

Data Analysis Project: First Steps Intervention Program to Reduce Risk of Low Birth Weight
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Abstract

King County has developed a "First Step" program to serve low-income pregnant women of all races. In this data analysis, I investigated the data of a random sample of all singleton births in King County in 2001. I created descriptive statistics for all the variables from the data, then started another table of t-tests of dichotomous variables comparing the birth weights based on exposure and non-exposure. I have also constructed graphs to display the races and birth weights association. Finally, I have assembled a report on the low birth weight, less than 2,500 grams, and the very low birth weight, less than 1,500 grams. Overall, this program is valuable for mothers with low income of all races because their babies' birth weight is comparable to the not participants' mothers' babies. My recommendation for the board of Public Health in King County is that although the outcomes don't make a massive difference between participants and non-participants. They should continue the program and improve the outreach methods to promptly enroll eligible mothers of color.

Introduction

King County has developed a "First Steps" program to provide services, guidance, and free prenatal care to low-income women of all races and ages. However, another concerning subsequent issue can occur in the life of children with low birth weight. Low birth weight is associated with joint disease resistance and growth in disease. Such as asthma, renal failure, hypertension, diabetes, kidney development, hearing impairment, motor and social development delays, and coronary disease. Not only some significant conditions these low birth weight babies go through but also death. Many studies have been identified concerning low birth weights over the years. The program "First Step" that king county has constructed is to reduce the risk factor for low birth weight and increase the birth weight in King County. I will analyze the random sample data of all singleton births in King County in 2001 and investigate whether participation in the "First Steps" program increases birth weights.

Result

The data I am working on is from King County and provides information that contains a sample size of 2500. The data are a random sample of all singleton births in King County in 2001. I have studied to investigate whether the baby is under 2500 grams, known as low birth weight. Does the King County program "First Step" minimize the number of babies born under birth weight in low income mothers?

Descriptive Statistics of King County Birth Weights 2001

	N	Msng	Mean	Std Dev	Min	25%	Mdn	75%	Max
sex: All	2500	0	0.5164	0.49983094380896	0	0	1	1	1
sex: Str 0	2097	0	0.514544587505961	0.499907620321466	0	0	1	1	1
sex: Str 1	403	0	0.52605459057072	0.499941356757506	0	0	1	1	1
age: All	2500	0	29.304	6.00163243099198	14	25	30	34	46
age: Str 0	2097	0	30.0562708631378	5.69766927196595	14	26	30	34	46
age: Str 1	403	0	25.3895781637717	6.02809265567415	15	20.5	24	30	43
race: All	2500	0	2.334	0.886994195855527	1	2	2	2	5
race: Str 0	2097	0	2.34525512637101	0.856061483540087	1	2	2	2	5
race: Str 1	403	0	2.27543424317618	1.03234602047408	1	2	2	3	5
parity: All	2500	0	0.8192	1.04179916404232	0	0	1	1	12
parity: Str 0	2097	0	0.80066762041011	1.01295969333922	0	0	1	1	12
parity: Str 1	403	0	0.915632754342432	1.17724223831831	0	0	1	1	7
married: All	2500	0	0.7824	0.412696459091835	0	1	1	1	1

