

# A Comparative and Comprehensive Analysis of Perinatal and Neonatal Death Using Repeated Measurement:

## A Malaysia Case Study

Wan Muhamad Amir W Ahmad<sup>1</sup>, Nor Azlida Aleng<sup>2</sup>, Nurfadhlina Halim<sup>3</sup>,  
Mustafa Mamat<sup>4</sup>, Mohd Pouzi Hamzah<sup>5</sup>, Adam Baharum<sup>6</sup> and Zalila Ali<sup>7</sup>

<sup>1,2,3,5</sup> School of Informatics and Applied Mathematics,  
Universiti Malaysia Terengganu (UMT), 21030 Terengganu, Malaysia

<sup>4</sup>Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin (UNISZA),  
21300 Terengganu, Malaysia

<sup>6,7</sup> School of Mathematics Sciences, Universiti Sains Malaysia (USM)  
11800 Minden, Pulau Pinang, Malaysia

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### Abstract

The case of perinatal and neonatal death is becoming a serious case. The incident of neonatal and perinatal death has increased dramatically in the last decade. Increasing case of neonatal and perinatal death had worried to the most of pregnant women all over the world. A large numbers of children die soon after the mother gives birth (during the first four weeks) which is better known as neonatal death or during pregnancy time (death of a fetus). A repeated measure analysis was conducted on two different types of data in order to determine the significance different level between of these two groups. Data collection consist of the 13 states in Malaysia and classified into two groups. Group one is the number of neonatal death case since 2001 till 2011 and Group Two is the number of perinatal death case since 2001 till 2011. In this study, we compared all the possible the gained results from perinatal death and neonatal death and come out with some suggestion and conclusion. Results for the neonatal death Female ( $F(3.174, 51.997) = 4.177, p < 0.05$ ) and male ( $F(3.176, 44.462) = 5.440, p < 0.05$ ) shows that there are significant difference because it's less than the criteri on value of  $\alpha = 0.05$ . The mean case of male neonatal death in years can be summarize as follows : year 2001 ( $70.53 \pm 43.00$ ), year 2002 ( $68.13 \pm 41.48$ ), year 2003 ( $58.20 \pm 40.15$ ), year 2004 ( $68.66 \pm 47.50$ ), year 2005 ( $68.93 \pm 43.07$ ), year 2006 ( $67.66 \pm 38.75$ ), year 2007 ( $64.93 \pm 39.14$ ), year 2008 ( $74.33 \pm 48.87$ ), year 2009 ( $83.06 \pm 55.03$ ), year 2010 ( $81.00 \pm 52.85$ ) and year 2011 ( $79.13$

$\pm 47.85$ ). The mean case of female neonatal death in years can be summarize as follows : year 2001 ( $53.87 \pm 34.47$ ), year 2002( $54.93 \pm 32.06$ ), year 2003( $44.46 \pm 30.27$ ), year 2004( $49.2667 \pm 33.42896$ ), year 2005( $51.80 \pm 34.37$ ), year 2006( $48.200 \pm 30.40$ ), year 2007( $53.60 \pm 34.03$ ), year 2008( $53.80 \pm 35.19$ ), year 2009( $59.93 \pm 36.94$ ), year 2010( $58.66 \pm 36.19$ ) and year 2011( $59.2000 \pm 42.52$ ). Results for the perinatal death (  $F(2.597, 36.351) = 2.547, p > 0.05$  ) and male (  $F(1.972, 27.605) = 1.065, p > 0.05$  ) shows that there are no significant difference from the 2001 to 2011. Finding shows that there was a significant difference between male and female in neonatal death in years while and for the perinatal death there is no significant different between male and female.

## Introduction

### *World Scenario of Infant Mortality*

Global, Yu (2003) found that the perinatal mortality rate (PMR) is 53 out of 1000 births and neonatal mortality rate (NMR) is 36 out of 1000 births. According to the previous studies, there are 7.5 million of perinatal deaths and 5.1 million of neonatal deaths each year. From the records, two-third of neonatal death (nearly 3.4 million) was in the early of neonatal deaths. This case was recorded in the first week of life. Overall, there are 141million births per year worldwide. The vast majority of births (127 million or 90%) occur in developing countries and only 10% of births (14 million) occur in developed countries. According to Yu (2003) in his journal title "Global, Regional and National Perinatal and Neonatal Mortality", he stressed that about 5 million deaths or 98% of total deaths in the world occurred in developing countries, while only 0.1 million deaths, or 2% of the total deaths in the world occurred in developed countries. Asia is the highest birth rates in five regions of the world. 76 million annual recorded representing 54% of total births in the world (22% African, 9% Central and South America, 6% European, and 3% in North America.

Table 1. PMR and NMR in five regions in the world

World Regions	Annual Birth	PMR (out of 1000)	NMR (out of 1000)
Asia	76 Million	53	41
Africa	31 Million	75	42
Central and South America	12 Million	39	25
Europe	8 Million	13	8
North America	4 Million	9	6

Sources: Yu (2003). Perinatal Mortality Rate (PMR) and Neonatal Mortality Rate (NMR)

According to Yu (2003) and Canadian (2008) South Asia has the highest PMR and NMR compared to the five regions in Asia. Table 2 give the summarize the Perinatal Mortality Rate (PMR) and Neonatal Mortality Rate (NMR). NMR in South Asia has the highest death rate in Asia region, it is about 51 out of 1000 birth.

