHNRI /PHEM every Thursday; and EHNRI /PHEM report to stakeholders every Friday (Figure 18).



**Figure 19. Frequency of weekly reportable diseases and conditions for public health surveillance activities; Ministry of Health; Ethiopia.**

For the immediately reportable diseases, a single suspected case is considered as a suspected outbreak. Therefore, suspected outbreak of those diseases should be notified from level to level

within 30 minutes of identification as below (Figure19). MoH to WHO within 24 hours of detection.



**Figure 20 Frequency of Immediately Reportable Diseases and Conditions for Public Health Surveillance Activities; Ministry of Health; Ethiopia.**

### **Study Rationale**

Surveillance system evaluation is a tool for monitoring surveillance activities; disseminate feedbacks and inputs for improvement of intervention programs. Enhancing evaluation is very important to control communicable diseases mainly those with public health importance. Measles is one of the communicable diseases, which is under surveillance activities and remaining major public health problem in Bole Sub City, Addis Ababa, in 2017.

Recently, Measles epidemic that affected many Sub Cities occurred in Addis Ababa. This study is intended to evaluate the surveillance system in Bole Sub City, mainly focusing on Measles prevention and control activities. Additionally, findings of this evaluation may lead decisions and used as an input for strengthening public health surveillance activities.

## **Objectives**

### **General Objective**

- To evaluate Measles surveillance system of Bole Sub City PHEM, Addis Ababa City Administration.

### **Specific Objectives**

- To assess the core activities of the surveillance system, such as case detection, reporting, analysis and training in Bole sub city.
- To assess the availability of resources required for surveillance activities in the Sub City
- To evaluate the surveillance system attributes of measles in Bole Sub City

## **Materials and methods**

### **Study Area and Population**

This evaluation was carried out in Addis Ababa, Bole Sub City, which is one of the ten Sub Cities. Bole Sub City, situated at the eastern part of the City, is an expansion area divided in to 14 Woredas, 152 Sub Woredas, 498 “Sefers” and 11603 blocks. The land covered by Bole Sub City is 11,849.49 hectares and an average density of 26.05 people per hectare. From the projection of 2007 Census, the total population of the Sub City was estimated to be 387,104 of which 176,555 (47%) were males and 201,549 (53%)females. The evaluation was conducted in five selected woredas 2,3,9,13 and 14 with their five health centers.

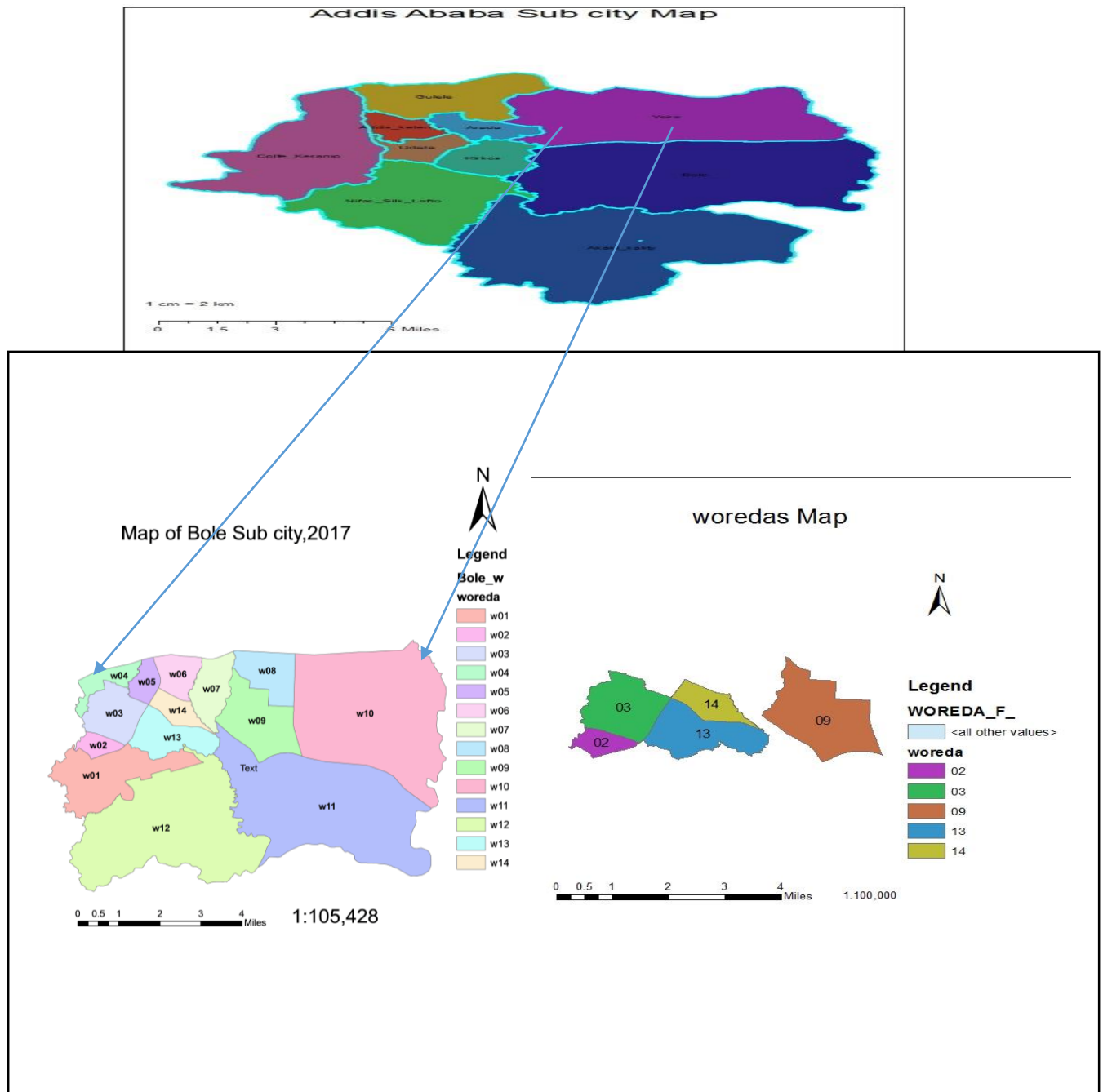


Figure 21. Map of Bole Sub City and selected woredas in the Sub City, Ethiopia, 2017

### Study Design and Period

A cross-sectional descriptive study was conducted from May 21- June 24, 2017.

### **Study units**

The study units were health centers, woreda health offices and the Sub City health department. Hence the sub city health department, five woreda health offices, five health centers were included in the study.

### **Sample Size and Sampling Technique**

First, purposive sampling was used to select one sub city from Regional PHEM. Then, five woredas and five health centers from Bole Sub City were selected using convenient methods. All surveillance focal persons in the selected health facilities, woreda and Sub City PHEM officer were included in the study.

### **Data collection tools and data sources:**

Data were collected using CDC updated guideline for Public health surveillance evaluation system. CDC surveillance evaluation checklist was used for face to face interviewing of Sub City and Woredas PHEM officers and Health Centers Surveillance focal persons. Review of reports and records were also used as part of the data collection system.

### **Data Analysis Tools**

During entry and analysis of quantitative data, Microsoft Excel software was used

### **Ethical considerations**

Written permission was secured from the respective organizations and willingness to participate on the surveillance data collection process of the respective sub city, woredas and health facilities PHEM officers and IDSR focal persons were obtained.

### **Dissemination of the Findings**

The final result of the study will be submitted to the Field Epidemiology Training Academic Coordination office, SPH-AAU, Regional health bureau/PHEM core process and Bole Sub City Health Department with a soft copy and hard copy

### **Measles case definition**

**Measles suspected cases at community level:** A community member should report any person with *rash* and *fever* to a health worker and also advise the person to go to a health facility.

**Suspected measles case:** Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects measles.

**Confirmed measles case:** A suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases in an outbreak.

**Epidemiologically linked case:** A suspected measles case that did not have a specimen taken for serologic confirmation and is linked (in place, person and time) to a laboratory confirmed case or another epidemiologically-confirmed case.

**Measles death:** For surveillance purposes, a measles death is defined as any death from an illness that occurs in a confirmed case or epidemiologically linked case.

**Operational definitions: -**

**Usefulness:** Usefulness of the surveillance system is reflected by documented changes in policies and procedures as a result of information generated by the system.

**Simplicity:** Simplicity denotes the structure and ease of operation of the surveillance system.

**Flexibility:** Flexibility of a surveillance system is its capacity to adapt to changing information needs or operating systems within minimal additional time, personnel and funding.

**Quality:** The quality of data reflects the completeness and validity of the data recorded in the Woreda Health Departments.

**Acceptability:** Acceptability is the willingness of persons, institutions or organizations to participate in the surveillance system.

**Sensitivity:** Sensitivity refers to the ability of the system to detect cases or outbreaks through trends in the surveillance data.

**Positive predictive value:** Positive predictive value is the proportion of reported cases that actually have the health-related event under surveillance.

**Representativeness:** Representativeness refers to the extent to which the surveillance system accurately describes the occurrence of medical condition over time and their distribution in the population by place and person.

**Stability:** Stability refers to the regularity (i.e., the ability to collect, manage, and provide data properly without stoppage) and availability (the ability to be operational when it is needed) of the public health surveillance system.

## **Result**

### **Engagement of the Stakeholder in the Evaluation System**

Prior to the evaluation of the surveillance system, discussion and consultation was conducted with Regional Public Health Emergency case team on how to select sites. It is known that stakeholders can provide input to ensure that the evaluation of a public health surveillance system addresses appropriate questions and assesses relevant attributes so that the findings will be more acceptable and useful. In this context, Bole Sub City PHEM officer and selected Woreda PHEM officers and Health Center focal persons participated in the evaluation of the surveillance system of Bole Sub City.

### **Description of the surveillance system to be evaluated**

At the time of the evaluation, the existence PHEM in the Sub City was confirmed. Public health emergency is the process of anticipating, preventing, preparing for detecting, responding to, controlling and recovering from consequences of public health threats in order that health and economic impacts are minimized. Regional PHEM unit is working with different stakeholders towards different needs and expectations. According to the Business Processing and Re-Engineering reform that has been implemented since 2008, Regional PHEM processes has two sub-process namely; Early Warning, preparedness, Response and Recovery and Health research. After the restructuring of the FMOH in 2009, the country adopted IDSR as part of Public Health Emergency Management (PHEM) and VPD surveillance became a component of the PHEM core process, at the Federal level within the Ethiopian Public Health Institute (EPHI) (14).

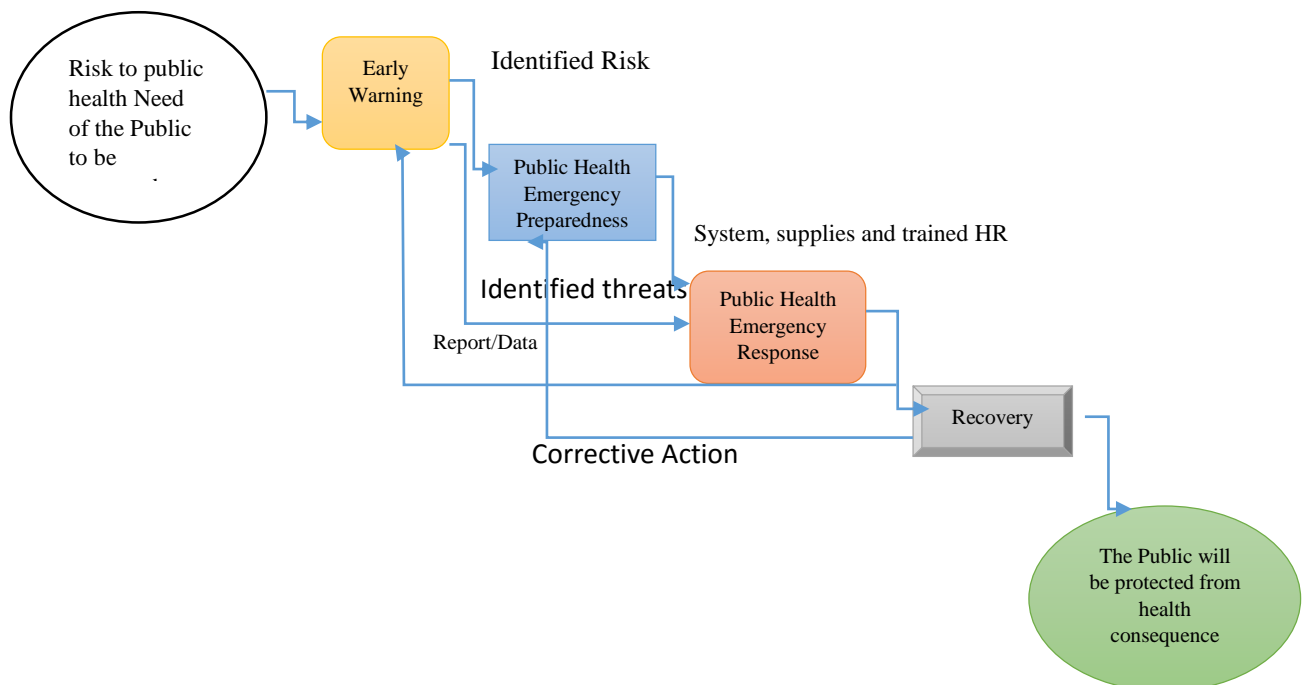
### **Describe the Public Health Importance of Measles in the Sub City Under Surveillance**

It is clear that surveillance could not be carried out for all diseases and conditions. Therefore, priority should be given to those diseases that are of interest at national and international levels. This surveillance evaluation tried to assess diseases targeted for epidemic potential in our region. Measles is one of immediately reportable disease under surveillance. Measles case based surveillance has been

## Descriptive the Purpose and Operation of Surveillance System

### Overview of the Surveillance System

PHEM is designed to ensure rapid detection of any public health threats, preparedness related to logistic and fund administration, and prompt response to and recovery from various public health emergency (14). Hence all public health emergencies related issues implemented at all levels throughout the country. Every public health emergency management processes have a starting and ending point. As indicated in Figure 21. Below.



**Figure 22. Public Health Emergency Management Core Process Sub-processes**

Source: FDRoE, EHNRI, PHEM Guidelines for Ethiopia, February 2012.

At Sub City level, the PHEM structure and task is the same as Regional level. Two health professionals are assigned on Sub City structure for PHEM activities. At district level, there is one PHEM focal person. Similarly, at health center level there is one surveillance focal person working on PHEM activities.

### Population under surveillance

The population in the catchment area of all selected Woredas and health facilities was included. The national PHEM targets all the population in the country to be under surveillance for all the

twenty-one priority diseases. Bole Sub City follows the same structure and the same are true for the selected five Woredas, Total population of about 151018 among them Female 77321(51.2%) and male 72,697(48.8%) (projected from the 2007 national census) (13) (Table 14)

**Table 12 The population under surveillance in the assessed district and health centers. Bole Sub City, 2017**

<b>Area Under Assessment</b>	<b>Total Population under study in 2017, as of 2007 national census</b>	<b>Female</b>	<b>Male</b>
<b>Woreda 2</b>	10108	5256(52%)	4851(48%)
<b>Woreda 3</b>	39,362	20468(52%)	18,893(48%)
<b>Woreda 9</b>	31,365	16309(52%)	15,055(48%)
<b>Woreda 13</b>	39,987	20793(52%)	19195(48%)
<b>Woreda 14</b>	30,196	14494(48%)	15,702(52%)
<b>Total</b>	<b>151018</b>	<b>77321(51.2%)</b>	<b>72,697(48.8%)</b>

## **Description of usefulness, Core and Support Function and Attributes of Surveillance System**

### **Usefulness**

All PHEM officers (n=6) (100%) and surveillance focal persons (n=5) (100%) agreed that the Surveillance System helps to detect outbreaks; estimate the magnitude of morbidity and mortality related to those diseases. Including identification of factors associated with those diseases permit assessment of the effect of prevention and control programs. They also agreed that surveillance system is useful to guide the planning, implementation, and evaluation of prevention and control interventions.

### **Core Function of Surveillance System**

#### **Case Detection**

The Bole Sub City Health Department surveillance system evaluation verified that, from 2012 – 2016; a total of 209 suspected cases and 0 deaths were reported from five selected woredas. Woreda3 account the highest number of cases 80 (38.2%) followed by Woreda9, 45 (21.5%) and Woreda13, 37 (17.7%). The lowest suspected measles case proportion reported in Woreda2, 17 (8%) (Table 15).

**Table 13. Five years reports of Measles cases for selected woredas, Bole Sub City, from 2012-2016.**

Woreda	Total Population	Cases	Cumulative IR/10,000	CFR/10000
Woreda2	10108	17(8%)	16.8	0
Woreda3	39362	80(38.2%)	20.3	0
Woreda9	31365	45(21.5%)	14.0	0
Woreda13	39987	37(17.7%)	9.3	0
Woreda14	30196	30(14.4)	9.9	0
<b>Total</b>	<b>151018</b>	<b>209(100%)</b>	<b>13.8</b>	<b>0</b>

Between 2012-2016, the Sub City reported 296 Measles suspected cases with 98 laboratory confirmed cases and no deaths (CFR= 0%). The average incidence rate of measles in Bole Sub City was 5.4/100,000 population. The IR seen in decreasing manner 10/100,000 in 2013 to 2/100,000 in 2016. The lowest IR 0.9/100,000 were reported in 2012 (Table 16).

**Table.14 Distribution of Measles by suspected cases and Incidence rate per 100000 population, in Bole Sub City, 2012-2016.**

Year	Population	cases	Laboratory confirmed	IR /100,000	CFR/100000
<b>2012</b>	343,856	47	3	0.9	0
<b>2013</b>	351978	83	36	10	0
<b>2014</b>	360434	94	34	9	0
<b>2015</b>	369189	51	17	5	0
<b>2016</b>	378104	21	8	2	0
<b>Total</b>	<b>1823514</b>	<b>296</b>	<b>98</b>	<b>5.4</b>	<b>0</b>

### **Case detection, registration and data reporting**

The case definition of measles was available in all visited health facilities and posted on the wall. The understanding of the available case definition by health care providers was satisfactory, as confirmed by some of health care providers. The clinical registration was found together with OPD registration at OPD and IMNNCI. Reporting formats are available and no shortage encountered

within the past six months' period, at all visited health facilities, Woreda PHEM office and Sub City PHEM. All visited health facilities had a surveillance focal person to collect, compile, and report cases to the next level. All reports were sent to the next level through telephone and text message. Reporting through telephone incurs personal expenses of some health workers, especially at the woreda health office and health center level, since that there is no government telephone service used for this purpose and this might contribute to late report.

### **Case Confirmation**

All visited health centers have the capacity to transport specimens to higher levels for confirmatory test. This can be explained by the fact that there are trained personnel and cold chain equipment for specimens handling and transportation. Confirmatory test for measles specific antibody (IgM) done at EPHI central level and takes up to three to six months to get feedback. Currently, Regional PHEM case got laboratory result of measles from EPHI through e-mail.

### **Data Analysis and Interpretation**

At Sub City level the data are analyzed weekly and monthly by person, place and time regularly for action. Trend monitoring (line graph) was also seen at Sub City level on priority diseases such as Typhus, Typhoid and Dysentery. During visiting, we observed only 20% (n=1) health institution analyzed data posted on the wall. Sixty% (n=3) Woredas PHEM regularly counted and compiled data. PHEM coordinators/officers were responsible for surveillance data analysis in all woredas. All Woredas were analyzing the surveillance data on quarterly bases. The threshold for action were set for measles at all levels. All woreda PHEM officers and health facility focal persons knew the threshold of immediately reportable disease like, Measles, NNT. They did not analyze the available data on weekly and monthly bases. Regional Health Bureau analyzes and follows trend for measles.

### **Epidemic preparedness and response**

All visited Woreda PHEM and health facilities under the Sub City did not experience measles outbreak in the previous year. There were written epidemic preparedness and response plan at Sub City PHEM and in all Woredas PHEM. However, the Sub City PHEM officer, woreda PHEM officers and health center surveillance focal persons did not know the availability of emergency drugs and supplies. All assessed health facilities set for epidemic preparedness and response plan

for the priority diseases. They had epidemic management committee like RRT and task force at their locality that was confirmed from minutes during visiting. All the Sub City, Woreda health office, and health facilities did not have budget line for outbreak management. In the assessed health facilities, there was available budget used for epidemic response, however in case of experiencing any emergency, the Region mobilize budgets for response activity. PHEM officers replied that epidemic RRT and management committee were actively engaged only if there is an outbreak, but they didn't monitor their activities and preparedness at all levels.

## **Support Function of Surveillance System Evaluation**

### **Training**

In 2017, Regional PHEM unit being with partners have conducted training for Sub Cities and woredas PHEM focal persons on new PHEM Guideline. Regional PHEM provided short term training for 4-5 days, for all visited Woredas PHEM officers and health center surveillance focal persons. This training will equip and extend opportunity to obtain knowledge and skill and enable to use the data collected from the system, detect and respond to priority diseases risks, conditions and events and thereby contributing to reduction of the burden of illness, death and disability. In health facilities health care providers, clinicians and HEWs, were only given surveillance orientation.

### **Supportive Supervision and Feedback**

Some of the visited woreda PHEMs and health centers had regular integrated supportive supervision from their respective Sub City health offices every three months (quarterly). Among five visited health centers two (40%) had never been supervised during the past 6 months by higher levels. As per PHEM officer, shortage of vehicle, budget and logistics were attributed for the inability of conducting regular supportive supervision at health facility level. Reporting system, active case searches and other surveillance activities were not reviewed in supervised districts and health facilities. Appropriate feedback can be maintained through supervisory visits. Discussion with the Sub City experts revealed that both verbal and written feedbacks are practiced, incorporated with routine integrated supportive supervision together with other departments. We didn't find out any written feedback documented in all visited Woredas and health facilities.

## **Material and resources available for surveillance**

### **Resource for communication**

Resources for data management, communication, and logistics were all available at the Sub City level. However, they became very scarce down the ladder. There were Computers at woreda health office and health center level, but not given particularly for PHEM department. Two out of five woredas PHEM had computer for surveillance purposes. Except at the Sub City level, the logistic and budget constraints were complained by all visited woredas PHEM and health centers. Those were mentioned frequently as the reasons for poor reporting, monitoring and evaluation of the health office and health facility. Immediately and weekly reports were sent by telephone, while monthly reports were sent from health facilities to woreda health office and Sub City using hard copy. At all health centers level, the only available communication tool was personal mobile phones without refunding of its cost.

### **Human Resource**

All Surveillance focal persons working in health centers were integrated with another department. They were delegated for data collection and to report data to the next level. All Woredas PHEM officers and Sub City PHEM officer were a fulltime worker in surveillance system and their position called PHEM officer under health promotion and disease prevention core process owner.

### **Availability of National PHEM Guideline**

From the assessment, we found out that all the five health facilities (100%), woredas PHEM and Sub City PHEM office had national PHEM surveillance guidelines and case definitions of measles.

## **Attributes of surveillance system**

### **Simplicity**

The system uses the registration book of health facilities as the source of information. All respondents agreed that the case definition for measles is easy to understand and applied by all health professionals. Communication channels are established, with the generation of a notification report by a health worker when a case is diagnosed at health facilities. Data generated are passed through defined reporting routes using the standard reporting formats case based Standardized tools in place. Line listings are submitted in the event of disease outbreak or epidemic. But, to

confirm the measles cases it needs laboratory at EPHI level. Registration at the health facility level takes very short time, records are not digital and retrieval of these records at health facility level were a little bit difficult. Report formats were familiar to all focal persons. It takes 5-10 minutes on average to file in prepared format. All level of reporting bodies reports for one site. All respondents at each level were familiar with when and for whom report will be send. Since it was set in the surveillance guideline and the route of data flow is simple and clear, the reporting entities do not complain any problem in this regard.

### **Flexibility**

System is flexible as it can accommodate new variables and information, can be operated with other systems. All (100%) respondents agreed that a flexible public health surveillance system can be and easily adjusted to use, change can be implemented with little information but, without additional time, personnel, or allocated funds.

### **Data Quality**

Data quality reflect the completeness and validity of data recorded in the public health surveillance system which is amount of unknown or blank response on weekly reporting formats filled or not reflects data quality. We verified that from two months' report formats; 60% (n=3) and 40% (n=2) health centers and Woredas health office report shows blank (unfilled cell in the report format) spaces were availed respectively.

### **Acceptability**

The reporting agents accept and were well engaged to the surveillance activities, the reporting rate of woreda PHEM office and Health centers were 90% within the past 12 months. The case definition and reporting tools were acceptable by all stakeholders. Five (100%) reporting agents were governmental Health Centers and some of private health facilities have accepted and have been engaged in the surveillance system.

### **Sensitivity**

The surveillance system must be sensitive enough to identify circulating measles virus in the community. During the evaluation, sensitivity was described at all level by surveillance focal

persons able to detect the case and notify the outbreak together with health professionals working in the clinical units, this refers to the ability of the system to identify clinical and community based case definition of measles. The community based case definition helps particularly the health extension workers (HEWs), and health development army (HAD) to identify and notify early all suspected measles cases and notifiable priority diseases at the community level. During evaluation at all woredas, we observed no community case definition in 5(100%) woredas and no report driven by health extension workers and this shows a gap in service in the area.

### **PVP**

The predictive value positive (PPV) or the proportion of cases reported by the system that actually have measles were difficult to measure because results did not return, to health facilities. The capacity of the diagnostic test was ensured by special lab only done at EPHI. PVP of Measles surveillance system is calculated as the guideline. PVP is represented by  $A/(A+B)$ , where A is true positive cases and B is false positive cases. During 2012-2016 reports 98 laboratory positive cases, where 296 cases. (Suspected and confirmed) were detected in assessed Woredas.

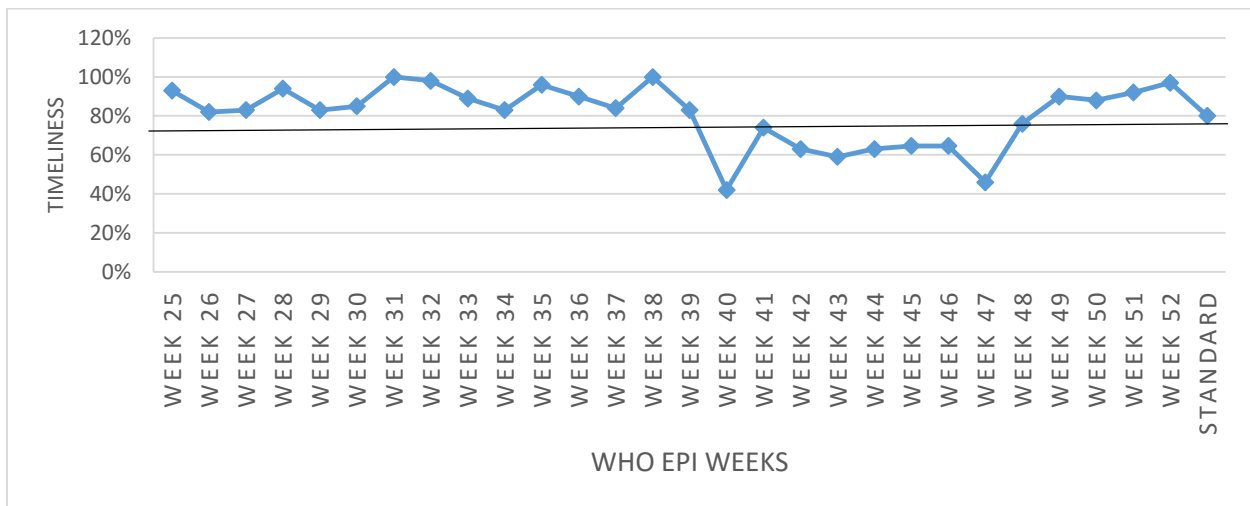
$PVP (\%) = 98/296 * 100 = 33\%$ .

### **Representativeness**

A public health surveillance system that is representative accurately describes the occurrence of a health-related event over time and its distribution in the population by place and person. Representativeness shows how far the routine surveillance report is covered by the health service delivery system and how many facilities are reporting to the offices. The representativeness of the surveillance system was assessed by health service coverage and by health seeking behavior for the disease. According to the Sub City health office, in assessed Woredas and health center coverage was 100%. The health seeking behavior of the community, which was usually commented as poor, particularly for measles. Though, these factors are not well met for some of the reasons mentioned above, the representativeness of the system is somewhat good.