married: Str 0	2097	0	0.837863614687649	0.368663791186708	0	1	1	1	1
married: Str 1	403	0	0.493796526054591	0.500582971872991	0	0	0	1	1
bwt: All	2500	0	3414.0188	559.354348299309	255	3095.5	3444.5	3765.5	5175
bwt: Str 0	2097	0	3424.68717215069	548.42480486924	255	3118	3459	3770	5175
bwt: Str 1	403	0	3358.50620347395	610.81940058871	788	2991	3402	3742	4933
smokeN: All	2500	0	0.5876	2.63292596927142	0	0	0	0	25
smokeN: Str 0	2097	0	0.502145922746781	2.44658980839217	0	0	0	0	25
smokeN: Str 1	403	0	1.03225806451613	3.41294748862368	0	0	0	0	20
drinkN: All	2500	0	0.0328	0.475620274860464	0	0	0	0	16
drinkN: Str 0	2097	0	0.0362422508345255	0.514691409127883	0	0	0	0	16
drinkN: Str 1	403	0	0.0148883374689826	0.157014037265694	0	0	0	0	2
welfare: All	2500	0	0.0168	0.128547149901891	0	0	0	0	1
welfare: Str 0	2097	0	0.0100143061516452	0.0995929204072076	0	0	0	0	1
welfare: Str 1	403	0	0.0521091811414392	0.22252344723026	0	0	0	0	1
smoker: All	2500	0	0.07	0.255198061160676	0	0	0	0	1
smoker: Str 0	2097	0	0.0591320934668574	0.235928024275225	0	0	0	0	1
smoker: Str 1	403	0	0.126550868486352	0.332882427764546	0	0	0	0	1
drinker: All	2500	0	0.0116	0.107098216657442	0	0	0	0	1
drinker: Str 0	2097	0	0.0119217930376729	0.10856004770213	0	0	0	0	1
drinker: Str 1	403	0	0.00992555831265509	0.0992546572305987	0	0	0	0	1
wpre: All	2500	0	146.944	34.5852587101502	75	125	140	160	350
wpre: Str 0	2097	0	146.208392942299	33.4117409504759	75	125	140	160	350
wpre: Str 1	403	0	150.771712158809	39.9706670282485	80	125	140	169	300
wgain: All	2500	0	32.2792	13.4094135706571	0	25	31	40	149
wgain: Str 0	2097	0	32.1430615164521	12.9411668116547	0	25	31	40	149
wgain: Str 1	403	0	32.9875930521092	15.620255535623	0	24	32	40	138
education: All	2500	0	14.0724	2.62577914654881	0	12	14	16	17
education: Str 0	2097	0	14.4549356223176	2.44188086610907	0	12	15	16	17
education: Str 1	403	0	12.0818858560794	2.65246424744118	3	11	12	14	17
gestation: All	2500	0	38.8756	2.37705380543175	18	38	39	40	45
gestation: Str 0	2097	0	38.9070100143062	2.28846123932397	18	38	39	40	45
gestation: Str 1	403	0	38.712158808933	2.79062504002606	19	38	39	40	45

Table 1: Descriptive statistics, stratifying by participants (1) and not participants (0) for converted numeric variables for the binary variables.

There are a few outliers in this sample; table 1 shows the descriptive statistic of the number of cigarettes per day pregnancy. The minimum is 0, the maximum is 20 for mothers enrolled in the King County "First Step" program, and for mothers not enrolled in the program minimum is 0, and the maximum is 25. Therefore, the 25th percentile, 75th percentile, and medium are all 0, and where the mean is 50%. The same is true for the number of drinks per day during pregnancy, where the minimum is 0, the maximum is 2 for enrolled, and 0 to 16 for not enrolled mothers. Because the mean is not meaningfully comparable with the median, the median needs to be better centered by the 25 percentile and 75 percentiles and the minimum and maximum. This indicates that there are potential outliers in the study.

Below I have a histogram of birth weight (bwt) counts that shows that both participants and not participants skew to the right. The descriptive birth weight statistics provide evidence of skewness for both participants and not participants. Because their means are lower than the median for both participants and not participants. The median is closer to 75 percentiles than 25 percentiles also tell us there is skew in this sample.

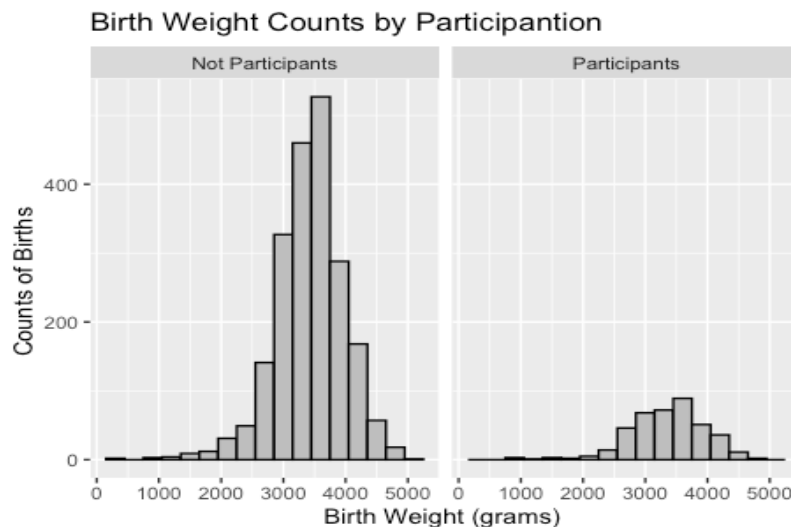


Figure 1: Histogram for birthweight in grams for all the non participants and all the participants.

