Determination of the Likelihood of Pregnant Women between the Ages of 18 – 25yrs Given Birth through Normal Delivery or Caesarean Section Using the Bayes' Theorem

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Abstract
This research work examined the likelihood of pregnant women between the ages of 18 – 25yrs given birth through the virginal delivery (normal delivery) or the caesarean section. The research discovered, from the posterior evidence/distribution, that 93% of pregnant women within the age bracket had virginal or normal delivery while 7% had caesarean section and the result is in contrast with the general medial belief (prior distribution) that pregnant women with the ages of 18 – 25yrs will deliver through CS due to developing pelvis. This result also shows that other factors are responsible for caesarean section and not age alone.

INTRODUCTION:

Bayes' theorem looks at the probability of an event based on prior knowledge of condition. This is done using the Bayesian Probability which assigns probabilities that represent states of knowledge. However, Bayesian is an evidential probability that assigned probability a hypothesis and it is then evaluated.

For Bayes' theorem, prior probabilities are updated to posterior probability using new data obtained from the process. The theorem is being used in many fields of study like marine biology, computer science (internet span bluchers of email). It has also been used to differentiate between a theory and evidence based on the theory.

On the other hand, normal delivery or birth is the process of bringing forth a child through the virginal of a pregnant woman. In some cases it may be effortless and in some other cases, it may be with a little effort of the pregnant woman and the attending nurse or midwife opening the pelvic cartilage. Also, normal delivery is the absence of a surgical operation to aid birth.

In contrast to the normal delivery or birth is the caesarean section or the C-section. The caesarean section or the C-section is the process of a pregnant woman to bring forth a child through surgical operations. This C-section is due to some medical complications during pregnancy and the composition or structure of the pregnant woman's pelvis. In most cases, a doctor (gynecologist) recommend a C-section for a pregnant woman to save the lives of both the pregnant woman (mother) and the child (baby) but, because of the high cost associated with C-section, most pregnant women do not opt for it and end up losing their babies or worst still, die with their babies.

Age is a major factor for both normal delivery and caesarean section for birth. Women between the ages of 18 – 25yrs are believed not to have a developed pelvis that can withstand a contraction during delivery and also, records have it that most women between the age brackets mentioned do not give birth through normal delivery. To ascertain the true position, this research was developed and carried out using both primary and secondary data to get the posterior probability (evidence) based on further information.

Method:
The method for this research is in stages:

STAGE 1: PERMISSION
To carry out the research, permissions were sought for and obtained from the managements of The General hospital Nchia, Health Centre Alode, Health Centre, Ebubu, Health Centre, Agboncia, Health Centre, Onne and some selected private clinics within Eleme LGA.

Stage 11: DATA COLLECTION
The data for this research is both primary and secondary data. The secondary data was obtained from the general hospital Nchia, Eleme, Rivers State and randomly selected Health Centre and private clinics in Eleme while the primary data was obtained from a randomly selected sample of mothers between the ages of 18 – 25yrs in Eleme Local Government Area using a well-developed questionnaire. The reason for the collection of both primary and secondary data is to ensure that cases of safe normal delivery by local birth attendants (LBA) not recorded in the hospital/Health Centre/private clinics as well as deaths recorded due to birth are collected to minimize error associated with small samples (few data).

Stage III: PRESENTATION OF DATA
The primary and secondary data obtained for the research were presented in tables and charts as shown below;

Primary Data: Normal Delivery (Table 1)

Ward	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Row Sum**
2012	8	9	10	12	13	10	06	8	9	11	95
2013	10	7	13	08	05	18	12	10	12	09	94
2014	14	9	8	15	08	7	11	18	08	08	106
2015	08	8	12	8	13	11	9	11	12	11	103
Total	**40**	**32**	**43**	**43**	**39**	**36**	**38**	**47**	**41**	**39**	**398**