Table 2. PMR and NMR in five sub region in Asia

World Regions	Annual Birth	PMR (out of 1000)	NMR (out of 1000)
South Asia	38 Million	66	51
East Asia	24 Million	41	32
Southeast Asia	13 Million	37	28
West Asia	0.5 Million	44	27
Oceania	0.5 Million	44	24

Sources: Yu (2003). Perinatal Mortality Rate (PMR) and Neonatal Mortality Rate (NMR)

### **Malaysian Scenario of Infant Mortality**

A study conducted by Rosnah (2008) showed that perinatal mortality rate has increased since 1980. According to her, the stillbirths contributed high mortality rate during this period. It is contributed rate nearly two-third of the whole death. Haslina et al.,(2013) conducted a retrospective cross-sectional study using hospital data on perinatal mortality and monthly census delivery statistics. Their aim to describe the trend of stillbirth and neonatal deaths in University Kebangsaan Malaysia Medical Centre from 2004 to 2010. They noted in their article on stillbirths and neonatal deaths is a very important health indicators. They also were focused on how to improve children's mortality among children less than 5 years between 1990 and 2015. To get a clear view and a better understanding of the current scenario, the annual report for the government and private hospital were analyzed and present by the Family Health Department. There are 45,277 births with 526 stillbirths and neonatal death were reported. The detailed data are also given by department Obstretik and Gynecology which is include number of birth by ethnicity, gestational age, birth weight collected from monthly census and many more.

The number of births reported by the Universiti Kebangsaan Malaysia Medical Centre (PPUKM) from 2004 to 2010 is 45 There were 45 live births, 453 deaths and 241 deaths neonatal. Still birth recorded as 168 (32.1%). According to the report, neonatal deaths were registered 170(32.3%) early neonatal deaths and 71(13.5%) for the late neonatal mortality. Bujang et al., (2012) in his study prove the rate of infant mortality in the neonatal period has increased about 10% since 1990 to 40% in 2010. From the record, the infant mortality rate in the world is between 2 and 136 per thousand population. The lowest rate mortality was recorded in Singapore, and the highest was in Afghanistan. A study participated by 108 countries reported that the median infant mortality rate is 33 per 1000 population. Thus, the infant mortality rate in Malaysia can be considered among the lowest among developing countries. According to the Ministry of Health Malaysia (2009), the number of death was a very useful indicator in measuring the health status among population. In the last 41 years (1968-2009), the death rate per 1,000 people has dropped to 4.5 compared to 7.2 in 1968. The trends in Infant Mortality (IM) and Neonatal Mortality Rate (NMR) in Malaysia is shown in Table 3. From the Table 3, we can see that the infant deaths per 1,000 live births has improved from 41.4 in 1969 to 6.5 in 2009.

Table 3. Infant Mortality Rate and Neonatal Mortality Rate

	1969	1979	1989	1999	2008	2009
IM	41.4	25.1	13.4	9.3	6.4	6.5
NMR	21.8	14.9	8.6	5.5	4.0	N/A

Source: Report of the Ministry of Health (2009)

According to the report of the Ministry of Health, the trend of the neonatal mortality rate per 1,000 live births also decreased 21.8 during the same period in 1969. Based on Table 4, the perinatal mortality rate per 1,000 births rose to 7.4 in 2008 from 6.8 in 2003. For the case of stillbirth rate also increased from boiling 4.2 per 1,000 live births in 2003 to 4.6 in 2006, then dropped to 4.2 in 2009.

Table 4. The Mortality Rate in the Year 2003 to 2007

Indicator	2003	2004	2005	2006	2007	2008	2009
Crude Death Rate (per 1,000 population )	4.5	4.5	4.5	4.5	4.5	4.7	4.5
Neonatal Mortality Rate (per 1,000 live births)	3.2	3.7	3.9	3.7	3.9	4.0	N/A
Stillbirth Rate (per 1,000 live births)	4.2	4.2	4.4	4.6	4.5	4.4	4.2
Perinatal Mortality Rate (per 1,000 live births)	6.8	6.8	7.2	7.3	7.3	7.4	N/A

### 2.2.3 Infant Mortality Factors

A study was conducted and related to the air pollution, inflammation and premature birth Mexico. Results from the repeated measure analysis indicate that premature birth is one of the global health problems that might be affected by air pollution and cause death perinatal. The study involved 800 pregnant women living in Mexico City for a sample. Data collection was taken at 3 to 4 weeks of during pregnancy. In this analysis, at each of the treatment, they also assessed the activity patterns of pregnant women and their exposure to air pollution. The results obtained, premature birth is a global problem that might be affected by exposure to air pollution. therefore, the existence of this inflammation causes of perinatal death (O'Neill et al., 2013; Armstrong, 2009; Mohamad Adam et al., 2012). Weeks (2008) and Bujang et al., 2012 have implemented a test of antepartum among the pregnant women before the stillbirth. He also stated in his article that women who have experienced with the stillbirth, will most likely be exposed to the risk of perinatal mortality in subsequent pregnancies. The case was proven by a study that was conducted by the British and the U.S. population in the 20th century. A study conducted by the U.S. National Institute of Neurological Diseases and Stroke, found that patients with a previous stillbirth mortality rate of 73 per 1000 in subsequent pregnancies. This study compares women who had stillbirths and women who had never experienced the stillbirth of the white and black races has increased by 57% in the next pregnancy complications. Table 5 shows that almost two-fold increase in mortality rates between blacks dead and the whites. In pregnancy the stillbirth, women among the blacks have high risk of dying seven times greater than the national average.

