Journal of the Nigerian Association of Mathematical Physics
Volume27, (*July, 2014*), pp215 – 226

A Time Series Analysis on Infant Killer Diseases: A Case Study of Anambra State University Teaching Hospital

NWOSU C. A.

Department of Statistics, Anambra State University Uli, Nigeria

Abstract

The study investigated on the four(4) out of the six(6) infant killer diseases, Malaria, measles, Poliomylitis and tuberculosis between the year 2003-2012, which attack infant after their birth in the communities, thereby resulting to their untimely death. The least square method of the time series has been applied to analyse the prevalence rate of the killer diseases, the trend value of the disease and the highest rate prevalence and seasonal index of each disease. From the analysis the following models were obtained for the four(4) killer diseases: Malaria - Y = 319.75 - 9.142t, Measles - Y_t = 1.525 - 0.0397t, Poliomylitis - Ý = 1.525 - 0.0397t and tuberculosis - Ý = 24.725 - 0.06921 The result obtained from these models indicated a tremendous decrease of these infant killer diseases as the year increases due to the national programme on immunization(NPI) mounted by the Federal Ministry of Health, for the control and management of the disease. We sincerely hope that some of these diseases will be completely wiped out of the programme on immunization continues the way it is going.

Keywords: Malaria, Measles, Poliomylitis, Tuberculosis, Least Square Method, Time series.

1.0 Introduction

Every culture has healthcare system both for health care of adult and infants/children, and is coined in socio-cultural practices. The most vulnerable population for illness/diseases in infant/children.

The infant killer diseases are diseases that attack infant after their birth in the communities, thereby resulting or causing untimely death of the infant. It has been estimated that the mortality rate of children below five years of age in Nigeria hovers between 97 to 120 per thousand births [1, 2]. Many families lost their children to anyone of the childhood killer disease, thus dashing the hopes of parents on such children. The effects of such loses often involve social, economic and political implications on the home. To prevent the rate of such infant mortality, parents embark on many practices ranging from the consultation of herbalists to appeasing of aggrieved gods, demons and devils believed to be the cause of the unfortunate occurrences [3]. This situation poses a health challenge to the Federal Government of Nigeria who looked and sourced for a way of reducing this rate to the barest minimum. As a way of preventing the loss of children through these killer diseases, the world heath organization (WHO) [4] launched a health scheme tagged the "Expanded Programme on Immunization (EPI)." The EPI is a UNICEF/WHO scheme designed to expand the accessibility of immunization services to an increased number of children within the age range of 0-2 years. The programme is aimed at combating the six(6) common disease of childhood namely malaria, measles, poliomylitis, tuberculosis, tetanus, whooping cough and diphtheria. It also aimed at educating individuals and mobilizing governments to adopt health policies that will protect children and mothers. Through the EPI, children who are within the first two years of life are immunized against the six childhood disease. Similarly pregnant women are vaccinated against tetanus in an effort to, at least, ameliorate., if not eradicate, infant mortality resulting from childhood diseases.

Corresponding author: Nwosu C. A.E-mail:vikkycee@yahoo.com Tel.: +2348134214959

Following the initiation of the EPI (Now NPI) by WHO [5 – 7], Nigeria launched her own chapter of NPI (National Programme on Immunization) in 1979, and revised in 1984. The objective of the programme in Nigeria was to achieve 60% of the target population by 1990. Many states and local governments then opened designated centres for NPI, where these vaccines can be accessed and administered. The vaccines work by building up the child defences. The present study therefore was to find the prevalence rate of the killer diseases, the trend values and seasonal indices of each disease.

2.0 Data Collection and Presentation

The data was sourced from the paediatrics record of Anambra State University Teaching Hospital Awka from the year 2003-2013. The information on the data covered the prevalence of the four(4) killer diseases, malaria, measles, poliomylitis and tuberculosis.

Table 1: Shows the Prevalence of the four(4) killer Diseases from2003-2012.

