Abstract

This study aims at assessing the impact of pre-natal care intervention to reduce low birth weight. The study was conducted by comparing participants and non-participants. It was found out that there is no significant evidence proving low birth weight and association. In addition, mothers age, marital status, number of cigarettes smoked, welfare status and maternal education level have been identified as potential confounders. It has also been identified that younger women, single motherhood, white mothers, mothers on welfare, smokers and mothers with lesser education have a higher probability of selection. Identified behavioral interventions which are smoking and drinking rehabilitation, and maternal education. Adjusting for confounding is required for smoking and maternal education interventions. In addition, it is recommended to do the study in a setting with a setting more controlling to confounders. It is also recommended that further studies can be implemented.

Introduction

Low birth weight has been one of the leading causes of mortality and morbidity for infants globally. Children with lower birth weights are prone to increased risks of ailments and morbidity on the later days of their lives [1, 2]. Studies have shown that various risk factors including biological, behavioral, environmental, and medical factors contribute to low birth weight [3,4]. Various interventions have proven to be of immense impact to reduce this condition. One of the well-known intervention is pre-natal care [5]. This study aims at assessing the impacts of a pre-natal intervention called first step intervention program for low income citizens in King county .

Results

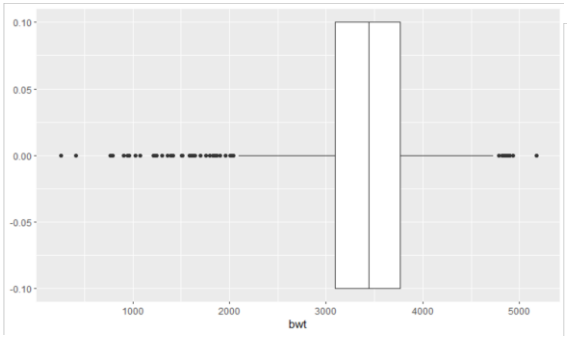
As per the descriptive analysis, as can be seen from table 1, 403 of the overall 2500 subjects were enrolled on the F.S program. It can also be seen that 22 percent of the overall subjects in general were single. Of the subjects enrolled in the FS program, about 204 (51%) were single. This is comparatively very large in comparison with the counterpart subjects that are not enrolled in the study that are single, which constitutes only about 16% of the non-participants. As per the welfare status, 5.2% of the participants were on welfare, while 1 % of the non-participants were on welfare. And from he participants, 13% were smokers, while 5.2% of the non-participants were non-smokers. Looking at the mean age, participants were younger, with mean age 25.39, as compared to non-participant with mean age 30.06. Considering education, mean years of mothers education on average for participants is about 12.08, slightly lower than non-participants averaging 14.45. Considering racial distribution, majority of the participants as well as non-participants are white, constituting about 71 and 47 percent for participants and non-participants. Minority of the participants were from other racial group constituting of about 1 and 2.7 percent for participants and nonparticipants. Mean weight gain is slightly larger for participants, which is about 32.99, as compared to that of non-participants of mean weight gain of about 32.14.

Table 1: Respondents Characteristics

Variable	N	Overall, N = 2,500	Non-P = 2,097	P = 403	p-value
sex	2,500				0.67
Female		1,209 (48%)	1,018 (49%)	191 (47%)	
Male		1,291 (52%)	1,079 (51%)	212 (53%)	
plural	2,500	2,500 (100%)	2,097 (100%)	403 (100%)	
age	2,500	29.30 (6.00)	30.06 (5.70)	25.39 (6.03)	**<0.001**

