

INTRODUCTION

"Diabetes is a disease that occurs when your blood glucose, also called blood sugar, is too high."(NIH) In the last two decades, the percentage of the United States population who were diagnosed with diabetes has skyrocketed over 5% (America's Health Rankings). There have been many articles that explain ways to prevent diabetes like eating healthy, working out, getting medication, etc. I want to determine which trait in adults put them at a higher risk of getting diagnosed with diabetes. By determining which traits relate the most the diagnoses of diabetes, we can create a model that can predict which groups of people should actively seek out these diabetes prevention methods. The traits that will be used for predicting a person's chance of being diagnosed with diabetes are Cholesterol, Glucose, High Density Lipoprotein, Age, Gender, Height, Weight, Systolic Blood Pressure, Diastolic Blood Pressure, Waist Size, and Hip Size.

BACKGROUND

One dataset was used for these analyses. It is comprised of information collected during the screening process for interviewees participating in a study by Dr. John Schorling from the University of Virginia. There were over one thousand African Americans in central Virginia who were screened but for this analysis, we are only focusing on 403 interviewees who had their Hemoglobin A1C levels tested. After getting this data, it was cleaned to remove personal information. Patient id's were removed as well as city the patient lived in. Other changes to the data was changing the gender column to 1s and 0s. The column where hemoglobin was recorded as also altered. It was changed to 1s and 0s to depict if the interviewee had diabetes or not. If their hemoglobin level was equal to or greater than 6.5, then the interviewee had diabetes and was changed to a 1. If their level was below 6.5, then they did not have diabetes and was changed to a 0. Changing this column to a binary group allows to predict our probabilities.

Proposed Analysis

Since we want to determine which traits relate the most to the diagnoses of diabetes, multiple linear regression will be used. Specifically, the backwards method will be used to test all traits at once and eliminating the traits that fail multicollinearity. It will give a generalized model that is better fitted for our second analysis. After finding the model that will be used for our predictions, we will continue the backwards method until three traits remain and trait with the lowest variance inflation will be the trait that relates the most. Once we have our new model of traits that relate the most to the diagnoses of diabetes, we will then separate the traits to make up smaller models. They will be used to make multiple prediction tables consisting of two traits and specified for each gender.