YEAR	MALARIA	MEASLES	POLIOMYLITIS	TUBERCULOSIS
2003	1763	44	6	113
2004	2157	25	12	148
2005	1729	20	8	144
2006	1617	16	8	79
2007	1068	13	4	65
2008	1048	10	7	67
2009	1185	9	5	51
2010	882	9	3	62
2011	703	8	5	16
2012	638	6	3	144
TOTAL	12756	160	61	989

3.0 Methodology

The time series has four(4) components; The trend, seasonal variation, cyclic variation and irregular variation or random fluctuation. Each of these components can be determined and its contribution in the series evaluated with a mathematical tool.

(i) **The Trend:** This is the smooth upward and downward movement of the time series. And this can be estimated using the least square method. This method is used in fitting line in a time series. The equation is given by

$Y_t = a + bt$ (1)

Y_t = the estimated trend values for a given time period *(t)*

a = intercept which is the value for a given time period *(t)*

b = slope or gradient of the trend line. Change in $Y_t$per unit of time

The parameters a, and b are estimated as follows

$$a = \frac{\sum Y}{n} - \frac{b\sum t}{n} = \bar{Y} - b\bar{t} \qquad or \quad a = \frac{\sum Y}{n} \tag{2}$$

$$b = \frac{n\sum ty - \sum Y \cdot \sum t}{n\sum t^2 - (\sum t)^2} \quad or \quad b = \frac{\sum ty}{\sum t^2} \tag{3}$$

(ii) **Seasonal Variation:** This is the influence of season on the time series data. It is the periodic movement or change in time series which can occur regularly in a year. The seasonal variation can be measured by the percentage to average method, which is a widely used technique in measure variations resulting from seasonal variation.

$$\text{Seasonal Variation} = \frac{Y_t}{\text{Trend}} \times 100 \tag{4}$$

Where Y_t is the original data from the table.

(iii) **Cyclic Variation:** The circle variation is a long time oscillation or circle of the time series. These period may or may not be periodic in nature and extend beyond one year. Movement are said to be cyclic only if they occur after time interval of more than one year.

(iv) **Irregular Variation:** These are the random movement of the time series that is completely unpredictable in nature. Under the multiplicative model, the time series can be denoted as

$Y_t = T \times S \times C \times I$ (5)

Where Y=Original value, T=the trend, S = seasonal variation, C — Cyclic variation, I — Irregular variation.

When the model is an additive model, it is denoted by

$Y = T + S + C + I$ (6)

4.0Application

We estimate the seasonal variations for the four (4) infant killer diseases: malaria, measles, poliomylitis, and tuberculosis (see Appendix A). From equations (2) and (3) the trend values of the prevalence model for the infant killer diseases are determined: From the equation:

$\acute{Y}t = a + bt$

We obtain for

MALARIA

a =319.75, b=-9.412

$\acute{Y}_t = 319.75 - 9.412t$ (7)

MEASLES

a= 4, b= -0.2016

$\acute{Y}_t = 4 - 0.2016t$ (8)

POLIOMYLITIS

a =1.525, b=-0.0397

$\acute{Y}_t = 1.525 - 0.0397t$ (9)

TUBERCULOSIS

a = 24.725, b=-0.0692

$\acute{Y}_t = 24.725 - 0.0692t$ (10)

See Appendix B for the calculation of the trend model. Using equation (4) we can critically examine the months that has the highest rate of prevalence of each disease, using the percentage to mean method (See Appendix C).

5.0 Results

The results obtained from the seasonal index indicated that malaria has the highest prevalence value of mean =124.13, in July, measles has its highest prevalence-value of mean =196.02 in the month of May; poliomylitis has the highest prevalence value of mean =177.96 in April and tuberculosis, with prevalence of 155.79 in the month of March.