Table 5. Stillbirth Rates by Race and Past History of Stillbirth

	History of Stillbirth	No History of Stillbirth
Black	35.9	7.6
White	19.1	4.2
Overall	22.7	4.7

Sources: Week (2008)

In addition, Warren et al., (2005) have found that more than 130 million babies born each year worldwide, it was found that there were 3.6 million babies die before reaching the age of one month. For all neonatal deaths, an estimated one million is attributed to the birth of this stillbirth. Death was attributed to maternal mortality health care, environmental conditions at birth, when the content of prenatal care and management needs before and after childbirth. The high mortality in the record at the beginning 24 hours after birth. It is also supported by Yu (2003) that states about 50% of the deaths occurred within three days

## Material and Methods

### Statistical Analysis

The data were analyzed with SAS software through the repeated measure analysis. In this study we used simple repeated measures design. In this methods, the treatment effects for subject  $j$  are measured relatively to the average response of subject  $j$  across a treatments (Amir et al., 2008). The simple repeated measure design can be summarized as:

Subject( $j$ )	Treatments ( $i$ )				Totals
	Year 2001	Year 2002	...	Year 2011	
Perlis	$y_{11}$	$y_{21}$	...	$y_{a1}$	$y_{.1}$
Kedah	$y_{12}$	$y_{22}$	...	$y_{a2}$	$y_{.2}$
Penang	$y_{13}$	$y_{23}$	...	$y_{a3}$	$y_{.3}$
⋮	⋮	⋮	...	⋮	⋮
Sarawak	$y_{1n}$	$y_{2n}$	...	$y_{an}$	$y_{.n}$
Totals	$y_{1.}$	$y_{2.}$	...	$y_{a.}$	$y_{..}$

with

$1 = \text{Perlis}$ ,  $2 = \text{Kedah}$ ,  $3 = \text{Pulau Pinang}$ ,  $4 = \text{Perak}$ ,  $5 = \text{Selangor}$ ,  $6 = \text{W.P.K.Lumpur}$   
 $7 = \text{Negeri Sembilan}$ ,  $8 = \text{Melaka}$ ,  $9 = \text{Johor}$ ,  $10 = \text{Pahang}$ ,  $11 = \text{Terengganu}$ ,  $12 = \text{Kelantan}$   
 $13 = \text{Sabah}$ ,  $14 = \text{W.P. Labuan}$  and  $15 = \text{Sarawak}$

The model for the single repeated measure design is give as follows:

$$y_{ij} = \mu + \tau_i + \beta_j + \varepsilon_{ij}$$

with

$\mu$  is the baseline mean

$\tau_i$  is the  $i^{\text{th}}$  treatment effect

$\beta_j$  is the  $j^{\text{th}}$  effect with  $\beta_j \sim (0, \sigma_\beta^2)$

$\varepsilon_{ij}$  is the random error with  $\varepsilon \sim (0, \sigma^2)$

The hypothesis is given by

$$H_0 = \tau_{2001} = \tau_{2002} = \dots = \tau_{2011} \text{ vs } H_0 = \tau_i \neq \tau_j \text{ for some } i \neq j$$

Table 6. ANOVA table

Sources of variation	Sum of squares	Degrees of freedom	Mean Square (variance)	F
Between Years	$SS_{\text{between}}$ $= a \sum_{j=1}^n (\bar{y}_{.j} - \bar{y}_{..})^2$	$n - 1$	$s_B^2 = \frac{a \sum_{j=1}^n (\bar{y}_{.j} - \bar{y}_{..})^2}{n - 1}$	$F = s_B^2 / s_W^2$
Within subject	$SS_{\text{within}}$ $= \sum_{j=1}^n \sum_{i=1}^a (\bar{y}_{ij} - \bar{y}_{.j})^2$	$n(a - 1)$	$s_w^2 = \frac{\sum_{j=1}^n \sum_{i=1}^a (\bar{y}_{ij} - \bar{y}_{.j})^2}{n(a - 1)}$	
Total	$SS_{\text{total}}$ $= \sum_{i=1}^a \sum_{j=1}^n (y_{ij} - \bar{y}_{..})^2$	$an - 1$		

(Sources : Kutner et al., 2005; Uda et al., 2008; Chua, 2008)

### Study Area

This research was conducted in Universiti Malaysia Terengganu (UMT).

### Study population

This study involves a number of death which was reported with Ministry of Health Malaysia from 2001 till 2011 (Indicators for Monitoring and Evaluation of Strategy for Health for All).

### Sample size calculation

The sample sizes required at analysis stage are as follows.

Input:	Effect size f	= 0.4
	$\alpha$ err prob	= 0.05
	Power (1- $\beta$ err prob)	= 0.8
	Number of groups	= 3
	Numerator df	= 10

Output:

Actual Power	= 0.8
Alpha	= 0.05
R-square of Full Model	= 0.1379
Total sample size	= 111

Form the calculation, the minimum sample size that we need is 111 subjects, and he calculation for the separated group is  $111/3 = 10$  per group. According to Lwanga and Lemeshow, [7]. In this case the response rate is estimated at only 75%, then add another 25%

for data collection stage. So, we get  $n = 10 + (0.25 \times 10) = 12.5 \approx 13$  samples of at least 13 observation are required at the analysis stage. For this analysis, we used 15 observations per group.