Predicting Diabetes Diagnoses Sarah Netchert

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Total Cholesterol 78 179 204 230 443 Stabilized Glucose 48 81 89 106 385 106 385 63 63 66 69 76	12 0.248 0.777 0.986 1.229 2.772 0.012 0.012 0.041 0.041 0.055 0.105 2.998 2.998 0.105 0.105 0.105 0.105	3 0.1 0.4 0.5 0.7 2.5 3 0.7 2.5 3 0.7 2.5 3 0.7 2.5 3 0.7 0.7 2.5 3 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	Fem High 8 119 16 552 727 546 727 727 546 727 546 727 546 727 727 546 727 727 546 727 727 546 727 727 546 727 727 727 546 727 727 727 727 727 727 727 727 727 72	nale Density Lipo 46 0.095 0.338 0.453 0.604 2.446 0.604 45 0.032 0.111 0.150 0.275 2.999 nale Waist 37 0.275 2.999 nale	59 0.065 0.238 0.323 0.438 2.250 60 0.058 0.196 0.260 0.463 0.323 0.196 0.260 0.463 0.260 0.463 0.260 0.463 0.260 0.463 0.260 0.463 0.260 0.463 0.260 0.463 0.260 0.463 0.260 0.463 0.260	120 0.011 0.041 0.058 0.081 0.983 0.983 0.983 0.195 0.595 0.595 0.755 0.755 1.178 3.000	Tota Cholest 78 179 204 230 443 443 443 443 81 89 106 385 106 385	I I I	112 0.169 0.527 0.667 0.830 1.851 0.030 0.005 0.019 0.026 0.026 0.026 0.026 0.026 0.026 0.026 0.031 0.026	Hig 38 0.081 0.283 0.283 0.375 0.493 1.703 1.703 34 0.010 0.034 0.034 1.999 33 0.349 0.253 0.253 0.211 0.211	Male ph Density 40 40 40 40 40 40 0.0 0.2 0.3 0.4 1.6 Male Ag 41 0.0 0.0 0.0 0.0 0.0 0.0 0.1 1.9 Wa 0.3 0.3 0.3 0.3 0.3 0.3 0.3	y Lipopr 6 65 30 30 30 30 30 30 30 30 30 30 30 30 30	otein 59 0.044 0.162 0.220 0.298 1.508 1.508 0.027 0.093 0.027 0.093 0.125 0.227 2.000	120 0.007 0.028 0.039 0.055 0.665 0.665 0.295 0.295 0.382 0.295 0.382 0.624 2.00											
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Total Total 78 179 204 230 443 Stabilized Glucose 48 81 89 106 385 66 63 66 69 76	12 0.248 0.777 0.986 1.229 2.772 0.012 0.012 0.041 0.055 0.105 0.105 2.998 2.998	3 0.1 0.4 0.5 0.7 2.5 3 0.7 2.5 3 0.7 2.5 3 0.7 2.5 3 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	Fem High 8 119 16 552 727 546 727 546 727 546 727 546 727 546 727 546 727 546 727 546 727 727 546 727 727 546 727 727 727 727 727 727 727 727 727 72	nale 1 Density Lipo 46 0.095 0.338 0.453 0.453 0.604 2.446 0.604 2.446 0.604 2.446 0.604 2.446 0.111 0.150 0.275 2.999 nale Waist 37 0.524 0.348 0.318 0.318 0.256	59 0.0655 0.238 0.323 0.438 2.250 60 0.058 0.196 0.260 0.463 0.727 0.463 3.000 41 0.727 0.463 0.4037 0.4561 0.371	120 0.011 0.041 0.058 0.081 0.983 0.983 0.983 0.195 0.595 0.755 1.178 3.000 56 1.178 3.000	Tota Cholest 78 179 204 230 443 443 443 48 81 89 106 385 106 385 66 63 66 69 Heigh	I I I	12 0.169 0.527 0.667 0.830 1.851 0.030 0.005 0.019 0.026 0.026 0.026 0.026 0.026 0.031 0.026 0.031 0.026 0.031 0.036	Hig 38 0.081 0.283 0.375 0.493 1.703 1.703 34 0.010 0.034 0.034 1.999 33 0.349 0.253 0.232 0.211 0.253	Male gh Density 40 0.0 0.0 0.2 0.3 0.4 0.3 0.4 0.3 0.4 0.3 0.4 0.3 0.4 0.4 0.5 0.4 0.5 0.6 0.7 <tr td=""></tr>	y Lipopr 6 65 30 30 30 30 30 30 30 30 30 30	otein 59 0.044 0.162 0.220 0.298 1.508 1.508 0.027 0.093 0.125 0.227 2.000 0.125 0.227 0.227 0.093 0.125 0.227 0.227 0.227	120 0.007 0.028 0.039 0.055 0.665 0.665 0.295 0.382 0.295 0.382 0.624 2.00 56 1.391 1.222 1.173 1.222 1.173											
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Total Total Cholesterol 78 179 204 230 443 Stabilized Glucose 48 81 89 106 385 106 385 63 64 76	12 0.248 0.248 0.777 0.986 1.229 2.772 0.012 0.012 0.041 0.055 0.105 0.105 0.105 0.105 0.105 0.105 0.105 0.133 0.121 0.133 0.121 0.133 0.121 0.133 0.121 0.133 0.121 0.133 0.121 0.133	3 0.1 0.4 0.5 0.7 2.5 3 0.7 2.5 3 0.0 0.0 0.0 0.0 0.0 0.1 2.9 3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	Fem High 8 119 52 52 727 546 727 546 727 546 727 546 727 546 727 546 727 546 727 546 727 546 727 727 727 727 727 727 727 727 727 72	nale 46 0.095 0.338 0.453 0.604 2.446 0.604 2.446 0.604 2.446 0.604 0.6032 0.111 0.150 0.275 2.999 nale Waist 37 0.348 0.318 0.318 0.318 0.256	59 0.0655 0.238 0.323 0.438 2.250 60 0.058 0.196 0.260 0.463 0.727 0.463 0.727 0.463 0.727 0.463 0.3000	120 0.011 0.041 0.058 0.081 0.983 0.983 0.195 0.595 0.755 1.178 3.000 1.178 3.000	Tota Cholest 78 179 204 230 443 63 89 106 385 63 63 63 63 63 69 Heigh Systol 81000 90 121	I I I	12 0.169 0.527 0.667 0.830 1.851 0.005 0.005 0.019 0.026 0.026 0.026 0.028 0.028 0.028 0.030 0.030 0.030 0.030 0.030 0.131 0.131 0.131 0.131 0.131 0.131	Hig 38 0.081 0.283 0.375 0.493 1.703 1.703 34 0.010 0.034 0.047 0.034 0.047 0.034 1.999 33 0.253 0.211 0.253 0.211 0.170 0.253 0.211 0.170	Male yh Density 40 0.0 0.2 0.2 0.3 0.2 0.4 1.6 Male Ag 0.0 0.0 0.0 0.0 0.0 0.1 0.0 0.1 0.0 0.1 0.0 0.1 0.0 0.1 0.0 0.1 0.0 0.1 0.0 0.1 0.0 0.1 0.2 Male VVa 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	y Lipopr 6 65 30 30 30 30 30 30 30 30 30 30	otein 59 0.044 0.162 0.220 0.298 1.508 1.508 0.227 0.027 0.093 0.125 0.227 2.000 0.125 0.227 2.000	120 0.007 0.028 0.039 0.055 0.665 0.665 0.382 0.295 0.382 0.624 2.00 2.00											
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After using the backwards method, it was determined that the best fitted model includes the traits cholesterol, glucose, high density lipoprotein, age, gender, height, systolic blood pressure, diastolic blood pressure, and waist. It is the first model that passes multicollinearity with values under 4. Continuing with the backwards method, we see that when three variables are left, the age trait has the lowest variance (Var(age) = 1.004) making it the strongest factor in predicting diabetes. We should expect the tables including these two traits should have higher probability percentages.

Looking at the prediction tables, we immediately see a difference in the probability percentages between males and females. The female tables all have much higher probability of being diagnosed in diabetes. Looking at the first pair of tables on cholesterol and high density lipoprotein, the group that would have the highest probability of being diagnosed with diabetes are those with high cholesterol and low levels of high density lipoproteins. The second pair of tables on glucose levels and age result in the group with the highest probability of being diagnosed are the older people with high glucose levels. The third pair of tables on height and waist size resulted in higher probabilities for those who are shorter with larger waists. The final pair of tables on systolic and diastolic blood pressure resulted in higher probabilities for those with higher systolic blood pressure and higher diastolic blood pressure. Our expectation from checking multicollinearity using the backwards method was correct. The tables including age and high density lipoprotein had the highest probabilities with age reaching as high as 300% for women. When taking into account the results of the eight prediction tables, we can conclude the group of people who have the greatest probability of being diagnosed with diabetes are older women with high cholesterol, low levels of high density lipoprotein, high levels of glucose, high systolic and diastolic blood pressure, have bigger waists, and who are short. People with these characteristics are at the highest rick of being diagnosed with diabetes and should make large lifestyle changes to reduce their risk.

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Conclusion

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