6.0 Conclusion

The findings indicated that malaria has the highest prevalence and decreases as a result of the programme on immunization. We also observe that each diseasehas a particular period of the month they are at their peak. Suffice to say that the trend of these diseases depend on the season of the year. The National programme on Immunization (EPI) has contributed immensely in the reduction of the killer diseases since the establishment of the programme in 1977 (National Programme on Immunization Act 1977). The objective and function of the programme is to effectively control, through immunization and the provision of vaccines, for the occurrence of the following deadly diseases i.e, (a) tuberculosis, (b) poliomylitis, (c) Diphtheria, (d) whooping cough, (e) tetanus, (f) measles [8, 9, 10]. Currently Immunization is carried out in fixed faculties, particularly primary health care centres in each ward in the localities with adjuncts from frequent outreaches/outdoor sessions done on certain days, either on a national level, state, or local government level. This is done to increase coverage of the immunization programme. Vaccines are stored via the cold chain storage and reverse cold chain for unused vaccines, and this is done at each local government level, up to state and finally the national government. However, the private sector too plays a role, though largely in conjunction with local government area in which it is situated.

APPENDIX A.

ESTIMATION OF SEASONAL VARIATION FOR MALARIA 2003-2012

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
JAN	219	207	132	180	99	120	116	160	33	70
FEE	77	93	100	121	60	90	150	110	77	26
MAR	90	102	107	92	104	33	117	16	126	15
APR	150	146	136	138	59	50	77	59	59	223
MAY	172	145	133	127	120	121	90	79	16	123
JUN	136	153	153	173	90	70	100	94	101	37
JULY	202	281	200	159	74	118	118	73	99	45
AUG	190	220	221	273	86	88	122	51	70	60
SEPT	132	262	181	162	102	85	117	32	99	[5]
OCT	190	220	147	69	115	122	97	99	14	30
NOV	127	181	117	100	90	109	42	60	7	4
DEC	78	147	102	73	69 '	42	39	49	2	0
TOTAL	**1763**	**2157**	**1729**	**1617**	**1068**	**1048**	**1185**	**882**	**703**	**638**

ESTIMATION OF SEASONAL VARIATION FOR MEASLES 2003-2012

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
JAN	8	2	i	0	0	1	0	1	1	0
FEB	10	4	2	2	1	0	1	1	0	0
MAR	4	2	4	2	2	1	1	0	0	1
APR	2	6	2	1	1	1	0	3	1	0
MAY	7	4	5	1	0	0	4	1	1	2
JUNE	[1]	0	1	0	0	0	0	0	1	0
JUL	5	0	0	0	*1*	0	0	0	1	1
AUG	0	2	0	1	0	I	0	2	0	1
SEPT	3	3	2	7	0	0	1	0	2	0
OCT	1	1	1	0	6	0	1	0	1	1
NOV	2	1	1	1	1	5	0	1	0	0
DEC	1	0	1	1	1	1	1	0	0	0
TOTAL	**44**	**25**	**20**	**16**	**13**	**10**	**9**	**1**	**8**	**6**

ESTIMATION OF SEASONAL VARIATION FOR POLIOMYLITIS 2003-2012

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
JAN	1	1	1	1	1	0	0	0	0	0
FEB	0	3	2	1	1	0	1	0	1	0
MAR	1	1	1	2	0	1	0	0	0	0
APR	1	1	0	0	0	0	1	1	1	1
MAY	0	0	1	1	0	2	1	0	0	1
JUN	0	0	0	0	1	1	0	0	0	0
JULY	0	0	0	0	1	0	0	0	0	0
AUG	0	1	0	0	0	0	0	0	1	0
SEPT	0	1	0	0	0	1	0	0	1	0
OCT	1	0	1	1	0	1	1	1	1	0
NOV	1	0	1	1	0	0	1	0	0	1
DEC	1	2	1	1	0	1	0	1	0	0
TOTAL	**6**	**12**	**8**	**8**	**4**	**7**	**5**	**3**	**5**	**3**

ESTIMATION OF SEASONAL VARIATION FOR TUBERCULOSIS 2003-2012

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
JAN	2	24	9	12	10	9	7	5	0	12
FEB	19	18	12	0	14	7	5	4	16	18
MAR	8	0	17	13	20	4	6	6	26	21
APR	10	16	11	0	8	0	8	3	21	10
MAY	14	9	4	6	2	0	4	7	18	0
JUN	0	5	1	10	1	5	9	7	4	0
JUL	0	0	2	9	3	7	3	3	15	3
AUG	2	19	21	14	1	3	5	4	18	9
SEP	13	14	16	7	4	3	0	7	8	11
OCT	5	6	3	0	0	15	2	8	15	14
NOV	17	23	8	5	1	0	1	6	15	7
DEC	23	14	10	3	1	14	1	2	20	9
TOTAL	**113**	**148**	**114**	**79**	**65**	**67**	**51**	**62**	**176**	**114**