Table 7. Trend Analysis of Neonatal Death By State And Gender (Female) of The Year 2001-2011

State	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Perlis	6	14	3	4	6	11	9	9	4	13	11
Kedah	89	71	72	69	73	54	86	72	87	75	67
Pulau Pinang	40	48	38	46	40	35	33	26	42	40	42
Perak	66	75	47	64	53	56	72	52	74	68	64
Selangor	114	122	114	132	125	118	126	142	150	147	182
W.P.K.Lumpur	62	52	35	30	28	31	45	42	36	36	41
Negeri Sembilan	32	31	36	24	32	28	23	26	39	34	30
Melaka	34	33	27	34	24	24	33	42	33	25	32
Johor	117	106	96	94	108	98	96	102	92	96	101
Pahang	45	59	35	41	56	61	43	48	58	48	70
Terengganu	53	65	46	55	69	55	75	68	62	75	65
Kelantan	61	52	50	58	63	52	57	66	83	90	64
Sabah	19	20	22	27	29	26	30	47	54	59	44
W.P. Labuan	2	7	3	3	3	8	4	3	6	7	2
Sarawak	68	69	43	58	68	66	72	62	79	67	73

*Ministry of Health Malaysia. (2009)*

Table 8. Trend Analysis of Neonatal Death By State and Gender (Male) of The Year 2001-2011

Negeri	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Perlis	17	8	13	13	7	10	14	15	16	11	15
Kedah	108	81	86	94	96	97	91	119	109	116	91
Pulau Pinang	58	69	52	69	51	64	53	54	57	58	67
Perak	79	83	70	95	85	75	66	79	86	109	81
Selangor	139	152	162	179	172	155	157	189	225	203	205
W.P.K.Lumpur	84	59	32	40	44	44	54	39	44	42	59
Negeri Sembilan	39	40	36	32	41	62	46	48	60	44	44
Melaka	43	42	42	38	51	46	32	34	42	43	47
Johor	157	147	114	142	123	119	115	136	142	152	123
Pahang	68	67	53	83	85	61	52	61	69	63	76
Terengganu	67	72	58	79	79	80	68	82	77	74	80
Kelantan	96	82	66	59	73	73	94	103	125	103	118
Sabah	30	32	22	23	39	34	39	52	74	83	65
W.P. Labuan	0	8	5	6	5	7	7	5	5	5	10
Sarawak	73	80	62	78	83	88	86	99	115	109	106

*Ministry of Health Malaysia. (2009)*



Table 9. Trend Analysis of Perinatal Death By State and Gender (Male) of The Year 2001-2011

Negeri	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Perlis	22	27	30	28	18	22	22	23	22	16	23
Kedah	204	190	185	179	195	184	170	191	193	189	180
Pulau Pinang	89	113	102	110	99	109	89	90	93	93	105
Perak	191	193	184	177	151	143	136	158	153	183	151
Selangor	222	242	286	275	297	292	277	326	390	354	345
W.P.K.Lumpur	111	89	73	77	74	84	86	77	95	113	92
Negeri Sembilan	70	75	84	82	85	82	88	88	101	81	73
Melaka	71	86	71	57	77	88	51	79	66	70	79
Johor	209	205	217	201	212	220	234	223	231	226	211
Pahang	139	130	117	146	135	123	121	110	106	104	129
Terengganu	126	138	115	144	137	139	141	132	166	166	150
Kelantan	175	178	194	174	177	172	199	205	213	198	211
Sabah	64	61	54	52	81	62	87	98	127	164	144
W.P. Labuan	8	15	11	7	12	10	11	11	10	9	12
Sarawak	95	82	92	117	127	138	146	167	194	159	182

Ministry of Health Malaysia. (2009)

Table 10. Trend Analysis of Perinatal Death By State and Gender (Female) of The Year 2001-2011

Negeri	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Perlis	18	21	11	14	19	22	15	12	9	28	20
Kedah	166	146	165	150	166	134	163	149	157	144	134
Pulau Pinang	63	74	70	87	68	88	80	78	78	66	79
Perak	138	135	127	126	124	137	139	125	131	122	138
Selangor	192	181	226	240	239	256	262	261	250	278	304
W.P.K.Lumpur	70	74	77	50	65	68	71	84	68	61	73
Negeri Sembilan	57	64	60	57	62	63	43	57	63	66	62
Melaka	70	56	64	55	50	64	69	63	64	42	51
Johor	154	172	176	157	176	167	183	165	188	176	182
Pahang	99	116	103	103	103	105	101	91	108	94	121
Terengganu	114	120	95	112	119	114	129	118	115	138	117
Kelantan	111	161	159	146	136	131	141	139	152	164	156
Sabah	43	48	38	56	65	53	55	91	108	123	120
W.P. Labuan	10	12	6	8	6	6	5	9	7	7	6
Sarawak	83	97	72	93	139	135	122	140	154	140	131

Ministry of Health Malaysia. (2009)

## Results

### Section I :Analysis of Neonatal Death by Year for Male From Year 2001-2011

Table 11. Mean of Neonatal Death (Male)

Year	Mean	Std. Deviation
2001	70.53	43.001
2002	68.1333	41.47782
2003	58.2000	40.14830
2004	68.6667	47.50739
2005	68.9333	43.07380
2006	67.6667	38.75687
2007	64.9333	39.14892
2008	74.3333	48.87545
2009	83.0667	55.03955
2010	81.0000	52.85965
2011	79.1333	47.85822