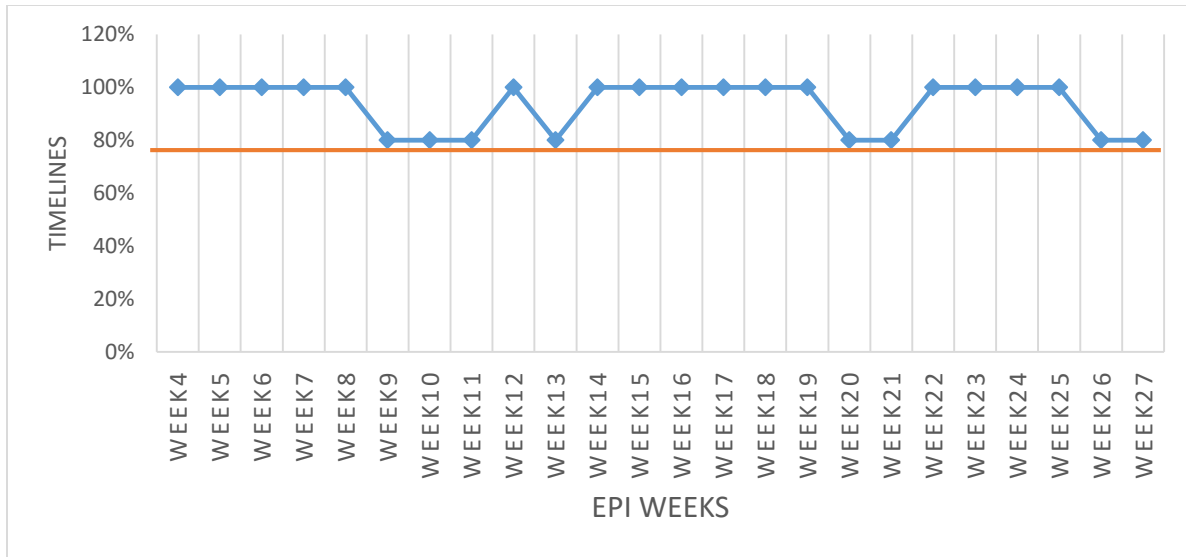
## Timeliness

Timeliness reflects the speed between steps in a public health surveillance system. The interval usually considered first is the amount of time between the onset of a health-related event and the reporting of that event to the public health agency responsible for instituting control and prevention measures. It shows how much data are reported on time. Bole Sub City weekly report to Region PHEM timeliness was on average 80.8 % in the past six months (2008 EFY). In the same reporting period, from week 40 to week 48, the Sub City timeliness were below the National minimum expected level 80%. The highest (100%) Sub City timeliness were reported in week 31 and 38; and lowest (42% and 46%) in week 40 and week48 respectively (Figure 22).



**Figure 23 Trend of timeliness of Bole Sub City PHEM in 2008 EFY; February 2017.**

A report is said to be on time, if all the reporting units within its catchments area have submitted the reports on its pre agreed time schedule. Based on this, Bole Sub City received from Woreda2,3,9,13 and14 weekly report timeliness were 93 % from Epi week4 to week 27 and completeness 100% in (2008 EFY) 2017 (Figure 23).



**Figure 24. Trend of Timeliness of Selected Woreda PHEM, Bole Sub City, from 4 to 27 in 2008 EFY; February 2017**

### Stability

The surveillance system in the visited woreda health office and health center were able to collect, manage and provide data properly without failure. Availability of PHEM focal persons at Sub City and woreda level is a good opportunity for running surveillance system even with limited resources. However, the great challenge in health centers were high turnover of focal persons. Due to this reason, there were interruptions in data collection and reporting to the next level. Shortage of budget and logistics is hindering supervision and capacity building activity at Sub City and woreda level. However, supportive supervision was conducted with integration of other programs. Even though PHEM unit of many woredas did not have some data management resources such as computers and printers, they were using other department's resources for data entry, compilation, analysis and dissemination. The immediately and weekly report through telephone, but in most of the facilities there were no fixed line telephones for surveillance system and health workers were forced to utilize personal cellphones.

## Discussions

Evaluation of a public health surveillance system focuses on how well the system operates to meet its purpose and objectives (1). All interviewed respondents agreed that early detection of disease under surveillance is useful. However, we did not find out any Measles trend analyzed to determine outbreak in all visited health facilities and woredas. That was why, Regional PHEM trigger using Sub City report in case of outbreak.

When reports are sent and received on time, the possibility of detecting a problem and conducting a prompt and effective response is greater (4). The Sub City weekly average completeness and timelines report were found 86.5%, which fulfill WHO standard ( $\geq 80\%$ ) (6). While, In the same reporting period from week 40 to week 48 the Sub City timeliness were below the National minimum expected level 80%. The Sub City PHEM received from woreda 100% completeness, timeliness on average 93%. It was more than minimum requirement expected by National (80%) (6).

The standard and community cases definition should be available and posted in health institutions for detection of suspected cases (4). The cases definition was available in the visited health institutions, but community case definition was not posted at woreda level. This may lead to low detection of measles from the community. The measles case definition was understood by all respondent health care providers and the detection rate of measles in the district were 100%. Use of the standard case definition for suspected measles cases is the primary tool in the surveillance system to ensure early detection of any suspected cases (15).

Yearly suspected measles detection rate should be greater than or equal to 2/100,000 population (6). The finding reveals that a yearly suspected measles detection rate of Bole Sub City was 5.5 in 2016. This surveillance system evaluation confirmed suspected measles detection rate greater than its expectation (6). While, among woredas under Bole Sub City detection rate was not uniform.

The structure of data reporting flow from the lower to the upper level was well organized with unidirectional of data, in simple and defined role and responsibility of each reporting entities. But flow has so many obstacles with reporting means and infrastructure like telephone and computers for data management and analysis. This impacts the overall generation of report by expected health

facilities and can make the surveillance system to relay on very limited data. All reporting agents accept and well engaged to the surveillance activities. The reporting formats were easy to fill out; this finding was unmatched with the CDC, updated guideline that is the simplicity of a public health surveillance system refers to both its structure and ease of operation (1,2). According to the guideline, Measles Surveillance data should be analyzed on a weekly basis at each level (i.e. health facility, woreda, zone, region and National) (13). In visited areas, there was no consistence. In Sub City level surveillance data were analyzed weekly and developed weekly bulletin. However, all visited woredas and health facilities didn't analyze on weekly base. Therefore, the absence of performing data analysis regularly may hinder early detection of health events and taking appropriate controlling and preventive actions before the events are causing more illness and disability in the community (1).

According to focal points, the case definition and its application is easy which indicates the simplicity. The Measles surveillance system is currently integrated with the Acute Flaccid Paralysis (AFP) and include others and it can accommodate change in case definition, which indicates its flexibility. Positive predictive value is the proportion of individuals detected by a system or test that actually have the disease of interest: low predictive value indicates many of the detected cases are not true cases and epidemics may be mistakenly identified (2). The positive predictive value of Measles in the assessed woreda during 2012-2016 were (23.8%). Similar study done in Nigeria reveal Predictive value positive(PVP) were 33%(16). A surveillance system with low PVP, and therefore frequent "false-positive" case reports, would lead to misdirected resources (1).

Visited health centers have a capacity to collect, handle and transport specimen of measles and AFP to central laboratory which is an opportunity for early case detection and management. The laboratory result has to be sent to the users with in a maximum of 7 days (6). In all visited health facilities, the duration of laboratory confirmation takes more than 6 months, (most of the time no feedback).

Feedback is an important function of all surveillance systems and the way of encouraging, an individual or staffs working in the surveillance system. At all visited levels there were no written feedback. This can reduce the interest and acceptability towards the system and compromise the

continuous learning platform that can be developed by this system. Current practice of the region on preparation and dissemination weekly bulletin is a good starting point to strengthen feedback system. To assure high-quality surveillance, the surveillance system must be monitored regularly and systematically, using a set of formal indicators (6). Regular feedback to everyone involved in the surveillance system using monitoring indicators is important to assure sustainability and refinements to the system. Absence of budget line either from government or non-governmental organizations for surveillance activities at Sub City and woreda level remain a major bottleneck to run tasks under PHEM to achieve its objectives. Additionally, shortage of resources for data management is a challenge to generate and disseminate PHEM reports timely, maintaining their quality.

Preparedness activities and tasks are those things that should be done prior to the occurrence of emergency. Establishing multi-sectorial PHEM committee and rapid response team is the primary steps of preparedness at each level. In addition, this established committee should be oriented or trained on epidemic preparedness and response (especially for RRT) (6). The committee should have a regular meet. There were no established multi-sectorial task force committee in all visited Woredas and Sub City. None of visited Sub City and Woreda PHEM had emergency stocks of drugs and supplies for outbreak control. This will make responses to be late and give epidemic to take the chance to progress.

## **Strength and Limitation**

### **Strengths**

- o Surveillance/ PHEM system was fully function in all Woredas of Bole Sub City;
- o All interviewed PHEM officers and focal persons were very cooperative for this system evaluation;

### **Limitation of the study**

- The study design and sampling technique may affect the representativeness, since we used the secondary data/source and non-probabilistic study design.

## **Conclusion**

- The implementation process of the surveillance system at all levels was not uniform.
- The surveillance system evaluation detects measles cases easily.
- Surveillance data was not properly analyzed and used for action
- The report timeliness and completeness above expectation (>85%).
- There was irregularity of supervision.
- The system was simple, acceptable, and useful to identify cases.
- There were no established multi-sectorial task force committee in all visited Woredas and Sub City.
- No Operational budget line at all level for surveillance system and emergency preparedness and response.

## **Recommendations**

- ❖ All the woreda and health center PHEM and surveillance focal persons should be able to manually organize, summarize and display data in table and graphs as appropriate.
- ❖ Improve the capacity and building positive attitude of health care providers in the disease detection, reporting and proper use of data.
- ❖ Regional PHEM should strengthen data processing capacity at all levels by providing necessary computing skill using the appropriate software.
- ❖ The Sub City PHEM and Woreda PHEM should integrate their supervision, giving feedback.
- ❖ The Woreda PHEM should Provide frequent supportive supervision and increase sensitization to improve data quality, improve competence of the reporting timely.
- ❖ The Sub City should set weekly, monthly, and quarterly time frame for data analysis at all levels, so that timely detection of any unusual variation and investigation will be possible.
- ❖ Emergency preparedness and response Team should be established at all levels.
- ❖ Regular revision of epidemic preparedness plan and local capacity and resource mapping should be done by woreda and Sub City PHEM follow and give feedback on regular bases quarterly.

- ❖ Sub City, woredas and health facilities surveillance system should have budget and be equipped with the minimum communication and electronic tools (telephone, computer and fax).
- ❖ Health facility should give duties and responsibilities (everyday jobs) of all focal people in the system in written forms; so, that system hand over to the new staff will be easy whenever there is staff turnover.

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# **Chapter IV – Health Profile Description**

## 4.1 Health Profile Description Report of Bole Sub City, Addis Ababa, Ethiopia, 2016GC.

### Abstract

**Background:** Health profile description is a system of collecting and summarizing health and health related events, demographic, socio-economic, political and cultural aspect of a particular Sub City. Summarizing and analyzing health and health related data of a district is important to prioritize public health data and determine disease burden. Health profile description was conducted in Bole Sub City of the Addis Ababa City Administration to understand the overall health and health related events, mainly performed in 2008EFY (2015/16).

**Methods:** Standard questionnaire was used during data collection, and the assessment was undertaken from March 6 to 15/03/2017. Beyond the Sub City Health Office, different sectors like, education, water, finance were interviewed using designed questionnaire and reviewed secondary data. Microsoft Excel software was used during data compilation and analysis. Described findings in the form of tables, figures and map.

**Results:** Bole Sub City is divided into 14 Woredas which are all urban. The total population of the Sub City was estimated to be 378,104 of which were 53% female in 2015/16 G.C. In the Sub City, there were 11 Hospitals, 9 health centers and 124 clinics. From a total of 13,322 eligible infants, 16,669(100+%) vaccinated for pentavalent, of 14,428(100+) for measles and 14,790(100+) were fully immunized. In this Sub City 17,019 infants were protected at birth (PAB). Of 50,660(100+) pregnant women have ANC coverage. Among a total of pregnant women in the sub city, 13,322(100%+) of them have got delivery service by skilled attendants. Acute upper respiratory infections were the leading cause of outpatient morbidity and under five OPD in 2015/16 G.C. A total 1031 all forms of TB cases were identified which is (100+) TB detection rate. Treatment success rate and cure rate were 93% and 86% respectively.

### Conclusion

Acute upper respiratory infections were the leading cause of outpatient morbidity and under five OPD Even though some activities were under taken by Sub City to improve health status of the community. All activities in preventive aspects were above 100%. The possible reason was the

area have many private hospitals and MCH clinics, furthermore, the neighboring community have got services in these health facilities.

**Key word: Health profile assessment, Bole Sub City, Addis Ababa, Ethiopia,2016**

## **Introduction**

Health profile description is a system of collecting and summarizing health and health related events, demographic, socio-economic, political and cultural aspect of a particular district. A process that engage systematically collect and analyze qualitative and quantitative health related data from a variety of sources within a specific community. The findings of the community health assessment are presented in the form of a community health profile and inform community decision making, the prioritization of health problems and the development and implementation of community health improvement plans. (1)

The purpose of this Community Health Profile is to describe the health status of the population, key health behaviors, describe de-terminates of health outcomes and behaviors, and examine root causes of ill health and health inequalities. A community health assessment and improvement plan is a collaborative, systemic process of collecting and analyzing data and information, mobilizing communities, developing priorities, garnering resources, and planning actions to improve the population's health (1). Having done this description in an annual basis is crucial in understanding current performance and to identify underperformed activities.

The right to health for every Ethiopian has been guaranteed by the 1995 Constitution of the Federal Democratic Republic of Ethiopia, which stipulates the obligation of the state to issue policy and allocate resources to provide public health services to its citizens (2). The Federal Ministry of Health of Ethiopia prepared a comprehensive Health Sector Development Plan (HSDP) of 20 years phased into 5 consecutive years of plan that aligns with the national Growth and Transformation Plan (GTP) (2). The current HSTP focuses on equitable access and quality health services, with a participatory approach of governance system. The strategies and approaches are directed towards improving the standards of living, particularly the health and wellbeing of its population by influencing the performance of health determinants including gender (2). Ethiopia follows a decentralized health care system promoting, preventive, and curative health care delivery by public and private (for profit and not for profit) players in the health sector.

The HSDP prioritizes maternal and newborn care, and child health, and aims to halt and reverse the spread of major communicable diseases, such as HIV/AIDS, TB, and malaria. The Health

Extension Programme (HEP) serves as the primary vehicle for the prevention, health promotion, behavioral change communication, and basic curative care (2).

As the purpose of this assessment is to describe health and health related issues in the given Sub city and communication of the local burden of morbidity, mortality, any disaster and other public health related information of the Sub City, it is very important document to be utilized by any stake holder in general and public health professionals in specific. The study is also helpful in reminding the Sub City officers, their past accomplishment and what to be done in the future, including plan updates, based on the feedback of this assessment in the area. The overall aim of this assessment is to describe the health profile of the Sub City so as to identify and recommend on areas that needs improvement.

### **Rationale of the description**

Health profile description is very important to understand the demographic, socio-economic status, morbidity, mortality and other health and health related indicators in the given Sub City and the woreda. The information generated from health profile description will help Bole Sub City Health Department, health office and other stake holders in public health planning, resource allocation, intervention and system evaluations as well.

## **Objectives**

### **General objective:**

- To assess and describe health and health related data to identify problems for priority setting of Bole Sub City, Addis Ababa City Administration.

### **Specific objectives:**

- To describe the demographic characteristics of the population in Bole Sub City in 2016G.C
- To describe health delivery infrastructures and health delivery status in Bole Sub City in 2016G.C.
- To assess the health status of the population in Bole Sub City, using health and health related indicators.
- To identify problems for priority setting of Bole Sub City.

## **Materials and Methods**

### **Study Design**

Descriptive cross sectional study was conducted using standard questionnaire. Reviewed available data in health offices and health institutions. Interview and discussion with concerned health office heads, experts, professionals etc.,

### **Study period**

Health and health related performance of 2015/16G.C, socio-economic, administrative setup and cultural aspect data were collected from March 6 to 15, 2017.

### **Study area**

#### **Background Information of Addis Ababa**

Addis Ababa is the largest as well as the dominant political, economic, cultural and historical city of the country, established in 1887 by Emperor Menilik II. It has the status of both a city and a state. It is the capital of the Federal Government and a chartered City. It is where the African Union and its predecessor, the OAU are based. It also hosts the headquarters of the United Nations Economic Commission for Africa (UNECA) and numerous other continental and international organizations. It is the largest City in Ethiopia. The City is divided in to ten Sub Cities which are

the second administrative units next to City Administration. In terms of area coverage Bole is the largest sub-city followed by Akaki- Kality and Yeka. Addis ketema is the smallest and followed by Lideta and Arada Sub-cities. The Sub-Cities are also divided in to weredas, which are the smallest administrative unit in the city. There are 116 weredas in the city administration. The number of weredas varies based on their size (3).

Health profile description was conducted in Bole Sub City, which is one of the ten Sub Cities in Addis Ababa, Ethiopia. Bole Sub City is divided in to 14 woredas, 124 “Ketenas”, 394 villages, and 1344 blocks. The Sub City is situated at the eastern part of the city, is also an expansion area, which covers a surface area of 11,852 Hectares. The Sub City is surrounded by three Sub Cities and one Region, to the North Yeka Sub City, to the West Kirkos, to the south Akaki Sub City and to the East with Oromia Region. From the projection of 2007 Census, the total population of a Sub City is estimated to be 387,104 of which 176,555 (47%) were male and 201,549 (53%)female in 2016GC. It is where Bole International Airport is situated. Bole Sub City is relatively well planned and has many real states and huge industrial sites.

### **Data Source**

- To develop this profile data were collected and reviewed from the following sources
- Bole Sub City Health Office, Plan and Program Core Process.
- Bole Sub City Education Office.
- Bole Sub City Bureau of Finance and Economic Development (BoFED).
- Addis Ababa Water and Sewerage Authority Gurd shola Office.
- Review of related Literatures conducted in Addis Ababa and Bole Sub City.

### **Data Collection Tools and Procedures**

During data collection, semi-structured questionnaire was used at Sub City level. Interview were conducted with selected Sub City offices focal persons using the questionnaire and reviewed secondary data.

### **Sample size and sampling technique**

Bole Sub City was selected purposively among Sub Cities found in Addis Ababa City.

**Data analysis procedure**

Data were compiled and analyzed by Microsoft Excel software. Frequency distribution, tables and figures were employed.

**Ethical Consideration**

A formal letter was submitted to the data manager at each source organizations in order to get access to data. We maintain confidentiality of available data.

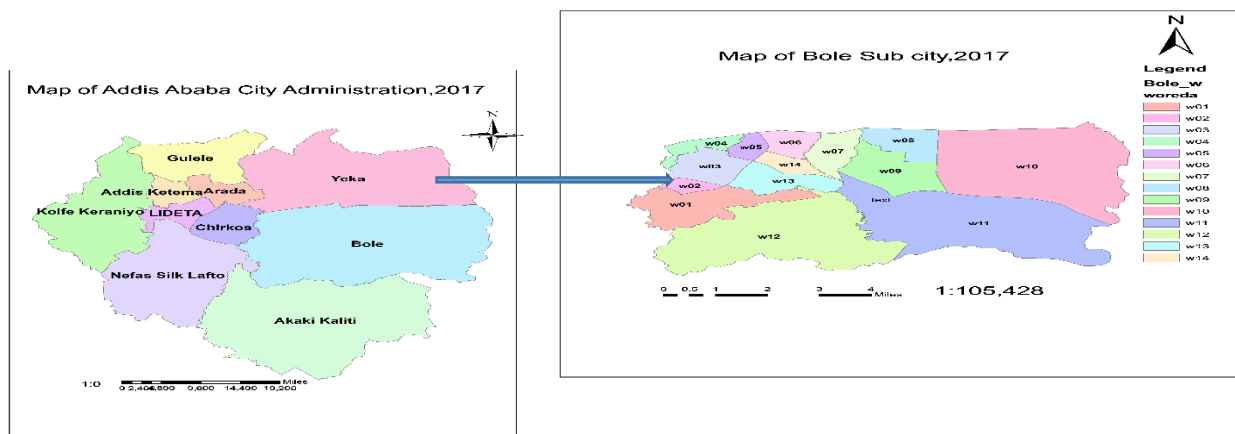
**Dissemination of the Results**

The study result will be disseminated to stakeholders using a report and EFEP coordinator, mentors, field supervisor.

## Results

### Geography and climate

Bole is the largest Sub City in terms of area coverage in Addis Ababa City Administration. The Sub City is found in the expansion area covers a surface area of 11,852 Hectares. The Sub City is situated in the eastern part of Addis Ababa, surrounded by three Sub Cities and one region, to the North Yeka , the West Kirkos ,South-west Nifas-Silk, south Akaki Kaliti Sub Cities and to the East with Oromia Region. In the Sub City the altitude ranges from 2120 to 2408 meters above sea level with a range of 288 meters.



**Figure 25. Map of administrative structure –Bole Sub City, Addis Ababa City Administration, Ethiopia, 2008(2015/2016)**

### Administrative and political structure

There are 116 wereds in Addis Ababa City Administration. The number of weredas vary based on their size. Bole Sub City is also divided in to 14wereds, which are the smallest administrative units in the City and 124 “Ketena” 394 villages, and 1344 blocks, the power organs of the Sub City are the council, chief executive, and the standing committee and the same goes for the woredas.

### Demographic Information

From the projection of 2007 Census, the total population of the Sub City were estimated to be 387,104 of which 176,555 (47%) were male and 201,549 (53%) female in 2016. This is 11.9 percent of the Addis Ababa population of 3,352,000 which makes Bole Sub City the 4<sup>th</sup> highly populated Sub City. All of them are residing in urban areas (4). The population size of woreds

varies in space. As a result, worda 6 (11.2%), worda 13 (9.8%), worda 3 (9.7%) and worda 1 (8.6%) have the largest share of population of the Sub City respectively. On the other hand, worda 11 (2.3%) has the smallest share of the Sub City's population (Table 1). The most densely populated woreda was woreda 4, with population density of 153.83 people/hectares (8659) and the least dense woreda were woreda 11 with population density of 2.76 people/hectare (Table 17).

**Table 15. Distribution of estimated population by woreda and age category, Bole Sub City, Addis Ababa Administration, 2016GC.**

S.No.	Wordas	Population	<1(2.24%)	<5(7.16%)	<15(23.97%)	LB(2.33%)
1	Worda1	34104	764	2442	8173	795
2	Worda2	9871	221	707	2366	230
3	Worda3	38439	861	2752	9212	896
4	Worda4	35137	787	2516	8421	819
5	Worda5	24484	548	1753	5868	570
6	Worda6	44575	998	3192	10683	1039
7	Worda7	25806	578	1848	6185	601
8	Worda8	30630	686	2193	7341	714
9	Worda9	30630	686	2193	7314	714
10	Worda10	28156	631	2016	6748	656
11	Worda11	9820	220	703	2353	229
12	Worda12	18002	403	1289	4314	419
13	Worda13	39050	875	2796	9359	910
14	Worda14	29488	661	2111	7067	687
<b>Total</b>		<b>378,104</b>	<b>8919</b>	<b>28,511</b>	<b>95,404</b>	<b>9279</b>

Under 1-year children are 8919(2.24%), less than 5 years 28,511(7.16%) and about One-quarter of the population was below the age of 15 years, suggesting a population with a high fertility rate. Childbearing women (15-49 years of age) accounted for 137,934(34.64%) of a population. Dependency ratio of the Sub City was 38% (Table 18). The average household size was 4.1 people per household. Oromo, Amhara, and Guraghe are the dominant ethnics in the districts. From unpublished literature regarding religion distribution, most district's populations are followers of Orthodox, Protestant and Muslims.

**Table 16 .Vital statistics data of Bole sub city Health office, Addis Ababa city administration, 2016 G.C.**

S.No	Demographic data	number	%	Remark
1	Total population	378,104	100	
2	Male	176,555	47	
3	Female	201,549	53	
4	Under 1 years old	8919	2.24	
5	Under 5 years old	28,511	7.16	
6	Under 15 years old	95,404	23.97	
7	Productive age female (15-49 years)	130,975	34.94	
8	Pregnant women	8810	2.33	
9	Non pregnant women	122014	32.27	
10	Live births	11089		
11	Total fertility rate	-----	-----	No data
12	Crude birth rate	-----	-----	No data
13	Crude death rate	-----	-----	No data
14	maternal mortality rate	-----	-----	No data
15	Child mortality	-----	-----	No data
16	Child mortality	-----	-----	No data
17	Under 5 mortality rate	-----	-----	No data
18	Infant mortality rate	-----	-----	No data
19	Dependency ratio		38	
20	Average household size		4.1	

### **Economic Status**

Despite obvious challenges, GDP of the city, calculated at constant price, show that it was 677.70 USD in 2009 to 649.43 USD in 2014E (5). Although, there is no detail data from the Sub City regarding the economic status of the population, Studies like 2012GC. survey result on Ethiopian Progress Towards Eradicating Poverty an Interim Report, 28.1% of the residents of Addis Ababa were under general poverty (5). On the other hand, 26.1% of the residents were under food poverty (6). When we compare poverty in terms of sex, females were more affected by poverty than males (1). Regarding unemployment status, there is temporal variation in unemployment condition, in the past three years from 2002-2004 EFY(2014-16GC). Even though, unemployment existed in the City the total number of unemployed persons increased every year. The Micro and Small Enterprises (MSE) Development Agencies in all areas of the country, along with the combined engagement of the Technical and Vocational Education and Training (TVET) institutes and the

Micro Credit institutions, have the responsibility of organizing the unemployed youth, training them, and engaging them in various areas of work, mainly in the booming construction sector and construction materials production (7). According to the Bole Sub City micro -finance enterprise 2008EFY (2015/16) report 13,502 unemployed were looking for work and registered in Sub City, among them 66% got job in different sectors, the number of males were twice than female. Data for the average monthly or yearly income of individuals in the Sub City was not available.

### **Transport, Communication and Electric power**

The main streets of Addis Ababa are asphalted and spacious. Many side streets are often unpaved, and/or potholed especially during the rainy season due to lack of recent maintenance. According to Addis Ababa Road Authority (ACCRA) annual report (2013) the city had a total of 1,848.5 km asphalt road, 1,830.74 km gravel and 827.15 km cobble stone (measures at an average width of seven meter) increasing the road coverage of the city by to 17.5 %. Compared to the federal standard, i.e. 30% road coverage is very low (5). The residents of Bole Sub City use private and government vehicles for transport. For public transportation, the community uses public buses, blue and white taxis. Bole International Airport also serves local and international community. The community uses mobile, fixed phones, faxes and internet for communication. All the Health Centers in the Sub City get electric power supply and have backup power supply.

### **Household Drinking Water and Sanitation Facilities**

Increasing household access to safe drinking water and sanitation facilities is a long-standing development goal that Ethiopia and other countries have adopted. The source of drinking water is an indicator of whether it is suitable for drinking. Lack of ready access to a water source may limit the quantity of suitable drinking water that is available to a household. Even if the water is obtained from an improved source, water that must be fetched from a source that is not immediately accessible to the household may be contaminated during transport or storage. Another factor in considering the accessibility of water sources is that the burden of going for water often falls disproportionately on female members of the household. Finally, home water treatment can be effective in improving the quality of household drinking water. There were no valuable data for Sub City. The source was surface water is which collected, threated and distributed from Legedadi the water supply coverage was greater than 90%, which is slightly similar with 2011EBHS (97%)

(8)

## Education Situation of the Sub City

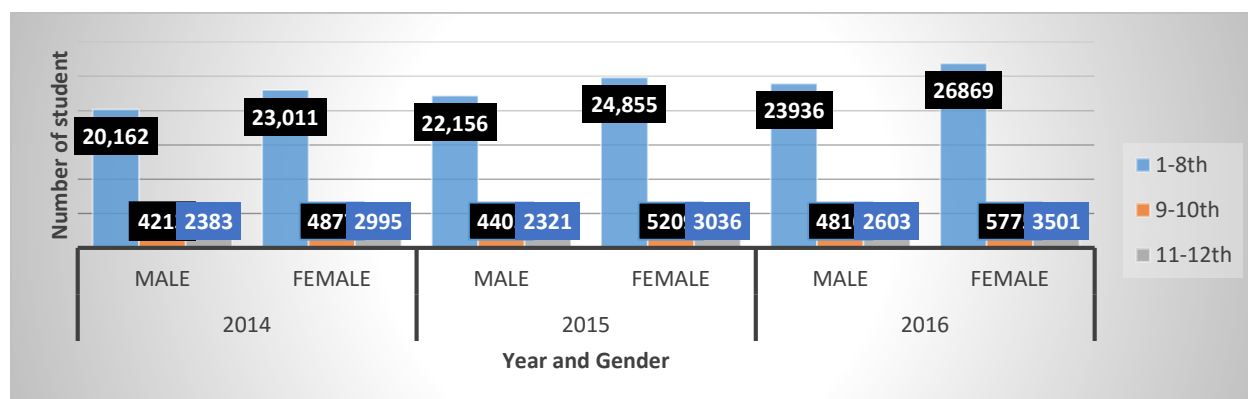
It was in Addis Ababa, where the first modern school, Menilik II opened in 1908. Since then, a number of schools at different level had opened and became operational. Education is the basis of countries social, economic, cultural and political development. In Ethiopia a remarkable success has been achieved in improving education coverage in the education sector by expanding schools all over the country. Still, there are challenges pertinent to accesses, equity, efficiency and promotion of standard education system in the country and in the Sub City.