APPENDIX B

THE LEAST SQUARE METHOD (TREND VALUE FOR MALARIA)

YEAR	MONTH QTR	t	*Y* (NO OF CASES)	t^2	*ty*	TRENDVALUE *(Y,)*
2003	1	-20	386	400	-7720	507.99
	2	-19	458	361	-8702	498.58
	3	-18	524	324	-9432	489.17
	4	-17	395	289	-6715	479.75
2004	1	-16	402	256	-6432	470.34
	2	-15	444	225	-6660	460.93
	3	-14	763	196	-10682	451.52
	4	-13	458	169	-7124	442.11
2005	1	-12	339	144	-4068	432.69
	2	-11	422	121	-4642	423.28
	3	-10	602	100	-6020	413.87
	4	-9	336	81	-3294	404.46
. . .	. . .	. . .	. . .	. . .	. . .	. . .
2010	1	9	286	81	2574	235.04
	2	10	232	100	2320	225.63
	3	11	156	121	1716	216.22
	4	12	208	144	2496	206.81
2011	1	13	236	169	3068	197.39
	2	14	176	196	2464	187.98
	3	15	268	225	4020	178.57
	4	16	23	256	368	169.16
2012	1	17	111	289	1887	159.75
	2	18	383	324	6894	150.33
	3	19	110	361	2090	140.92
	4	20	34	400	680	131.51
TOTAL		0	12790	5740	-54025	12790

$b = \frac{\Sigma ty}{\Sigma t^2} = \frac{-54025}{5740} = -9.4120$; $a = \frac{\Sigma Y}{n} = \frac{12790}{40} = 319.75$

$\acute{y}_t = a + bt$; $\acute{y}_t = 319.75 - 9.4120t$

THE LEAST SQUARE METHOD (TREND VALUE FOR MEASLES PREVALENCE)

YEAR	MONTH QTR	t	*Y* (NOOF CASES)	t^2	*ty*	TRENDVALUE *(Y,)*
2003	1	-20	22	400	-440	8.30
	2	-19	10	361	-190	7.83
	3	-18	8	324	-144	7.63
	4	-17	4	289	-68	7.43
2004	1	-16	8	256	-128	7.23
	2	-15	10	225	-150	7.02
	3	-14	5	196	-70	6.82
	4	-13	2	169	-26	6.64
2005	1	-12	7	144	-84	6.42
	2	-11	8	121	-88	6.22
	3	-10	2 .	100	-20	6.02
	4	-9	3	81	-27	5.81
. . .	. . .	. . .	. . .	. . .	. . .	. .
2010	1	9	2	81	18	2.19
	2	10	4	100	40	1.98
	3	11	2	121	22	1.78
	4	12	1	144	12	1.58
2011	1	13	1	169	13	1.38
	2	14	3	196	42	1.18
	3	15	3	225	45	0.98
	4	16	1	256	16	0.77
2012	1	17	1	289	17	0.57
	2	18	2	324	36	0.37
	3	19	2	361	38	0.17
	4	20	1	400	20	-0.03
TOTAL		0	160	5740	-1157	160

$b = \frac{\Sigma ty}{\Sigma t^2} = \frac{-1157}{5740} = -0.2016$; $a = \frac{\Sigma Y}{n} = \frac{160}{40} = 4$

$$\acute{y}_t = a + bt; \quad \acute{y}_t = 4 - 0.2016t$$

THE LEAST SQUARE METHOD (TREND VALUE FOR POLIOMYLITIS)