race	2,500				**<0.001**
Asian		392 (16%)	339 (16%)	53 (13%)	
Black		178 (7.1%)	118 (5.6%)	60 (15%)	
Hespanic		220 (8.8%)	132 (6.3%)	88 (22%)	
White		1,679 (67%)	1,488 (71%)	191 (47%)	
Other		31 (1.2%)	20 (1.0%)	11 (2.7%)	
parity	2,500	0.82 (1.04)	0.80 (1.01)	0.92 (1.18)	0.37
married	2,500				**<0.001**
Single		544 (22%)	340 (16%)	204 (51%)	
Married		1,956 (78%)	1,757 (84%)	199 (49%)	
bwt	2,500	3,414.02 (559.35)	3,424.69 (548.42)	3,358.51 (610.82)	0.078
smokeN	2,500	0.59 (2.63)	0.50 (2.45)	1.03 (3.41)	**<0.001**
drinkN	2,500				0.97
0		2,471 (99%)	2,072 (99%)	399 (99%)	
1		13 (0.5%)	11 (0.5%)	2 (0.5%)	
2		10 (0.4%)	8 (0.4%)	2 (0.5%)	
3		1 (<0.1%)	1 (<0.1%)	0 (0%)	
5		2 (<0.1%)	2 (<0.1%)	0 (0%)	
10		2 (<0.1%)	2 (<0.1%)	0 (0%)	
16		1 (<0.1%)	1 (<0.1%)	0 (0%)	
welfare	2,500				**<0.001**
Not on welfar		2,458 (98%)	2,076 (99%)	382 (95%)	
welfare		42 (1.7%)	21 (1.0%)	21 (5.2%)	
smoker	2,500				**<0.001**
Non-smoker		2,325 (93%)	1,973 (94%)	352 (87%)	
Smoker		175 (7.0%)	124 (5.9%)	51 (13%)	
drinker	2,500				>0.99
Non-drinker		2,471 (99%)	2,072 (99%)	399 (99%)	
drinker		29 (1.2%)	25 (1.2%)	4 (1.0%)	
wpre	2,500	146.94 (34.59)	146.21 (33.41)	150.77 (39.97)	0.15
wgain	2,500	32.28 (13.41)	32.14 (12.94)	32.99 (15.62)	0.38
education	2,500	14.07 (2.63)	14.45 (2.44)	12.08 (2.65)	**<0.001**
gestation	2,500	38.88 (2.38)	38.91 (2.29)	38.71 (2.79)	0.86
1 n (%); Mean (SD)					
2 Pearson's Chi-squared test; Wilcoxon rank sum test; Fisher's exact test					

There is a considerable amount of outliers detected as can be seen from figures 1 and 2. The data is skewed towards the left, whereby there is a large amount of outliers below the median. This can be due to the fact that mothers at riks of LBW are encouraged to apply for the intervention, hence causing left skewing. Since the data is highly skewed towards the left, it is better to make comparison based on median than that of mean. Result of t-test to test the significance of association between F.S enrollment and birth weight has shown that there is a significant assiciation. Mean birthweight of non-participants is about 3425 gm whereas that of non-participants is about 3359 gm, and absolute difference in mean equals 66 gms. The condifence interval is within the range (6.57, 125.79). It is known that the existence of outliers can impact association between features. There are two ways to deal with this kind of situations. One is to remove the outliers, which is undesirable as this leads to missing information.The other method is to use non-parametric test which makes comparison based on difference in median than mean, since median is more robust to outliers than mean. While doing the Mann-Whitney U-test for non-parametric, the test shows that the difference in medians is insignificant (P-value = 0.07), opposite result from the parametric.



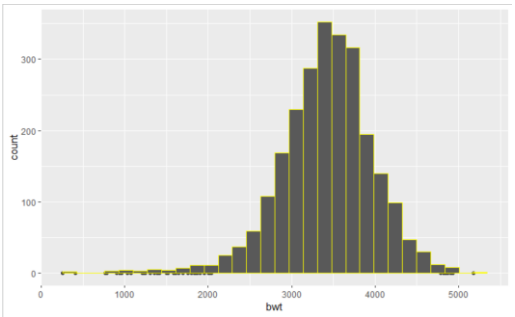


Fig 1. Box plot of distribution

Fig 2. Histogram distribution

Looking at the significance of association between enrollment status and amenable dichotomous variables, it can be seen that welfare and smoking status have been found to be significant, using Chi-squared test, as per *table 1*. It can also be noted that median of birth weights among participants is slightly higher than that of non-participants as indicated in *figure 3*.Looking at the continuous variables from table 1, age, race and number of cigarettes per day are found to have a significant association with enrollment to the program.