Source: Questionnaire

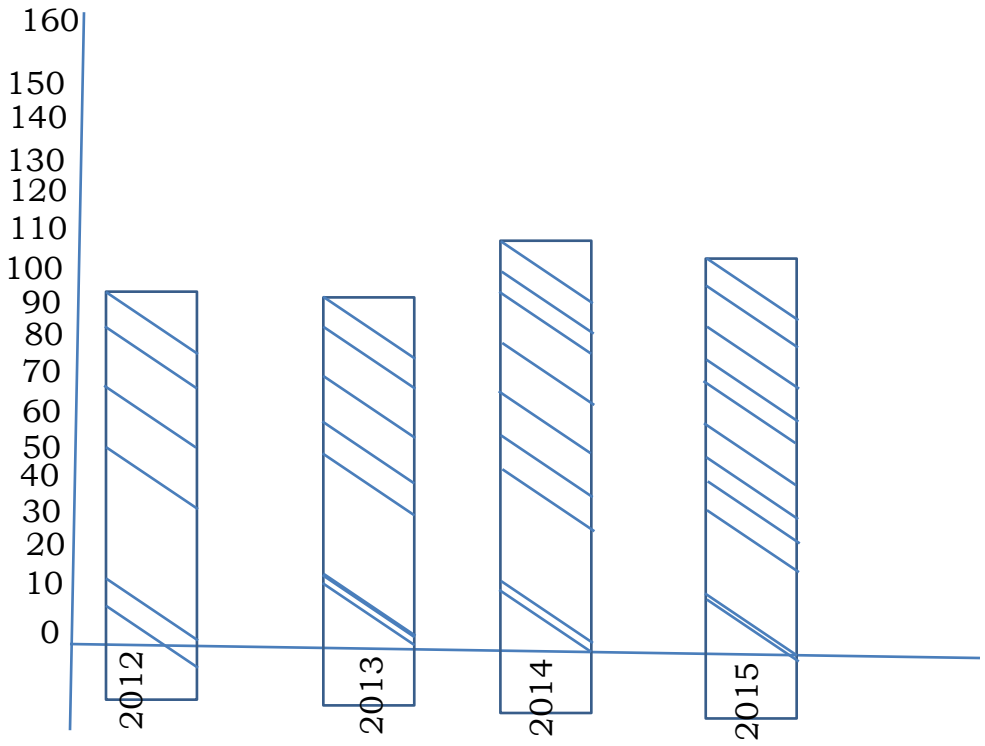
Secondary Data: **(Table II)**

Ward		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Row Sum**
	N	10	13	4	8	7	5	11	6	14	13	91

2012	CS	4	2	0	1	2	2	0	1	3	1	16
2013	ND	7	4	12	8	14	9	18	13	12	7	104
	CS	2	1	2	3	3	2	3	0	1	2	19
2014	ND	9	5	10	11	17	13	16	14	10	12	117
	CS	0	2	1	2	0	1	0	2	0	1	9
2015	ND	14	9	7	7	9	9	10	6	13	8	92
	CS	3	0	3	0	1	0	2	3	0	1	13
Total	ND	40	31	33	34	47	36	55	39	49	40	
	CS	9	5	6	6	6	5	5	6	4	5	

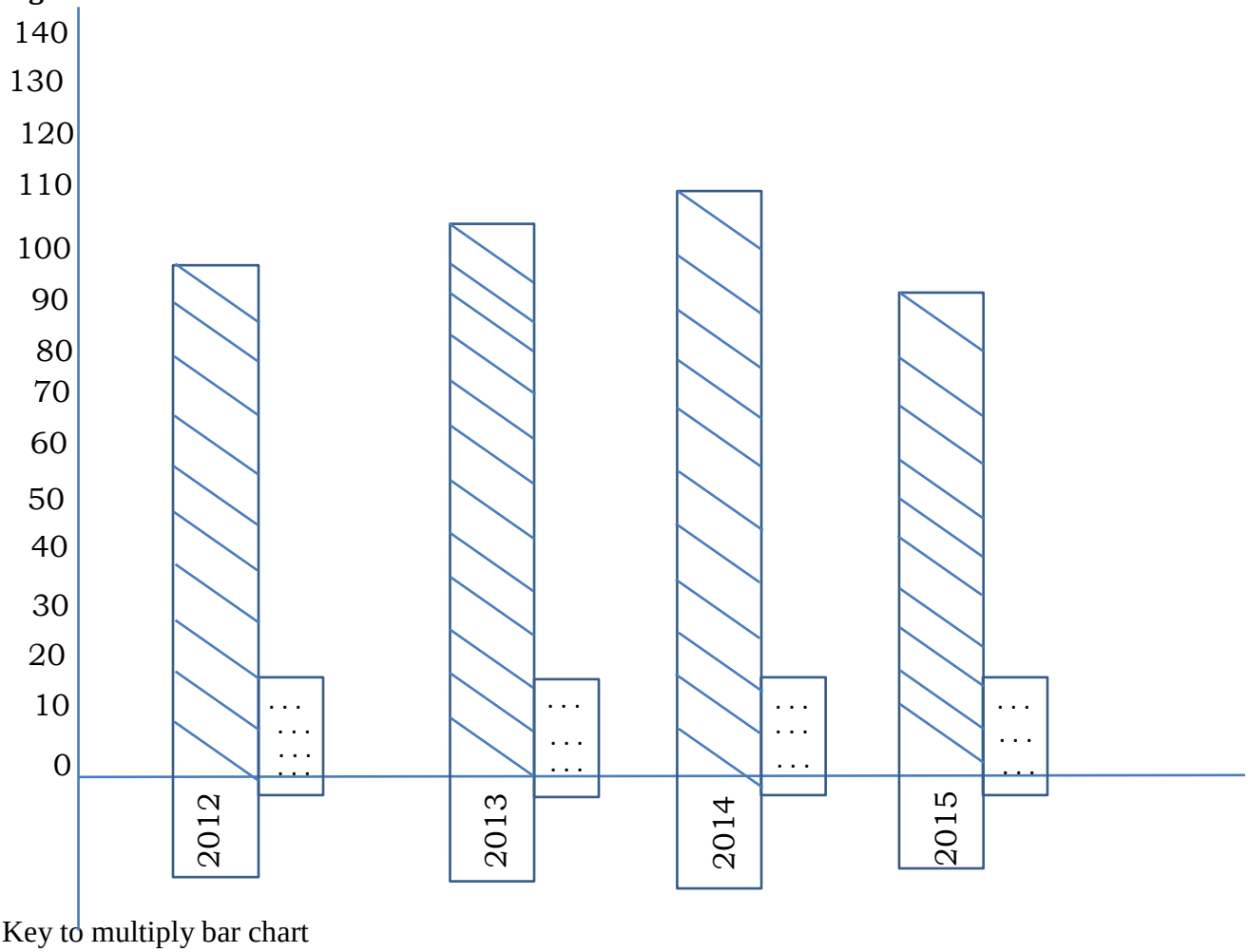
Grand Total: ***ND*** ***=*** ***404***
CS ***=*** ***57***