YEAR	MONTH QTR	t	*Y* (NOOF CASES)	t^2	*ty*	TRENDVALUE *(Y,)*
2003	1	-20	2	400	-40	2.32
	2	-19	1	361	-19	2.28
	3	-18	0	324	0	2.24
	4	-17	3	289	-51	2.20
2004	1	-16	5	256	-80	2.16
	2	-15	3	225	-45	2.12
	3	-14	2	196	-28	2.08
	4	-13	2	169	-26	2.04
2005	1	-12	4	144	-48	2.00
	2	-11	1	121	-11	1.96
	3	-10	0	100	0	1.92
	4	-9				
. . .	. . .	. . .	. . .	. . .	. . .	. . .
2010	1	9	0	81	0	1.17
	2	10	1	100	10	1.13
	3	11	0	121	0	1.09
	4	12	2	144	24	1.05
2011	1	13	1	169	13	1.01
	2	14	1	196	14	0.97
	3	15	2	225	30	0.93
	4	16	1	256	16	0.89
2012	1	17	0	289	0	0.85
	2	18	2	324	36	0.81
	3	19	0	361	0	0.77
	4	20	1	400	20	0.73
TOTAL		0	61	5740	-228	61

$b = \frac{\Sigma ty}{\Sigma t^2} = \frac{-228}{5740} = -0.03972$; $a = \frac{\Sigma Y}{n} = \frac{61}{40} = 1.525$

$\acute{y}_t = a + bt$; $\acute{y}_t = 1.525 - 0.03972t$

THE LEAST SQUARE METHOD (TREND VALUE FOR TUBERCULOSIS PREVALENCE)

YEAR	MONTH QTR	t	*Y* (NOOF CASES)	t^2	*ty*	TRENDVALUE *(Y,)*
2003	1	-20	29	400	-580	26.11
	2	-19	24	361	-456	26.04
	3	-18	15	324	-270	25.97 1
	4	-17	45	289	-765	25.90
2004	1	-16	42	256	-672	25.83
	2	-15	30	225	-450	25.76
	3	-14	33	196	-462	25.69
	4	-13	43	169	-559	25.62
2005	1	-12	38	144	-456	25.55
	2	-11	16	121	-176	25.49
	3	-10	39 '	100	-390	25.42
	4	-9	21	81	-189	25.35
. . .	. . .	. . .	. . .	. . .	. . .	. . .
2010	1	9	15	81	135	24.10
	2	10	17	100	170	24.03
	3	11	14	121	154	23.96
	4	12	16	144	192	23.89
2011	1	13	42	169	546	23.82
	2	14	43	196	602	23.76
	3	15	41	225	615	23.69
	4	16	50	256	800	23.62
2012	1	17	51	289	867	23.55
	2	18	10	324	180	23.48
	3	19	23	361	437	23.41
	4	20	30	400	600	23.34
TOTAL		0	989	57400	-397	988.98

$b = \frac{\Sigma ty}{\Sigma t^2} = \frac{-397}{5740} = -0.0691$; $a = \frac{\Sigma Y}{n} = \frac{989}{40} = 24.725$

$$\acute{y}_t = a + bt; \quad \acute{y}_t = 24.725 - 0.0691t$$

APPENDIX C
AVERAGE PERCENTAGE METHOD FOR MALARIA
(AVERAGE TO MEAN METHOD)

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	TOTAL	MEAN	STD
JAN	149.06	115.16	91.61	96.47	111.24	137.40	117.47	217.69	56.33	131.66	1224.09	122.41	40.36
FEB	52.41	51.74	69.40	89.80	67.42	103.05	151.90	149.66	131.44	48.90	915.72	91.57	38.41
MAR	61.26	56.75	74.26	68.27	116.85	37.79	118.49	21.77	215.08	28.21	798.72	79.87	54.77
APR	102.10	81.22	94.39	102.41	66.29	57.25	77.97	80.27	100.71	419.43	1182.04	118.20	101.47
MAY	117.07	80.67	92.31	94.25	134.83	138.55	91.14	107.48	27.31	231.35	1114.96	111.49	49.81
JUN	92.57	85.12	106.19	128.39	101.12	80.15	101.27	127.89	172.40	69.59	1064.6	106.47	28.36
JUL	137.49	156.33	138.81	117.99	83.15	135.12	119.49	99.32	168.99	84.64	1241.33	124.13	27.35
AUG	129.32	122.39	153.38	202.60	96.63	100.76	123.54	69.39	119.49	112.85	1230.40	123.04	33.88
SEP	89.85	145.60	125.62	120.22	114.61	97.33	118.48	43.54	168.99	9.40	1033.60	103.36	44.56
OCT	129.32	122.39	102.02	51.21	121.21	139.70	98.23	134.69	23.89	56.43	987.10	98.71	38.80
NOV	86.44	100.69	81.20	74.21	101.12	124.80	42.50	81.60	11.95	7.52	712.10	71.21	36.71
DEC	53.09	81.78	70.79	54.17	77.52	48.09	39.99	66.67	3.41	0.00	495.02	49.50	26.99
												1200	