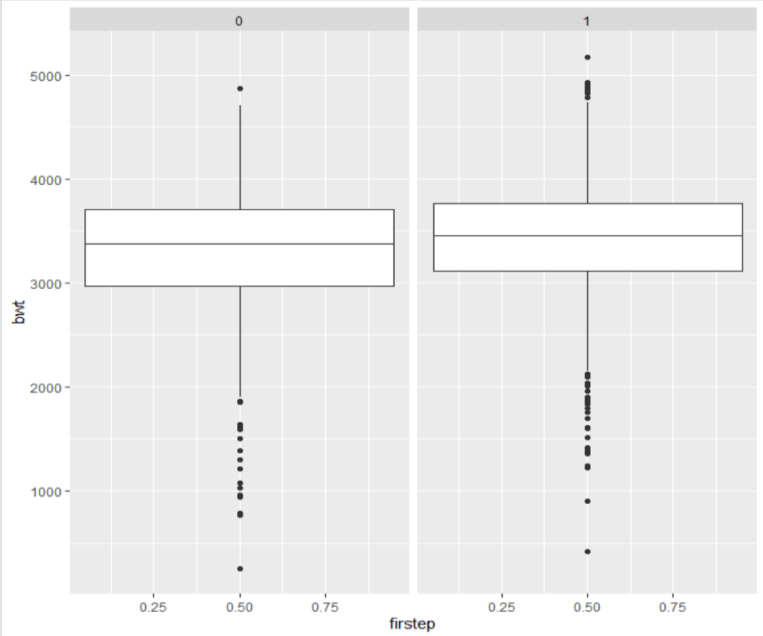


Fig 3. Box plot showing stratified by enrollment of first step program

As can be seen from *figure 4*, birth weight of participants not on welfare is higher than that of the ones on welfare. It can also be seen from *figure 4* that of those who are on welfare, participants have significantly less birth weight as compared to that of non-participants.

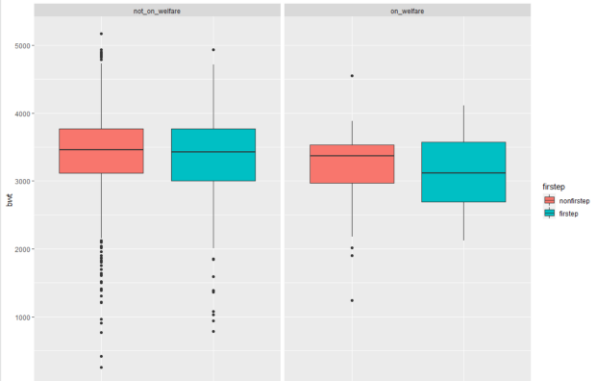


Fig 4. Welfare status grouped by first step program enrollment

It can also be seen from *figure 5* that birthweight of children of married individuals has higher median value than that of single ones. But there is only slight difference between participants and non-participants for both married and single groups.

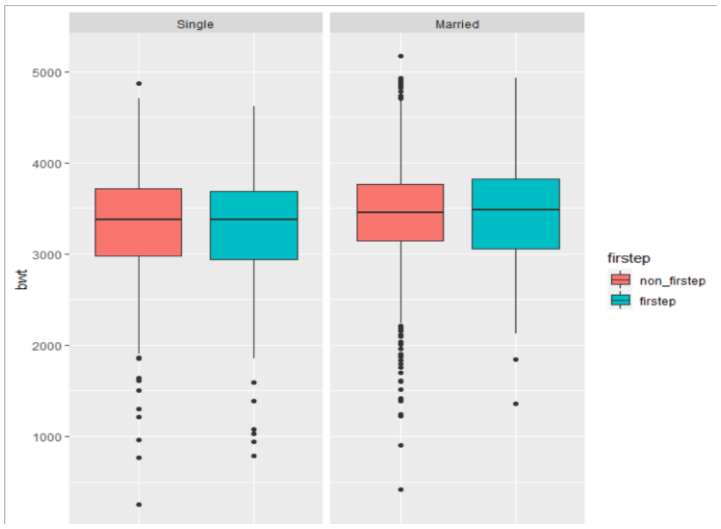


Fig 5. Marriage status grouped by first step program enrollment

In *figure 6*, we can see that birthweight of children of smoking parents has a lower birth weight in relation to non-smokers, but only slight difference exist between participants and non-participants for both smoker and non-smoker parents.