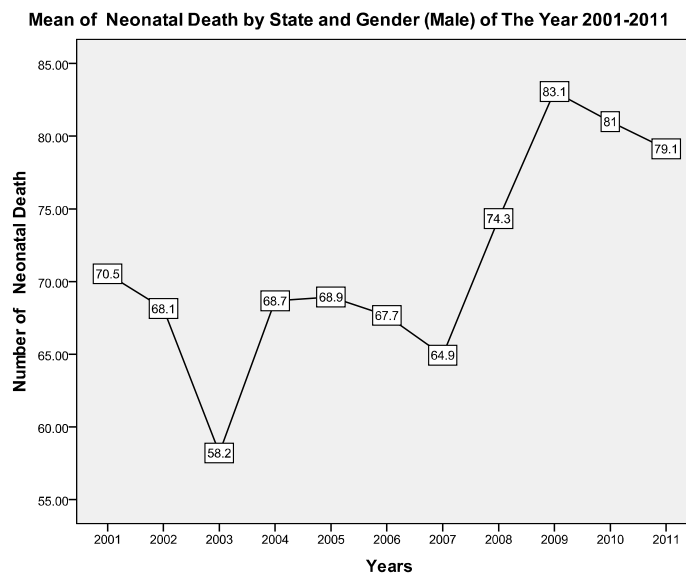


Figure 1. Mean Plot of Neonatal Death (Male)

Table 12. Tests of Within-Subjects Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	10	8273.9273	827.3927	5.44	< 0.0001
subject	14	298344.3273	21310.3091	140.12	< 0.0001

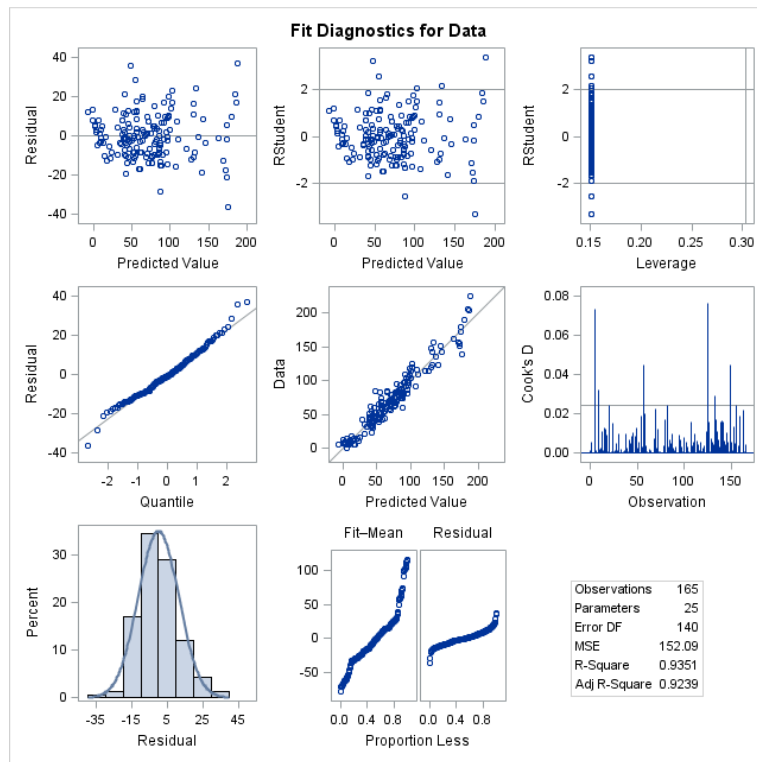


Figure 2. Fit Diagnostics for Data

Table 13. Multiple Comparison

(I) Years	(J) Years	Mean Difference (I-J)	Std. Error	Sig. <sup>a</sup>
2003	2005	-10.733*	2.497	0.040
	2008	-16.133*	3.793	0.044
	2009	-24.867*	5.618	0.032
	2010	-22.800*	5.168	0.033
	2011	-20.933*	4.406	0.017
2005	2003	10.733*	2.497	0.040
	2011	-14.200*	3.381	0.049
2009	2003	16.133*	3.793	0.044
	2003	24.867*	5.618	0.032
2010	2003	22.800*	5.168	0.033
2011	2003	20.933*	4.406	0.017
	2007	14.200*	3.381	0.049

A one way repeated measure analysis of variance was conducted in order to compare the year of neonatal death (male) by state with a statistical test starting year 2001 till 2011. The mean and standard deviation are presented in Table 11. The null hypothesis that the average for all the years is the same was rejected. The main effect of chance over year was statistically significantly with years,  $p < 0.0001$  (see Table 12). This results from the mean plot suggest that year factor is significantly different and increased over the time (see the Figure 1). In our case, the residuals "bounce randomly" around the 0 line (residual vs predicted value). This suggests that the assumption that the relationship is linear is reasonable. A higher R-squared value of 0.9351 indicates how well the data fit the model and also indicates a better model. The multiple comparison from Table 13 shows the summarize all the difference between years. Looking at the Table 6, we can see that the mean for year 2009, 2010 and 2011 is greater than  $\alpha = 0.05$ , then the null hypothesis (mean of year 2009, year 2010 and year 2011) were equal and was not rejected. Overall, we can see that the mean was increased from year 2001 to year 2011.