In Bole Sub City, each woreda has education office to manage all levels of schools, both run by the government and private sectors. Academic and training institutions for computer, technical and vocational education, colleges are also growing, particularly with the involvement of private. In Bole Sub City there were functional 151 KGs, 115 Primary (grade 1-8), 34 secondary school and 3TEVET and 5 health science colleges in 2016. The majority of the schools were private owned by private owners, 259 (86%). In 2008 EFY (2015/2016) 67,497 students were enrolled to school in the Sub City. Elementary schools (grade 1-8) have a total pupil of 50,850 (73.3%) with 23,936(47%) were females and 26,869(52.8%) males. Secondary schools (grade 9-10) have total students of 10,585; with 4810 (45.4%) of males and 5775(54.6%) females. The Sub City has a total of 6104 preparatory students. The majority of students enrolled in preparatory schools were female (57.4%). Among enrolled students of 22,088 KG (Table19).

**Table 17 Number of Enrolled Students by sex in Bole sub city, Addis Ababa city administration, 2008EFY(2015/2016).**

School type	Grade	Frequency	Number of student		
			Male	Female	Total
Government	KG	15	1712(50.4%)	1682 (49.6%)	3394 (100%)
	1-8 <sup>th</sup>	20	10810(44%)	13752 (56%)	24562 (100%)
	9-10 <sup>th</sup>	6	2628 (42.7%)	3530 (57.3%)	6158 (100%)
	11-12 <sup>th</sup>		1233 (38.7%)	1955 (61.3%)	3188 (100%)
Privet	KG	136	9539 (51%)	9155 (49%)	18694 (100%)
	1-8 <sup>th</sup>	95	13126 (50%)	13117 (50%)	26243 (100%)
	9-10 <sup>th</sup>	28	2182 (49.3%)	2245 (50.7%)	4427 (100%)
	11-12 <sup>th</sup>		1370 (47%)	1546 (53%)	2916 (100%)
Government	TEVET	1	21 (95.5%)	1 (4.5%)	22 (100%)
NGO	“	2	318 (73.6%)	114 (26.4%)	432 (100%)
Privet	“	48	60 (75%)	20 (25%)	80 (100%)

As of 2016 report the number of regular students increased compared to 2015. Males by 8.84% (5484) to 9.4%(2725) and females by 8.58% (2809) (Figure25).



**Figure 26 Number of student by year, Bole Sub City, Addis Ababa City Administration 2014-16GC.**

The dropout rate of 2016GC were (1.06%,1.44%) in primary and secondary school respectively (Table 20). In 2016 the dropout rate relatively declined compared to 2014 and 2015 GC, but the rate increases in 9<sup>th</sup> -12<sup>th</sup> and have wide gaps with standards so it needs follow-up by concerned bodies (9) Almost all schools have water supply and with toilet/latrine for both sexes. Almost all schools have different clubs like: HIV, Traffic, Environmental, Mini-media, reproductive health, Ethics, clever student’s clubs and so on.

**Table 18.Drop out of student by its grade, Bole Sub City ,2016GC**

Organization	1-8 <sup>th</sup> Grade			9 <sup>th</sup> -12 <sup>th</sup> Grade		
	Male(%)	Female(%)	Total(%)	Male(%)	Female(%)	Total(%)
Governmental	1.47	1.44	1.46	2.38	1.68	1.98
Private	0.77	0.6	0.68	0.72	0.8	0.76
Total	1.08	1.03	1.06	1.6	1.31	1.44

### Literacy Status by Sex

The literacy rate for the Ethiopian population over fifteen years of age has increased from 23.4% in 1994 to 39.0% in 2008 (Ethiopian Demographic and Health Survey report, 2011). According to the third population and housing census of Ethiopia of 2007, about 85.3 percent of the population

of Addis Ababa was literate. The literacy rate by sex also reveals that there was significant difference between males and females. Thus about 91.3 percent of male were literate, while the proportion of literate among female populations accounted for 79.9 percent (3). In 2016, Bole Sub City enrolled (20,988), (35,551) and (10,585) students KG,1-8 and secondary schools respectively, among those 53% were females (Table 18).

### **Organizational profile**

At the core of the health policy are democratization and decentralization of the health care system; developing preventive, promotive and curative components of health care; assurance of accessibility of health care for all parts of the population; and encouraging private and NGO participation in the health sector. Rapid expansion of the private for profit and NGO sectors is augmenting the public | private | NGO partnership for health and boosting health service coverage and utilization (10). Bole Sub City Health Office is technically supported by AACAHB and administratively monitored by the Sub City's CEO. The Health Office has 3 core process; disease prevention, and health promotion, curative health service and HIV prevention Records from the implementation of HSDP I and II show that encouraging improvements occurred in health service coverage as well as in the utilization of services at all levels of the Ethiopian health care system (10).

Bole Sub City, in terms of physical health facilities had 11 private hospitals,9 Health Centers and 124 clinics served the community in 2016. The Hospitals and health centers have been given a VCT and ART follow up services. Based on one Health Center Serving for 25,000 people and one District Hospital Serving 100,000 people (8), the Sub City health service coverage, by health centers is of 60% and100% by Hospital. Bole Sub City health facility to population ratio for H.C 1: 42,016, there were 11 private hospitals for 1: 34,373 populations and 124 private clinics for 1:3049 provide the services (Table 21). Due to Private Hospitals do not follow the referral system, they, serve as well the neighboring Sub Cities.

**Table 19. Distribution of health institution, in Bole sub city, Addis Ababa city Administration, 2016GC.**

Name of facility	Public	NGO	Private	Total	Health facility to population Ratio	Remark
Hospitals	-	-	11	11	1: 34,373	
Health Centers	09	-	-	09	1:42,016	
Clinics	-	1	123	124	1:3049	2 MCH clinic
Drug store &pharmacy	-	-	116		1:3260	

A total of 721 health workers were found in the Sub City Government health facilities, among those, majority 399(55%) were Health extension workers and nurses. The health professional to Population ratio for physician 1:378,104, for Health Officer, Nurses and Midwife of the Sub City is indicated below (1:3534, 1:1384, 1:4346 for Health Officer, nurses and midwife respectively) (Table 22).

**Table 20. Distribution of Human resource of Public Health Facilities in Bole Sub City, in 2016GC.**

No	Profession	Number	Professional to population ratio
1	Specialist of all type	0	-
2	General practitioner	1	1:378,104
3	Health officer	107	1:3534
4	Pharmacist (Diploma, Bsc.)	71	1:5325
5	Nurses(Bsc, Dip)	273	1:1384
6	Mid wife (Dip+ Bsc)	87	1:4246
7	Lab technician	56	1:6752
8	Health extension workers	126	1:3000
	Total	721	1:524

## Health Budget allocation

Based on the information from the Sub City Finance & Economic Development Office, the annual budget in 2008 EFY (2015/16), 900,960,410 ETB allocated for all Bole Sub City sector offices. Annual budget for health sector allocated 70,659,933 ETB. Of this total budget, the Sub City Health Office, 14 Woredas health offices and Health Centers had allocated for salary and running different routine activities. In addition, 36,110,000 ETB was allocated for capital budget.

## Maternal health services

The health status of the community is measured by many indicators; maternal health service indicators are among the major indicators. Proper care during pregnancy and delivery is important for the health of both the mother and the baby. Antenatal care (ANC) from a skilled provider is important to monitor pregnancy and reduce morbidity and mortality risks for the mother and child during pregnancy, delivery, and the postnatal period (within 42 days after delivery). Over the past years the maternal health indicators in Bole Sub City have shown a significant improvement as shown in the table below. Most of the performances were above 100% since of clients got services coming from the neighboring areas (Table 23).

**Table 21 .Trends of Maternal Health Service in Bole Sub City, from( 2004-2008E.C)2014-2016)**

N o	Service	2004	2005	2006	2007	2008
		No,%	No,%	No,%	No,%	No,%
1	ANC 1 <sup>st</sup> coverage	49923(145)	57284(163)	49907(131)	22183(100+)	22735(100)
2	ANC 4th coverage	21485(293)	20943(332)	23309(329)	31642(100+)	23089(100+)
3	VDRL screening	14375(178)	14562(192)	16146(187)	20584(100+)	22413(100+)
4	TT for Pregnant women	6851(85)	8400(120)	10430(146)	14380(100+)	17019(100+)
5	Iron Supplementation	20505(184)	20669(273)	23083(297)	No data	No data

PMTCT service is given for every mother that attends ANC visits to prevent HIV transmission from mother to child. To prevent HIV transmission from mother to child the strategy has been

changed from giving the mother ARV drug as a prophylaxis to put the mother on ARV drugs. In the Sub City PMTCT services provision had improved in the past years but provision of ARV drugs for the mothers was 52% in 2015/16. which needs improvement to prevent mother to child HIV transmission(Table24).

**Table 22. PMTCT service provision of Bole Sub City, 2002-2008EFY (2010/11-2015/16)**

No.	Service	2002		2003		2004		2005		2006		2007		2008	
		No	%	No	%	No	%	No	%	No	%	No	%	No	%
1	PMTCT service	650	10	539	88	887	11	1314	18	1749	20	1705	17713	(78%)	
		7	3	8		7	0	9	3	2	9	2			
2	Positive mothers	250	3.8	155	2.9	266	3	216	1.6	278	2.5	331	292	(1.7%)	
3	Prophylaxis/ART	107	42	110	71	121	46	190	88	201	76	268	152	(52%)	

### Family planning

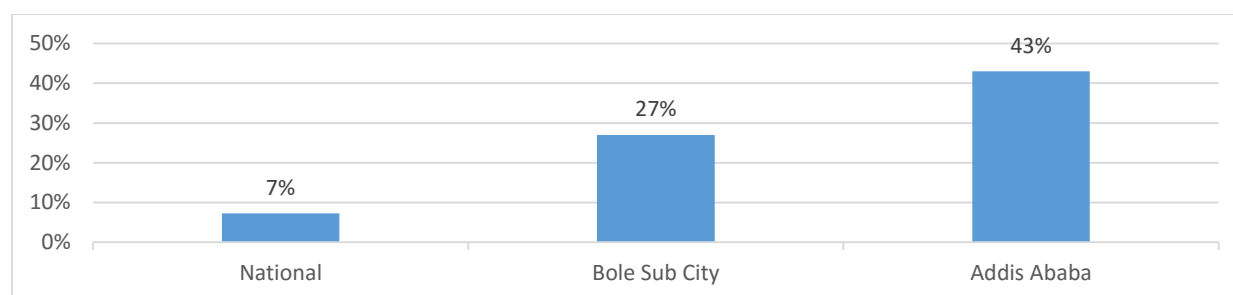
Family planning refers to a conscious effort by a couple to limit or space the number of children they have through the use of contraceptive methods. To empower women for their health by avoiding unwanted, unplanned, unsupported pregnancy and providing family planning services can transform women lives, social, economic and health of the community. The contraceptive acceptance rate of Bole Sub City was above 100% between 2011/12-2015/16. The lowest report 43% in 2014/15 (Table 25).

**Table 23. Bole sub city family planning coverage, 2004-2008E.C(2011/12-2018/16)**

No.	Service	2004EFY (2011/12)		2005EFY (2012/13)		2006EFY (2013/14)		2007EFY (2014/15)		2008EFY (2015/16)	
		No	%	No	%	No	%	No	%	No	%
1	Family planning	49923	162	57284	163	49907	311	16030	43	50660	134

## Safe Abortion

Twenty-seven percent (2384) of women received safe abortion services in 2008 FEY, this was three fold compared to national, and lower than Addis Ababa, 7% and 43% respectively (Figure 27).



**Figure 27. Abortion Care Coverage in Bole Sub City as Compared to National and Addis Ababa City, 2008 EFY (2015/16).**

## Child health

All health centers in the Sub City provide IMNCI service. During child health and growth monitoring, of 69,604 under five children were weight measured. Among them 777(1.7%) and 631(2.8%) under 2yrs (0-24 mon) and 3-5years (25-59 mon) were moderately acutely malnourished. Severe acute malnourished cases of the same age group were 40 and 18 children respectively. In the same year (2015/16) there were 801(7%) live births weighing less than 2500gm. For 37,338(91%) children 6-59 month of age were vitamin A supplemented in the Sub City (Table 26).

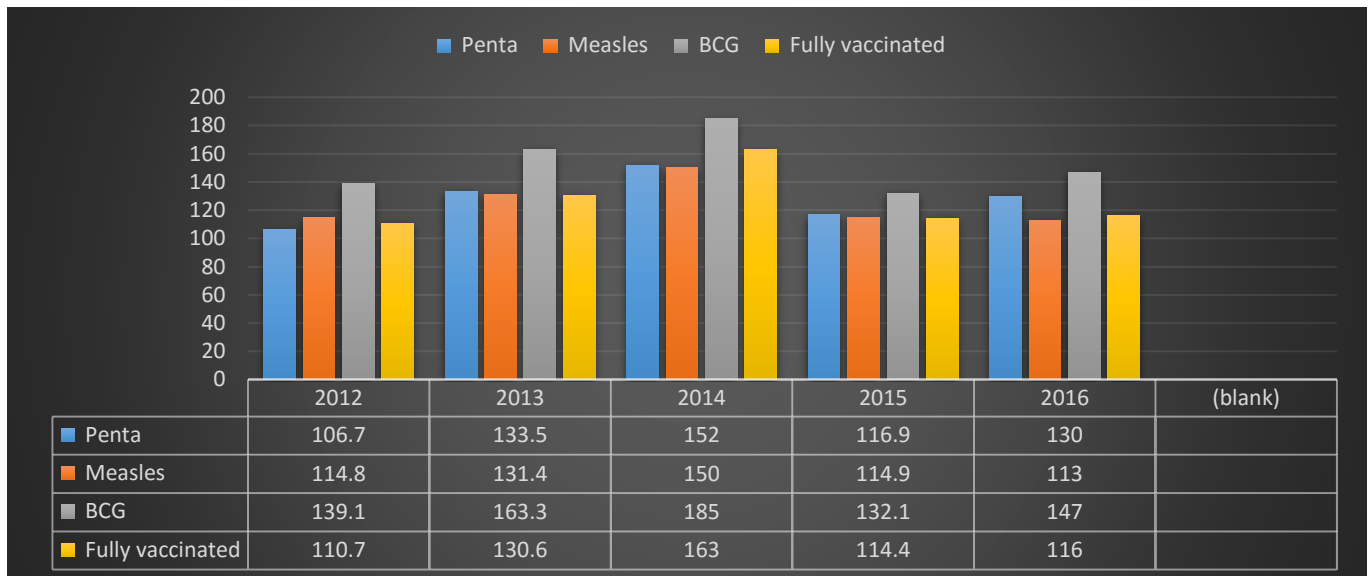
**Table 24. Distribution of Nutritional status of under five children, Bole Sub city, Addis Ababa ,City Administration,2008 EFY**

Variables	No. of children Wt. measured	Wt.< 2500gm.	MAM	SAM	Children who receive Vit. A
Livebirth	13327	801(6%)	--	-	--
0-24month	46985	---	771(1.6%)	40(0.1%)	--
25-59 month	22619	---	631(2.8%)	18(0.1%)	--
6-69 months	40,873				37338(91%)

## **Immunization coverage**

According to the guidelines developed by the World Health Organization, children are considered to have received all basic vaccinations when they have received a vaccination against tuberculosis (also known as BCG), three doses each of the DPT-HepB-Hib (also called pentavalent), polio vaccines, and a vaccination against measles. The BCG vaccine is usually given at birth or at first clinical contact, while the DPT-HepB-Hib and polio vaccines are given at approximately age 6, 10, and 14 weeks. Measles vaccinations should be given at or soon after age 9 months. The Ethiopian immunization programme considers a child to be fully vaccinated if the child has received all basic vaccinations, three doses of the pneumococcal conjugate vaccine (PCV vaccine) (also given at age 6, 10, and 14 weeks), and two doses of the rotavirus vaccine (given at age 6 and 10 weeks). The overall performance of vaccination activities in the Sub City were above 100% which indicates the total population of the Sub City is underestimated.

The achievement above 100% showed that there were clients from neighboring Sub Cities that had the service. Full immunization coverage of Bole Sub City in 2015/16 were 116 % with pentavalent1 coverage of 128% & pentavalent3 coverage of 130 %, measles coverage of 112%, BCG coverage (147%), proportion of infants protected at birth (PAB) from tetanus 100+%(figure 28). The data gathered from sub City Health Office about immunization coverage and dropout rate clash each other. Many antigens coverage reached > 100%. This means there should be no dropout rate. For instance, PENTA dropout rate ( $\frac{\text{PENTA 1} - \text{PENTA 3}}{\text{PENTA 3}} \times 100$ ) was 2.7% in 2008 EFY. I discussed the issue reason why it happens? The program owner/ EPI officer verified that the actual population size of the Woreda is by far greater than CSA 2008 population projection. The Regional Health Bureau report confirmed that what the officer said.



*Figure 28. Trends of Measles and Fully Vaccinated by year from 2012-16, Bole Sub City. Addis Ababa City Administration, 2008EFY*

### Hygiene and Environmental health services

There was no data on coverage and utilization rate of latrine made. Solid waste management performed by small scale and micro enterprise association, home to home solid waste collecting and road cleaning services. In 2016 in average per day 885 m<sup>3</sup> solid waste collected. Regular health education was given in the schools, health centers on harmful traditional practices, HIV, TB, malaria and environmental sanitation. The health education has been focusing on raising awareness in the population on the relationship between their health and their surroundings.

### Top Causes of Outpatients Visit (Morbidity)

According to the information obtained from the Sub City Health Office, the ten leading causes of outpatient visit in the sub City in 2008EFY (2015/16) are listed below in their descending order (Table 27). Acute upper respiratory infection 62728(22.6%) was the top cause of morbidity. Dyspepsia, urinary tract infection and trauma (12.1%), (10.7%), and (10.2%) respectively were next consecutives top ten causes of morbidity in OPD. Dental and gum diseases sit at the last (5.6%). The admission rate of the Sub City was 38/1000 population.

**Table 25. Distribution of Top ten adult morbidity of outpatient department, Bole Sub City,2008EFY (2015/16)**

Rank	Disease in adult OPD	Number of cases	%
1	Acute upper respiratory infections	62728	22.6
2	Dyspepsia	33709	12.1
3	Urinary tract infection	29850	10.7
4	Trauma (injury, fracture etc.)	28199	10.2
5	Acute Febrile Illness (AFI)	27588	9.9
6	Diarrhea (non-bloody)	22889	8.2
7	Diseases of the musculoskeletal system and connective tissue	20834	7.5
8	Infections of the skin and subcutaneous tissue	19714	7.1
9	Other or unspecified diseases of the digestive system	16655	6.0
10	Dental and gum diseases	15597	5.6
	<b>Total</b>	<b>277763</b>	<b>100.0</b>

The top five under five year children morbidity were acute upper respiratory infection, which account half of the cases 34,090(52.2%). Followed by diarrhea (Non bloody) (15,379,23.5%) and pneumonia (7522,11.5%) in decreasing order(Table 28).

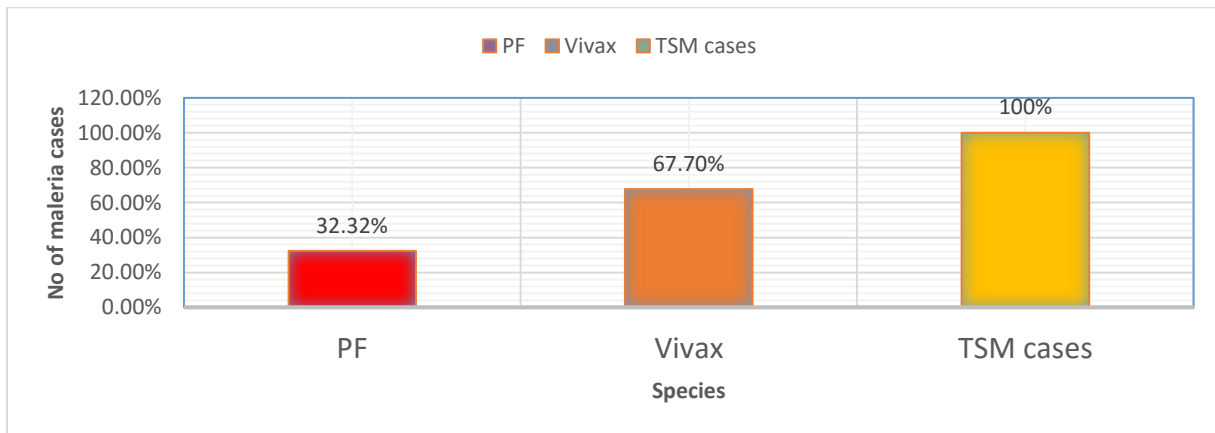
**Table 26. Distribution of Top five leading causes of under five morbidity in bole city,Addis Ababa,2008EFY(2015/16)**

Rank	Disease	<5 Years	%
1	Acute upper respiratory infections	34090	52.2
2	Diarrhea (non-bloody)	15379	23.5
3	Pneumonia	7522	11.5
4	Infections of the skin and subcutaneous tissue	5197	7.9
5	Acute bronchitis	3118	4.8
	<b>Total</b>	<b>65,306</b>	<b>100</b>

## Malaria

Malaria causes morbidity and mortality in malaria epidemic areas. Even though Bole Sub City is not a malaria area, clients from malaria's area come and get treated. Health description of Bole Sub City verified that a total of 3546 malaria suspected cases were examined by RDT or microscopy and a total of 564 (clinical + parasitological confirmed) case were reported in 2008 EFY. Malaria detection rate from total suspected fever was 17% ( $560 \times 100 / 3546$ ).

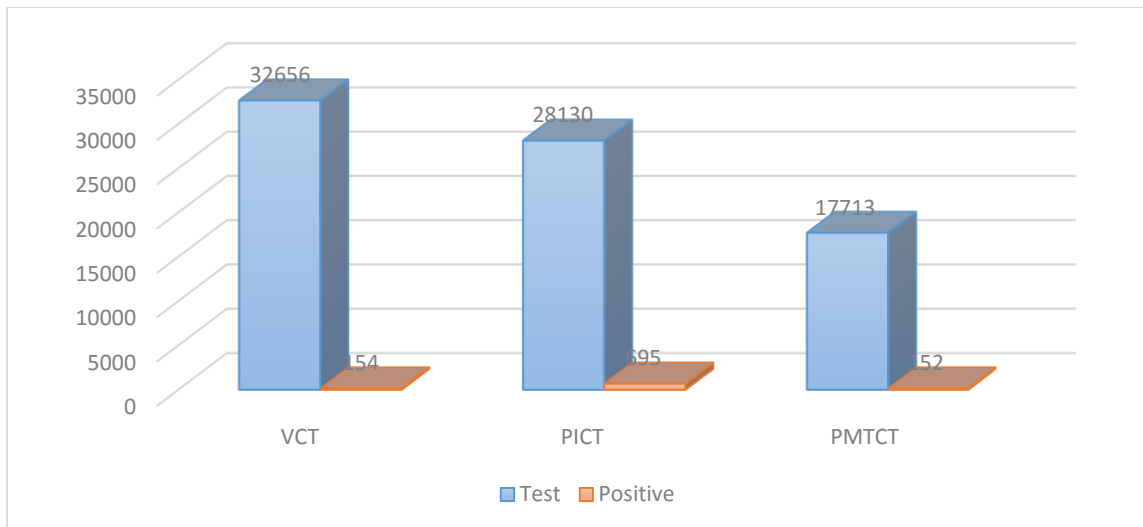
From the total malaria cases; 96.9% ( $560 / 578 \times 100$ ) cases were parasitological confirmed. Among confirmed cases; Plasmodium Vivax constitutes 67.7% ( $379 / 560 \times 100$ ) while the rest 32.3% ( $181 / 560 \times 100$ ) were valuing Plasmodium falciparum. Total inpatients due to malaria were cases 28 and no death due to malaria was reported in 2008EFY (Figure 29).



**Figure 29. Proportion of plasmodium falciparum and Plasmodium vivax of Bole Sub City, Addis Ababa City Administration, 2008 EFY.**

## HIV/AIDS

A total of 32,656 people screened for HIV/AIDS among those 4526(13.9%) VCT and 28,130(86.1%) were PICHT. Eight hundred forty-nine (2.6%) were positive, of which 506(2%) were females and 343(4%) males (Table 28). There were 84,236 PLWHIV. HIV prevalence rate 1.4%. positive cases 7137 (37.2%) were initiated and put on antiretroviral therapy (ART) and 733 were enrolled for pre ART chronic care. Patients enrolled on ART were 736(Figure 30).



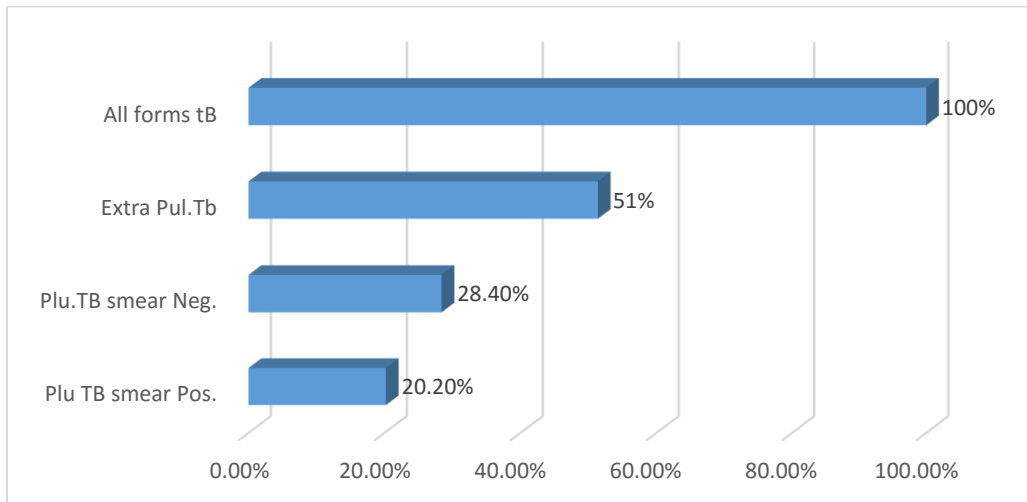
**Figure 30. Distribution HIV screening by VCT, PICT and PMTCT, Bole sub city,2008EFY (2015/16).**

**Table 27. Distribution of HIV screening by sex, Bole Sub City, Addis Ababa City Administration, 2008EFY**

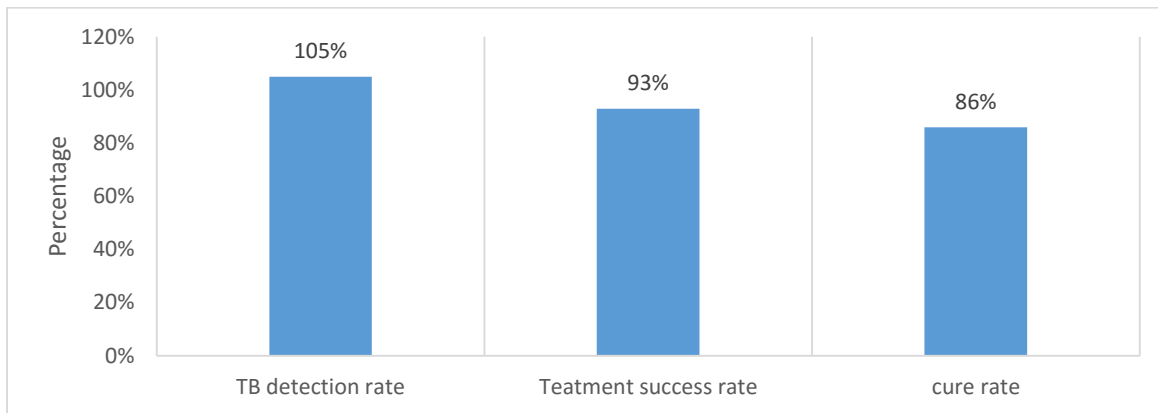
Variable	VCT		PICT		Total(Positive)
	Number	Positive	Number	Positive	
<b>Male</b>	<b>2109(46.6%)</b>	<b>60(2.8%)</b>	<b>7082(25.2%)</b>	<b>283(4%)</b>	<b>343(4%)</b>
<b>Female</b>	<b>2417(53.4%)</b>	<b>94(3.9%)</b>	<b>21048(74.8%)</b>	<b>412(2%)</b>	<b>506(2%)</b>
<b>Total</b>	<b>4526</b>	<b>154(3.4%)</b>	<b>28130</b>	<b>695(2.5%)</b>	<b>849(3%)</b>

### TB/Leprosy

A total of 1031(All forms) new TB cases were reported in the Sub City Health Office, of those 208 (20.2%) were Pulmonary TB positive, 293 (28.4%) were pulmonary TB negative and 530 (51.4%) were extra pulmonary TB cases. Among the new smear-positive TB cases estimated in the Sub City (TB detection rate) were 105% and treatment success rate and cure rate were 93% and 86% respectively. From the total number of 1031TB patients enrolled in TB treatment, 825(80%) were screened and tested for HIV. These was above national TB/HIV screening strategy 15% is encouraging Scale-up collaborative TB/HIV activities. Of these TB patients enrolled in TB treatment screened and tested for HIV, who were HIV (+) positive were 222(26.9%) (Figure 31,32).



