EARLY DETECTION OF DIABETES USING MACHINE LEARNING

Problem Background

- Diabetes, a rapidly escalating global health issue, affected 422 million people worldwide as of 2018 (WHO).
- The number of people affected is expected to have increased significantly since then.
- Approximately 50% of all people with diabetes are undiagnosed due to its long-term asymptomatic phase.
- In the United States, 8.5 million people (23.0% of adults) are undiagnosed. (June 29, 2022)
- Early detection is vital for clinically meaningful outcomes, requiring careful assessment of both common and less common symptoms.

The Challenge

- Currently, there is a lack of efficient methods to predict the likelihood of developing diabetes.
- The unique asymptomatic phase of diabetes presents a significant challenge for early detection and intervention.

EARLY DETECTION OF DIABETES USING MACHINE LEARNING

Our Approach

- We used data mining classification techniques and machine learning models to predict the likelihood of developing diabetes.
- A dataset of 520 instances from Sylhet Diabetes Hospital in Sylhet, Bangladesh, collected via direct questionnaires, will serve as the basis for our model.
- Tools: Alteryx for data preparation and blending, Tableau for data visualization and exploration, and machine learning for predictive modelling and analysis.

Objective

- To leverage the power of Alteryx, Tableau, and Machine Learning to create a robust risk prediction model.
- The ultimate goal is to facilitate the early detection of diabetes, thus enabling timely interventions and improved patient outcomes.

Initial Data Dictionary

Patient Details

- Age [20-65]
- Sex [Male, Female]

Binary Medical Condition Variables

- Polyuria
- Polydipsia
- sudden weight loss .
- weakness
- Polyphagia
- Genital thrush
- visual blurring
- Itching
- Irritability
- delayed healing
- partial paresis
- muscle stifness
- Alopecia
- Obesity

Target Variable

- Class (Positive/Negative)

Final Data used in Modeling

Upon conducting a comprehensive literature review, I discovered that 'partial_paresis' and 'muscle_stiffness' are symptoms often associated with prolonged diabetes. Conversely, 'alopecia' (hair loss) does not typically correlate with diabetes

Based on the Chi-Square test results, I decided not to include 'obesity', 'itching', and 'delayed_healing' as these showed insignificance in relation to the target variable.