Bar Chart Primary Data



Multiple Bar Charts for Secondary Data

Fig i



Key to multiply bar chart

= normal delivery (ND)

= caesarean section (CS)

Analysis

Bayes' formula

Let $B_1, B_2, \ldots\ldots, B_n$ be prob. Space

Then $P(B_1/A) = \frac{P^{(B_1 nA)}}{\sum PB_i nA}$

And $P^{(B_1 nA)} = P^{(B_i)} \; P^{(A/B_i)}$

$= P(B_1/A) = \frac{P^{(B_1 nA)}}{P(A)}$

$= \frac{P^{(B_1 nA)}}{\sum(PB_i)} \; P^{(A/B_i)}$

Table 3 – Showing Data from both Primary and Secondary Sources.

Table III

Yr/Ward		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Row Sum**
2012	ND	18	21	14	20	20	15	17	14	23	24	186
	CS	4	2	0	1	2	2	0	1	3	1	16
2013	ND	17	11	25	16	19	17	30	23	24	16	198
	CS	2	1	2	3	3	2	3	0	1	2	19
2014	ND	23	14	18	26	25	20	27	32	18	20	223
	CS	0	2	1	2	0	1	0	2	0	1	9
2015	ND	22	17	19	15	22	20	19	17	25	19	195
	CS	3	0	3	0	1	0	2	3	0	1	13

Analysis

B = Birth ← delivery a baby either through ND or CS
Key ND = Normal delivery
CS = Caesarean section or C-section

P (ND) = Probability of normal delivery
P (CS) = Probability of Caesarean section

P (ND/B) . P (CS/B)

$= \frac{P(B) n NB}{P(B)}$ $= \frac{P(CS \, n \, B)}{P(B)}$

P (B) = P (Bn) + ND

⇒ P (ND nB)

P (B) . P (B/ND)

$\frac{ND}{B}$

P (ND/B)

= $\frac{P\,(ND)\,n\,B}{P\,(B)}$

= $\frac{P\,B\,n\,NB}{P\,(B\,n\,ND)+P(B\,n\,CS)}$

Since P (B) = P (B n ND) + P (B n CS)

And P (B n ND) = P (B) . P (B/ND)

Similarly:

P (CS/B) = $\frac{P\,(CS\;\;n\;\;B)}{P\,(B)}$

= $\frac{P\,(B\,n\,CS)}{P\,(B\,n\,ND)+\;P\,(B\,n\,CS)}$

= $\frac{P\,(B)\,.\,P(B/\,CS)}{P\,(B)\,.\,p(B/ND)+\;P\,(B).\;P\,(B/CS)}$

From table III, total CS for the period under consideration is 16 + 19 + 9 + 13 = 57 and ND = 186 + 198 + 223 + 195 = 802.

From the record obtained from the Eleme LGA, 32% of women within the age bracket under consideration give birth to a child. This implies that P (B) $\frac{32}{100}$ = **0.32**

And P (ND)= $\frac{802}{859}$ = **0.93**

$$P(CS) = \frac{57}{859} = \mathbf{\underline{0.07}}$$

$$P(B/CS) = 0.0224$$

$$P(CS/B) = \frac{0.32 \ x \ 0.0224}{0.32\ (0.2976) + \ 0.32 \ (0.0224)}$$

$$= \frac{0.00717}{0.09523 + \ 0.00717}$$

$$= \frac{0.00717}{0.1024} = 0.07002 \approx \mathbf{\underline{7.0\%}}$$

$$P(ND/B) = 1 - 0.07002$$
$$= 0.92998$$
$$\approx \mathbf{\underline{93\%}}$$

CONCLUSION

This research has proved the general belief that most pregnant women with the ages of 18 – 25yrs deliver through the caesarean section wrong. The evidence using the posterior distribution shows that 93% of pregnant women within the ages of 18 – 25yrs gave birth through virginal or normal delivery and only 7% of them gave birth through CS. This research has lain to rest the erroneous medical belief that most pregnant women within the age bracket of 18 – 25yrs will give birth through CS due to their developing pelvis.

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