**Figure 31. Distribution of TB by New Smear Positive, Smear negative and extra pulmonary, Bole Sub City,2008EFY (2015/16).**



**Figure 32. Distribution of TB by Detection Rate, Treatment Success Rate and cure rate, Bole Sub City,2008EFY (2015/16).**

### Essential drugs

All essential drugs were available. No shortage was seen in all government health facilities during 2008EFY.

## Discussion

Bole Sub City is one of the densely populated Sub Cities with an average 153.83 people/hectare. The average household size was 4.1 people per household. This is 11.9 percent of Addis Ababa population of 3,352,000 which makes Bole Sub City in the 4<sup>th</sup> highly populated Sub City. Females account 53%. One-quarter of the population was below the age of 15 years, suggesting a population with a high fertility rate. Trends in fertility since the early 2000s can be examined by observing a time series of estimates produced from demographic surveys conducted in Ethiopia over the last 16 years, beginning with the 2000 EDHS. The trends in TFRs since 2000 indicate that fertility in Ethiopia has been declining since the 2000s. The TFR has declined from 5.5 children per woman in 2000, to 5.4 children per woman in 2005, to 4.8 children per woman in 2011, and to 4.6 children per woman in 2016(8). According to the Ethiopian Demographic and Health Survey 2012, the TFR of Addis Ababa was 1.5. This means that the fertility rate of Addis Ababa is below replacement level. There were substantial differentials in the TFR among urban and rural areas. The TFR of Addis Ababa was much less than the urban average (2.6) (country level 2011/ 2012). The level of fertility is directly related to women's socio economic attainment (3).

The Health Center coverage is slightly above the national urban coverage standard, which states a health center to give service for 40,000 populations (8). In contrary the hospital coverage is higher than the national planned standard, which is (1: 500,000), but these Hospitals are private and served for any client who seek services. Similarity is also observed with overall Addis Ababa health service coverage in which a health center gives service for 43,795 and a single hospital for 228,357 (8).

Looking at the health human power distribution, in health facilities of Bole Sub City, a single medical practitioner gives a service for 378,104 populations. This is by far lower than the overall Addis Ababa population to general practitioner ratio (1:22,342), this can be due to the presence of resident medical practitioner in one health center residing in Bole Sub City.

It has been documented that contraceptive use can have an impact in reducing maternal mortality by averting more than half of maternal deaths (11) It is also observed that the 2015/16 contraceptive acceptance rate in Bole Sub City (100+%) which was three fold compared to 2014/15 (43%), and with Addis Ababa contraceptive acceptance rate in the same year, which were

38% according EDHS survey in 2016(12). The national target for contraceptive acceptance rate by the end of HSDP IV was 82% based on 2007 EFY. People in urban setup are believed to have a higher level of CAR as they can access information related to family planning. Urban women are much more likely than their rural counterparts to use any method of contraception (52 percent versus 33 percent) (12).

Antenatal care (ANC) from a skilled provider is important to monitor pregnancy and reduce morbidity and mortality risks for the mother and child during pregnancy, delivery, and the postnatal period (within 42 days after delivery) (8). The ANC 1<sup>st</sup> and 4<sup>th</sup> coverage and delivery by skilled person and post-natal care coverage in Bole Sub City were 100+%, uniform from 2005-2008EFY (2013-16), which is similar with Addis Ababa 100+% in two consecutive years 2007 and 2008EFY (12). Access to proper medical attention and hygienic conditions during delivery can reduce the risk of complications and infections that may lead to death or serious illness for the mother, baby, or both (8). In the Sub City PMTCT services provision had improved in the past years, but provision of ARV drugs for the mothers was 52% in 2016G.C, which is lower than national and Addis Ababa (12). which needs improvement to prevent mother to child HIV transmission. According to the 2013 UNAIDS Report, Ethiopia is one of the few “rapid decline” sub-Saharan African countries, with a reduction by 50% of new HIV infections among children between 2009 and 2012(11). The overall performance of activities in the Sub City were above 100%, which indicates the total population of the Sub City was underestimated and could be clients from neighboring Sub Cities have been getting services.

All health centers in the Sub City provide IMNCI service. Immunization coverage of the Sub City was above 100%, which is similar with the Addis Ababa coverage (12). Slightly different with national coverage (97.6%,94.3 and 91.3%) Penta3, measles and fully vaccinated respectively. Vitamin A supplemented for (6-59 month) children of 37,338(91%), which is slightly lower than national coverage (100%) (12). In contrast higher than Addis Ababa coverage 61% (12).

The progress in health status of the Ethiopia’s population indicates that about 80% of diseases are attributable to preventable conditions related to infectious diseases, Malnutrition and personal and environmental hygiene (2). The same was true in Bole Sub City. Acute upper respiratory tract infection was the leading causes of morbidity both in under five and adult population. Diarrheal

disease and Pneumonia were also found to be important causes of morbidity in under five children. Diarrhea, Urinary tract infection and Dyspepsia were common causes of morbidity in general population. This finding is similar to the national top causes of morbidity (12). Unlike the national data in Bole sub city trauma were one of the top ten causes of morbidity, which can be explained by the urban nature of the Sub City which makes it vulnerable to road traffic accidents and construction related traumas.

The TB detection rate of the sub city were 100% which is the same as Addis Ababa report (10). Treatment success rate also have similarities with national which accounts for 93% and 92% respectively. Cure rate were slightly high in Bole Sub City 86%.

Increasing access to improved drinking water is one of the Millennium Development Goals that Ethiopia and other nations worldwide have adopted (United Nations General Assembly, 2002). The source of the water is an indicator of whether it is suitable for drinking. Sources that are likely to provide water suitable for drinking are identified as improved sources. These include a piped source within the dwelling, yard, or plot; a public tap/standpipe; borehole; a protected well; a protected spring; and rainwater (WHO and UNICEF, 2010). More than half of households in Ethiopia (57 percent) have access to an improved source of drinking water. Only 4 percent of households have an improved toilet facility, not shared with other households (13). When we come to look at Bole Sub City, 90% coverage from surface water, treated and distributed. No available data by house holed level and latrine coverage. The waste disposal process has a formal and an informal segment. In each *Keble*, containers are placed at common places near main roads. The distance to these containers may be different for different households. For some, it may be next door and for others a kilometer or more away. On the basis of schedules from the micro enterprise, employees carry bags of waste to the containers with a trolley.

Poor hygiene, insufficient and unsafe drinking water accounted for 7% of the total disease burden and 19% of child mortality worldwide. In Ethiopia, about 75% of causes of OPD visits are largely due to the lack of basic sanitation provisions (9). Likewise, in Bole Sub City from top 10 causes of morbidity, both in adults and children, majority of the diseases were communicable diseases which can be prevented through improving hygiene and sanitation.

Due to no vital event registration in the Sub City, data on 10 top cause of mortality in adult and pediatric population in the health office and at the health facility is difficult to determine the main causes of mortality. The Sub City Health Office should also be supported by the higher level government entities and stakeholders to have less than one year, less than five-year death and other death records for better planning and success.

### **Priorities Identified**

- ✓ Acute upper respiratory tract infection and diarrhea were the top disease in the sub city.

### **Limitations**

- We used secondary data as a source which can make the result unrepresentative.

### **Conclusion**

- Acute respiratory tract infection and diarrhea diseases burden were leading health problem in the Sub City
- Information of utilization rate latrine were not available in the Sub City.
- Proportion of skilled delivery attended, ANC coverage , CAR and Immunization coverage were above 100%.
- Health related indicators like, death/mortality, total fertility rates, crude rates were not recorded appropriately.

### **Recommendation**

- The Sub City Health Office should monitor the EPI coverage based on the real count of children population in parallel to the projected population.
- The Sub City Health Office should monitor the MCH coverage based on the real count of women 15-49years population in parallel to the projected population.
- Bole Sub City health facilities and health extension professionals should strengthen health education on prevention and control of communicable disses and environmental sanitation practices to the community.
- The Sub City Health Office should access and avail the latrine coverage and latrine utilization data for immediately follow up of the priority diseases in the area;

**Table 28. Action Plan Developed Based on Major Problems Identified on Health Profile Assessment of Bole Sub city**

<b>Identified Problems</b>	<b>Ordered Possible Solutions</b>	<b>Responsible Body</b>	<b>Time Frame</b>
<b>1. General Disease Burden</b>			
High burden of acute respiratory infections and diarrheal disease both in under 5 and general population	Health education on prevention and control of respiratory disease, hygiene and sanitation practices	Bole Sub city health office, HEWs and health facility	Routine
	Expand personal and community latrines in the sub city	Bole Sub city health office and Addis Ababa City administration municipal	
	Continuous mentorship supervision on data management at facility and sub city level	Addis Ababa and Bole Sub city health office	Routine
	Start implementation of HMIS in private health facilities of the sub city	Addis Ababa and Bole Sub city health office	Jan 1,2018

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**Chapter V –  
Scientific Manuscripts  
for  
Peer reviewed Journals**

## **5.1 Title: Rubella Outbreak investigation in Arada Sub City, Addis Ababa City Administration, Ethiopia, 2018**

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### **Abstract**

**Introduction:** Rubella is a contagious disease, caused by rubella virus and transmitted via the respiratory route. Ethiopia does neither currently have a rubella immunization program nor a congenital rubella syndrome (CRS) surveillance. To identify risk factors associated with rubella outbreak in Woreda 2 of Arada Sub City; Addis Ababa City Administration, Ethiopia, outbreak investigation was undertaken.

**Method:** Case-control study was employed to investigate the outbreak. Matched case control study in the ratio of 1:3 (12 cases - 36 controls) was conducted. Case was defined as any person with fever and maculopapular (nonvascular) generalized Rash and Cough, Coryza or conjunctivitis (red eyes). Health center records and line lists were reviewed. Furthermore, cases and controls were interviewed using structured questionnaire, from 27th February 2018 to 10 March 2018. In addition to that, five blood samples were taken for laboratory confirmation. Epi Info was used to calculate frequencies, odds ratios and 95% confidence interval.

**Results:** A total of 12 cases and zero death (CFR=0) were line listed. The overall AR was 40.9 per 100,000 populations. The ASAR was high in < 5 year of age 380 per 100,000. The mean age was 4.4 years (range from 2-8 years). Sex ratio were 1:1. Cases were reported from six (85.7%) Ketenas. Forty-two percent of the cases were reported from one Ketena. All five samples were positive for Rubella IgM. Having contact history with rubella infected person (AOR=5.9; 95%CI:1.03-33.2), and having travel history to rubella affected Kebele/ area (AOR= 6.6; 95%CI: 1.04-41.62) were statically associated with rubella infections.

**Conclusion:** An outbreak of occurred in woreda2, Arada Sub City affecting primarily those <5 years of age. Contact with suspected individuals and travel history to affected areas likely contributed to the outbreak. A rubella specific case definition is needed for early case detection.

**Key Words:** Rubella outbreak; Congenital Rubella Syndrome, Woreda2, Arada Sub City.

## Introduction

Rubella is a vaccine-preventable, mild rash-inducing viral disease with complications that include a spectrum of birth defects in the developing fetus, especially if the infection is acquired in the early months of pregnancy (1). The disease is caused by rubella virus, a togaviridae family that is enveloped and has a single-stranded RNA genome [1,2]. It is the only non-arthropod borne virus in the family and the aetiologic agent of rubella (1). Humans are reservoir, the peak incidence in endemic countries occurs during late winter and early spring (2).

Acquired rubella is transmitted person-to-person by direct or droplet contact with infectious nasopharyngeal secretions (2). Congenital rubella syndrome occurs through transplacental infection of the fetus during the mother's viremia. Infants with CRS shed large quantities of virus in their pharyngeal secretions and urine for a prolonged time, for a year or longer, and may be a source of infection to their contacts (3,4).

Up to 50% of persons with rubella have either subclinical infections or mild symptoms without a rash (2). Clinical infection is usually mild, characterized by a generalized erythematous maculopapular rash, lymphadenopathy and slight fever (3). Young children generally have little or no prodrome, while adolescents and adults often report 1–5 days of low grade fever, malaise, and anorexia [2,3]. The rash starts on the face, becomes generalized within 24 hours, and lasts approximately for three days (3). The rash of acquired rubella typically lasts 3 days and is occasionally pruritic, spreading and fading more quickly than the rash caused by measles [2,3]. Up to 70% of adult females with infections experience rubella joint symptoms which appear about the same time as the rash and may persist for up to one month(2). Lymphadenopathy commonly involves the postauricular, posterior cervical and suboccipital nodes and lasts five to eight days (2-3).

Up to 90% of infants born to mothers infected during the first 11 weeks of gestation will develop CRS [5, 6]. These include, miscarriage, stillbirth, or a constellation of birth defects known as congenital rubella syndrome (CRS) (5). The most common congenital defects associated with CRS are cataracts, heart defects, and hearing impairment (Deafness is the most common birth defect associated with CRS, and is sometimes the only manifestation [2,5,6,]. Infants who are moderately or severely affected by CRS are readily recognizable at birth, but mild CRS (e.g., slight cardiac involvement or deafness) may be detected months or years after birth, or not at all (5).

The incubation period for acquired rubella ranges from 12–23 days (typically 16–18 days) (2). People are infectious during the week before and after the appearance of the rash (6). Most rubella cases develop IgM antibody five days after rash onset. Therefore, a suspected rubella case in which serum collected less than five days after rash onset initially tests IgM negative should have a second serum collected greater than five days after rash onset for IgM retesting (3).

Rubella infection is prevented by active immunization programs using live attenuated vaccines and a single dose of the vaccine confers long-lasting immunity in more than 95% of the vaccine recipients (7). It is unacceptable that every day 300 children still enter the world with the disabilities of CRS despite the availability of effective, safe and inexpensive vaccines (8). However, rubella infections remain one of the leading causes of globally preventable congenital birth defects (10). The number of rubella cases reported from 2000 to 2014 increased in the African Region (from 865 cases in seven countries to 7402 cases in 44 countries) (5). In Ethiopia, Rubella tests are done on all cases which are negative for measles specific IgM. In 2014, a total of 16,210 suspected measles cases were reported and 13,305 (82%) of the cases were positive for measles; and 213 (10%) out of 2047 “Measles IgM negative” cases were positive for rubella specific IgM (11).

There is no specific treatment for rubella; however, management is a matter of responding to symptoms to diminish discomfort. The goal of a rubella vaccination program is to prevent the consequences of rubella infection during pregnancy [1,5]. Although the rubella vaccine has been implemented in many countries since 1969, worldwide coverage is still a distant goal, particularly in Africa, where only a few countries routinely immunize against rubella [6,10]. Many developing countries, including Ethiopia, have not yet introduced it in their routine immunization system (12).

The Global Measles and Rubella Strategic Plan (2012–2020) included goals to eliminate rubella and CRS in at least two WHO regions by 2015 as well as in at least five WHO regions by 2020. However, in this plan, the African Region does not have a specific target (6). In April 2015, the World Health Organization declared the Americas to be free of rubella transmission (10). High coverage with one dose of RCV provides sufficient protection against rubella, although many countries choose the operational advantages of using a combined MR vaccine in their programmes, and deliver two MR doses (8). The WHO recommends the first dose be given at 12 to 18 months of age, with a second dose at 4-6 years (2,5).

Immunity is usually permanent after natural infection and believed to be long-term after immunization with rubella-containing vaccine (3). Infants born to immune mothers are usually protected for six to nine months after birth (3).

As of December 2010, 131 of the 194 WHO Member States included rubella-containing vaccines (RCVs) in their routine immunization programmes, in the form of MR or MMR (8). High coverage with one dose of RCV provides sufficient protection against rubella, although many countries choose the operational advantages of using a combined MR vaccine in their programmes, and deliver two MR doses (8). The national priority areas indicated in the new cMYP introduction of new vaccines such as MR (11), is not yet implemented

Rubella remains endemic in countries where rubella vaccine has not been introduced (3). WHO recommends that countries without rubella vaccination programs should assess the burden of rubella and CRS (6). Integrated case-based surveillance with laboratory testing to detect measles and rubella is recommended in countries with an established measles elimination or rubella control goal. In Africa, several countries have conducted subnational rubella seroprevalence surveys; however, none has established routine surveillance for CRS (6).

Surveillance for rubella or CRS does not exist in Ethiopia; however, the measles case-based surveillance system, established in 2004 [12,13]. The measles case-based surveillance system has helped greatly in terms of documenting the epidemiology of measles in Ethiopia. However, little is known of the magnitude and distribution of Rubella cases. In African countries, including Ethiopia, CRS is widely under-recognized as a public health problem, and information on rubella and CRS epidemiology is very limited. Outbreak investigations, laboratory confirmation of suspected cases and detailed analysis of available measles/rubella surveillance data help to characterize the outbreak and ensure the global measles & rubella strategic plan (8). On average, there were 18 annual outbreaks of rubella in Ethiopia and more than 63% of confirmed cases and 52% of confirmed outbreaks occurred in 2012 and 2013 (12).

On February 27, 2018 the Arada Sub City PHEM notified the Regional PHEM of 7 suspected measles cases from epi week 4-7 report from woreda 2. The Region deployed a team of investigators on February 27, 2018 to undertake possible investigations and intervention measures. The Team was deployed to the field by developing questionnaires and equipped with necessary materials.

## **Objectives**

### **General Objective**

- To investigate rubella outbreak and identify risk factors associated with rubella outbreak in Woreda2 of Arada Sub City; Addis Ababa City Administration; Ethiopia

### **Specific objectives**

- To confirm/verify the existence of the outbreak in woreda2, Arada Sub City. From February27-March 3,2018.
- To describe the outbreak by person, place and time.
- To identify potential risk factors of disease transmission.

## **Materials and Methods**

### **Background of Woreda2**

Arada Sub City is one of the ten Sub Cities in Addis Ababa and covers an area of 950 hectares. It is situated in the central part of the City. The Sub City is divided in to 10 woredas. Woreda2 is one of the ten woredas of Arada Sub City. Administratively the Woreda is divided into 7 ketenas/Gotes. The Woreda is found at East of the Sub City. It shares a boundery with Woreda3 North; woreda1 and Lideta Sub City in South; Addis Ketema Sub City in East and Woreda 6 in the West. Total population of Woreda2 was estimated to be 29,343 (projection based on 2007 census). Of these population; male 14,085 (48%) and female 15,258 (52%); children under 5 years of age 2101 (7.16%); numbers of women of reproductive age (15-49) 10,164 (34.64%). Regarding the Health service coverage, the Woreda has 1 Health Center and 8 private clinics which gives a potential health coverage about 95%.



**Probable:** a case that meets the clinical case definition, has no serologic/ virologic testing, and is not epidemiologically linked to a laboratory-confirmed case.

**Confirmed:** a case that is laboratory confirmed (with or without symptoms) or that meets the clinical case definition and is epidemiologically linked to a laboratory-confirmed case

**Epidemiologically linked case** is a suspected case, which has contacts (possibly got the virus) with laboratory confirmed case or another epidemiologically confirmed case.

### **Inclusion Criteria**

**Case:** any resident of Woreda2 during the study who had maculopapular (nonvascular) generalized Rash and fever and /or Cough, Coryza or arthralgia/arthritis or lymphadenopathy or conjunctivitis (red eyes), any person in whom a clinician suspects rubella.

**Control:** Any person in the woreda2 and who was a neighbor to a case without sign and symptoms of rubella at the time of the study, but matched with age.

### **Data Collection Method**

Structured questionnaire was used to interview cases and controls. Active search was conducted using line listing of cases. We conducted formal discussions with different stakeholders about the overall outbreak situation and the control and prevention efforts undertaken in the Woreda.

### **Data Entry and Analysis**

Collected quantitative data were checked and entered on a computer and analyzed using Microsoft office Excel and Epi Info 7.1. Descriptive statistics were used to determine the frequency of different variables. Both multi variate and bivariate analysis were applied and Results were displayed using tables and graphs. Ninety-five percent confidence interval (CI) was used for OR (odds ratio).

### **Rapid Response Team**

Addis Ababa Regional PHEM case team received report on 27th February 2018, from woreda2, Arada Sub City, 7 suspected measles cases were reported from Epi week 4-7. The Regional Rapid Response team and EFETP residents were deployed to the area to investigate and confirm the outbreak.

**Laboratory Investigation**

Blood specimens were collected from five suspected rubella patients and sent to EPHI

**Environmental Investigation**

General housing condition sleeping rooms, housing ventilation and hygienic conditions of the cases and controls were observed.

**Ethical issue**

Informed verbal consent was taken from all respondents before interviews and all agreed to take part. Kept data by password and excluded patient name to assure confidentiality.

**Data Dissemination**

Findings of this investigation in both soft and hard copies were communicated to the Addis Ababa Regional PHEM, Arada Sub City, woreda2 PHEM and the Addis Ababa University. Additionally, soft copies of the document were sent to FETP Resident Advisors, Mentors, Co-coordinators and Field Supervisors.

## Results

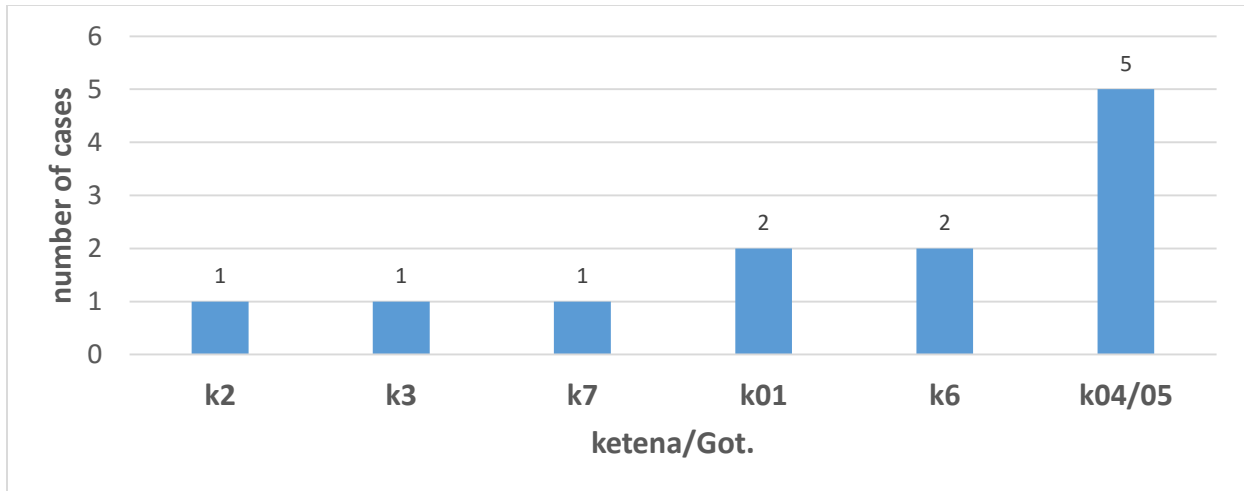
### Descriptive Epidemiology

Among the suspected cases 5 blood samples were taken to identify the etiologic agent and laboratory result has shown that five out of five samples tested positive for Rubella IgM. On 29<sup>th</sup> January; 2018 the first case (index) was registered and reported from Ketena 6 of Woreda2. The index case was male and 5years old. A total of 12 rubella cases (5 confirmed and 7 Epi-linked) were reported from six ketenas of Woreda2 since 29/1/2018 – 10/3/2018. Sixty-seven percent of the cases were <5 years, and (4)33 % were in 5-9 years. ASAR were high in under five years 38.1/10,000population compared to 5-9 years , 9.4/10,000population. The overall attack rate was 4 per 10,000 populations. CFR was zero. Mean age of cases was 4 years (ranges from 2years to 8 years. None of cases were lower than one year and above 10 years of age. Of the total affected cases male to female ratio were 1:1 (Table31).

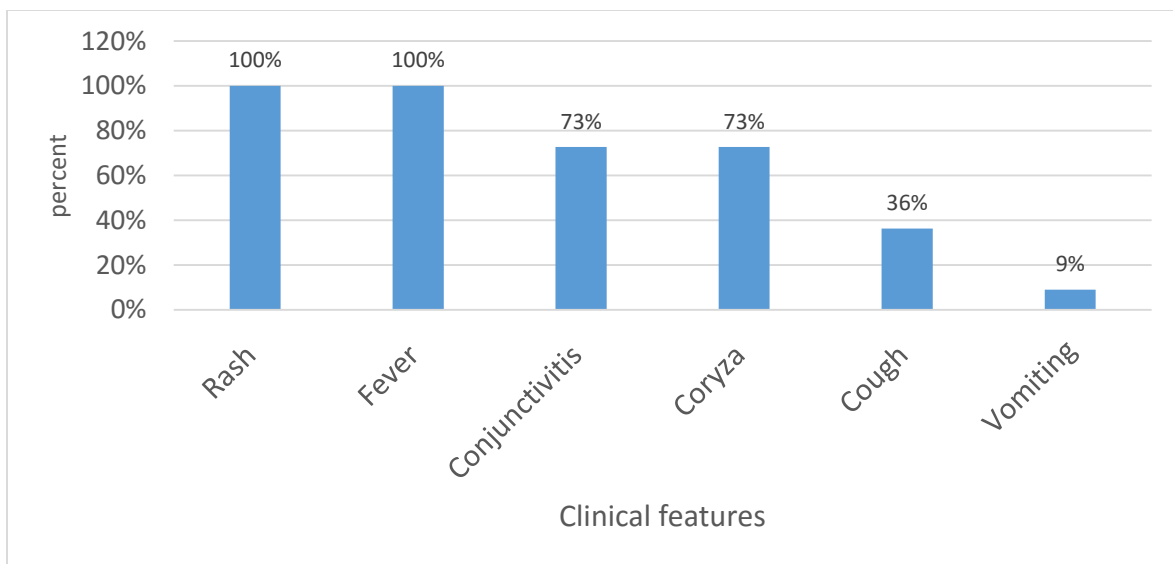
**Table 29. Rubella distribution by Age group from 83th January 2018 to 10th March 2018 in Woreda2; Arada Sub City of AACAA; March 2018**

Variable		Population	cases	Percent	Age Specific A/Rper10,000
Age Group	<1yer	657	0	0	
	1-4yr.	2101	8	66.7	38.1
	5-9yr	4275	4	33.3	9.4
Sex	F	15,285	6	50	3.9
	M	14,085	6	50	4.3

The outbreak started in Ketena 6, but quickly spread to neighboring five Ketenas. The number of reported cases ranged from 1 to 5 cases per Ketena. Out of 7 Ketenas; six (86%) Ketenas were affected. From the total cases five 41.7% were reported from Ketena 04/05. Ketena 1 and 6 reported two (16.7%) each. The remaining 3(25%) cases were reported from the rest of the three Ketenas (Figure34).