Figure 1, the histogram for birth weight, shows the overall difference in birth weight between babies whose mothers were enrolled in the "First Steps" program and babies whose mothers were not enrolled in the "First Steps" program. According to figure 1, there are more non-participants than participants, and both groups have similar birth weights. We are 95 % confidence that the substantial population percentage or the average is between 3401.201 grams and 3448.174 grams for participants. We are 95 % confidence that the actual population percentage or the average is between 3298.690 grams and 3418.322 grams, not participants. There were 403 participants enrolled in "First Steps," and 2097 participants were not enrolled in "First Steps." Of the participants in the "First Steps," the proportion of married people is 0.493. This means 49.3 % are married, and 50.7 % are single participants. Compared to the non-participants, 83.7% are married, and 16.3% are single. Participants on welfare are 5.2 %, and these are participants who receive the benefits. Non-participants that are on welfare are 1%. The participants in the "First Steps" program who are on welfare are less than participants who are not in the program. About 13 % of mothers enrolled in the "First Step" program are smokers, and 87% are not smokers. Mothers not enrolled in the "First Step" program who smoke are 5.95%. More not participants do not smoke compared to participants.

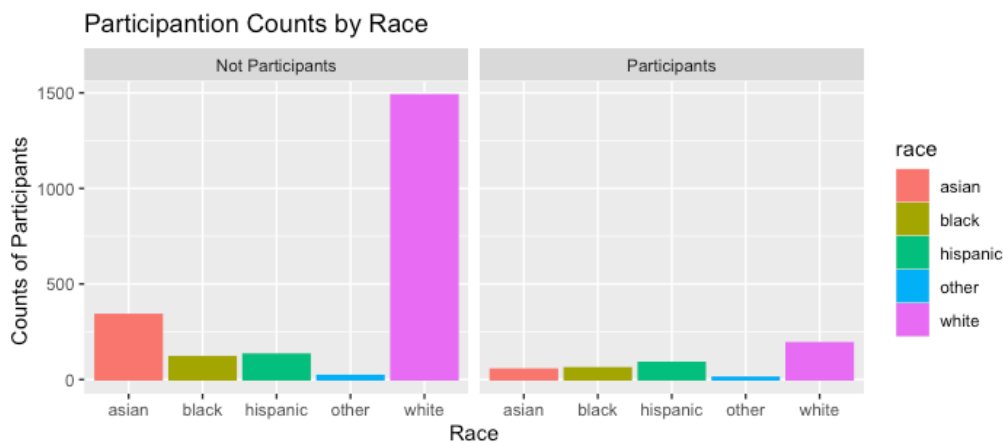


Figure 2. The counts of participants and not participants by race.

The average age of enrolled mothers is 25 years old, and the average age of not enrolled mothers is 30. Therefore, participants are much younger compared to not participants. Likewise, the average number of years the participants have been to school is 12 years. Which means they have finished at least high school. Non participants' average number of years is about 14 years of school, meaning they are in post-high school. The races for participants and not participants are very diverse, as shown in figure 2. The study has Asian, Black, Hispanic, White, and other races included. The highest number of participants are White for those enrolled in the "First Step" program and those not enrolled. There is a slight difference between the mean of weight gain among participants and not participants. Participants have a slightly higher mean of weight gain than the not participants by 0.84, shown in table 1.

Mean Differences on Birthweight on Dichotomous Variables

	Mean Birth Weight in Exposed	Mean Birth Weight in Unexposed	Differences in Mean of Exposed and Unexposed group	P-Value	95 percent confidence interval
Smoke	3185.737	3431.201	-245.464	0.0000002032	-335.3437 , -155.5846
Married	3446.276	3298.035	148.241	0.000000952	-207.12763, -89.35466
Welfare	3136.952	3418.753	-281.801	0.008821	-488.82637, -74.77498

Table 2: The t-test of dichotomous variables provides the mean of the people who said yes and no for the dichotomous variable, along with the mean, p-value, and 95%, confidence interval.

