Supervised Learning on Birth Weight

Palak Kaur

Hult International Business School

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Summarize the problem

Birth weight is an important indicator to predict health condition and quality of life for a newborn. According to Martin, Hamilton, Osterman, Driscoll, & Drake (2018), 8.17% of infants were born weighing less than 2500 grams in 2016. There are several factors that affect this measurement and can be controlled during pregnancy to increase the odds of healthy birth weight and therefore, a healthy baby.

I, as a public health consultant, have researched and analyzed a dataset of 196 newborn weights to predict which factors lead to low birth weights. Following are the variables with the most impact on the predictability of a baby's weight.

- Drinking during pregnancy (Average per week)
- Smoking during pregnancy (Average per day)
- Mother's age (higher outliers)
- Father's age (higher outliers)
- Father's Education
- Number of Prenatal Visits (higher outliers)

This model is able to predict birth weight with an accuracy of 0.701 on unseen data.

Key insights

1. Drinking: "After a pregnant woman ingests any kind of alcoholic drink, the alcohol swiftly passes through the umbilical cord, reaching the fetus" (American Addictions Center, n.d.). This indicates continuous exposure of the fetus to alcohol, leading to a delay in normal

growth, thus, affecting birthweight as well as putting the child at risk of health, and emotional, mental and intellectual issues. Based on the results found from the analysis, drinking negatively affects the birth weight and for a unit increase in average drinks per week, the birth weight of a newborn goes down by 113.028 grams.

2. Smoking: The model suggests that smoking also negatively affects birth weight and on average, a unit increase in average cigarettes per day is associated with 37.932 grams decrease in the birthweight. A possible explanation is that smoking during pregnancy can cause low birth weights by reducing both, maternal appetite and weight gain, possibly, due to the hypoxic effects of carbon monoxide, meaning that the body gets deprived of adequate oxygen supply at the tissue level. It has been seen that efforts to prevent or reduce smoking have benefited the mother and child more than the efforts to increase food intake while continuing smoking (MB, 1978). This can further be highlighted by a study that women who smoked fewer than 10, 10-19, or 20+ cigarettes per day delivered infants weighing 96 g, 183 g, and 200 g, respectively, less than infants born to non-smokers (Abell, Baker, & Ramsey, 1991).

3. Mother's age: In 2016, 18.8% of all birth weights under 2500 grams were born to women within the ages of 45 to 54 (Martin et al., 2018, p. 47). Additionally, Bilodeau (2018) mentions 51 years as the average age for menopause for women in the U.S., but this could range from early 40's to 55 and up. Our study shows that approximately 28% of the babies born to women over 48 years old were under 2500 grams. The American College of Obstetricians and Gynecologists (2018) asserts that women have a fixed number of eggs in their ovaries. As the years go by, the number of eggs decreases; the remaining eggs are more

likely to have abnormal chromosomes. This entity states that becoming pregnant at a later age can lead to health issues for the mother as well as the fetus. A similar situation was evident during the analysis, hence, information about women aged above 54 was used to predict low birthweight. On the basis of the model, holding other variables constant, babies born to mothers aged above 54 years weigh on average 461.88 gm less than babies born to mothers below that age.

4. Father's age - It is usually thought that the age and health of the mother should be the major factor affecting baby weight, however, a few studies have shown that children of fathers aged 45 above were born 20.2g lighter, on average, and were at a 14% higher risk of low birth weight. Their risk of being admitted to neonatal intensive care and having seizures was also 14% and 18% greater, respectively (Robertson, S., 2018). According to the model, holding other variables constant, babies having fathers aged above 54 years weigh on average 182.86 gm less than babies having fathers below that age.

5. Father's education: The level of a father's education can help us understand the economic conditions of certain families. A lower level for the same usually indicates lower paying jobs, access to lesser or no benefits for workers and their families, lesser prenatal care and healthy diets, et cetera. The model suggests that for a unit increase in father's education, the newborn weight goes up 13.528 grams.

6. Prenatal visits - Carter, et al. (2016) state the median for prenatal visits in the United States per woman is 11. Women who have complications throughout their pregnancy are required to visit their doctors more often in order to keep track and stay ahead of any possible complications. According to our model, babies born to mothers having frequent

prenatal visits (16 or more) weigh on average 59.42 gm less than babies born to mothers who had these visits less often. This explains the situation because, as explained earlier, mothers facing complications would go to see the doctor more often than those having normal pregnancies. These complications might lead to lower birth weights.

Implementation Recommendations

First and foremost, families should leverage the resources available to them for better family planning:

- Prepare accordingly for the pregnancy by avoiding consumption of any alcoholic drink and smoking of tobacco before and during pregnancy.
- Try to the best of their capabilities to plan their family expansion within the healthy ages of both woman and man.
- Look for assistance in education, prenatal care, and prenatal visits to ensure they are taking as much care as possible during this process.

In case the family finds itself in an unplanned pregnancy, the recommendations within the same variables are:

- Quit drinking alcoholic drinks and smoking tobacco immediately.
- Assist a health care professional for evaluation of the situation. The prenatal care expert will adjust recommendations for each specific case.
- Follow the expert's prenatal care program in order to give birth to a healthy child.

To be able to provide an infant healthy birth weight and later, a healthy life, is not an easy task; after the analysis, this is conspicuous. However, there are a lot of things parents can do

to make sure their newborn can grow stronger and healthier, it all starts by making changes to old habits and breaking unhealthy cycles, keeping an open mind and being willing to follow the health professionals' advice.

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