Patient Details

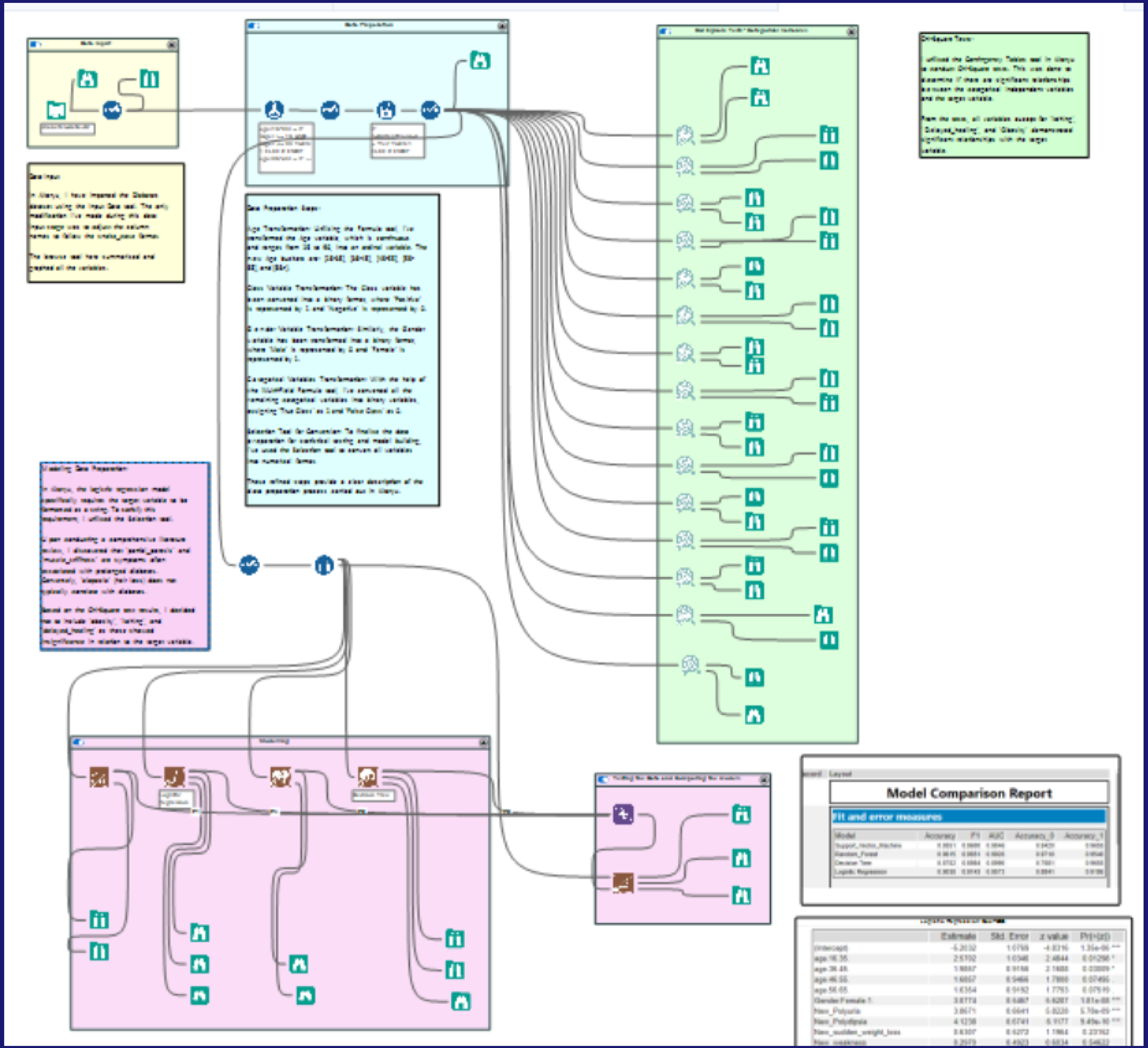
- Age Ordinal Bucketing
- Sex [Male, Female]