Table 2 provides essential information about the mean and mean differences between exposure and non exposures. I have analyzed the significant risk factor: smoking is the most influential risk factor among married, welfare, and drinking. Drinking data does not provide meaningful information about the effect of exposure. Here, we can see that the differences in the birth weight mean of the smokers and non smokers are 245.464 grams, married and single is 14.241 grams and on welfare and not on welfare is 281.801 grams. The most amenable modification risk factor is smoking because we can get participants to limit the number of cigarettes per day. On the other hand, we cannot change someone's marital status, and taking anyone off welfare is not a good idea. As presented in table 2 if the mean birth weight of smokers and nonsmokers are identical, which they are not, the extreme probability of finding the result is 2.032×10^{-7} , which is also the p-value provided in table 1.

Additionally, I ran a t-test for the smokers between participants and not participants. I saw a p-value of 0.470, much higher than the p-value of 0.05 (a p-value of 0.05 or less shows the differences). Therefore, there are no differences between participants and not participants. For not smokers between participants and not participants, the p-value is 0.170. Due to the p-value, there are no differences in birthweight between participants and non-participants among mothers exposed to the risk factor, and the same for mothers who were not exposed to the risk factor.

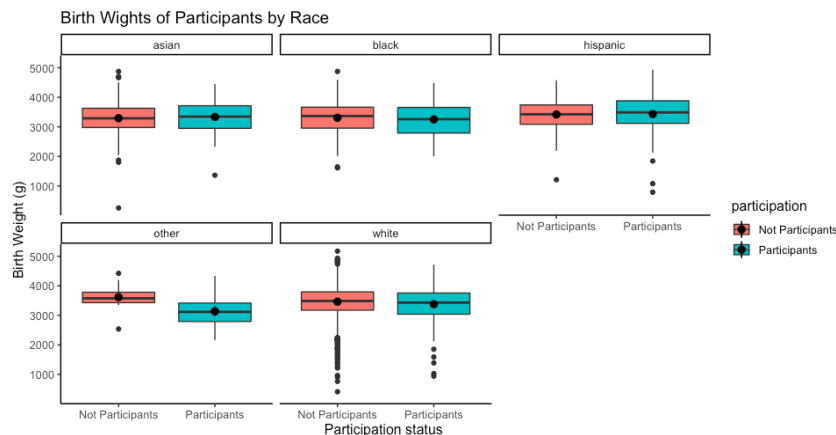


Figure 3: Comparison of Birth weight by race.

Above is figure 3, which shows the races and the birth weights of participants and not participants. As you can see, the median is mainly at the same level for White, Black, Asian and Hispanic. Except for the "other" races, it has a slightly lower median of participants compared to not participants. All the participants of all races have a median body weight between 3,000 to 4,000 grams, although the white race has slightly higher body weights than any other race. For Hispanics, participants seem to have body weight marginally lower than not participants. It is hard to say if the participants benefit from the program "First Step" because everyone has about the same birth weight. However, White non-participants have more birth weight than participants, but that is because there are more white non-participants in the sample. We can conclude from figure 3 that other races seem to benefit from the "First Step" program when they are disadvantaged by low income.