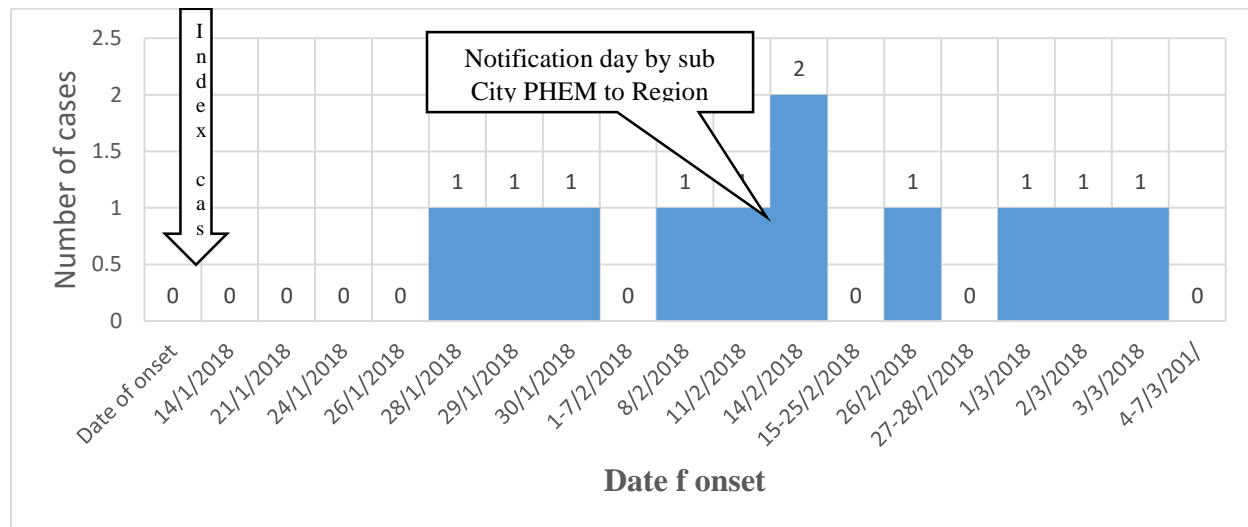
**Figure 34 Distribution of Rubella cases by ketene/Gote, Woreda2, Arada Sub City, from January 29-March 10, 2018.**



**Figure 35. Presenting sign and symptoms of Rubella patient from 28th January to 3rd March, 2018 in Woreda2, Bole Sub City of Addis Ababa City Administration**

Rubella has similar symptoms with measles, but milder compared to measles. The common signs and symptoms manifested in rubella cases are listed below; rash and fever (100%), cough (36.4%), and Conjunctivitis (72.7%); Coryza (72.7%) and vomiting (9%) (Figure 35).

Hundred percent of children less than 5 years reported have been vaccinated against measles while none had been vaccinated against rubella. All cases were treated as outpatients. All Cases and controls nutritional status were normal. The first case was reported to the woreda health office on January 29, 2018 and subsequently additional cases were being reported on 30<sup>th</sup> January, 2018 and progressively cases were increased (Figure 36).



**Figure 36. Rubella cases reported by Date of Onset from 28th January to 3 March 2018, in wored2, Arada Sub City, Addis Ababa City Administration, March 2018.**

### Public Health Intervention

The investigation Team identified and characterized the rubella outbreak. Technical assistance was given for health workers on case management, recording and reporting situation. Cases were treated to prevent complication and further spread. Health education was given for the community members to prevent the transmission of the disease, to motivate health seeking behavior and treatment if there is sign and symptoms of rubella. Encouragingly the community, health extension workers and community leaders were implemented to strength the local surveillance system.

### Analytical Epidemiology

We compared 12 rubella cases with 36 community controls matched by age and place of residence. Descriptive statistics and odds ratios (OR) with 95% confidence intervals (CI) were calculated. Analysis was performed using Epi Info version 7. More than half 8(67%) of cases and 26(72%) of

controls were less than 5 years old. Contact history with rubella infected (AOR=5.9; 95%CI:1.03-33.2); Travel history to rubella affected Kebele/ area (AOR= 6.6; 95%CI: 1.04-41.62) and estimated area of the house <8m<sup>2</sup> (AOR: 5.5; 95% CI: 1.01 –29.5) were statically associated with the rubella infection Further, family size above 4 (AOR: 3.7; 95% CI: 0.7 – 18.7) were not associated with the rubella infections (Table 32).

**Table 30. Bivariate and Multivariate Analysis for different exposures 29th January 2018 to 3<sup>rd</sup> March 2018, in Woreda2; Arada, Addis Ababa, City Administration; March 2018**

<b>Risk Factory</b>	<b>Exposure</b>	<b>Case (n=12)</b>	<b>Control (n=24)</b>	<b>COR</b>	<b>95% CI</b>	<b>AOR</b>	<b>95% CI</b>
Estimated area of the house	<8m <sup>2</sup>	8(67 %)	10(28 %)	5.2	1.33-21.18	<b><u>5.5</u></b>	<b><u>1.01-29.5</u></b>
	>=8m <sup>2</sup>	4(33 %)	26(72%)	1			
Family size	>4	8(67 %)	11(31%)	6.2	1.5-30.2	3.7	0.7-18.7
	<=4	4(33 %)	25(69%)	1			
N21 Travel history to active Rubella cases	<b>Yes</b>	9(75 %)	14(39 %)	4.7	1.1-20.5	<b><u>6.6</u></b>	<b><u>1.04-41.6</u></b>
	<b>No</b>	3(25%)	22(61%)	1			
N23 Contact with rubella 2-3wk	<b>Yes</b>	9(75 %)	11(31%)	6.8	1.5-30.2	<b><u>5.9</u></b>	<b><u>1.03-33.2</u></b>
	<b>No</b>	3(25 %)	25(69%)	1:00			
Family educational level	<b>Elementary and below</b>	5(42%)	19(58%)	1.6	0.4-5.8	--	--
	<b>Secondary and above</b>	7(58%)	17(42%)	1:00			
Age Group	<b>&lt;5 years</b>	8(67%)	26(72%)	0.8	0.2-3.13	--	---
	<b>&gt;=5 years</b>	4(33%)	10(28%)	1:00			
Sex	<b>Male</b>	6(50%)	24(67%)	1:00			
	<b>Female</b>	6(50%)	12(33%)	0.5	0.13-1.9	--	

## Discussion

Rubella vaccination is not part of the routine vaccinations in Ethiopia (12,8). The major clinical concern for rubella is the risk of congenital rubella syndrome. However, CRS surveillance was not established in the national program (6).

Our finding revealed that children aged <10 years were affected in woreda2. A retrospective epidemiologic analysis of the epidemiology of rubella during 2009-2015 in Ethiopia revealed rubella was endemic throughout Ethiopian and children below the age of 10 years were the most affected (12). In some countries in Africa, the proportion of cases was highest among children <5 years of age, suggesting the possibility of infection at a younger age (6). Similarly, in our finding in <5 years' children had highest age specific attack rate. In another study done in Kyrgyzstan the highest age specific incidence rate was among children aged 3–6 years (9). The possible reason may be due to rubella infection occurring at younger age in areas with high population density and contact rates. In our analyses both sexes were equally likely to have rubella, similar to findings elsewhere in Ethiopia (11).

We attributed this outbreak to the fact that our country does not currently provide RCV in the National Immunization Program; therefore; most of the children were susceptible to this disease. The results of the investigation revealed that of the total number of rubella (12)100% had never been vaccinated against rubella infection. Studies in other countries not providing RCVs have also demonstrated widespread transmission and rubella outbreak [4,9].

The epidemic curve has two peaks typical of a propagated outbreak, suggestive of person to person transmission. This finding is therefore, biologically plausible considering that rubella is spread through respiratory secretions. Contact with rubella cases was a significant risk factor for rubella outbreak in Woreda2 of Arada Sub City and, thus was highlighted to be the driver of the current outbreak. This was consistent with the study finding with significant risk factor for contracting rubella unpublished document in Benishangule- Gumze in 2016.

Care givers perceived rubella as measles which are almost similar in terms of transmission; prevention and control; there was no significant difference in knowledge between cases and controls. This might be due to recall bias, whereby caregivers of cases were more likely to know

how their children presented than of controls. However, caregivers did not know the importance of isolation of sick children both at home and at school, thus enhancing quick outbreak spread.

### **Strength of the Study**

- Arada Sub City and Woreda 2 PHEM officer were deployed to the outbreak site and sensitized the health center staffs prior to the Regional PHEM deployed.

### **Limitation of the Study**

○ There was a possibility that controls could have been infected with rubella virus but not yet developed signs and symptoms of rubella during the investigation period. This could have introduced ascertainment bias which might have reduced the strength of associations;

### **Conclusions and Recommendation**

- Rubella outbreak were confirmed in Arada Sub City, woreda 2.
  - All cases were under 10 years' children.
  - Ketena 04/05 was more affected Kebele.
- Ethiopia may consider adopting a comprehensive approach to surveillance, including a more inclusive case definition for measles and rubella, establishing sentinel surveillance for CRS,

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# **Chapter VI – Abstracts for Scientific Presentation**

## **6.1 Title: Surveillance Data Analysis of Measles from 2012-2016GC. Addis Ababa City Administration, Ethiopia, 2017**

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**Resident Advisors and Mentors: Professor A. Ali, G. Muluken**

**Authors Affiliation: <sup>1</sup>Ethiopian Field Epidemiology Training Program, Addis Ababa University School of Public Health, <sup>2</sup>Addis Ababa City Administration, Public Health Emergency Management Core Proses.**

### **Abstract**

**Introduction** Measles is one of the communicable diseases causing preventable morbidity and mortality in Ethiopia. Epidemiological surveillance of measles is a major public health strategy to prevent and control disease. Thus the data analysis were conducted to describe magnitude and trends of measles and its distribution in Addis Ababa from 1, January 2012 to 31st December 2016.

**Methods:** We reviewed retrospectively national measles case-based surveillance data base from January 2012 to 31st December 2016. We entered all laboratory confirmed measles cases in to Microsoft Excel 2016. We utilized check list to clean, edit, validate and analyze data. We calculated incident rate of confirmed measles cases and described it by place, person, and time, then presented data in tables and figures.

**Result:** We identified 2764 suspected measles cases and two deaths (CFR 0.07%). Of 730 (27 %) were positive for measles IgM, while 1906(68%) were negative. Of 734 confirmed Measles cases, 326(44%) were females, 283(39%) male and 17% missed information. The age of cases ranged from one month to 33 years with a mean age of 11 years and 15.5 inter quartile range(IQR). Annual incidence rate ranged from 1.2 to 8.4 per 100,000 populations. Three-fourth of all confirmed Measles cases were aged less than 15 years. Of 430(58.5%) cases had unknown vaccination status. We identified high incidence rate, 11.8/100,000 population in Kolfe Keranio Sub City in 2014. The number of laboratory confirmed cases increased from 36 in 2012 to 268 and 2014, but dropped to 68 in 2015 then again doubling in 2016. Seen seasonality in hot dry season (January through

June). A total of 64 Measles outbreaks were identified by laboratory confirmations in the study period.

**Conclusion and recommendation:** Measles was endemic in Addis Ababa City Administration of Ethiopia; most affected people were under 15 years of age. The highest incidence rate was reported in 2014 in Kolfe Kerano Sub City. The Region and health facilities should improve routine immunization, and conduct Supplementary Immunization Campaign.

**Keywords:** Measles Confirmed Measles, Addis Ababa City Administration

# **Chapter VII**

## **Proposal for Epidemiologic Research Project**

## 7.1 Assessment of Factors Affecting Full Vaccination status of children Aged 12-23 Months in Addis Ababa, Yeka Sub City, Addis Ababa City Administration, Ethiopia

### Executive Summary

#### Introduction

Immunization is a critical component in the global drive towards significant reduction in childhood mortality. However, there are several challenges hindering wide and complete childhood immunization, especially in low- and middle-income countries like Ethiopia. In Ethiopia, incomplete immunization is a major reason for recent outbreaks of vaccine-preventable diseases. According to the 2016 Ethiopian Demographic and Health Survey (EDHS), only 39% of children aged 12-23 months were fully vaccinated. In order to control and eliminate the vaccine preventable diseases it is important to know vaccination coverage and reasons for non-vaccination.

**Objective:** To determine full immunization coverage and factors affecting childhood vaccination status in Addis Ababa, Yeka Sub City, Ethiopia.

**Methods:** A cross-sectional quantitative method will be carried out. The study sample size will determine by single population proportion formula. Since the proportion of children aged 12-23 month fully vaccinated in Addis Ababa is 89 % according to EDHS 2011, the 89 % proportion is used. Therefore, at 95% confidence level, 4% margin of error and with design effect 2, the sample size is calculated and using simple random sampling method 580 households that have at least one 12-23 months' children are selected as sample. Data will be collected using a pre-tested questionnaire by health professionals. Data will be entered and analyzed by Microsoft Excel, Epi info 7 and SPSS. Bivariate and multivariate analysis will be done to determine the association between dependent and independent variables.

**Work plan:** Data collection will be started March- April, 2020, and the overall work of the study is planned to finalize until end of Jun 2020.

**Budget:** The required cost for the study is estimated 73,017 ETH Birr.

## **Background**

Immunization is one of the major public health strategies to avoid childhood illnesses and mortality. WHO also stated that immunization is a proven tool for controlling and eliminating life-threatening infectious disease and has been estimated to alleviate 2 to 3 million deaths each year (1). Without the same, more than five million children would die each year because of diseases that could have otherwise been prevented through vaccination (2). The Expanded Programme on Immunization (EPI) was established by the World Health Organization in 1974 to control vaccine preventable diseases (3). EPI has also averted over 15.6 million deaths since, 2000 through measles immunization, eliminated maternal and neonatal tetanus from 35 out of 59 high-risk countries, and dramatically reduced the prevalence of polio globally (4).

The report on global vaccination coverage showed that the proportion of the world's children who receive recommended vaccines has remained steady for the past few years giving an instance that the percentage of infants fully vaccinated against diphtheria-tetanus-pertussis (DTP3) was 83% in 2011, 84% in 2010 and 83% in 2009(1). WHO (2013) further stated that although global vaccination coverage is holding steady increase but an estimated 22 million infants worldwide are still missing out on basic vaccines (1). A recent report from world health organization (WHO) revealed that the number of children in under one year of age who did not receive DTP3 vaccine worldwide 21.8 million in 2013 compared to 22.8 million in 2012(5).

In 2014, 7.4 Million infants in WHO African Region did not receive the third dose of DPT vaccine, out of an annual birth cohort of 32.7Million approximately 23%(6). Despite the fact that most low- and middle-income countries depend on EPI for delivery of vaccines to children, coverage is still below the expected 80% (4). As a result, every year more than 10 million children die before they reach their fifth birthdays (1). Most die because they do not access effective interventions that would combat common and preventable childhood illnesses.

The Ethiopian EPI Program initially focused on the six major vaccine preventable diseases (measles, diphtheria, tetanus, polio, tuberculosis, and pertussis) for coverage of children less than 1 year of age (3). The Government of Ethiopia introduced the pneumococcal conjugate vaccine

(PCV 13) and monovalent human rotavirus vaccine (RV1) into the national's Infant Immunization Programme in November 2011 and October 2012, respectively (7). The pneumococcal vaccine protects against *Streptococcus pneumonia* bacteria, which cause severe pneumonia, meningitis, and other illnesses. Rotavirus is a virus that causes gastroenteritis; an inflammation of the stomach and intestines. If left untreated, it can lead to severe dehydration and death (7). Other childhood vaccines given in Ethiopia protect against hepatitis B, and *Haemophilus influenza* type b (Hib) (7)

The Government of Ethiopia has been delivering routine immunization services through static, outreach and mobile strategies (8). Despite the huge efforts made over decades, the access and utilization of immunization remains low, with wide regional variations and unacceptably high drop-out rates (8). The reaching every district (RED) approach has been implemented in Ethiopia since 2004 in districts with poor immunization coverage and high dropout rates. As a result, the coverage showed marked improvement. DPT3 coverage increased from 52% in 2003 to 87% in 2014(3). The variation in coverage among regions, however, is large.

When immunization rates are high, it is much less likely that a pathogen will be carried and transmitted from person to person. Declines in vaccination rates allow diseases to emerge in the population again (1). In Ethiopia Immunization service provision has shown gradual increase since 2004, reaching 86% administrative coverage of penta 3 in 2010 and 2011(3). Despite this gain, there was decline in 2012 and 2013 to 83 and 82 respectively and with increasing once gain to 87% in 2014 (3).

The Ethiopia immunization programme considers a child to be fully vaccinated if the child has received all basic vaccinations, three doses of the pneumococcal conjugate vaccine (PCV vaccine) (also given at age 6, 10, and 14 weeks), and two doses of the rotavirus vaccine (given at age 6 and 10 weeks) (7). According to the EDHS survey in Ethiopia 2016 fully immunized child (FIC) coverage for children aged 12-23 months was 39%. Nevertheless, this coverage varies from 9% in Afar to 79% in Addis Ababa (7).

## **Statement of the problem**

Immunization currently averts an estimated two to three million deaths every year in all ages from diphtheria, tetanus, pertussis (whooping cough), and measles (1). Every year more than 10 million children in low- and middle-income countries die before they reach their fifth birthdays (1). Most die because they do not access effective interventions that would combat common and preventable childhood illnesses. Immunization is a critical component in the global drive towards significant reduction in childhood mortality (4). However, there are several challenges hindering wide and complete childhood immunization, especially in low- and middle-income countries like Ethiopia (7). According to the guidelines developed by the World Health Organization, children are considered to have received all basic vaccinations when they have received a vaccination against tuberculosis (also known as BCG), three doses each of the DPT-HepB-Hib (also called pentavalent), polio vaccines, and a vaccination against measles. A cross-sectional study conducted in Mizan Aman town of the Southern part of Ethiopia in 2017 has shown that the fully valid immunization coverage for age assessed by card plus history was From total children, 27 (8.4%) were not immunized at all, 159 (49.4%) were partially immunized, and 136 (42.2%) were fully immunized (9). According to the 2011 Ethiopian Demographic and Health Survey (EDHS), only 24% of children age 12-23 months were fully vaccinated. According to 2016 EDHS survey 39% of Children age 12-23 months have received all basic vaccinations. Sixteen percent of children in this age group have not received any vaccinations (7). The information obtained in the survey on differences in vaccination coverage among subgroups of children is useful for programme planning and targeting resources towards areas most in need. Although in Addis Ababa the achievement of the programme is increasing but it is still some way from the target of at least 90% national coverage and 80% in every district with all vaccines by 2020 (3). An understanding of the factors related to the acceptance of immunization services is of considerable relevance to planners and policy-makers to bridge the gap between the immunization potential and actual performance of the programme. This study will be able to document child vaccination coverage of Yeka Sub City, Addis Ababa City Administration and identify factors affecting childhood vaccination status that could help towards improvement of immunization service in the area and through the region as well.

## **Significance of the study**

Despite many efforts towards control of vaccine-preventable diseases, occurrence of significant under five children morbidity and mortality is associated with these communicable diseases. Poor intake of child vaccine is a major attributed factor for magnitude of vaccine-preventable communicable diseases.

Based on administrative and World Health Organization (WHO)-United Nations Children's Fund (UNICEF) joint estimates, immunization performance in Ethiopia showed improvement from 2012-2014. However, variation and discrepancies within regions and zones still remained a challenge where in 2013 and 2014 the proportion of zones that achieved DPT3 vaccination coverage of at least 80% were 50% and 73% respectively (8). There is little published evidence of studies conducted in Yeka to identify the reasons why some jurisdictions perform well in immunization activities while others do not despite being in the same setting of infrastructure and socio-economic contexts. All these situations had trigger us to assess magnitude and factors associated with child vaccine utilization in Yeka Sub City.

## **Literature Review**

Universal immunization of children against six common vaccine-preventable diseases, namely tuberculosis, diphtheria, whooping cough (pertussis), tetanus, polio, and measles, is crucial to reducing infant and child mortality (7). According to the guidelines developed by the World Health Organization, children are considered to have received all basic vaccinations when they have received a vaccination against tuberculosis (also known as BCG), three doses each of the DPT-HepB-Hib (also called pentavalent), polio vaccines, and a vaccination against measles (4). The BCG vaccine is usually given at birth or at first clinical contact, while the DPT-HepB-Hib and polio vaccines are given at approximately age 6, 10, and 14 weeks. Measles vaccinations should be given at or soon after age 9 months (7).

## **Global Immunization Coverage of children**

The Expanded Programme on Immunization (EPI) was established by the World Health Organization in 1974 to control vaccine preventable diseases (3). The report on global vaccination coverage showed that the proportion of the world's children who receive recommended vaccines

has remained steady for the past few years giving an instance that the percentage of infants fully vaccinated against diphtheria-tetanus-pertussis (DTP3) was 83% in 2011, 84% in 2010 and 83% in 2009(1). WHO (2013) further stated that although global vaccination coverage is holding steady but an estimated 22 million infants worldwide are still missing out on basic vaccines (1). A recent report from world health organization (WHO) revealed that the number of children in under one year of age who did not receive DTP3 vaccine worldwide 21.8 million in 2013 compared to 22.8 million in 2012(5). Close to seventy percent of these children live in ten countries: Democratic Republic of the Congo, Ethiopia, India, Indonesia, Kenya, Mexico, Nigeria, Pakistan, Viet Nam and South Africa (5).

In 2014, 7.4 Million infants in WHO African region did not receive the third dose of DPT vaccine, out of an annual birth cohort of 32.7 Million approximately 23% (6). Despite the fact that most low- and middle-income countries depend on EPI for delivery of vaccines to children, coverage is still below the expected 80% (4). As a result, every year more than 10 million children die before they reach their fifth birthdays (1). The African Region adopted a measles elimination goal for 2020 with targets of at least 95% MCV1 coverage at national and district levels (6).

### **Vaccination Coverage of children in Ethiopia**

In Ethiopia the expanded programme on immunization was launched in 1980 with the objective of increasing the coverage by 10% annually and achieve 100% Diphtheria-Pertussis Toxin Vaccine 3 (DPT3) coverage by 1990's (8). However, the coverage in the first 20 years was very low although during the 1990's good progress was observed through Universal Child Immunization (UCI) (3). Pentavalent 3 coverage increased in EFY 2005 to 87.6%, short of the target (94.0%) set for the year. Despite the huge efforts made over decades, the access and utilization of immunization remains low with wide regional variations and unacceptably high drop-out rates (8). In Ethiopia Immunization service provision has shown gradual increase since 2004 reaching 86% administrative coverage of penta 3 in 2010 and 2011(3). Despite this gain, there was decline in 2012 and 2013 to 83 and 82 respectively and with increasing once gain to 87% in 2014(3).

## **Factors influencing full immunization of children**

Different factors determine a child's complete vaccination status, depending on whether the child lives in an area with a low or high routine EPI coverage. Socioeconomic and demographic factors, maternal characteristics, child characteristics, knowledge of age begins, finishes and session needed for immunization, knowledge of mothers on vaccination and vaccine preventable diseases, availability and accessibility of vaccination service, Antenatal care (ANC) follow up and TT status of mothers, factors associated with missed opportunities and Perception of mothers may influence complete immunization status of children.

### **Socio-demographic factors**

Studies have shown that low literacy level, lack of knowledge on the immunization schedule, low economic status and long distances to the health facilities are the major factors that hinder immunization (2).

### **Availability of Maternal and child health services**

Findings of the recent national vaccination coverage cluster survey, conducted in 2012, which revealed the existence of pockets of inaccessibility and poor utilization of the service in most regions (8).

Some studies exhibited that proximity to health facility, frequency of health worker's visit, mother's mobility, education, age, gender of child, ownership of radio, economic condition of household, and region of residence have a statistically significant association with the acceptance of immunization (13).

### **Availability and accessibility of vaccination service**

EDHS 2016 survey shown that full vaccination coverage is much higher in urban than rural areas (65 percent versus 35 percent) (5). Urban children are more than two times as likely as rural children to have all basic vaccinations (48 percent compared with 20 percent) (10). Similar, study in Sudan show that Children living in the urban areas in the country are more likely to be vaccinated than those living in rural areas, and vaccination coverage is highest among children whose mothers have a secondary or higher education (11).

The Last Ten Kilometers (L10K) Project of the John Snow, Inc. (JSI) Research & Training Institute in selected seven Ethiopia Region shown that limited access and poor quality vaccination service were also identified as the main factors that limit vaccination coverage nationally (8). Similarly, a research conducted in Sudan identified utilization is higher when vaccination centers are easily accessible and provide good quality care (11).

### **Knowledge of mothers on vaccination and vaccine preventable diseases**

High maternal workload combined with lack of knowledge, and hence less value associated with vaccination were the main reasons to which the unacceptably high dropout rate was ascribed, according to the survey (8).

### **Knowledge of age begins, finishes and session needed for immunization**

Study done in Hosaina shown that mothers' that have knowledge of age to begin, finishes and session needed for immunization were Significant predictors associated with fully immunization of children (12). Base line survey on EPI conducted in four region reveal that the major reasons for incomplete vaccinations were that the mother was too busy or unaware of the need to for vaccination or of the need to return for subsequent doses (8).

### **Mother's education status**

According to the 2016 EDHS survey vaccination coverage increases with mother's education. About 3 in 10 (31 percent) of children whose mothers have no education are fully vaccinated compared with more than 7 in 10 (72 percent) of children whose mothers have more than a secondary education (5). Similar patterns are observed by household wealth (EDHS) (10). Similar study done in Hosain, on factors affecting childhood immunization documented that Educational status, occupation, age of mothers, religion, and family income of the mother and experience of child death showed significant association with the immunization status of the children (12).

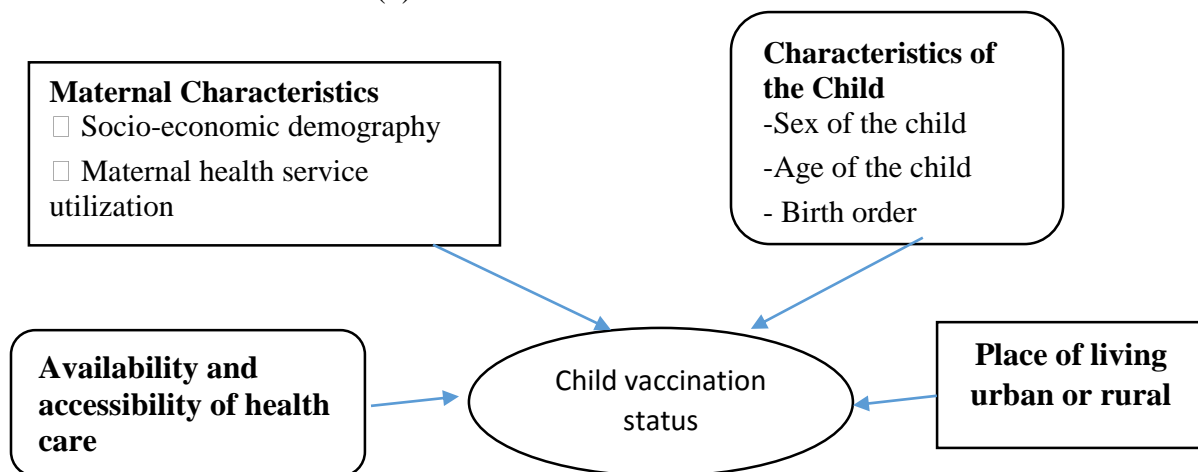
At individual level assessment on vaccine uptake in Sub-Saharan African countries identified that maternal age, region, religion, education status/literacy level, wealth index, marital status, and occupation directly affected commencement, continuation, and completion of immunization (4).

## Child characteristics

Some studies exhibited that place of delivery is identified as determinant factor for childhood immunization. Antenatal follow up, institutional delivery and knowledge of mothers about the age at which child begins and finishes the vaccination are significant predictor of child immunization status. The study revealed that children are more likely to be vaccinated if the child is health institution born and mothers' followed Antenatal care (ANC) [8]. In addition, study done in Hosaina shows that Children of mothers who received sufficient antenatal care (at least five or more antenatal care visits) were significantly more likely to be fully immunized than children of those mothers who received insufficient antenatal care and those who had received no antenatal care (12).