Binary Medical Condition Variables

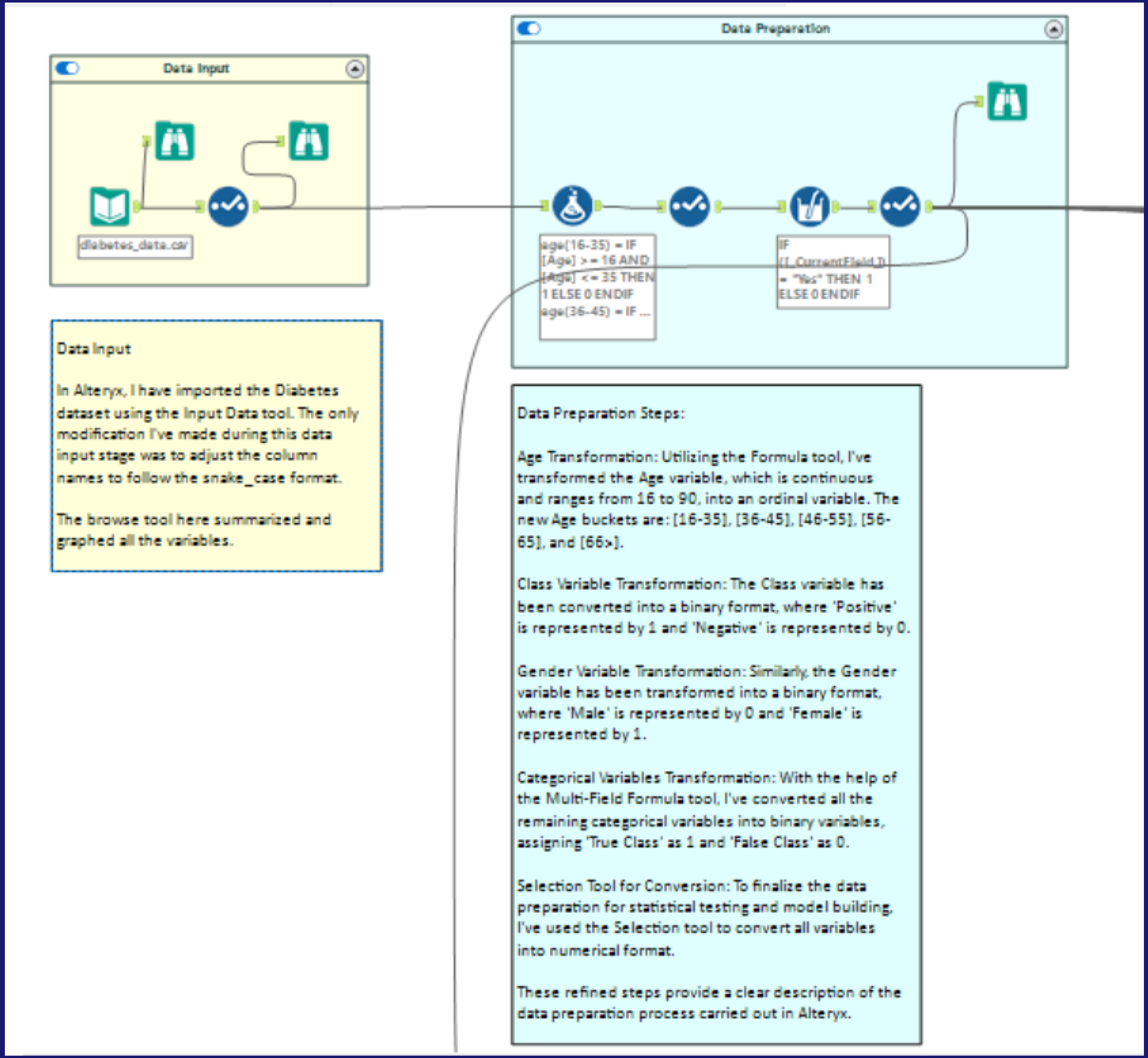
- Polyuria
- Polydipsia
- sudden weight loss .
- weakness
- Polyphagia
- Genital thrush
- visual blurring
- Obesity