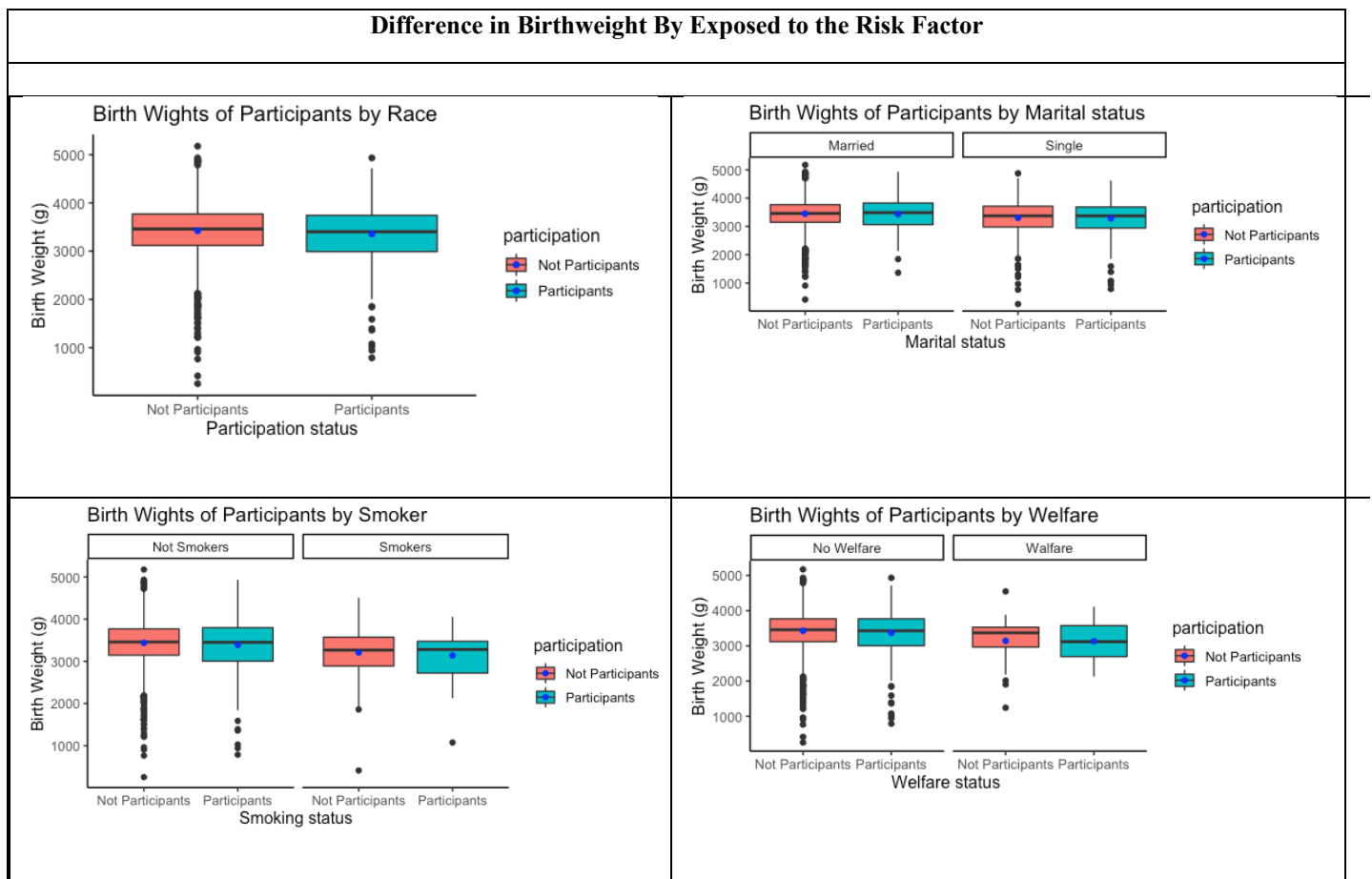


Figure 4: The birthweight compared by the dichotomous variables/the risk factors.

Additively, I have calculated the percentage of low and very low birth weight among participants and not participants. My results show that anyone whose birth weight is less than 1,500 grams is 1.48 % of the "First Step" participants, and 6.20 % have birth weights less than 2,500. Of the not participants, there are 0.52 % with very low birth weight, and 4.86 % with low birth weight. Due to the differences in the birth sample for participants and not participants, it is hard to tell if the participants have the more low or very low birth weights than not participants.

Discussion

In my discussion, I would like to start by talking about how we have very few participating in the "First Step" and many more not participating. It is hard to say that this sample's "First Steps" program is adequate overall. However, the consequence is good because enrolled mothers come from low-income economic status. According to all the data and the graphs presented, participants and non-participants have similar birth weights, which is sufficient

because, due to the low income of enrolled mothers, they could not maintain the birth weights compared to higher economic status.

King County has specifically selected low-income women, which could be a bias toward this sample. Low income women already need resources and are already in situations of low birth weights due to lack of resources. According to my analysis, most low birth weight is more toward participants of color. Since race is not changeable, this could have influenced the result of the participants as well.

Recommendations

The first step is a great program that works toward decreasing low birth weight and providing resources and advice to increase birth weight. Pregnant women must care for their babies to grow healthy in their gestation period. My recommendation for the "First Step" program is to promptly improve the outreach strategies to enroll eligible women earlier. "First step" should focus more on "other" races. They should also concentrate on women with exposure.