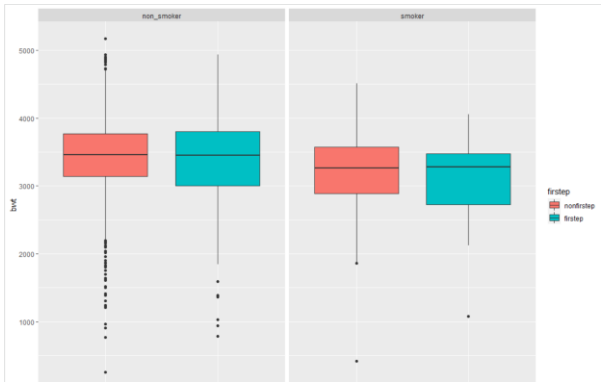


Fig 6. Smoking grouped by first step program enrollment

Figure 7 shows the difference in distribution of race between participants and non-participants. It has been previously indicated from *table 1*, that there is a significant association between the race and enrollment status. Here also, as can be seen on *figure 7*, slight difference can be seen between participation status,

despite for the **other** races, which has a larger median difference.

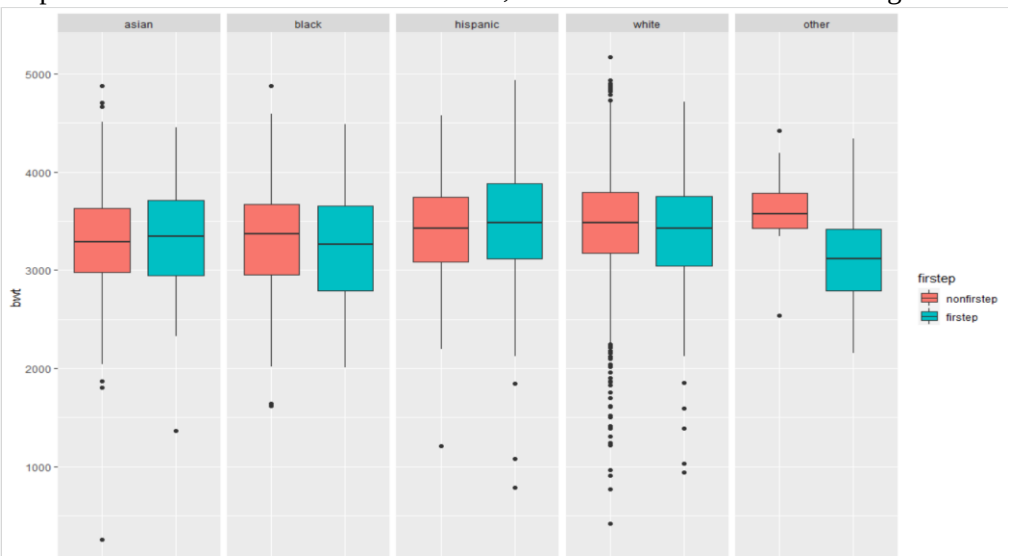


Fig 7. Race grouped by first step program enrollment

It has been tried to study the association between low birth weight and enrollment. The results show that the relation is insignificant, as can be seen from *table 3*.

Table 3. association between grouped birth weight and enrollement.

Characteristic	**Overall**, N = 2,500[1]	**nonfirstep**, N = 2,097[1]	**firstep**, N = 403[1]	**p-value**[2]
bwt_1				0.10
Very low birth weight	17 (0.7%)	11 (0.5%)	6 (1.5%)	
Low birth weight	110 (4.4%)	91 (4.3%)	19 (4.7%)	
Normal	2,373 (95%)	1,995 (95%)	378 (94%)	

[1] n (%)
[2] Fisher's exact test

Discussion

Various risk factors are known to affect low birth weight, which is the main contributing factor for Neonatal mortality. Of the various efforts made to mitigate prevalence of low birth weight,the first step program offers free pre-natal care for low income countries. This study has found that there is compromised association of enrollement of first step program to reduce birth weight, there is no strong evidence that the program is effective, as described above. This is probably due to the presense of other confounders.Some potential confounders include mothers age, maritial status, Number of cigarate smoking, welfare status and education status. One way is to find the best control (non-participant) group which is very similar in nature to the participants to control confounders. Another selection bias noticed from the study is the large number of white individuals in both participants and non-participants.

From the overall enrolled mothers, single mothers, younger mothers,white mothers, mothers on welfare, less educated and smoker mothers are likely to be selected for the intervention. Controling these confounders would likely to enhance the accuracy of the results.

Intervenable factors include education, rehabilitation for drinking and smoking, but adjustment shall be made on smoking and education, as they are potential confounders since they are associated to both low birth weight as well as to participation.

In conclusion,other studies including but not limited to qualitative studies shall be conducted with a better control in confounders. Interventions from multiple sectors including socio-economic and pharmaceutical sectors shall be conducted.

References

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