The findings of another study carried out in Kenya revealed that over 80% of children delivered at home having not received full immunization, the place of birth was found to be one of the factors that influence full immunization (2). Similar study shows mothers/care-taker gave birth to child at health institution were more likely to fully vaccinate their child than mothers delivered at home (12).

According to the 2016 EDHS survey first births are more likely to be fully immunized (30 percent) than births of order six and higher (20 percent) (7). Similar finding in Kenya, mothers with more than four children are two times more likely not to have their children fully immunized compared to those with less than three (2).



**Figure 37** Source- Demeke Tolera *Conceptual Framework for Factors Affecting Fully Immunization Status of Children Aged 12- 23 Months in in Addis Ketema Sub-City, Addis Ababa city Administration, Ethiopia.2014*

## Objectives

## **General Objective**

To assess magnitude and factors affecting childhood vaccination status in 12-23 month of children in Yeka Sub City, Addis Ababa City Administration, Ethiopia.

## **Specific Objectives**

- To determine magnitude of full immunization coverage among children of aged 12-23 months
- To assess factors associated with full immunization of children aged 12-23 months

## **Materials and Method**

### **Study area and period**

The study will be conducted from 1<sup>st</sup> March –31 April 2020 in Yeka Sub City, one of the 10 sub-cities of Addis Ababa Government. Yeka Sub-City is composed of 14 Woreda. (district) administrations. It has an estimated population of 444080. Under five populations is 31796. In the Sub-City there are 14 government health centers, and private health facilities (2 hospitals (1Gov., 1Private), 110 higher clinics, medium clinics and lower clinics) and 2 NGO. According to the Yeka Sub City Health Bureau annual report, the physical health service coverage of the sub-city was estimated to be 100%.

### **Study Design**

Community based cross-sectional study design will be employed. Quantitative data will be collected from mothers/caretakers who had children aged 12-23 months to assess the immunization status and factors affecting it in Yeka Sub-City, Addis Ababa City Administration.

### **Source Population**

All households with children 12-23 months living or residing in Yeka Sub City will be the source population.

### **Study Population**

Study populations will be all children in households having aged 12-23 months living or residing in Yeka Sub City based on inclusion and exclusion criteria.

## Sample Population

Children of 12-23 months of age and their mothers/caretakers in the selected eligible households.

## Sample Size Determination

Sample size (n) will be calculated based on the assumption of the proportion of fully immunized children aged between 12-23 months which is 89% for Addis Ababa City (5). The survey used WHO-EPI regional cluster sampling, based on the latest WHO immunization Coverage Cluster Survey reference manual (14). Based on these  $P = 89\%$ , precision is  $\pm 5\%$  with 95% confidence level and the sample of 33 clusters; 7 children per cluster should be surveyed. The total number of children to be surveyed is  $33 \times 7 = 259$

Number of Sample Size =  $(1.96)^2 \times P(1-P) = 235$

d 2

Where: - d = Absolute precision = 4%

P = Estimated prevalence = 89%

In addition, 10% of the calculated sample size for non-respondents will be added, i.e. a total of **259** mothers/caretakers will be study participants.

## Sampling Procedure

The 2005 WHO Immunization coverage cluster sampling method will be used. The study domain is composed of one Sub City of the study area. The Sub City is composed of a total 14 woredas and 124 Gotes. In this research a cluster represent the former administrative demarcation called kebele now it is sub-woredas. To identify clusters first all kebeles in the area to be surveyed will be listed with an up-to-date population. Then cluster identification form to list all kebeles include in the immunization target area to be evaluated. This list will be the sampling frame from which the sample is to be selected. A sampling frame is a list of kebeles found in survey area. A sampling interval will be determined by dividing total population by number of clusters. The first cluster will be selected randomly. This will be done by locating the community list in which the cumulative population equals or exceeds the random number. For subsequent clusters, identify the community in which that cluster is located by adding the sampling interval to the running total of adding the sampling interval to the random number (14). From each cluster (36 clusters), 16 households will be selected, (this number of households will be assigned based on personal judgment). In each cluster the first household will be selected by randomly chosen (this will be done by using a table of random numbers) from

the list of the households. The subsequent households will be select according to the inclusion criteria, based on the principle of the next nearest household (that is after visiting the first household, the second household to be visited will the one that is nearest to the first. The nearest household is defined as the household reachable in the shortest time on foot from the household just visit. The nearest household need not be in direct line of vision or on the same side of the street or road. If there are two or more households equally near to the one just visited, the one on the immediate right to the one stands in the doorway of the house looking out will select. In case of two or more children found in selected house, the youngest child will select. Additionally, if the selected household is identified with no child of 12-23 months' age, the nearest household with 12-23 months' children will be selected (exclusion criteria). Equal number of household will take from each cluster. To calculate a sampling interval, the total population to be survey will be divide by the number of clusters yielding 12,335. Following this a random number between one and the sampling interval will be draw.

### **Data Collection Procedure**

The questionnaire will be developed in English and will be translated to local language (Amharigna). Also the Amharic version will be translated back to assess consistency of the questionnaire. The questionnaire includes, vaccination histories of children (12-23 months), information on socio-demographic characteristics of mothers, economic status of the family/caretakers, sex of the child, ANC follow up, child place of delivery, maternal immunization, accessibility and availability of vaccination service, family size and knowledge of mothers or immediate caretakers on immunization. During data collection, child vaccination history will be filled based on child vaccination card or mothers/caretakers recall in the absence of the card. Data on vaccination histories and sex category of all 12-23 months' age children found in selected household will be collected. Selected 10 health professionals for data collection will be trained on the designed questionnaire for three days. The training will include overall content of the questionnaire, how to select households to be interviewed and other related issues. The questionnaire will be pre-tested in 30 households of selected clusters for its applicability, completeness, desirability and updates and necessary amendments shall be made.

## **Operational Definitions**

**Vaccination:** - The administration of a vaccine to stimulate protective immune response that will prevent disease in the vaccinated person if contact with the corresponding infectious agent occurs subsequently.

**Immunization:** - If vaccination is successful, it results in immunization: the vaccinated person has been immunized.

**Fully Vaccinated:** - A child between 12-23 months old who received one BCG, at least three doses of Pentavalent, three doses of OPV, three doses of PCV, two doses of Rota Virus and a measles vaccine.

**Partially Vaccinated:** - a child who misses at least one dose of the ten vaccines.

**Unvaccinated:** - a child who does not receive any dose of the ten vaccines.

**Immunization Coverage:** - proportion of children who took vaccination.

**Immunization Status:** - being fully/partially vaccinated or unvaccinated

**Immunization Service:** - Activities delivered to mothers and children that contain full package of vaccination at health facilities or outreach sites.

**Availability of Immunization Service:** - The presence or absence of immunization services in studied areas.

**Accessibility of Immunization Services:** - Opportunity to get immunization services within short radius (less than 5 kilometers' for health center).

**Coverage by card only:** coverage calculated with Numerator based only on documented dose, excluding from numerator those vaccinated by history.

**Coverage by card plus history:** coverage calculated with Numerator based card and mother's report.

## **Inclusion Criteria**

All households with at least one 12-23 months' child will be included in the study.

## **Exclusion Criteria**

This study will not include mothers or care takers refuse to participate.

## **Variables of the Study**

### **Dependent Variables**

- Childhood vaccination status.

### **Independent Variables**

- Socio demographic characteristics of mothers/caretakers
- Knowledge of mothers/caretakers
- Tetanus toxoid vaccination status of mothers/caretakers
- ANC follow up of mothers/caretakers
- Place of delivery
- Family size
- Family income
- Number of 12-23 months' children in the home
- Sex of children
- Vaccination history of the children
- Birth order of the children
- Time of travel to reach the nearest health facility

## **Data Quality Management**

The questionnaire that will be used for the study is adopted from the Ethiopian Demographic and Health Survey (EDHS) and other studies conducted in different countries on assessment of factors associated with childhood vaccination status. During data collection, every questionnaire filled by data collectors will be checked by field supervisors for their completeness on daily basis. Unfilled questions on the questionnaire will be completed by revisiting those households. Data collectors will be supposed to fill information on child vaccination history based on vaccination card (if available) and give time for mothers/caretakers to bring their cards. card. Additionally, the principal investigator will check filled questionnaire and give feedback for field supervisors every day prior to data entry.

## **Data Entry and Analysis Procedures**

Data will be entered and analyzed by Microsoft Excel, Epi info version 7.1 and Stata 12 after having encoded each data per respondent. Magnitude of childhood vaccination status will be

described by percentage and number for different independent variables. Binary logistic regression will be undertaken to determine the odds ratio for both multivariate and bivariate analysis. Bivariate analysis will be done to determine factors associated with childhood vaccination status. The findings of the study will be presented by tables and charts.

### **Ethical Clearance**

Ethical clearance of the study will be obtained from the Addis Ababa University School of Public Health Institutional Review Board. Upon approval of this project proposal, support letter will be written for respective Addis Ababa City Administration Health Bureau. Then, we will obtain support to conduct the study and participate in the study from the Region, selected Sub city and woreda. The willingness of all study participants will be asked to be a part of the study by using prepared consent form. Nobody shall be forced to participate in the study without his/her interest. The English version of participant consent form that will be translated to Amharic is annexed to this document. Oral consent will be asked from households at start of interviews. Indicate as well priorities to be made for sick babies, etc.

### **Dissemination of Findings**

The result of this study will be disseminated for Addis Ababa University School of Public Health Ethiopian Field Epidemiology Training Program, Ethiopian Public Health Institute and Addis Ababa City Administration Health Bureau. Also Sub City and woreda health offices will be the recipients of the study result. Additionally, findings of the study will be presented on different seminars, workshops and conferences held at National and International level. Similarly, training will be conducted for Regional, Sub City and Woreda health staffs to discuss on findings. Efforts will be made to publish the findings on different journals.

**Table 31. Work plan for the major activities to be conducted during the project time 1, March-April 31/2020**

Major activities	Tentative Schedule							
	March,2020				April,2020			
	Week1	Week2	Week3	Week4	Week1	Week2	Week3	Week4
Proposal submission								
Arranging administrative issues								
Data collection (field work)								
Data entry								
Data analysis and interpretation								
Writing progress report								
Writ up								
Submitting final report and dissemination of the finding								

**Table 32 Budget breakdown for research project, Yeka Sub City, Addis Ababa, 2020.**

Item descriptions	Unit description	Quantity	Unit cost	Total cost	Remark
Personnal					
Principal Investigator	Day	15days	500Birr	7500Birr	
Supervisor	Day	15days	250Birr	3750Birr	
Driver	Day	15days	200Birr	3000Birr	
Data collectors	Day	10days	150Birr	1500Birr	
Clerk	Day	10days	150Birr	1500Birr	
Sub Total			1100Birr	16,500Birr	
Training cost					
Principal Investigator	Day	3days	500Birr	1500Birr	
Supervisor	Day	3days	250Birr	750Birr	
Clerk	Day	3days	150Birr	450Birr	
Data collectors	Day	3days	150Birr	450Birr	
Sub total				3150Birr	
Travel					
Fuel cost	Liter	500liter	25Birr	12,500Birr	
Car rent (one)	Day	15Day	2000Birr	30,000Birr	
Sub Total				42,500Birr	
Logistic /supplies					
Writing pad	Piece	5	20Birr	100Birr	
Paper(A4 size)	Pak	3	200Birr	600Birr	
Blank WR CD	Piece	3	10Birr	30Birr	
Printing and photocopying	Page	6000	1Birr	6000Birr	
Pen	Piece	10	10Birr	100Birr	
Pencil	Piece	10	5Birr	50Birr	
Sharper	Piece	5	2Birr	10Birr	
Binder	Piece	5	50Birr	250Birr	
Flip chart	Piece	1	100Birr	100Birr	

Marker	Pak	1	150Birr	150Birr	
Sub Total				7390	
Total				69540	
<b>Contengency5%</b>				<b>3477</b>	
<b>Grand Total</b>				<b>73,017</b>	

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# **Chapter VIII**

## **Additional Out Put**

Week 29

Weekly Bulletin

10-16/11

/2009EFY

Prepared by:

Genet Gebre

EFETP Resident

### **Highlights of the Week 5(Jan.30 – Feb.5/2017)**

Addis Ababa Surveillance report completeness and timeliness rates for health facilities under each sub Cities were 93 %.

Completeness and timeliness for sub Cities were 91%.

Completeness and timeliness rate for hospitals were 100% and 78 % respectively.

- Seventy new MAM and SAM cases were reported in week 29 of 2017.
- From 604 malaria suspected cases 163 were confirmed. Cases were increased by 11% from the previous weeks.
- Seven Relapsing fever cases were reported in week 29. Cases were decreased by 6.3% from the previous weeks.
- Number of typhoid cases were 3354.
- Number of epidemic typhus cases were 2450.
- Fifteen measles case were reported in this week from Addis ketema, Bole, Kirkos, kolfe, Nifassilk and Yeka sub cities.

### **1. Introduction**

This Epidemiological Weekly Bulletin serves to provide key information on public health emergency management activities, and summarizes surveillance data and performance on Immediately and weekly reportable diseases reports for Regional PHEM.

The bulletin mainly includes surveillance data of week 29 of 2017. It highlights the surveillance completeness and timeliness across all Sub Cities, trends of diseases under surveillance, cluster of cases and events, ongoing outbreaks and responses undertaken at all levels in the city. The number of disease specific cases indicated in this issue of bulletin are subject to change due to on-going receiving late surveillance data and retrospective verification and investigation of data from outbreak areas.

II. Surveillance report completeness and timeliness.

### **Completeness and Timeliness**

In week 29 the aggregated surveillance report of completeness and timeliness for health facilities under each sub city were 92 % and same with previous

week. The completeness and timeliness in all sub city were above the standard value (figure 38 and 39)

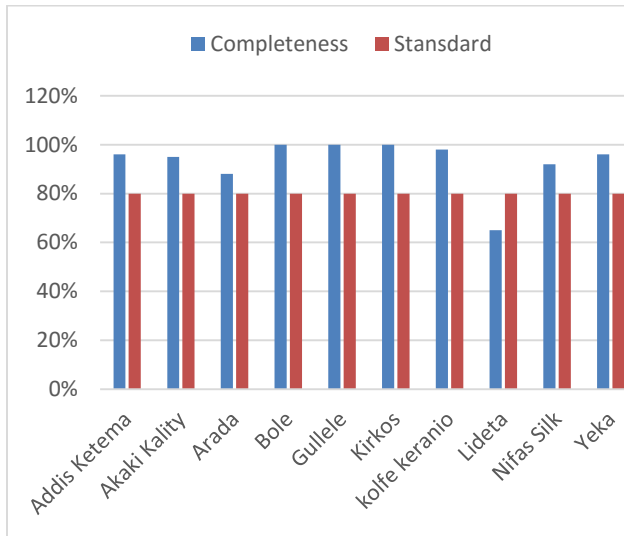


Figure 38. Completeness of week 29,2017

Timeliness shows how much the report on time. A report is said to be on time. If all the reporting units within its catchments area has submitted the reports on its pre agreed time schedule Based on this, our regional weekly report timeliness was 92% on week 29,2017 (Figure 41).

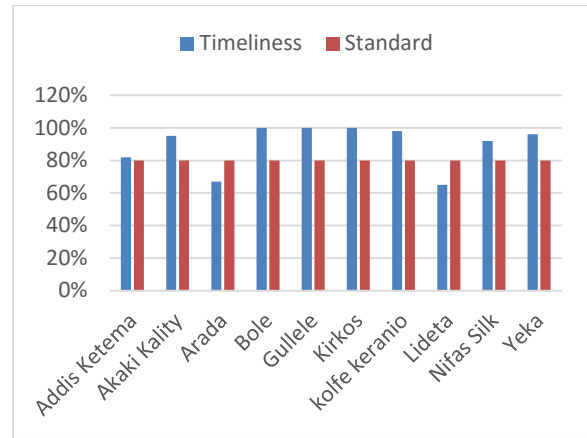


Figure 39. Timeliness of week 29,2017

### Completeness and Timeliness by hospitals:

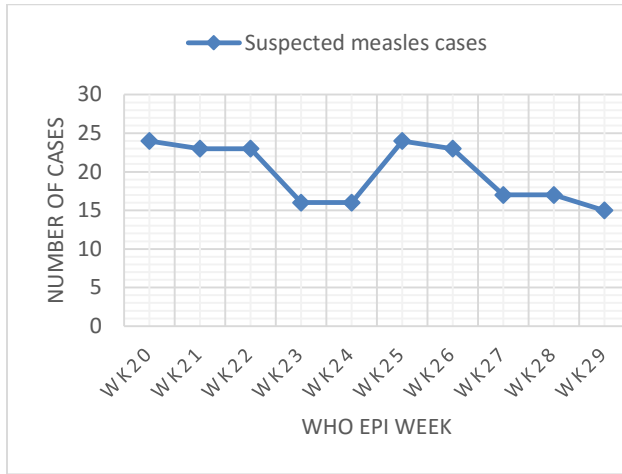
Completeness by hospitals in week 29 were 100%. The timeliness report in hospitals were 78%. All hospitals were reported their weekly surveillance data timely except Minilic and Yekatite Hospital.

### III. Diseases and conditions

#### 1. Measles

A total of Fifteen suspected measles cases were reported in WHO week 29. Cases were reported from Nifassilk, Kolfe , Bole, Kirkos, Addis ketema and Yeka Sub City in decreasing order. Measles case has decreased by two cases as compared from the previous week. The previous consecutive ten WHO weeks

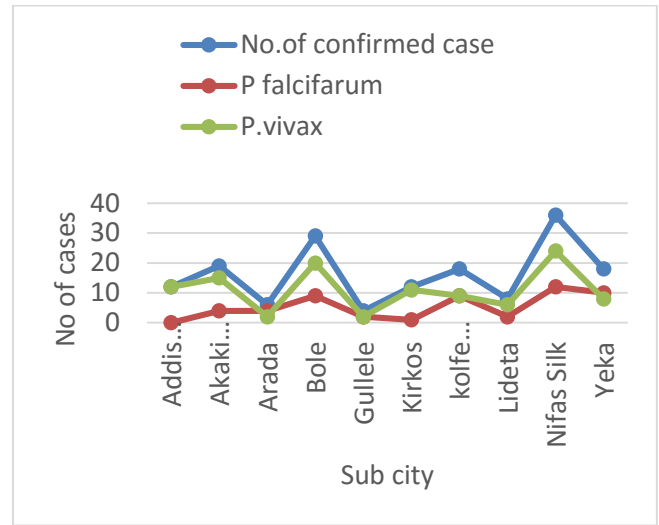
(20/2017-29/2017) suspected measles cases trend is indicated below.



**Figure 40.** Trends of suspected measles cases from week 20/2017 – 29/2017,

## 2.Malaria

The systematically collected and analyzed data from AA regional PHEM case Team of Week 29 verified that, a total of 604 suspected malaria cases was examined by RDT or microscopy and a total of 163 (clinical + parasitological confirmed) cases were reported. Week 29 malaria detection rate from total suspected fever was 163(27%). From total malaria, 27% cases were parasitological confirmed. Among confirmed cases, P. Falciparum constitutes 54(33%) while the rest 109(67%) were P. vivax. It was increased by 31.3% as compared to the previous weeks. Higher no of cases was reported from Bole and Kolfe Sub City (Figure 42).



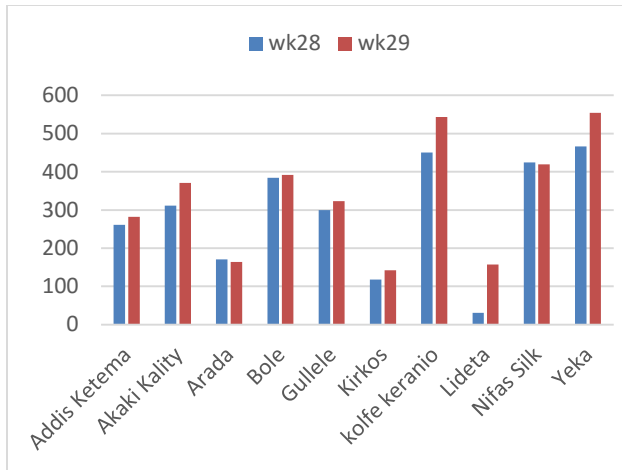
**Figure 41.** Malaria Confirmed Trend Addis Ababa, Week 29, 2017

## 3. Meningitis

In week 29, a total of 3 suspected meningitis cases were reported. Among the total cases, 3 of them were reported from Ras Desta, St. Pawlos and Alert Hospitals.

## 4. Typhoid

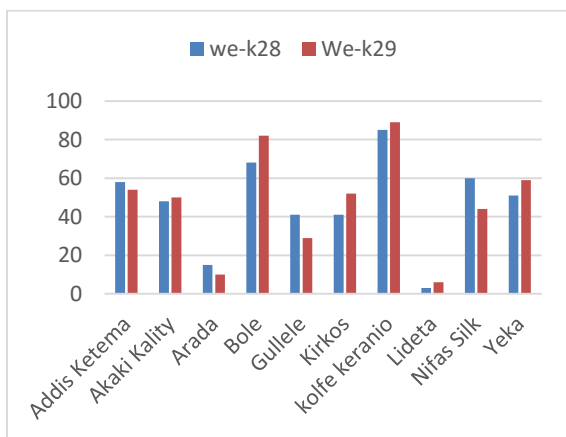
A total of 3,354 typhoid cases with no death were reported in week 29. The number of Cases were increased as compared to the previous week. Higher number of cases were reported from Yeka sub city 554, followed by kolfe keraniyo Sub City 543, and Nifas Silk 419 cases (Table 42)



**Figure 42. Typhoid fever case distribution by Sub City, Addis Ababa City Administration.**

### 5. Dysentery

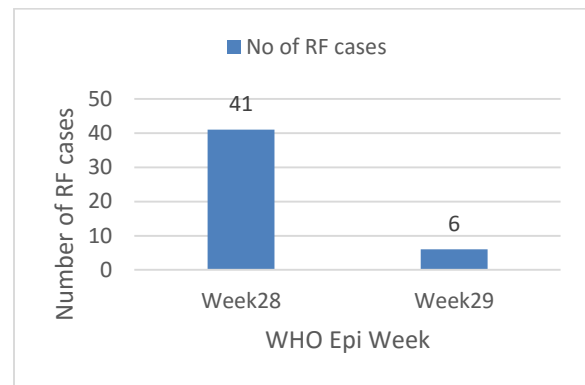
A total of 475 dysentery cases were reported during week 29. The number of Cases show some decrement compare to the previous week.



**Figure 43. Distributions of Dysentery by Sub City, wk-28 and wk-29,2017 Addis Ababa City Administration**

### 6. Relapsing fever

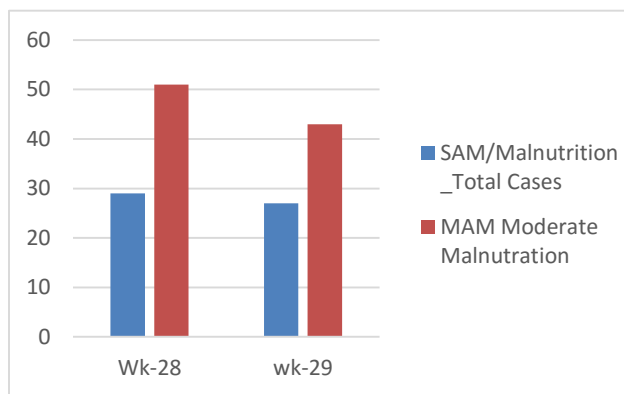
A total of 6 Relapsing fever cases were reported. The number of cases were decreased by 35 case as compared to the previous week. In year 2016 of the same epi week 7 relapsing fever cases were reported.



**Figure 44 .Trends of Relapsing fever cases in Addis Ababa, week 28 and week 29, 2017.**

### 6. Malnutrition

A total of 70 malnutrition cases were reported in this week of which 27 were SAM and 43 were MAM. Cases were decreased by 14.2% as compared to the previous week. The highest number of cases were reported from Kirkos Sub City 25 (36%) followed by Gulele Sub City, 23 (33%), Addis Ketema, 11 (15.7%) (See figure 45).



**Figure 45.** Malnutrition cases, Addis Ababa week 28 and week 29, 2017.

## 7. Maternal death

During this week two maternal death were reported from Tirunesh Beijing hospital and St. Paulos Hospital.

NNT, SARS, AWD, Anthrax, AFP, Rabies, Guinea worm, VHF, Yellow fever and other immediately reportable diseases were reported zero in week 29.

## IV. Response activities

- Strengthened active case management and routine EPI.
- Strengthened active surveillance.
- Strengthened completeness of report through providing routine feedback.

## 9 Annex:

### 9.1 Questionnaires for Case - control study on Rubella outbreak Questionnaire for Case - control study on Rubella outbreak in Woreda 2, Arada Sub City, AACCA, 2018

Hello. My name is \_\_\_\_\_ we are investigating rubella outbreak and identify risk factors associated with rubella outbreak in Woreda2 of Arada Sub City; AACCA; Ethiopia. The information we collect will help the government to plan the health services. Your household is selected for the survey. The survey usually takes about 15 to 25 minutes. We do not write your name, all of the answers you give will be confidential and will not be shared with anyone. You have to right to disagree on the survey, but we hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time.

Do you have any questions?

Are you willing to participate in the interview?