## Section II :Analysis of Neonatal Death by Year for Female From Year 2001-2011

Table 14. Mean of Neonatal Death (Female)

Year	Mean	Std. Deviation
2001	53.87	34.477
2002	54.9333	32.06571
2003	44.4667	30.27462
2004	49.2667	33.42896
2005	51.8000	34.37025
2006	48.2000	30.40724
2007	53.6000	34.03108
2008	53.8000	35.19984
2009	59.9333	36.94101
2010	58.6667	36.19524
2011	59.2000	42.52764

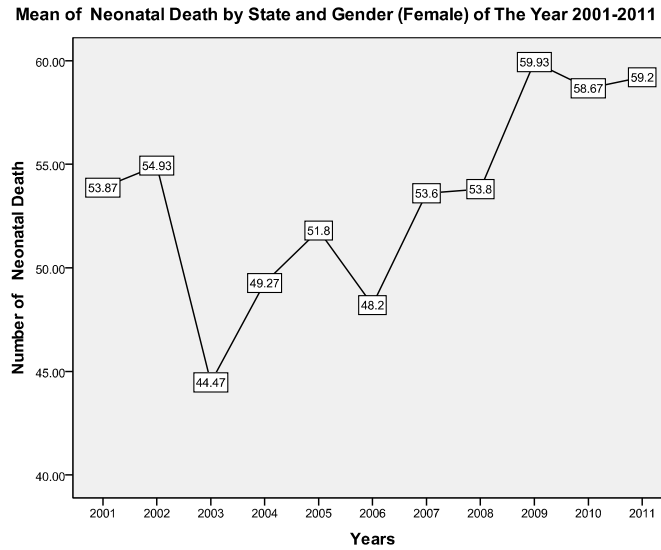


Figure 3. Mean Plot of Neonatal Death (Female)

Table 15. Tests of Within-Subjects Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	10	3499.6485	349.9648	4.18	< 0.0001
subject	14	173593.9030	12399.5645	148.01	< 0.0001

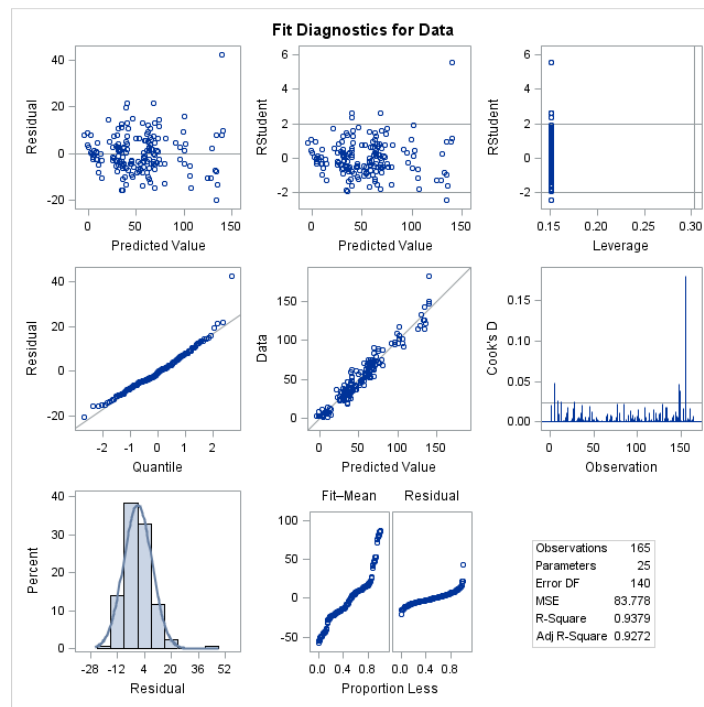


Figure 4. Fit Diagnostics for Data

Table 16 Multiple Comparisons

(I) Years	(J) Years	Mean Difference (I-J)	Std. Error	Sig. <sup>a</sup>
2004	2002	-10.467*	2.685	0.002
	2004	-4.800*	2.176	0.045
	2005	-7.333*	2.578	0.013
	2007	-9.133*	3.039	0.009
	2008	-9.333*	3.076	0.009
	2009	-15.467*	3.744	0.001
	2010	-14.200*	3.903	0.003
	2011	-14.733*	4.904	0.009
	2002	-5.667*	2.362	0.031
	2009	-10.667*	2.642	0.001
	2010	-9.400*	2.995	0.007
2006	2011	-9.933*	3.646	0.016
	2009	-8.133*	3.036	0.018
	2010	-6.867*	3.097	0.044
	2002	-6.733*	2.080	0.006
	2009	-11.733*	3.592	0.006
	2010	-10.467*	3.768	0.015
	2011	-11.000*	4.067	0.017

A one way repeated measure ANOVA was conducted for neonatal death (female) with a statistical test starting by year 2001 till 2011. The mean and standard deviation are presented in Table 14. The null hypothesis that the average for all the years is the same was rejected. The main effect of chance over year was statistically significantly with years,  $p < 0.0001$  (see Table 12). This results from the mean plot (see the Figure 3) suggest that year factor is significantly different and fluctuating over the time by showing an increasing gradually. Figure 4 shows that the residuals appear to behave randomly and around 0 line (residual vs predicted value). This suggests that the ANOVA assumption is met. R-square shows a higher value of 0.9379 also indicates a better model. The multiple comparison from Table 16 shows the summarize all the difference between years. Looking at the Table 16, we can see that the mean for the three years which are year 2009 till 2011 is greater than  $\alpha = 0.05$ , then the null hypothesis (mean of year 2009, year 2010 and year 2011) were equal and shows that the results were not sufficient to reject the null hypothesis and this shows that this three means are in the same group. According to the plot these three mean are the highest and they are significantly different from other means. Overall, we can see that the mean of neonatal death for female baby was increased clearly from the year 2001 to year 2011.