Target Variable

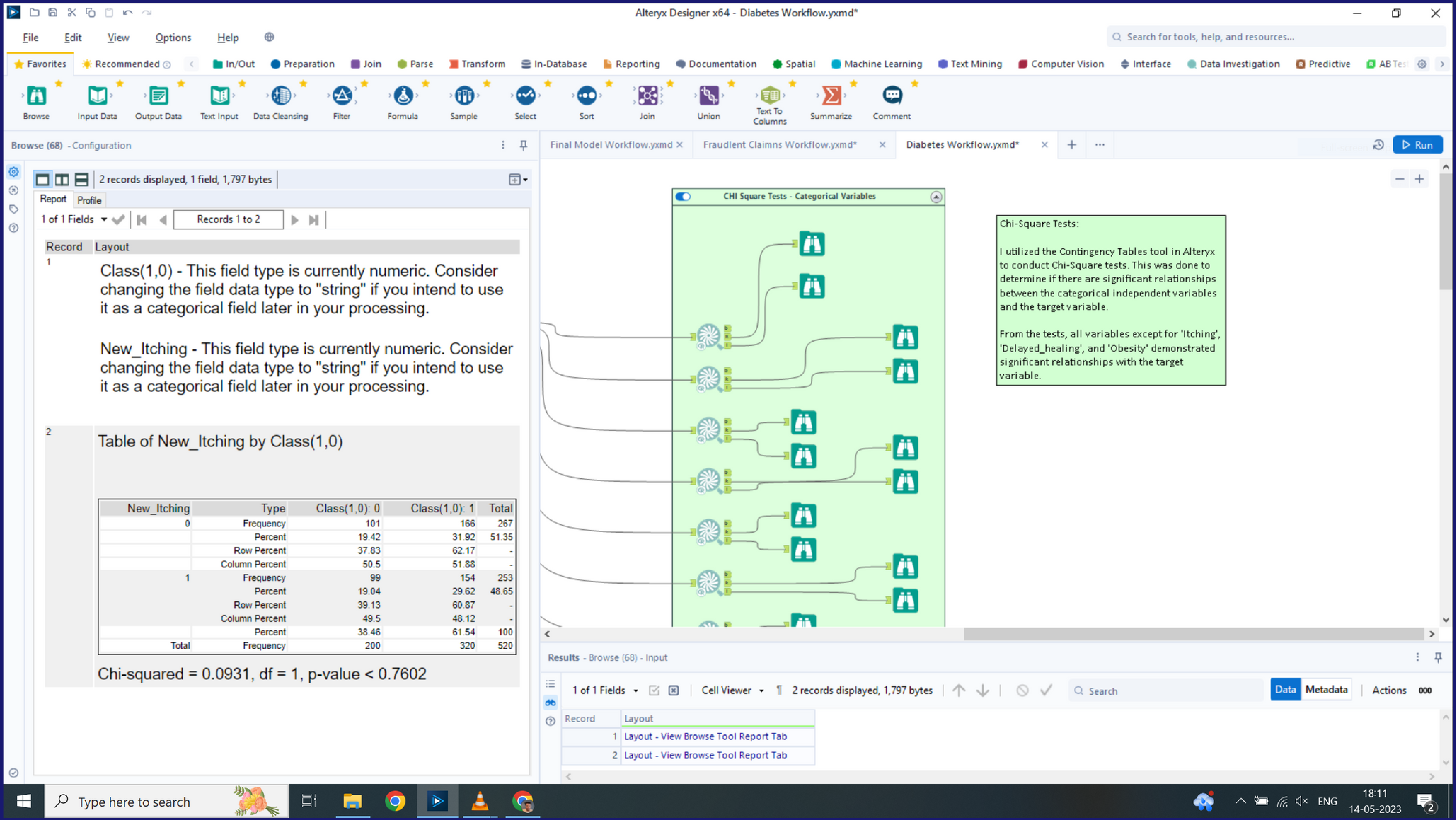
- Class (Positive/Negative)



ALTERYX WORKFLOW



DATA PREP ALTREYX WORKFLOW



CHI SQUARE ALTREYX WORKFLOW

Final Models

ecord Layout

Model Comparison Report

Fit and error measures

Model	Accuracy	F1	AUC	Accuracy_0	Accuracy_1
Support_Vector_Machine	0.9551	0.9600	0.9846	0.9420	0.9655
Random_Forest	0.9615	0.9651	0.9926	0.9710	0.9540
Decision Tree	0.8782	0.8984	0.8990	0.7681	0.9655
Logistic Regression	0.9038	0.9143	0.9573	0.8841	0.9195

MODEL PERFORMANCE ON THE TEST DATA. RANDOM FOREST IS THE ONE WITH HIGHEST AUC AND ACCURACY.

Logistic Regression | Coefficient's

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-5.2032	1.0769	-4.8316	1.35e-06	***
age.16.35.	2.5702	1.0346	2.4844	0.01298	*
age.36.45.	1.9857	0.9156	2.1688	0.03009	*
age.46.55.	1.6857	0.9466	1.7808	0.07495	.
age.56.65.	1.6354	0.9192	1.7793	0.07519	.
Gender.Female.1.	3.0774	0.5467	5.6287	1.81e-08	***
New_Polyuria	3.8671	0.6641	5.8228	5.78e-09	***
New_Polydipsia	4.1238	0.6741	6.1177	9.49e-10	***
New_sudden_weight_loss	0.6307	0.5272	1.1964	0.23152	
New_weakness	0.2970	0.4923	0.6034	0.54622	
New_Polyphagia	1.4431	0.5637	2.5601	0.01046	*
New_genital_thrush	0.9075	0.5362	1.6925	0.09055	.
New_visual_blurring	-0.4126	0.5158	-0.7999	0.4238	
New_Obesity	0.2036	0.6067	0.3355	0.73721	
age...66.	NA	NA	NA	NA	

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial taken to be 1)