AVERAGE PERCENTAGE METHOD MEASLES

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	TOTAL	MEAN	STD
JAN	218.16	96.00	57.14	0.00	0.00	120.05	0.00	133.33	149.93	0.00	774.60	77.46	73.99
FEB	272.70	192.00	144.29	150.04	92.34	0.00	133.33	133.33	0.00	0.00	1088.03	108.80	85.15
MAR	109.08	96.00	228.57	150.04	187.64	120.05	133.33	0.00	0.00	200.00	1221.74	122.17	72.73
APR	54.54	288.00	114.29	75.02	92.34	120.05	0.00	400.00	149.93	0.00	1294.17	129.42	119.39
MAY	190.89	192.00	285.71	75.02	0.00	0.00	533.33	133.33	149.93	400.00	1960.21	196.02	161.56
JUN	27.27	0.00	57.14	0.00	0.00	0.00	0.00	0.00	149.33	0.00	234.34	23.43	45.82
JUL	136.35	0.00	0.00	0.00	92.54	0.00	0.00	0.00	149.33	200.00	578.62	57.86	74.71
AUG	0.00	96.00	0.00	75.02	0.00	120.05	0.00	26.67	0.00	200.00	757.70	75.71	91.08
SEP	81.81	144.00	114.28	525.10	0.00	0.00	133.33	0.00	299.85	0.00	1289.00	129.80	199.80
OCT	27.27	48.00	57.14	0.00	554.00	0.00	133.33	0.00	149.95	200.00	1169.70	116.97	160.20
NOV	54.54	48.00	57.14	75.02	92.34	600.24	0.00	133.33	0.00	0.00	1060.60	106.10	169.80
DEC	27.27	0.00	57.14	75.02	92.34	120.05	133.30	0.00	0.00	0.00	505.20	50.52	49.80

APPENDIX C

AVERAGE PERCENTAGE METHOD FOR POLIQMYLITIS

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	TOTAL	MEAN	STD
JAN	200.00	100.00	149.93	149.93	0.00	0.00	0.00	0.00	0.00	0.00	900.16	90.02	102.03
FEB	0.00	300.00	299.80	149.90	300.30	0.00	239.80	0.00	239.80	0.00	1529.70	152.97	131.75
MAR	200.00	100.00	149.93	299.80	0.00	171.50	0.00	0.00	0.00	0.00	921.30	92.13	103.41
APR	200.00	300.00	0.00	0.00	0.00	0.00	239.80	400.00	239.80	400.00	1779.60	177.96	157.60
MAY	0.00	0.00	149.93	149.93	0.00	343.10	239.80	0.00	0.00	400.00	1282.70	128.30	146.80
JUN	0.00	0.00	0.00	0.00	300.30	171.50	0.00	0.00	0.00	0.00	471.83	47.20	98.70
JUL	0.00	0.00	0.00	0.00	300.30	0.00	0.00	0.00	0.00	0.00	300.30	30.03	90.09
AUG	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	239.80	0.00	339.80	33.98	74.81
SEP	0.00	100.00	0.00	0.00	0.00	171.50	0.00	0.00	239.80	0.00	511.34	51.13	84.13
OCT	200.00	0.00	149.93	149.93	0.00	171.50	239.80	400.00	239.80	0.00	155.10	15.51	121.99
NOV	200.00	0.00	149.93	149.93	0.00	0.00	239.80	0.00	0.00	400.00	1139.70	113.70	131.40
DEC	200.00	200.00	149.92	149.93	0.00	171.50	0.00	400.00	0.00	0.00	1271.40	127.14	123.60
												1200	