**Section III :Analysisof Perinatal Death by Year for Female from The Year 2001-2011**

Table 17. Mean of Perinatal Death (Female)

Year	Mean	Std. Deviation
2001	92.53	53.480
2002	98.4667	53.92437
2003	96.6000	63.05191
2004	96.9333	61.26111
2005	102.4667	63.21151
2006	102.8667	62.44754
2007	105.2000	68.11251
2008	105.4667	63.42247
2009	110.1333	65.45977
2010	109.9333	69.24848
2011	112.9333	72.65817

Mean of Perinatal Death by State and Gender (Female) of The Year 2001-2011

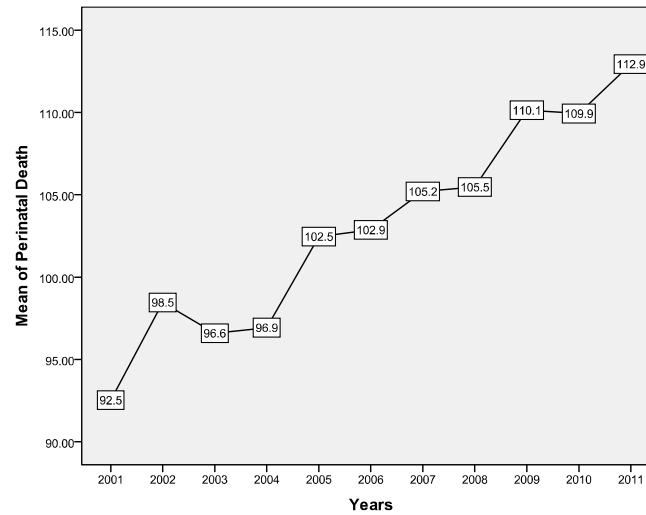


Figure 5. Mean Plot of Perinatal Death (Female)

Table 18. Tests of Within-Subjects Effctcs

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	10	6250.4121	625.0412	2.55	0.0075
subject	14	587429.6121	41959.2580	171.00	<.0001

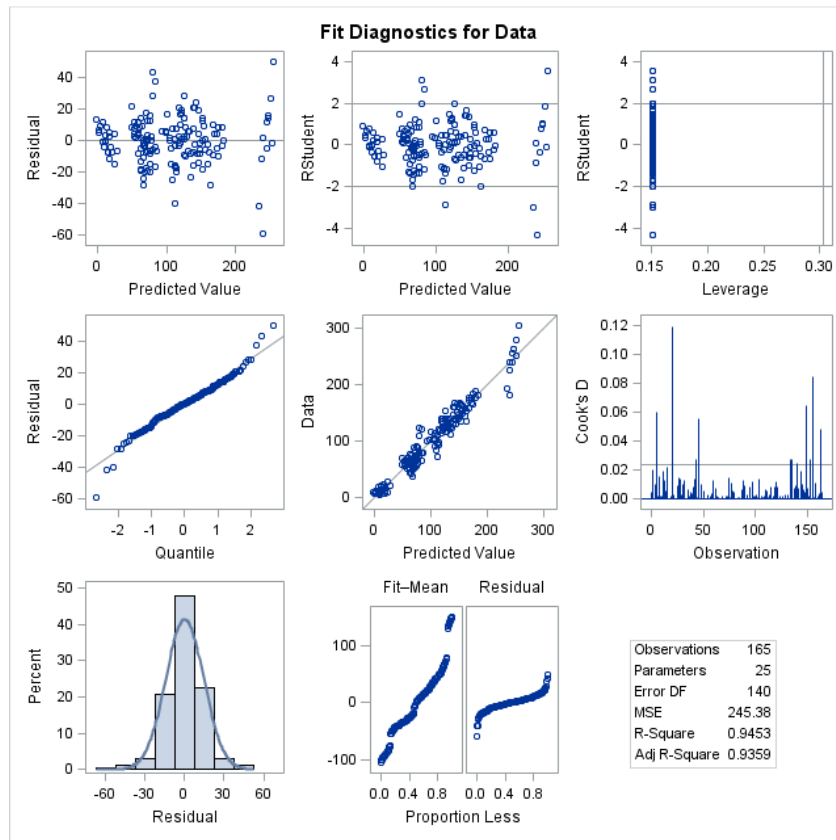


Figure 6. Fit Diagnostics for Data

Table 19. Multiple Comparison

(I) years	(J) years	Mean Difference (I-J)	Std. Error	Sig. <sup>a</sup>
2001	2007	-12.667*	5.631	0.041
	2008	-12.933	6.816	0.079
	2009	-17.600*	7.376	0.032
2004	2007	-8.267*	3.467	0.032
	2009	-13.200*	5.148	0.022
	2011	-16.000*	6.150	0.021
2005	2009	-7.667*	3.303	0.036
2007	2001	12.667*	5.631	0.041
	2004	8.267*	3.467	0.032
	2009	17.600*	7.376	0.032
	2004	13.200*	5.148	0.022
2009	2005	7.667*	3.303	0.036
	2004	16.000*	6.150	0.021

The next analysis is to assess the perinatal death among the female baby from the year 2001 to the year 2011. A one way repeated measure ANOVA was conducted for perinatal death (female) with a statistical test starting from the year 2001 till 2011. The mean and standard



deviation are summarized as shown in Table 17. The null hypothesis was stated as the average of perinatal death among female since the year 2001 till year 2011 is the same. Results from Tests of Within-Subjects Effects (the main effect of chance over year was statistically significantly) from Table 19 indicate that the null hypothesis is rejected with  $p$  is equal to 0.0075. This results from the mean plot (see the Figure 3) suggest that mean of perinatal death by the year of 2002 is increasing slowly over the year till 2011. Figure 8 shows that the residuals appear to behave randomly and around 0 line (residual vs predicted value). This suggests that the ANOVA assumption is met. R-square shows a higher value of 0.9382 also indicates a better model. The multiple comparison from Table 19 shows there is a difference between year 2001 with year 2002. According to the plot only given by Figure 5, year 2001 recorded the lowest mean and this mean is significantly different from other means. Overall pattern of the mean of neonatal death for female baby was increased clearly from year 2001 to 2002.