Yes

No (Thank and stop)

Name and Signature of interviewer \_\_\_\_\_

Date \_\_\_\_\_

Name and Signature of the supervisor \_\_\_\_\_

Date \_\_\_\_\_

**“Status”**

1. Case      2. Control

Patient Name/ID No \_\_\_\_\_ date of Data collection \_\_\_\_\_

Sub city \_\_\_\_\_ Woreda \_\_\_\_\_ Kebele \_\_\_\_\_ Got \_\_\_\_\_ Phone \_\_\_\_\_

Location: Longitude: \_\_\_\_\_ Latitude: \_\_\_\_\_

S. No	Questions I. Socio demographic Characteristics	Alternatives
1.1	Sex	1. Male 2. Female
1.2	Age	years _____ Months _____
1.3	Occupation of the patient/control (Circle one choice)	1. Farmer 2. House wife 3. Student 4. Unemployed 5. Daily laborer 6. Merchant 7. Gov't 8. Other (specify) _____
1.4	Family Occupation	1. Farmer 2. House wife 3. Student 4. Unemployed 5. Daily laborer 6. Merchant 7. Gov't 8. Other (specify)
1.5	Religion	1. Orthodox 2. Protestant 3. Muslim 4. Catholic 5. Other (specify) _____
1.6	Family size	_____
1.7	Educational level of the patient/control	1. Illiterate 2. Read and write 3. Elementary 4. Secondary 5. Above secondary 6. Under school age 7.KG
1.8	Educational level of the mother/care taker	1. Illiterate 2. Read and write 3. Elementary

		4. Secondary 5. Above secondary
1.9	Marital status of the patient/control	1. Single 2. Married 3. Divorced 4. Widowed 5. Separated, 6. N/A
1.10	Is there any sick person with rash, fever, running nose/conductivities (illness)? In the family?	1. Yes 2. No
1.11	If yes, number of sick person	_____
<b>II. Clinical History of Diseases</b>		
2.1	What was the symptom?	1.fever 2. <i>Rash</i> 3.cough, 4.coryza (runny nose), 5. conjunctivitis (red eyes) 7. Ear discharge 8. pneumonia 10. Vomiting 11. Others _____
2.2	Ask ONLY if complication	1) Pneumonia: <input type="checkbox"/> yes no <input type="checkbox"/> 2) Cornea: <input type="checkbox"/> yes no <input type="checkbox"/> 3) Blindness: <input type="checkbox"/> yes no <input type="checkbox"/> 4) Convolution <input type="checkbox"/> yes no <input type="checkbox"/> 5) Otitis media (ear discharge): <input type="checkbox"/> yes no <input type="checkbox"/> 6) diarrhea: <input type="checkbox"/> yes no <input type="checkbox"/> 7) Feeding problem <input type="checkbox"/> yes no <input type="checkbox"/>

2.3	Date of rash on set	____/____/____
2.4	Duration of rash_____	
	Date seen at health facility	//
2.6	Illness duration before visiting the health facility	_____ in days/hours
2.7	Did you (he/she) take treatment?	1.Yes 2.No
2.8	If yes, treatment taken	1.ORS 2.Antibiotics 3.Vitamin A 4.Supplementary food 5. TTC ointment 6.Anti Pyretics 7.Others given_____
2.9	1. Location when rash started?	District_____ Kebele_____
2.10	Did you recover after the treatment?	1.cure 2. partially 3. deteriorated/disabled 4.death
<b>III. Risk factor</b>		
3.1	Did you ever vaccinate for measles?	1.Yes 2.No 3. Unknown 4.Not applicable
3.2	If yes last vaccination date	1. Patient recall _____ dd/mm/yy 2. Vaccination card _____ dd/mm/yy 3. Don't remember
3.3	Number of vaccine doses received	1. One dose 4. Don't remember 2. Two dose 3. Three and above
3.4	Age of vaccination at first vaccinated.	_____
3.5	If not vaccinated why?	<input type="checkbox"/> lack of knowledge about vaccination, <input type="checkbox"/> absence during vaccination campaign, <input type="checkbox"/> other, specify
3.6	Did you have any travel history 7-18 days to areas with active measles cases before onset of symptoms?	1.Yes 2.No

If Yes where _____		
3.7	Did you contact with a person with measles symptoms within the last 2-3 weeks?	1.Yes 2.No
3.8	Do you have any travel history four days before and after rash onset	1.Yes 2. No If yes where _____
3.9	Do you have any contact history with someone else four days before and after rash onset	1.yes 2.No If yes with whom _____
3.10	If Yes to question 3.9 place of travel	1.School 2.Neighbor 3.Other _____
3.11	Do you know modes of transmission for measles?	1.Yes 2.No 3. If yes specify _____
3.12	Nutritional status of the cases	1.Normal 2.Moderate 3.Severely malnourished
3.13	What is the estimated area of the house?	_____
3.14	House condition?	<input type="checkbox"/> ventilated <input type="checkbox"/> not ventilated
3.15	Distance from house to HC?	<input type="checkbox"/> greater than 1 km <input type="checkbox"/> equal or less than 1 km
3.16	Where did you go first when you get ill?	1. Health Facility 2. Traditional Healers 3. Holy Water 4. Stayed at home 5. Other: (Specify) _____
3.17	How do you think people get measles?	1. Contact with a virus from ill person 2. From God 3. Bad attitude of other people 4. Other (Specify)
3.18	Do you Know measles is vaccine preventable?	1. Yes 2. No 3. Don't Know
3.19	Who do you think can be affected by measles?	1. Children of aged less than 5 years

		<ul style="list-style-type: none"> <li>2. Children of aged less than 18 years</li> <li>3. Women of any ages</li> <li>4. Any age groups of both male and women</li> <li>5. Other</li> <li>(specify): _____</li> <li>_____</li> </ul>
3.20	How do you think measles can be cured?	<ul style="list-style-type: none"> <li>1. Using modern medicine</li> <li>2. Using traditional Medicine</li> <li>3. Holly water</li> <li>4. By feeding nutritious foods</li> <li>5. Keeping the sick person indoor</li> <li>6. Other(Specify) _____</li> </ul>

## 9.2 Questionnaires for Health Profile Assessment

### Health Profile Assessment Questionnaire Checklist

#### 1. Historical aspects of the sub city

1. **sub city** Name \_\_\_\_\_
2. How & why the name given \_\_\_\_\_
3. How and when the **sub city** was formed \_\_\_\_\_
4. Any other historical aspect about the **sub city** \_\_\_\_\_

#### 2. Geography and Climate

1. **sub city** map \_\_\_\_\_
2. Location(distance) \_\_\_\_\_ Direction \_\_\_\_\_
3. Altitude \_\_\_\_\_
4. Surface Area \_\_\_\_\_ ( \_\_\_\_\_ % )
5. Town \_\_\_\_\_ rural \_\_\_\_\_ (land)

#### 2. Geographical coordinate

1. Latitude \_\_\_\_\_
2. Longitude \_\_\_\_\_
3. Annual rain fall(average) \_\_\_\_\_
4. Annual temp(average) \_\_\_\_\_
5. Climatic zones \_\_\_\_\_ ( % ) \_\_\_\_\_ ( % ) \_\_\_\_\_ ( % )

#### 3. Sub city boundaries

- a) North \_\_\_\_\_ C) South \_\_\_\_\_
- b) East \_\_\_\_\_ d) West \_\_\_\_\_

#### 4. Population and Population structures

**A. Demographic data**

- Total Population \_\_\_398192\_\_ Male\_\_\_\_\_ Female\_\_\_\_\_ sex ratio\_\_\_\_\_
- Urban Total \_\_\_\_\_ Male\_\_\_\_\_ Female\_\_\_\_\_
- Rural Total \_\_\_\_\_ Male\_\_\_\_\_ Female\_\_\_\_\_
- Population under 1yrs\_\_\_\_\_
- Population under five yrs.\_\_\_\_\_
- Population < 15 years\_\_\_\_\_
- Population >64 years\_\_\_\_\_
- Women 15\_49 years of age\_\_\_\_\_
- Total population by woreda (each woreda pop) \_\_\_\_\_
- Population enumerated by Sub city /H.E. Ws\_\_\_\_\_

**Table 33. Distribution of Population by age group and sex, Bole sub city,2008EC (2015/16)**

Woredas	Total Population	Age Group						Sex		Residency	
		<1	1_4	5-15	15-49	50-64	>64	Male	Female	Urban	Rural
<b>Total</b>											

**Table 34. Distribution of Population Pyramid, Bole sub city,2009EC (2015/16)**

Population data by age and sex								
Sex	<1	1_4	5-14	15-24	25-34	35-49	50-64	>65
Male								
Female								

**Table 35. Distribution of population by Ethnic/language and religion, Bole sub city, Addis Ababa city administration,2008EC**

Characteristics	Frequency	Percentage
<b>Ethnic/language</b>		
Oromo		
Amhara		
Tigre		
Gurage		
Others		
<b>Religion</b>		
Orthodox		
Muslim		
Protestant		
Others		
Total		

**Table 36. Distribution of Educational institution in bole sub city, Addis Ababa city administration, 2008(2015/16)**

<b>Characteristics</b>				
<b>Educational institution</b>	<b>Frequency</b>			
	<b>Gov.</b>	<b>Privet</b>	<b>NGO</b>	<b>Public</b>
K.G				
Primarily School				
Secondary				
Preparatory				
College/ University				
TVET				
School health activities: Number of schools with Water supply				
Schools with functional latrines				
Schools with HIV/other Health clubs				

### 3. Water coverage

**Table 37. Amount of water production from different sources, their distribution and per Capita consumption in 2008 E.C**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Total safe water coverage</b>		
<b>Safe water supply coverage by sub city</b>		
<b>Main source of water supply</b>		
<b>Sub city getting safe water</b>		
<b>Population getting safe water</b>		
<b>Daily water consumption per day per person</b>		

### 4. Education

**Table 38. Distribution of school enrolment by sex, Bole sub city Addis Ababa city administration , Ethiopia, 2008**

<b>School Enrolment</b>	<b>Sex</b>		<b>Percentage</b>
	<b>Male</b>	<b>Female</b>	
	<b>Frequency</b>	<b>Frequency</b>	
<b>KG</b>			
<b>1_8</b>			
<b>9_12</b>			
<b>TVT</b>			
<b>Collage/University</b>			
<b>School Age Children (target)</b>			
<b>School dropout in 6 months or year 2008</b>			

## 5. Other Facilities

**Table 39. Distribution of other facility in Bole sub city, Addis Ababa city administration, 2008EC**

Transport	Frequency	Percent
<b>Accessibility (main roads)</b>		
<b>Type of road</b>		
<b>How many kebeles have access to transportation</b>		
<b>Flow of transportation per day</b>		
<b>Telecommunication</b>		
<b>How many people have access to fixed telephone</b>		
<b>How many people have access to mobile phone (coverage )</b>		
<b>Post Office</b>		
<b>Bank</b>		
<b>Power supply</b>		
<b>How many house hold get power supply</b>		
<b>Total</b>		

## 6. Disaster situation in the sub city

2. Was there any disaster (natural or manmade) in the sub city in the last one year? \_\_\_\_\_

3. Any recent disease outbreak/other public health emergency \_\_\_\_\_

If yes cases \_\_\_\_\_ and deaths \_\_\_\_\_

## 7. Vital Statics and Health Indicators

1. Infant Mortality Rate (IMR) \_\_\_\_\_ (total <1 yr deaths this 2008yr \_\_\_\_\_)

2. Child Mortality Rate \_\_\_\_\_ (this year's total <15 yr deaths \_\_\_\_\_)

3. Crude Birth Rate \_\_\_\_\_

4. Crude Death Rate \_\_\_\_\_ (total deaths 2008 yr \_\_\_\_\_)

5. Maternal Mortality Rate \_\_\_\_\_ (2008 total maternal deaths \_\_\_\_\_)

6. Contraceptive prevalence rate \_\_\_\_\_ 50660/?

7. Contraceptive acceptance rate \_\_\_\_\_20559/?
8. ANC rate (how many of the total expected pregnancies attended 1st ANC) \_22735/?
9. ANC rate (how many of the total expected pregnancies attended 4th ANC) \_ 23089/?
10. Percentage of deliveries attended by skilled birth attendants\_\_13322\_\_\_\_\_
11. Percentage of deliveries attended by HEWs\_\_\_\_\_
12. Percentage of deliveries attended by TBA \_\_\_\_\_
13. Average family size\_\_\_\_\_

### 8. Immunization Coverage (for children and Women)

1. BCG \_18702\_\_\_\_ (\_107.6\_ %).
2. OPV0\_\_\_\_ (\_\_\_\_ %), OPV1\_13091\_\_\_\_ (\_\_\_\_ %), OPV3\_\_15889\_\_\_\_ (\_\_\_\_ %)
3. Penta1\_\_16669\_\_\_\_ (\_\_\_\_ %), penta2 \_\_\_\_\_ (\_\_\_\_ %) penta3\_16239\_\_\_\_ (\_\_\_\_ %)
4. Measles\_14428\_\_\_\_ (\_\_\_\_ %).
5. PCV-10-1\_\_16592\_\_\_\_ (\_\_\_\_%), PCV-10-3\_\_15981\_\_\_\_ (\_\_\_\_%)
6. TT2+P.W\_\_17019\_\_ (\_\_\_\_%), TT2+ N.P.W\_\_\_\_\_ (\_\_\_\_%)

### 9. Health Service

#### 2. Type and Number of Health Institution

**Table 40. Distribution of health institution, in Bole sub city, Addis Ababa City Administration, 2008EFY**

Name of facility	Government	NGO	Private	Total	Remark
<b>Hospitals</b>					
<b>Health Centers</b>					
<b>Clinics</b>					
<b>Diagnostic lab</b>					
<b>Drug store &amp;pharmacy</b>					

### 3. Health institution to pop ratio:

1. Hospital: Pop-----.
2. HC: Pop-----
3. Health service coverage-----

### 4. Type and Number of health professionals

**Table 41. Distribution of health professionals in Bole sub city, Addis Ababa city administration, 2008 EC.**

Type	No.	Remark
Specialist		
G.P		
HO		
Nurses (Deg. and Dip.)		
Mid wife (Deg. and Dip.)		
Lab. (Deg. and Dip.)		
Pharmacy (Deg. and Dip.)		
Env. Health (Deg. and Dip.)		
HEWs		
Others		
Total		

### 5. Health professional to population ratio

1. Doctor: pop. Ratio\_\_\_\_\_
2. Nurse: pop. Ratio\_\_\_\_\_
3. Mid. Wife: pop. Ratio \_\_\_\_\_
4. HEW: pop. ratio\_\_\_\_

### 12. Top causes of morbidity

**Table 42. Top ten cases of morbidity in Bole sub city, Addis Ababa city administration, 2008eEFY**

	Adult	Number %	Pediatrics/ < 5 years	Number %
1				
2				
3				
4				
5				
6				
7				
8				

9				
10				

### 13. Health budget allocation

#### Government

- a) Total budget allocated for the sub city \_\_\_\_\_
- b) Total budget allocated for health \_\_\_\_\_ (\_\_\_\_%) Found from NGO
- a) Total \_\_\_\_\_ (purpose/programs) \_\_\_\_\_

### 14. Community Health Services

1. Status of services provided by community health workers namely:
2. Responsibility of HEWs\_\_126\_\_\_\_\_
3. Others \_\_\_\_\_

### 15. Status of Primary Health Care Components – with focus on the eight PHC elements and MDG

1. MCH (Delivery, ANC, PNC) \_\_\_\_\_
2. FP(Methods)\_\_\_\_\_
3. EPI (outreach service, cold chain, vaccine: \_\_\_\_\_
4. Environmental Health & sanitation.
5. Latrine coverage\_\_\_\_\_ & utilization rate\_\_\_\_\_
6. Solid waste management\_\_\_\_\_
7. Liquid waste management \_\_\_\_\_
8. others\_\_\_\_\_
9. Health Education (what, when, where, how and who conducted health education) \_\_\_\_\_

### 16. Endemic diseases

#### A). Malaria:

1. Total malarias kebeles \_\_\_\_\_ & Pop at risk \_\_\_\_\_
2. ITNs coverage (including current dist.) \_\_\_\_\_
3. Is there IRS this year (No of kebeles) \_\_\_\_\_
4. Total cases/yr\_\_\_\_\_ deaths/yr\_\_\_\_\_, <5yr cases\_\_\_\_\_ deaths\_\_\_\_\_
5. Malaria supplies (Coartem, RDT, etc.) shortage \_\_\_\_\_
6. Other issues \_\_\_\_\_

#### B). TB/Leprosy:

1. Total TB cases\_\_\_\_\_ 946

2. PTB negative \_\_\_\_\_ 303
3. PTB positive \_\_\_ 252
4. Extra PTB \_\_\_\_\_ 460
5. TB detection rate \_\_\_\_\_
6. TB Rx completion rate \_\_17(PTB+),264 (P/Neg.) and 418(EPTB)
7. TB cure rate \_\_\_\_\_ 217()
8. TB Rx success rate \_\_\_\_\_
9. TB defaulter \_\_\_\_\_ 4(PTB+),5(P /Neg) and 7(EPTB)
10. Death on TB Rx \_\_\_\_\_ 7(PTB+), 32(P/Neg) and 27(EPTB)
11. Total TB patients screened for HIV \_\_\_\_\_ 445 males, females 380
12. Total Leprosy cases 0 \_\_\_\_\_ on Rx \_\_\_ 0 \_\_\_\_\_

**C). HIV/AIDS**

1. Total people screened for HIV (last one year) \_\_\_\_\_ 32656
2. VCT \_\_\_ 4526 \_\_\_ PITC \_\_\_ 28130 \_\_\_\_\_ PMTCT \_\_\_\_\_
3. HIV prevalence \_\_\_\_\_
4. HIV Incidence (new cases/yr) \_\_\_\_\_ 695/
5. Total PLWHA \_\_\_\_\_
6. On ART \_\_\_ 7137 on Pre-ART \_\_\_ 733
7. Other HIV prevention activities \_\_\_\_\_

**D). Nutrition**

1. Total OTP sites \_\_\_\_\_, total admissions to OTP/yr \_\_\_\_\_
2. Total SC sites, \_\_\_\_\_, Newly opened/yr \_\_\_\_\_, total admissions to SC/yr. \_\_\_\_\_
3. Is there TSF (targeted supplementary feeding) program in the sub city

**17. Essential drugs (shortage) \_\_\_\_\_**

**Schedule for work plan Conducting Health Profile Data Assessment in Bole sub city, Addis Ababa March 6-31<sup>st</sup>,2017**

**Table 43 Schedule for work plan Conducting Health Profile Assessment in Bole Sub City, Addis Ababa March 6-31<sup>st</sup>, 2017.**

<b>S/ N o</b>	<b>List of Activities</b>	<b>March 6-12</b>	<b>March 13 -19</b>	<b>March 20-26</b>	<b>May 27- 2, Aprile</b>	<b>April 3-9</b>
<b>1</b>	<b>Collect Data</b>					
<b>2</b>	<b>Process data and make preliminary interpretation</b>					
<b>3</b>	<b>Analyze data and Write report</b>					
<b>4</b>	<b>Disseminate and discuss of the analyzed data and preliminary recommendation with Health Staff, Policy makers/managers/o thers</b>					

## 9.3 Questionnaire for Surveillance System Evaluation

### QUESTIONNAIRE FOR THE HEALTH CENTER BACKGROUND:

Town/woreda \_\_\_\_\_ Health center \_\_\_\_\_ Catchment  
population \_\_\_\_\_ Respondent(s) \_\_\_\_\_  
Address: Office no \_\_\_\_\_  
Cell phone no \_\_\_\_\_ e-mail \_\_\_\_\_

#### A. Assessment of availability of Surveillance Documentation, Registers, and Forms

1. Did you have National Guide line for PHEM? Yes No Not Applicable
2. Did you have standard case definition for all country priority diseases? Yes No NA
3. Was the case definition posted? Yes No
4. Did you have case based reporting formats for out breaks? Yes No NA
5. Was there national manual for surveillance? Yes No NA
6. Was there guide line for specimen collection, handling and transportation to the next level?  
Yes No NA
7. Did you have line list for reporting outbreaks? Yes No Not Applicable
8. Who is responsible for providing you reporting formats of surveillance?
  - a. Federal Ministry of Health PHEM unit.
  - b. NGOs
  - c. Others \_\_\_\_\_
9. Have you encountered shortage of appropriate surveillance forms at any time during the last 6 months? A. Yes B. No C. Unknown

#### II. Case detection and registration

2. Within what time interval (between date of onset and reach health facility) have you detected the most recent outbreak (e. g meningitis, malaria, measles and so on)? \_\_\_\_\_
3. Is there clinical register at this facility?
  - a. yes b. no c. UnknownIf yes, observed the existence of a clinical register \_\_\_\_\_
4. Is clinical register is filling correctly? a. yes b. no c. unknown  
Observe the last month filled clinical register if correctly done \_\_\_\_\_

5. Are you using standardized case definitions for the country's priority diseases? A. yes B. No  
C. Don't know

**III. Case confirmation**

6. Are you able to collect blood /serum A. yes B. No
7. Do you have the capacity to handle blood/serum until shipment at this facility?  
A. Yes B. No C. Unknown D. Not applicable

If yes, observe presence of functional cold chain at health facility and packing materials for shipment of specimens at health facility

---

8. Can you report accurately cases from the registry into the summary report to send to higher level?  
A. Yes B. No C. don't know

Observe that the last monthly report agreed with the register for measles diseases;

A. Measles Y N U N/A

9. How many times have you sent surveillance report in the last three months?

Number of reports in the last 3 months compared to expected number

Weekly: \_\_\_\_ /12 times the number of sites

Immediately: /-- times the number of sites

**B. Data analysis, Computer skill and training assessment**

1. When are you expected to send weekly report to the sub city/Woreda PHEM unit?

Monday Tuesday Wednesday Thursday Friday Saturday Sunday

I don't know exactly

2. How is your facility communicating the Sub city/Woreda PHEM officers in case of immediately reportable diseases? By e-mail By phone By fax Regular weekly report

3. Did you analyze data of the surveillance system? Yes No

4.If Q3 is no Who is responsible for data analysis? \_\_\_\_\_

5. How the data entry and compilation is accomplished? Manual Computer other

6. Did you have computer? Yes No

7. Did you have computer skill? Yes No

8. Do you describe data by person (outbreaks, sentinel)?

a. yes b. no c. Don't know

If yes, Observe description of data by age and sex \_\_\_\_\_

9. Do you describe data by place (locality, village, work site etc)?

a. yes b. no c. don't know

If yes, Observe description of data by place \_\_\_\_\_

10. Do you describe data by time?

a. yes b. no c. don't know

If yes, Observe description of data by time \_\_\_\_\_

11. Do you perform trend analysis?

a. yes b. no c. doesn't know

yes, Observe line graph of cases by time \_\_\_\_\_

12. Did you have denominators for data analysis?  total pop  male  female  <5

13. Please indicate the frequency of your data analysis.  weekly  every two week  Monthly

quarterly  every 6 month  annually  No regular time

14. Did you notify the results of your analysis to the higher level PHEM?

15. How can reporting system be improved?

\_\_\_\_\_  
\_\_\_\_\_

16. Do you have an action threshold for any of the country priority diseases?

a) Yes b) No c) I don't know

17. *If yes*, what is it? \_\_\_\_\_ cases \_\_\_\_\_% increase \_\_\_\_\_ rate (for Measles case)

**D. Epidemic response and preparedness assessment**

1. Did you have plan for epidemic response and preparedness?  Yes  No

2. Did you have emergency stocks of drugs and supplies?  Yes  No

3. If answer for Q2 is No, how did you control epidemics? -----

4. Had you experienced shortage of drugs, vaccines and supplies last one year?  Yes  No

5. Was an epidemic management committee built in your office?  Yes  No  Not Applicable

6. Did the epidemic management committee have regularly scheduled meeting time?  Yes  No

7. Was Rapid response team (RRT) built in your office?  Yes  No  Not Applicable

8. Did the RRT have regularly scheduled meeting time during epidemics?  Yes  No

9. Did you have case management protocol for epidemic prone diseases?  Yes  No  Not Applicable

10. Did your PHEM have multi sectoral emergency preparedness and response task force?  Yes  No  Not Applicable

11. Were partners working together with your office on emergencies?  Yes  No

12. If answer for Q11 is yes, what type of supports did they give to your office?

13. Was there a budget for epidemic response?  Yes  No

14. Who had the authority to mobilize the emergency finance?  Health center head  experts  other-----

15. Had you a car assigned for emergencies (PHEM)?  Yes  No  Not applicable

16. If answer for Q15 is NO, how did you address emergencies?

**E. Outbreak investigation and case confirmation assessment**

1. Had you investigated any outbreak in 2017?  Yes  No, list if any

2. Did you have outbreak investigation check list?  Yes  No

3. If answer for Q2 is No, how did you know possible factors for the outbreak?

4. Where was laboratory confirmation of cases?  regional lab  Hospital  EPHI  HC

other-----

5. Who was responsible to investigate an outbreak?  RRT  HEWs  staffs of Health Bureau  experts organized randomly  health facility staffs  other-----

6. Had you faced any challenge in outbreak investigation, if any?  Yes  No

7. If answer for Q7 is yes, a) List the challenges -----  
 b) List the alternatives that you take to tackle the challenges -----

**F. Supervision and feedback assessment**

1. Were you supervised by higher level officers in 2017GC?  Yes  No  
 2. If answer for Q1 is yes how many times in 2017GC? -----  
 3. Had you received feedback from higher level supervisors in 2017GC?  Yes  No

**PART-TWO Is the Surveillance System Helpful?**

1. To detect outbreaks early on time to permit accurate diagnosis?  Yes  No  
 2. To estimate the magnitude of morbidity and mortality?  Yes  No  
 3. Permit assessment of the effect of prevention and control programs?  Yes  No  
 4. To estimate research intended to lead to prevention and control?  Yes  No

**Describe Each System Attributes: 1. Simplicity:**

1. Is the case definition easy for case detection by all level health professionals?  Yes  No  
 2. Does the surveillance system allow all levels of professionals to fill data?  Yes  No  
 3. Does the surveillance system help to record and report data on time?  Yes  No  
 4. How long does it take to fill the format?  <5 min  5 to 10 min  10 to15min  >15 min  
 5. How long does it take to have laboratory confirmation? -----?

**2. Flexibility**

1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty?  Yes  No  
 2. Did you think that any change in the existing procedure of case detection and reporting formats will be difficult to implement?  Yes  No, Add your explanation -----

### 3. Data quality

1. Are all reported forms Complete? Yes No
2. If answer for Q1 is No, how many unfilled spaces are in the past 6 months' report? -----
3. Percentage of unknown or blank responses to variables from the total reports of in the past 6 months report\_\_\_\_\_
4. Percent of reports which are complete that is with (no blank or unknown responses) from the total reports -----

**4. Acceptability** 1. Do you think all the reporting agents accept and well engaged to the surveillance activities? Yes No

2. If yes, how many are active participants (of the expected)? -----
3. If No, what is the reason for their poor participation in the surveillance activity? A) Lack of understanding of the relevance of the data to be collected B) No feedback / or recognition given by the higher bodies for their contribution C) Reporting formats are difficult to understand D) Report formats are time consuming E) Other: -----
4. Were all the health professionals aware about the surveillance system? Yes No

### 5. Representativeness

1. Was the surveillance system enabled to follow the health and health related events in the whole community? Yes No
2. Are all the Characteristics of the population variables included in the surveillance reporting format (like Age, sex, and vaccination status, etc...)? Yes No
3. Do you think, the populations under surveillance have good health seeking behavior for these diseases?

1. Yes 2. No

### 6. Timeliness

1. Are you reporting on time? Yes No
2. Percent of reporting sites that report on time according national standard. -----

**7. Completeness**

- 1. Are all reporting sites reporting?  Yes  No
- 2. Percent of HPs that send report of each week in 2006 EFY. -----

**8. Stability** 1. Was any new restructuring affected the procedures and activities of the surveillance?  Yes  No

- 2. Was there lack of resources that interrupt the surveillance system?  Yes  No
- 3. Was there any time /condition in which the surveillance is not fully operating?  Yes  No
- 4. If the answer for Q3 is yes, explain why? -----  
-----

**District/woreda Level Questionnaire for Surveillance System Evaluation**

**Identifiers**

Date \_\_\_/\_\_\_/\_\_\_ Region \_\_\_\_\_  
 Interviewer \_\_\_\_\_ sub city \_\_\_\_\_  
 Respondent \_\_\_\_\_ District/woreda \_\_\_\_\_

**I. Availability of national surveillance manual**

- 1. Is there a national manual for surveillance at this site?  
 A. Yes B. No C. Unknown D. Not Applicable

**I. Case confirmation**

- 2. Does the district have the capacity to transport specimens to a higher level lab?  
 A. Yes B. No C. Unknown D. Not Applicable
- 3. Does the district have guidelines for specimen collection, handling and transportation to the next level?  
 A. Yes B. No C. Unknown D. Not Applicable

**II. Data reporting**

- 4. Have you lacked forms recommended for the country at any time during the last 6 months?  
 A. Yes B. No C. Unknown D. Not Applicable
- 5. What are the reporting entities for the surveillance system?  
 A. Public health facilities B. NGO health facilities  
 C. Military health facilities D. Private health facilities E. Others \_\_\_\_\_

6. Number of reports received in the last 3 months compared to expected number

Weekly: \_\_\_\_\_/12 times the number of health facilities

Immediately: \_\_\_\_\_/----- times the number of health facilities

**On time (use national deadlines)**

7. Number of weekly reports submitted on time: \_\_\_\_/12 times the number of health facilities

8. Number of immediately reports submitted on time: \_\_\_\_\_/3 times the number of health facilities

9. How do you report to the next level?

A. Mail B. Fax C. Telephone D. Radio E. Electronic F. Other

**Strengthening reporting**

10. How can reporting be improved?

---

**III. Data analysis**

11. Do you describe data by person (case based, outbreaks, sentinel)

A. Yes B. No C. Unknown D. Not Applicable

If yes, Observe description of data by age and sex

12. Do you describe data by place? A. Yes B. No C. Unknown D. Not Applicable

If yes, Observe description of data by place (locality, village, work site etc.)

13. Do you describe data by time?

A. Yes B. No C. Unknown D. Not Applicable. If yes, Observe line graph of cases by time .

List: \_\_\_\_\_

14. Do you have an action threshold for any of the country priority diseases?

A. Yes B. No C. Unknown D. Not Applicable

If yes, what is it? \_\_\_\_\_cases \_\_\_\_\_% increase \_\_\_\_\_rate

(Ask for 2 priority diseases) \_\_\_\_\_

15. Do you have appropriate denominators A. Yes B. No C. Unknown D. Not Applicable

If yes, presence of demographic data at site (E.g. Total population, <5 yr, population by woreda, )

16. Who is responsible for data analysis? \_\_\_\_\_ .

17. How often do you analyze the collected data?

A. Daily B. Weekly C. Every 2 weeks D. Monthly E. Quarterly F. As needed.....

**IV. Outbreak investigation**

18. Number of outbreaks suspected in the past year 6 months: \_\_\_\_\_

**Obs.** Of those, number investigated (Observe reports and take copies if possible): \_\_\_\_\_

19. Has your district ever investigated an outbreak?

A. Yes B. No C. Unknown D. Not Applicable

***V. Epidemic preparedness***

20. Is your districts has plan for epidemic preparedness and response

A. Yes B. No C. Unknown D. Not Applicable

If yes, Observe a written plan of epidemic preparedness and response

22. Is your districts has emergency stocks of drugs and supplies at all times in past 1 year?

A. Yes B. No C. Unknown D. Not Applicable

If yes, Observe the stocks of drugs and supplies at time of assessment

23. Is your districts experienced a shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)

A. Yes B. No C. Unknown D. Not Applicable

24. Is there a budget line or access to funds for epidemic response?

A. Yes B. No C. Unknown D. Not Applicable

25. Is established epidemic management committee at district level?

A. Yes B. No C. Unknown D. Not Applicable

If yes. Observe minutes (or report) of meetings of epidemic management committee

26. Does the district have a rapid response team for epidemics? A. Yes B. No C. Unknown D. Not Applicable

***VI. Responses***

27. Has the district implemented prevention and control measures based on local data for at least one reportable disease or syndrome? A. Yes B. No C. Unknown D. Not Applicable

28. Is your district responded within 48 hours of notification of most recently reported outbreak?

A. yes B. No C. don't know

If yes, observe that the district responded within 48 hours of notification of most recently reported outbreak (from written reports) \_\_\_\_\_

29. What were the case fatality rates during most recent outbreak mainly for measles?

\_\_\_\_\_

Observe that the district achieved an acceptable case fatality rate for most recent outbreak (Observe from outbreak report) \_\_\_\_\_

30. Has epidemic management committee evaluated their preparedness and response activities during the past year?

a. Yes b. No c. Unknown

If yes, observe written report to confirm \_\_\_\_\_

**VII. Feedback**

31. How many feedbacks written reports has the district produced in the last year?

A. Yes B. No C. Unknown D. Not Applicable

**If yes,** Observe the presence of a written report that is regularly produced to disseminate surveillance data for health facility.