AVERAGE PERCENTAGE METHOD TUBERCULOSIS

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	TOTA	MEAN	STD
JAN	21.24	194.60	94.74	182.30	184.60	161.20	164.50	96.80	0.00	126.30	1226.70	122.70	65.28
FEB	201.76	145.95	126.32	0.00	258.50	125.40	117.70	77.40	109.10	189.50	1351.50	135.20	67.40
MAR	84.95	0.00	178.95	197.50	369.20	71.70	141.20	162.12	177.30	121.10	1557.90	155.80	95.20
APR	106.20	129.70	115.80	0.00	147.80	0.00	188.24	58.06	143.18	105.26	994.10	99.41	59.06
MAY	148.70	72.97	42.11	91.14	36.92	0.00	94.12	135.50	122.7	0.00	774.10	77.41	50.80
JUN	0.00	40.54	10.53	151.90	18.50	89.60	211.80	135.50	27.30	0.00	685.50	68.55	70.80
JUL	0.00	0.00	21.10	136.7	55.40	125.4	20.60	58.10	102.30	31.60	601.03	60.10	46.50
AUG	21.24	154.10	221.10	212.70	18.50	53.70	117.70	77.40	122.70	94.70	1093.70	109.40	67.64
SEP	138.10	113.50	168.40	106.30	73.80	53.70	0.00	135.05	54.50	115.80	959.70	95.97	47.50
OCT	53.10	48.70	31.60	0.00	0.00	268.70	47.10	154.80	102.30	147.40	853.50	85.40	79.90
NOV	180.50	186.50	84.20	75.95	18.50	0.00	23.50	168.12	102.30	73.70	861.20	86.12	60.30
DEC	244.20	113.50	105.30	45.50	18.50	250.80	23.50	38.70	136.40	94.70	1071.20	107.12	79.90

7.0 References

[1.] Unicef Immunization: The global Vaccine Action Plane 2011 – 2020.

[2.] W.H.O. (World Health Organization 2001): Global Tuberculosis control: Geneva.

[3.] Jegede A. S. (1998): African Culture and Health, Stirling –Horden Pub. Ibadan ,pp 126.

[4.] World Health Organization (W.H.O. 1977): Essential Medicines and Health Product Information Portal.

[5.] W.H.O. African Region (1983): Expanded Programme on Immunization: A Case study in the Administration of the Expanded Programme in Immunization in Nigeria. Journal of Tropical Paediatrics vol. 29 pp 217 – 219.

[6.] Anita-Obong O. E, Young M. V, Effiong C. E. (1993); Neonatal Tetanus Prevalencebefore and subsequent to Implementation of the ExpandedProgramme on Immunization. Annals of Tropical Paediatrics, volume 13,P7-12.

[7.] Babaniyi O., Parakoyi B, (1991), Cluster Survey for Poliomylitis and Neonatal Tetanus in Ilorin Nigeria, International Journal of Epidemology. Volume 20(2), P. 201-515.

[8.] Bell L. M, Pritchard M, Anderko R, Levenson R, (1997); A program toImmunize Hospitalized Pre-school aged children, Evaluation and impact paediatrics, Volume 1000, P. 192-196.

[9.] Elmore-Meegan M, Controy R. M., Ole Lengecy S, Renhault K, NyangoleJ (2001); Effect on Neonatal Tetanus mortality after a culturally BasedHealth Promotion Programme. American Journal of Hygiene, volume 358, P. 41-640.

[10.] Tugumisrize F., Twinwine J. K., Mworeizi E. A. (2002); Missed opportunities and caretaker constraints to childhood vaccination in a rural area inUganda; East African Medical Journal, volume 79, P. 347-354.

[11.] Black F. L. (1976); Measles in viral Infection of Humans: Epidemiology and control, 1st Ed., A. S. Evans, New York.

[12.] Maronna R. A. and Yohavi V. J. (1994); Robust Statistics, Theory andMethods. John Wiley and sons Ltd, West Sussex.