The Fargo Health Group has been spending a lot of extra money sending patients to other locations because they don’t always have the staff to cover the demand for service. Having the staff to be able to process all incoming patients would be a great way to reduce costs to Outpatient Clinics as well as fees paid to the Regional Office of Health Oversight. To help reduce these extra costs we will be creating a model based off historical data to help predict future demand for service, so the Fargo Health Group can be appropriately staffed.

The first step in this process was filtering the data. There was a lot of information to go through so to make a more reasonable model we filtered down to look at just cardiovascular related appointments that were performed at or originated from the Abbeville location.

Then we had to remove any unreasonable data; Incoming examinations recorded as non-numeric information or values or 100,000 within a single month. After the data had been cleaned we could then summarize the information to a count of incoming examinations per month, but there was still some missing data. To make our model the best it could be we then imputed those missing values using the R programing language Amelia library. Then the data was finally ready for us to start predicting future values.

We started with a least squares regression model. This model assumes a linear relationship between time and hospital visits. The second model was an autoregressive and moving-average model (ARIMA). This model tends to be better with time series data and can better account for seasonality within the data. Both were built using the Zelig R library as is recommended when using the Amelia library to impute missing information. If we look at the data we will the least squared model has visits always increasing as time goes on, exactly what we would expect from a linear model. The ARIMA model has much more fluctuation and is more of what we would expect to see in real life. Both models were run 5 times and an average of all runs was taken for the final values. I would recommend that Fargo Health has at least enough staff to cover all the estimated visits for future months if they would like to send less patients to the public health agencies.

When we examine the ethical implications for making forecasts using this case study here are the conclusions I come to:

This data was collected to help improve health care service, so I see no issue using it to help make sure the hospital is properly staffed to be able to serve patients faster. That seems to be right in line with what the data was collected for.

I don’t think consent was necessary for the high-level information that was collected in this instance but I’m sure there are others that would be bothered by it. I would highly doubt that informed consent was provided prior to data collections or even an opportunity to decline which is an issue.

I believe this data set has appropriate breadth and depth, if anything there is a little more information than we needed, and it could have been scrubbed a little more before being given to an outside source but if the hospital doesn’t have the staff to handle that it must happen eventually.

If the results are acted on it should result in better service for patients, lower costs for Fargo Health, more hours and opportunities for Fargo Health employees and lower visits for the public health agencies. Considering we used data for patients that originally came to Fargo Health for help it seems to be equitable for all parties to me.

Fargo Health owns the dataset, analysis, and insights since they paid for the work. I don’t think there is a moral obligation for them to act on the model as the patients are still currently receiving care, just not all with Fargo Health.

Fargo Health would be responsible for mistakes made in data collection, but we would be responsible for any mistakes made in the analysis. Fargo Health could still end up being over or understaffed if they follow the recommendations, but I’d say that’s the more likely outcome. Models are almost never 100% accurate, this should be a tool to help them get closer to having the staff needed to meet patient demand. If they have an in-house staff they could go over the code used, otherwise they will have to wait for the predicted months to pass to see how close they were to the actual demand.