34. How many feedback bulletin or reports has the district received in the last year from zone/region? \_\_\_\_\_

Observe at least 1 report or bulletin at district from a higher level during the past year on the data they have provided \_\_\_\_\_

**VIII. Supervision**

32. How many times have you been supervised in the last 6 months? \_\_\_\_\_

**Obs.** Observed supervision report or any evidence of supervision in last 6 months

33. Is appropriate review of surveillance practices were done during supervision?

A. yes B. No c. don't know

34. The most usual reasons for not making all required supervisory visits. (Text)

Reason 1 \_\_\_\_\_

Reason 2 \_\_\_\_\_

Reason 3 \_\_\_\_\_

**IX. Training**

35. Have you been trained in disease surveillance? A. Yes B. No C. Unknown D. Not Applicable

36. Number of health personnel trained in disease surveillance

\_\_\_\_\_

37. What percent of your personnel in the district have been trained in surveillance and epidemic management? \_\_\_\_\_

**XII. Resources**

38. Is your district has enough logistics for surveillance activities?

a. Motor cycles b. Vehicles

39. Data management

a. Stationery b. Calculator c. Computer d. Printer e. Statistical package

40. Communication

a. Telephone service b. Fax c. Computers that have modems

41. **Information education and communication materials**

a. Posters b. Megaphone c. Flipcharts or Image box d. VCR and TV set e. Generator f. Screen g. Projector (Movie) h. Other:

***XIII. Surveillance co-ordination:***

42. Is there a surveillance co-ordination focal point within the district epidemic management committee?

a. yes b. no c. don't know

If yes, observe some documents \_\_\_\_\_

***XIV. Satisfaction with surveillance system***

43. Are you satisfied with the surveillance system?

A. Yes B. No C. Unknown D. Not applicable

44. *If no*, how can the surveillance systems is improved?

---

***XV. Opportunities for integration***

45. What opportunities are there for integration of surveillance activities and functions (core activities, training, supervision, guidelines, resources etc?)

---

–

**Questionnaire for Attributes and level of Usefulness:**

A. Total population under surveillance \_\_\_\_\_

B. In 2015/16, what is the incidence / Prevalence of:

Measles incidence \_\_\_\_\_ prevalence \_\_\_\_\_ Deaths \_\_\_\_\_

## **I. Level of Usefulness of the Surveillance System for these selected priority diseases**

1. Does the surveillance system help;

A. To detect outbreaks of these selected priority diseases early? Yes/ No

B. To estimate the magnitude of morbidity and mortality of these diseases, including identification of factors associated with these diseases? Yes/ No

C. Permit assessment of the effect of prevention and control programs? Yes/ No

### **Observe (confirmation):**

interventions and diseases trends analyzed \_\_\_\_\_

## **II. Description of Each System Attributes:**

### **i. Simplicity:**

1. Is the case definition of Measles easy for case detection by all level health professionals?

a. Yes b. No c. Unknown

2. What are the organizations which need to receive reports of the surveillance data?

\_\_\_\_\_

3. Do you feel that additional data collected on cases are time consuming?

a. Yes b. No c. Don't know

4. How long it takes to fill the reporting format?

a. <5 minutes b. 10-15 minutes c. >15 minutes

Overall comments of on the above points \_\_\_\_\_

### **ii. Flexibility:**

5. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty? a. Yes b. No c. Don't know

6. Do you think that any change in the existing procedure of case detection, case definition, allocating funds, report forms, and formats will make difficult to implement? a. Yes b. No c.

Don't know

Overall comments on the above points:

---

**iii. Data Quality: (Completeness of the reporting forms/and validity of the recorded data )**

7. Are the data collection formats for these priority diseases clear and easy to fill for all the data collector's/ reporting sites? a. Yes b. No

8 Percent of reports which are complete that is with (no blank or unknown responses) from the total reports -----

9. During the most recent outbreak of (measles) within how many days these outbreaks were reported to the region after the first case/index case/

---

10. Is enough information is available for control of selected diseases during outbreak?

a. yes b. No c. don't know

Comment \_\_\_\_\_

11. How long does it take to have laboratory confirmation of Measles \_\_\_\_\_

**vii. Stability:**

12. Was there lack of resources that interrupt the surveillance system? Yes/No

13. Was there any time /condition in which the surveillance is not fully operating?   Yes

No

If the answer for Q13. is yes, explain why? -----

### 3.1.1: Sub city Level Questionnaire for Surveillance System Evaluation

---

#### Identifiers

Date \_\_\_/\_\_\_/\_\_\_ Region \_\_\_\_\_ Respondent Name \_\_\_\_\_  
sub city \_\_\_\_\_ Interviewer \_\_\_\_\_

#### General

##### I. Availability of a National Surveillance Manual;

1. Is there a national manual for surveillance?

A. Yes B. No C. Unknown

If yes, describe (last update, diseases included, case definitions, surveillance and control, integrated or different for each disease):

---

##### II. Case Detection and Registration;

2. Do you have standard case definitions for all country priority diseases?

a. Yes b. No c. Unknown d. Not applicable

If yes, observe the standard case definition for those diseases \_\_\_\_\_

---

##### III. Data reporting:

3. Who is responsible for providing you reporting formats of surveillance?

A. Federal Ministry of Health PHEM unit.

B. NGOs

C. Others \_\_\_\_\_

4. Have you encountered shortage of appropriate surveillance forms at any time during the last 6 months? a. Yes b. No c. Unknown

5. What are the reporting entities for the surveillance system?

A. Public health facilities B. NGO health facilities

C. Military health facilities D. Private health facilities E. Others \_\_\_\_\_

6. Number of woredas has reported weekly and immediately report in the last 3 months compared to expected number? \_\_\_\_\_

7. Number Health centers, Hospitals, NGO health facility, Others (private) sent immediately and weekly report in the last three months? \_\_\_\_\_

Weekly: \_\_\_\_\_

Immediately: \_\_\_\_\_

8. On time (use national deadlines)

Number of woreda has sent weekly reports on time in the last 3 months:

\_\_\_\_\_

9. Was there any report of the immediately reportable diseases in the past 1 month?

a. Yes b. No

If yes, with in what time is the report received after detection of the case/ diseases?

A. Less than 1 hour B. 2-24 hour c. 1- 2 days d. 3- 7 days e. After 1 week

f. Other \_\_\_\_\_

10. How do you report to the next level?

A. Mail B. Fax C. Telephone D. Other \_\_\_\_\_

#### IV. Data analysis

11. Do you describe data by person (case based, outbreaks, and sentinel)?

a. yes b. no c. don't know

If yes, observe analyzed data by person: \_\_\_\_\_

12. Do you describe data by place?

a. yes b. No c. don't know

If yes, Observe description of data by district (tables, maps)

\_\_\_\_\_

13. Do you describe data by time?

a. yes b. no c. don't know

If yes, observe description of data by time:

\_\_\_\_\_

14. Do you perform trend analysis?

a. yes b. no c. doesn't know

If yes, observe line graph of cases by time

\_\_\_\_\_

List disease(s) for which line graph is observed -----

---

**V. Availability of defined threshold;**

15. Do you have defined threshold level for Measles?

a. yes b. No c. doesn't know

If yes, observe for some diseases \_\_\_\_\_

16. Who is responsible for the analysis of the collected data? \_\_\_\_\_

17. How often do you analyze the collected data?

a. Daily      b. Weekly    c. Every 2 weeks    d. Monthly

e. Quarterly      f. As needed

18. Have you an appropriate denominator?

a. Yes              b. No              c. don't know

If yes, observe presence of demographic data (E.g. population by woreda and hard to reach groups)

---

**VI. Outbreak Investigation**

19. Number of outbreaks suspected in the past one year: \_\_\_\_\_

20. List the diseases: \_\_\_\_\_

21. Of those suspected/detected, how many of them were investigated? \_\_\_\_\_

(Observe reports and take copies if possible) \_\_\_\_\_

22. Number and percentage of outbreaks in which risk factors were looked for: \_\_\_\_\_

23. Number and percentage of outbreaks in which findings were used for action: \_\_\_\_\_

[Observe report]

24. Number of wordas that looked for risk factors [observe in reports]

---

25. Number of wordas that used the data for action [observe in final report]

---

**VII. Epidemic preparedness (relevant for epidemic prone diseases)**

26. Is there sub city plan for epidemic preparedness and response?

a. Yes B. No c. Unknown

If yes, observe a written plan of epidemic preparedness and response

27. Has the sub city had emergency stocks of drugs, vaccines, and supplies at all times in past 1 year? A. Yes B. No C. Unknown

28. Has the sub city experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)? a. Yes b. No c. Unknown

29. Is there standard case management protocols for Measles?

A. Yes B. No C. Unknown \_\_\_\_\_

Observe the existence of a written case management protocol for at least 1 priority disease

---

**VIII. Presence of a budget line for epidemic response;**

30. Is there a budget line for epidemic response?

a. Yes b. No c. Unknown

If yes, describe total budget allocated and utilized in the past one year \_\_\_\_\_

**IX. Existence of sub city epidemic management committee;**

31. Is there established sub city epidemic management committee? A. Yes B. No C. Unknown

If yes, observe minutes (or report) of meetings of epidemic management committee

---

32. Has epidemic management committee evaluated its preparedness and response activities during the past one year? A. yes B. No C. don't know

If yes, observe written report to confirm \_\_\_\_\_

**X. Sub city rapid response team for epidemics;**

33. Does the sub city have a rapid response team for epidemic?

A. Yes B. No C. Unknown

34. Is there any notification of recently reported outbreak to which you had response within 48 hrs?

A. Yes B. No C. Unknown

If yes, observe that the sub city responded within 48 hours of notification of most recently reported outbreak (from written reports with trend and intervention)

**XI. Feedback;**

35. How many feedback bulletin or reports has the regional level produced in the last year?

\_\_\_\_\_

Observe the presence of a report or bulletin that is regularly produced to disseminate surveillance data \_\_\_\_\_

**XII. Supervision;**

36. How many supervisory visits have you made in the last 6 months compared to expect?

\_\_\_\_\_ (%)

37. If no supervision was not made during the past 6 months, please mention the reasons,

\_\_\_\_\_

**XIII. Training on surveillance activities;**

37. Did you give any onsite orientation about surveillance system for HC and Woreda PHEM focal persons?  Yes  No

38. What percent of your subordinate personnel have been trained in surveillance? \_\_\_\_\_

39. On what topics have you gave training in the last 6 months?

\_\_\_\_\_

40. What are your stakeholders those supporting you in giving training? \_\_\_\_\_

\_\_\_\_\_

41. Major challenges during and after training activities \_\_\_\_\_

\_\_\_\_\_

**XIV. Resources**

**Do you have;**

**43. Data management equipment**

Computer \_\_\_\_\_ Printer \_\_\_\_\_ Photocopier \_\_\_\_\_  
Data manager \_\_\_\_\_ Statistical package \_\_\_\_\_ Stationary \_\_\_\_\_

**44. Communications:**

Telephone service \_\_\_\_\_ Fax \_\_\_\_\_ Mobile phone \_\_\_\_\_  
Other \_\_\_\_\_

**XV. Surveillance Networking**

45. Do you have functional computerized surveillance network at this level?

A. Yes B. No C. Unknown

**XVI. Budget for surveillance**

46. Is there a budget allocated for surveillance activities from the Regional Health Bureau budget (governmental source)? A. Yes B. No C. Unknown *If yes*, what is the proportion of this budget from total allocated budget for other activities?

\_\_\_\_\_ ( %)

**47. Budget line (from donors) A. yes B. No**

48. How could surveillance be improved?

\_\_\_\_\_  
\_\_\_\_\_

**XVII. Surveillance Co-ordination**

49. Is there a focal unit for surveillance at this level?

A. Yes B. No C. Unknown

If yes, observe organogram of the sub city to confirm

\_\_\_\_\_

50. What opportunities are there for integration of surveillance activities and functions (core activities, training, supervision, guidelines, resources etc.)?

**Questionnaire for Attributes and level of Usefulness:**

A. Total population under surveillance \_\_\_\_\_

B. In 2015/16, what is the incidence / Prevalence of:

Measles incidence \_\_\_\_\_ prevalence \_\_\_\_\_ Deaths \_\_\_\_\_

**I. Level of Usefulness of the Surveillance System for these selected priority diseases**

- A. Does the surveillance system help;
- B. To detect outbreaks of these selected priority diseases early? Yes/ No
- C. To estimate the magnitude of morbidity and mortality of these diseases, including identification of factors associated with these diseases? Yes/ No
- D. Permit assessment of the effect of prevention and control programs? Yes/ No

**Observe (confirmation):**

interventions and diseases trends analyzed \_\_\_\_\_

**II. Description of Each System Attributes:**

**I. Simplicity:**

1. Is the case definition of Measles easy for case detection by all level health professionals? a. Yes b. No c. Unknown

2. What are the organizations which need to receive reports of the surveillance data?  
\_\_\_\_\_

3. Do you feel that additional data collected on cases are time consuming?

a. Yes b. No c. Don't know

4. How long it takes to fill the reporting format?

a. <5 minutes b. 10-15 minutes c. >15 minutes

Overall comments of on the above points \_\_\_\_\_  
\_\_\_\_\_

**ii. Flexibility:**

1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty? a. Yes b. No c. Don't know

2. Do you think that any change in the existing procedure of case detection, case definition, allocating funds, report forms, and formats will make difficult to implement?

a. Yes b. No c. Don't know

Overall comments on the above points:

---

**iii. Data Quality: (Completeness of the reporting forms/and validity of the recorded data)**

1. Are the data collection formats for these priority diseases clear and easy to fill for all the data collector's/ reporting sites? a. Yes b. No

2. Have you ever gave training for data collectors on data quality management?

A. yes B. No. C. don't know

3. Are the reporting site and data collectors supervised regularly? a. Yes b. No

4. **Observe:** Review the last month report of selected diseases

A. Average number of *unknown or blank responses* to variables in each of the reported forms

---

B. Percent of reports which are complete (that is with no blank or unknown responses) from the total reports \_\_\_\_\_

Comment \_\_\_\_\_

2. During the most recent outbreak of (measles) within how many days these outbreaks were reported to the region after the first case/index case/

---

3. Is enough information is available for control of selected diseases during outbreak?

a. yes b. no c. doesn't know

Comment \_\_\_\_\_

4. How long does it take to have laboratory confirmation of Measles \_\_\_\_\_

**vii. Stability:**

1. Was there lack of resources that interrupt the surveillance system? Yes/No

2. Was there any time /condition in which the surveillance is not fully operating?   Yes

No

If the answer for Q2 is yes, explain why? -----

-----

-----

## 9.4 Questionnaires for Epidemiological Research Project

Addis Ababa University; School of Public Health, Department of EFETP

**The Questionnaire was prepared for Assessment Factors Affecting Fully Immunization Status of Children Aged 12- 23 Yeka Sub City, Addis Ababa City Administration,**

### 1. Consent Form

How are you doing? My name is \_\_\_\_\_. I am working in \_\_\_\_\_. We want to conduct study on assessment of magnitude and factors affecting childhood vaccination status in your district. The aim of this study are to describe magnitude of childhood vaccination status and factors associated with vaccine utilization. I will ask you about you and your children those age 12-24 months vaccination status. The interview may take 30 minutes. By having participate in the study, there is no any influence on you and health services that you are gaining. However, your responses will help to improve health care services mainly immunization program. You are not obligated to participate in the study and you can quit from the interview whenever you need. Additionally, you can skip some questions if you don't want to answer it. By considering these, would you volunteer to participate in the study and respond to the following questions? Yes \_\_\_\_ No \_\_\_\_\_

### Formed Consent

I have been briefly told about the study and I understood the objectives of the study. So that, I agreed to participate in the study and approve by signature below.

Signature \_\_\_\_\_. Date \_\_\_\_\_.

Signature of the Interviewer \_\_\_\_\_. Date \_\_\_\_\_.

Signature of The supervisor \_\_\_\_\_. Date \_\_\_\_\_.

Characters	Responses
<b>I. Socio-economic demography of caretaker and identifying information of children</b>	
<p>1. Name of the child/ren</p> <p><b>N.B.</b> In the case of polygamy or more than one mothers/caretakers with 12-24 months age child in selected household, please randomly select one mothers/caretakers and ask history for her/his children</p>	<p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>If more, state below;</p> <p>_____</p> <p>_____</p>
<p>2. Sex of children</p>	<p>1. Male/Female</p> <p>2. Male/Female</p> <p>3. Male/Female</p>
<p>3. Birth Date of Children (E.C)</p>	<p>1. ____//__//____ ( D/ M/ Y)</p> <p>2. ____//__//____ ( D/ M/ Y)</p> <p>3. ____//__//____ ( D/ M/ Y)</p> <p>4. Don't Know</p>
<p>4. Birth Order of the Children</p>	<p>1. 1st, 2nd, 3rd (if other, specify _____)</p> <p>2. 1st, 2nd, 3rd (if other, specify _____)</p> <p>3. 1st, 2nd, 3rd (if other, specify _____)</p>
<p>5. Who is Primary caretaker for children?</p>	<p>A. Mother</p> <p>B. Father</p> <p>C. Relative</p> <p>D. If other, specify _____</p>
<p>6. Age of the Primary caretaker</p>	<p>1. ____ years</p> <p>2. Don't know</p>

7. Religion of the primary caretaker	1.Muslim 2.Orthodox 3.Protestant 4.Catholic 5.Other _____
8. Occupation of the primary caretaker	1.Howse wife 2.Student 3.Merchent 4.Daily laborer 5.Gov. 6.If other, Sspecify _____
9. Educational status of the primary caretaker	1. Illiterate 2. Read and Write 3. Primary 4. Secondary and Above 5. If other, specify _____
10. Family monthly income	_____

## II. Child Immunization

<b>1. Is there vaccination card or family folder?</b>	1. Yes/No 2. Don't know			
1.1. <b>If yes</b> , may I see?	1. Yes, I have seen 2. Yes, but I haven't seen 3. No Card			
1.2. <b>If no</b> , did you ever received a card?	1. Yes 2. No 3. Don't know			
<b>2. Fill the following vaccination history based on data recorded on the card or family planning (ONLY from card or family folder)</b>	Date of Immunization (E.C) Day/Month/Year			
	<b>Child 1</b>	<b>Child 2</b>	<b>Child 3</b>	<b>Child 4</b>
1. Date of Birth as recorded	_____ /____/____	_____ -/-/____	_____ -/-/____	

2. BCG	- /___	-/-/___	-/-/___	-/-/___
3. Polio at Birth	- /___	-/-/___	-/-/___	-/-/___
4. OPV 1	- /___	-/-/___	-/-/___	-/-/___
5. OPV 2	- /___	-/-/___	-/-/___	-/-/___
6. OPV 3	- /___	-/-/___	-/-/___	-/-/___
7. Penta 1	- /___	-/-/___	-/-/___	
8. Penta 2	- /___	-/-/___	-/-/___	
9. Penta 3	- /___	-/-/___	-/-/___	
10. PCV 1	- /___	-/-/___	-/-/___	
11. PCV 2	- /___	-/-/___	-/-/___	
12. PCV 3	- /___	-/-/___	-/-/___	
13. Rota Virus 1	- /___	-/-/___	-/-/___	
14. Rota Virus 2	- /___	-/-/___	-/-/___	
15. Vitamin A	- /___	-/-/___	-/-/___	
<b>3. Number of doses received by the child those did not recorded (during routine Immunization or Campaign)</b>	<b>Child 1</b> BCG___ Penta __ PCV___	<b>Child 2</b> BCG___ Penta __ PCV___	<b>Child 3</b> BCG___ Penta __ PCV___	

		Rota__ Meas.__ Vit. A__	Rota__ Meas.__ Vit. A__	Rota__ Meas.__ Vit. A__	
<b>4. Record number of doses and date for those children who did not have CARD (based on caretaker recall). Tell the caretaker site of injection and others remembering issues for each antigen.</b>		Record <b>2</b> , if child did not take the vaccine; Record <b>3</b> , if caretaker did not know whether the child take vaccine or not in each row.			
		<b>Child 1</b>	<b>Child 1</b>	<b>Child 1</b>	
<b>1. BCG</b>	Date received	__/__/__	__/__/__	__/__/__	
<b>2. OPV</b>	# of doses	_____	_____	_____	
	Date (1st dose)	__/__/__	__/__/__	__/__/__	
	Date (Last dose)	__/__/__	__/__/__	__/__/__	
<b>3. Penta</b>	# of doses	_____	_____	_____	
	Date (1st dose)	__/__/__	__/__/__	__/__/__	
	Date (Last dose)	__/__/__	__/__/__	__/__/__	
<b>4. PCV</b>	# of doses	_____	_____	_____	
	Date (1st dose)	__/__/__	__/__/__	__/__/__	
	Date (Last dose)	__/__/__	__/__/__	__/__/__	
<b>5. Rota Virus</b>	# of doses	_____	_____	_____	
	Date (1st dose)	__/__/__	__/__/__	__/__/__	
	Date (Last dose)	__/__/__	__/__/__	__/__/__	
<b>6. Measles</b>	# of doses	_____	_____	_____	
	Date (1st dose)	__/__/__	__/__/__	__/__/__	
	Date (Last dose)	__/__/__	__/__/__	__/__/__	
<b>7. Vitamin A</b>	# of doses	_____	_____	_____	
	Date (1st dose)	__/__/__	__/__/__	__/__/__	

	Date (Last dose)	___/___/___	___/___/___	___/___/___	
5. Where did the child received his/her last routine immunization	<b>Child 1</b>	<b>Child 2</b>	<b>Child 3</b>		
	1. Health center 2. Hospital 3. Privet clinic 4. Outrech 5. Other 6. Dont know	1. Health center 2. Hospital 3. Privet clinic 4. Outrech 5. Other	1. Health center 2. Hospital 3. Privet clinic 4. Outrech 5. Other		
<b>II. The following questions refer to your experience getting immunization services for this child during the past two years</b>					
1. Have you ever been at health facility for any purpose rather than vaccination?		1. Yes 2. No 3. Don't know			
2. How long time will take to the nearest health facility?		1. Less than 10 minutes 2. 10-30 minutes 3. 31-50 minutes 4. More than 50 minutes 5. Don't know			
3. Sometimes vaccinations are given for children when they go to health facility for other purposes rather than vaccination. Have your children ever vaccinated in this situation so far?		1. Yes 2. No 3. Don't know			
3.1. <b>If yes</b> , how many of your children vaccinated?		_____			
4. Have you ever decided <b>NOT</b> to take your children to get vaccination?		1. Yes 2. No 3. Don't know			
4.1. If yes, why did you not to take the child to vaccination?  (Circle all responses)		A. Child ill B. Not Important C. Too busy D. NO one to take child E. Did not know where to take child F. Did not know when to take child G. Fear side effect H. Place too far			

	<ul style="list-style-type: none"> <li>I. Time of visit was inconvenient</li> <li>J. Other</li> <li>K. Don't know</li> </ul>
5. Were there any child you taken to a health facility for vaccination but not vaccinated then?	<ul style="list-style-type: none"> <li>1. Yes</li> <li>2. No</li> <li>3. Don't remember</li> </ul>
5.1.If yes, why was the child not vaccinated? (Circle all responses)	<ul style="list-style-type: none"> <li>A. No vaccine</li> <li>B. No vaccinator (not closed)</li> <li>C. Health Facility closed when I went</li> <li>D. Vaccinator refused to vaccinate child</li> <li>E. Vaccinator refused because not able to (e.g. too busy, NOT no vaccine)</li> <li>F. The visit was not in the vaccination day</li> <li>G. The caretaker refused the vaccination</li> <li>H. Others (Specify) _____</li> <li>I. Do not know</li> </ul>
5.2.Have you ever refused vaccination for this child?	<ul style="list-style-type: none"> <li>1. Yes</li> <li>2. No</li> <li>3. Don't remember</li> </ul>
<b>5.2.1. If you refused then, why?</b> (Circle all responses)	<ul style="list-style-type: none"> <li>1. Too many shots at visit</li> <li>2. Child ill</li> <li>3. Wait too long, so left</li> <li>4. Other, specify _____</li> <li>5. Don't know</li> </ul>
<b>V. Now I want to ask you about what and where you have heard about vaccination.</b>	
1. From where have ever heard message about vaccination? (Circle all responses)	<ul style="list-style-type: none"> <li>A. Community members</li> <li>B. Health workers</li> <li>C. Health workers at home visit</li> <li>D. Radio</li> <li>E. TV</li> <li>F. Newspaper</li> <li>G. Kebele administrator</li> <li>H. Other, specify</li> <li>I. I don't remember</li> </ul>
2. What messages have you heard about immunizations? (Circle all responses)	<ul style="list-style-type: none"> <li>A. About campaigns (date, target group)</li> <li><b>About Routine EPI</b></li> <li>B. Importance of routine vaccination</li> <li>C. Where to get routine vaccination</li> </ul>

	<p>D. Age to get vaccination</p> <p>E. Return date to get the next doses of vaccination</p> <p>F. About new vaccines (Pneumococcal/Rota virus)</p> <p>G. Others, specify _____</p> <p>H. Don't know</p>
<p><b>VI. Now I wanted to ask you some questions about what you do with your child if they are sick (or if they have been sick, on your experience)</b></p>	
<p>1. When your child is seeking, where would you take the child?</p> <p>(Circle all responses)</p>	<p>A. Health facility</p> <p>B. Holly water</p> <p>C. Traditional healer</p> <p>D. Prayer place</p> <p>E. Other, specify _____</p> <p>F. Don't know</p>
<p>2. Usually, where do you prefer more to take your child when they sick?</p>	<p>A. Health facility</p> <p>B. Holly water</p> <p>C. Traditional healer</p> <p>D. Prayer place</p> <p>E. Other, specify _____</p> <p>F. Don't know</p>
<p><b>VII. Some information on maternal health offered</b></p>	
<p>1. Do you ever see anyone for pregnancy care during your pregnancy?</p>	<p>1. Yes</p> <p>2. No</p> <p>3. I don't remember</p>
<p>1.1.If yes, whom do you seen?</p> <p>(Circle all responses)</p>	<p>1. Doctor</p> <p>2. Health Officer</p> <p>3. Nurse/Midwife</p> <p>4. Health Extension Worker</p> <p>5. Traditional Birth Attendant</p> <p>6. Community Health Worker</p> <p>7. Other, specify _____</p> <p>8. Don't Remember</p>

<p>2. Were you offered tetanus tetanus vaccination during the visit? (injection in the left upper arm)</p>	<p>1. Yes 2. Not 3. I don't remember</p>
<p>3. Where did you deliver your last child?</p>	<p>A. Home B. Relative/Neighbor's home C. Health Post D. Health Centre (Gov.) E. Hospital (Gov.) F. Private or NGO Facility G. Other, specify</p>
<p>4. Who attend the delivery of your last child?  (Circle all responses)</p>	<p>A. Doctor B. Health Officer C. Nurse D. Midwife E. Health Extension Worker F. Traditional Attendant G. Community Health Worker H. Relative/Friend I. Other, specify _____ J. Don't Remember</p>