**Section IV :Analysis of Perinatal Death by Year for Male From Year 2001-2011**

Table 20. Mean of Perinatal Death (Male)

Years	Mean	Std. Deviation
2001	67.27	41.004
2002	73.9333	44.08509
2003	73.4000	48.58248
2004	70.9333	42.18914
2005	74.1333	46.48328
2006	75.4667	46.46637
2007	74.7333	45.84830
2008	77.4667	47.68478
2009	81.6000	55.48591
2010	79.6667	48.66308
2011	79.6000	51.44178



Figure 7. Mean Plot of Perinatal Death (Male)

Table 21. Tests of Within-Subjects Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
year	10	12194.9818	1219.4982	2.89	0.0026
subject	14	886777.1758	63341.2268	149.85	<.0001

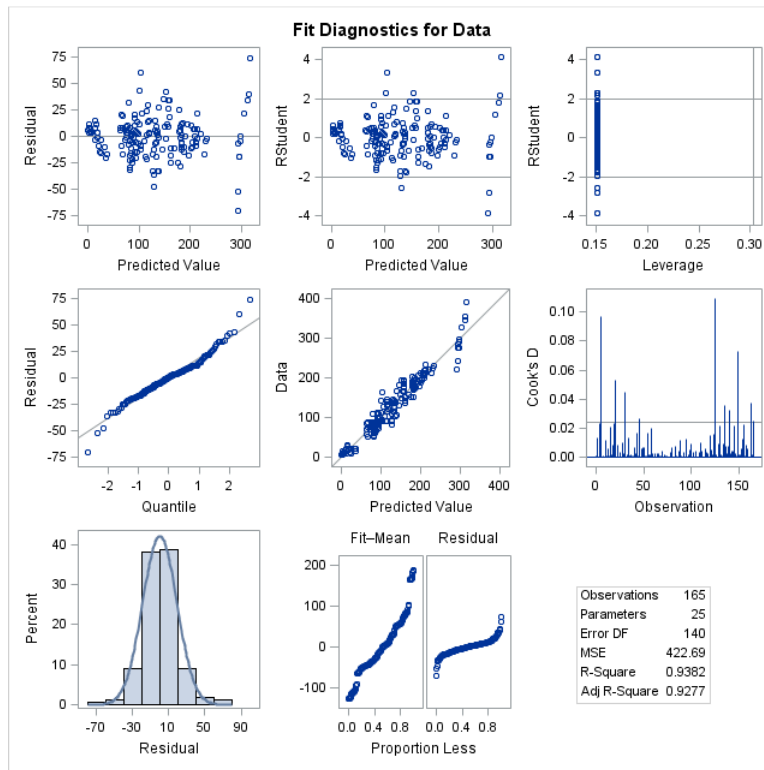


Figure 8. Fit Diagnostics for Data

Table 22. Multiple Comparison

(I) years	(J) years	Mean Difference (I-J)	Std. Error	Sig. <sup>a</sup>
2001	2002	-6.667*	2.435	0.016
2002	2001	6.667*	2.435	0.016

The last analysis is to assess the perinatal death among the male baby from the year 2001 to the year 2011. ANOVA analysis was conducted for perinatal death (female) with a statistical test starting from the year 2001 till 2011. The mean and standard deviation are summarized as shown in Table 18. The null hypothesis was stated as the average of perinatal death among male since the year 2001 till year 2011 is the same. Results from Tests of Within-Subjects Effects (the main effect of chance over year was statistically significantly) from Table 16 indicate that the null hypothesis is rejected with  $p$  is equal to 0.0026. This results from the mean plot (see the Figure 7) suggest that mean of perinatal death by the year of 2002 is increasing slowly over the year till 2011. Figure 8 shows that the residuals appear to

bahavebouce randomly and around 0 line (residual vs predicted value). This suggests that the ANOVA assumption is met. R-square shows a higher value of 0.9382 also indicates a better model. The multiple comparison from Table 13 shows there is a difference between year 2001 with year 2002. According to the plot only given by Figure 5, year 2001 recorded the lowest mean and this mean is significantly different from other means. Overall pattern of the mean of neonatal death for female baby was increased clearly from year 2001 to 2002.

## Summary and Conclusion

This paper provides an overview of neonatal dan perinatal death among male and female infant. In this paper, four analysis have been used due to the case of neonatal and perinatal death. First two analysis were noenatal death of male and female baby and the last two anaysis were perinatal death among male and female baby. From the descriptive statistics we found that neonatal mean death rate of male infants is relatively high compared with the neonatalmean death rate forfemale infant. Overall, the pattern for these two plots for neonatal mortality (male) and neonatal mortality (female) is increased throughout the year. The results of the repeated measure analysis shows that both mean of neonatal death by years for male ( $p < 0.001$ ) and female ( $p < 0.001$ ) infant is increased. From the descriptive statistics we found that perinatal mean death rate of female infants is relatively high compared with the perinatal mean death rate formale infant. The two plots obtained from the perinatal death implies that perinatal mortality rates among male and female is worrying. From repeated measure ANOVA infant mortality trend for female recorded a very significant increased compared to male. This study found that the rate of perinatal and neonatal mortlaity are increasing since 2001 till 2011 and this need special attention to overcome this problem from getting worse.

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