EDLD 652 Final Project Proposal

**Description of the data and source**

I will be doing my final project using data from a survey and interviews that are part of an active study. The study is the pilot for my dissertation. I had thought about using simulated data I have created, but I am now planning to use data from 10 participants who have already completed the study.

**Brief Background Information:** Type 1 Diabetes is a lifelong autoimmune disease that can be diagnosed at any age from a few months old to late in life. Once it begins, there is treatment, but no cure. The invention of insulin 100 years ago stopped death by type 1 diabetes, but there is still a long road ahead to allow a person with type 1 diabetes to live an unaltered life. While, medical interventions are studied and improved, it is vital to increase knowledge about what makes life with diabetes more about life than about diabetes.

The only way that this is possible is if management practices are made to take up minimal time but have massively successful effects on blood sugar. This study aims to initiate research that will help us understand what approaches to diabetes management are the least invasive to general well-being and the most effective at allowing a person with diabetes to live with blood sugar levels as close as possible to those of a person who does not live with diabetes.

**Hypotheses:**

1. Information matters. More access to information = more empowerment and improved blood glucose outcomes
2. Self-adjusting insulin leads to improved blood sugar outcomes (it could decrease diabetes distress by increasing empowerment, but it could also increase diabetes distress because it adds to the tasks involved in diaily diabetes management)
3. Symptom experience from low and high blood sugar varies from person to person and those who have stronger symptoms likely have an entirely different relationship to their diabetes management. This will likely show up in the relationships between the diabetes distress scale, diabetes empowerment scale, and blood glucose outcomes.

The dataset includes 7 validated scales along with questions about what resources people use to access information about diabetes and questions about their symptom experiences from low and high blood sugar. Participants are uploading 90 days of blood glucose monitor data wherein there is a blood glucose value for every five minutes of every day over 90 days. There is a package in R that processes this data and creates variables that will look nice in a plot.

I hope to have 200 people fill out the survey, and to interview 30 of those 200 people. I have done 9 of the interviews so far and am excited to explore visualizing textual data.

I want to visualize my descriptive statistics as well as create visuals for my statistical analyses for both lay audiences and publication. I have many ideas for visuals and will narrow them down based on what we learn in class and what is the best visual representation of my data.

**Research Questions:**

How does resource use by people with type 1 diabetes who use constant glucose monitors affect health outcomes (measured via blood sugar readings, and self report scales on both physical and mental health)

What is the relationship between self-adjustment of insulin, symptom experience, diabetes distress and health outcomes?

How does symptom experience and awareness influence health outcomes and diabetes distress?

**Data Preparation**

This process needs to be done for all 7 scales

dds\_fun = function(x){  
 y = case\_when(  
 x == "Not a Problem" ~ 1,  
 x == "A Slight Problem" ~ 2,  
 x == "A Moderate Problem" ~ 3,  
 x == "Somewhat Serious Problem" ~ 4,  
 x == "A Serious Problem" ~ 5,  
 x == "A Very Serious Problem" ~ 6,  
 TRUE ~ NA\_real\_  
 )   
 }  
 survey = survey %>%   
 mutate(  
 across(c(DDS\_1:DDS\_17), dds\_fun))  
   
survey$dds\_means = survey %>%   
 select(starts\_with("DDS")) %>%   
 rowMeans(na.rm=T)

#I have code calculating years since diagnosis based on date of survey and diagnosis date. I removed it for space reasons

**Visualization idea #1**

Interactive plot intended for study participants and other lay people with type 1 diabetes. The same basic format for high and low blood sugars.

On the x axis is the variable feel\_lows\_b4 which is a 6 option likert scale in response to the question “I often feel my lows before I get the alert about them”. On the y axis is a variable with the same likert scale in response to the question “I feel it in my body when my blood sugar drops quickly.” As you hover over each data point I envision the textual data from the interview questions on the experience of low blood sugar to show up.

Another, idea is to integrate some of the blood sugar data into the chart. Some way to show the frequency of low blood sugar occurances across the different degrees of sensation from low blood sugar. One consideration is to keep only one of the above variables and then have the y axis be the percentage of time that participants’ blood sugar is below 80 mg/dl.

Tha variable names I would be looking at are: feel\_lows\_b4 feel\_drops feel\_highs\_b4 feel\_rises

survey %>%   
 ggplot(aes( feel\_drops, feel\_lows\_b4)) + geom\_point()

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**Visualization idea #2**

For manuscript/publication on research question 1:

A faceted plot that shows the diabetes empowerment score and diabetes distress score for 4 categories of resources that people said they use (e.g., social media, medical providers, books, and people). I am envisioning side by side histograms in 4 quadrants. I will need to create to see if it shows anything meaningful. (I also have data on the frequency people use resources and how useful they find it. It might be good to include these in the analyses and plots as well. I am still working that out).

**Visualization idea #3**

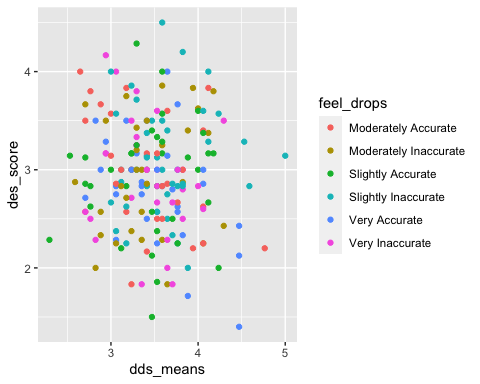
For publication audience and a general audience I am teaching some diabetes 101:

Descriptive graphics

1. scatterplot showing the relationship between number of resources used and knowledge about diabetes score
2. scatterplot showing the relationship between diabetes distress score and diabetes empowerment score
3. scatterplot showing the relationship between percentage of time blood sugar is in range and likert scale response to question about self-adjustment of insulin

one example

survey %>%   
 ggplot(aes(dds\_means, des\_score)) + geom\_point(aes(color = feel\_drops))



I thought this might be visually informative but I think that I would want to facet\_wrap feels\_drops since it has 6 options and lose the color. It might be meaningful to add color for in range blood sugar 80% of the time yes/no.

**Visualization idea #4**

Visualization of mediation between resource use, engagement (measured through the Consumer Health Activation Index), and blood sugar outcomes. I am still working out the code to run this analysis. Maybe a triangular figure with arrows and the variable names.