



Implementation of waist circumference as a critical predictor of pre-type II diabetes

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Abstract

A high accumulation of abdominal fat is an important factor in the development of type II diabetes and to other chronic diseases such as cardiovascular disease and forms of cancer. Waist circumference, along with body mass index (BMI) is positively associated with type II diabetes. Therefore, waist circumference should be considered in conjunction with BMI to reduce the number of misidentified patients in a “normal” BMI range that could benefit from lifestyle changes to prevent type II diabetes.

The overarching goal of this project was to utilize Go365 biometric data collected from state employees and eligible spouses to target those at risk for pre-type II diabetes for local health department outreach and potential recruitment to local health department programs. Additionally, the correlation between waist circumference and pre-type II diabetes was explored and a positive correlation was identified.

Introduction

Prediabetes occurs when blood sugar is higher than “normal” but not high enough yet to be diagnosed as type II diabetes. This means having a fasting plasma glucose between 100 mg/dL and 125 mg/dL¹. Approximately 88 million adults or 1 out of every 3, have prediabetes. More than 80% of American adults do not realize he or she is already considered prediabetic. Pre-type II diabetes turns into type II diabetes over time when the pancreas cannot make enough insulin for the body, or does not use insulin well enough to move glucose into cells¹.

While body mass index (BMI) is the “gold standard” for identifying patients at increased risk for adiposity-related health outcomes, body fat distribution should be recognized as an important risk factor to obesity-related outcomes such as type II diabetes². Waist circumference (WC) is often used as a measure of visceral fat mass because WC correlates with abdominal fat and is associated with cardiometabolic disease risk². The more visceral fat around the organs of the abdomen, the more resistance the cells become to insulin³. The risk of insulin resistance increases for men with waists larger than 40in and women with waists larger than 35in³. Other variables that lead to increase abdominal fat include sedentary lifestyle, poor diet, high cholesterol, high blood pressure, alcohol use, sleep disorders, and genetics³.

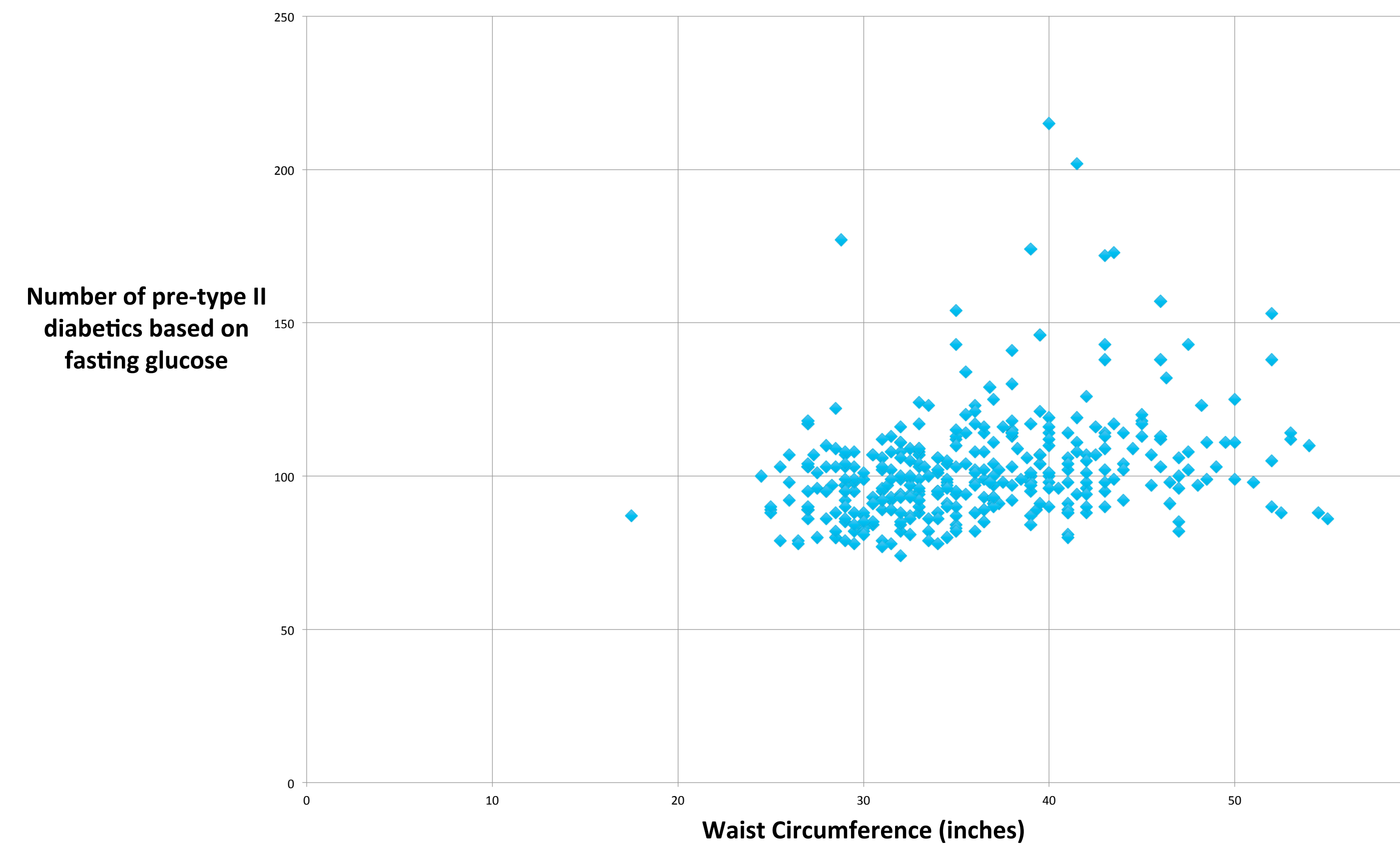
Hesitation to use waist circumference in clinical practice is reinforced by uncertainty that waist circumference can predict health risks beyond what is evaluated through routine cardiometabolic risk factors such as BMI, blood pressure (BP), lipid panel, and a fasting glucose blood plasma level.

The diabetes mortality rate in Bullitt County is 59.9 per 100,000 for women and 64.9 per 100,000 for men⁴. Compare this to the national average of 49.6 and 63.8, respectively⁴.

2018-2019 Go365 Patient Data For WC and Pre-type II Diabetes

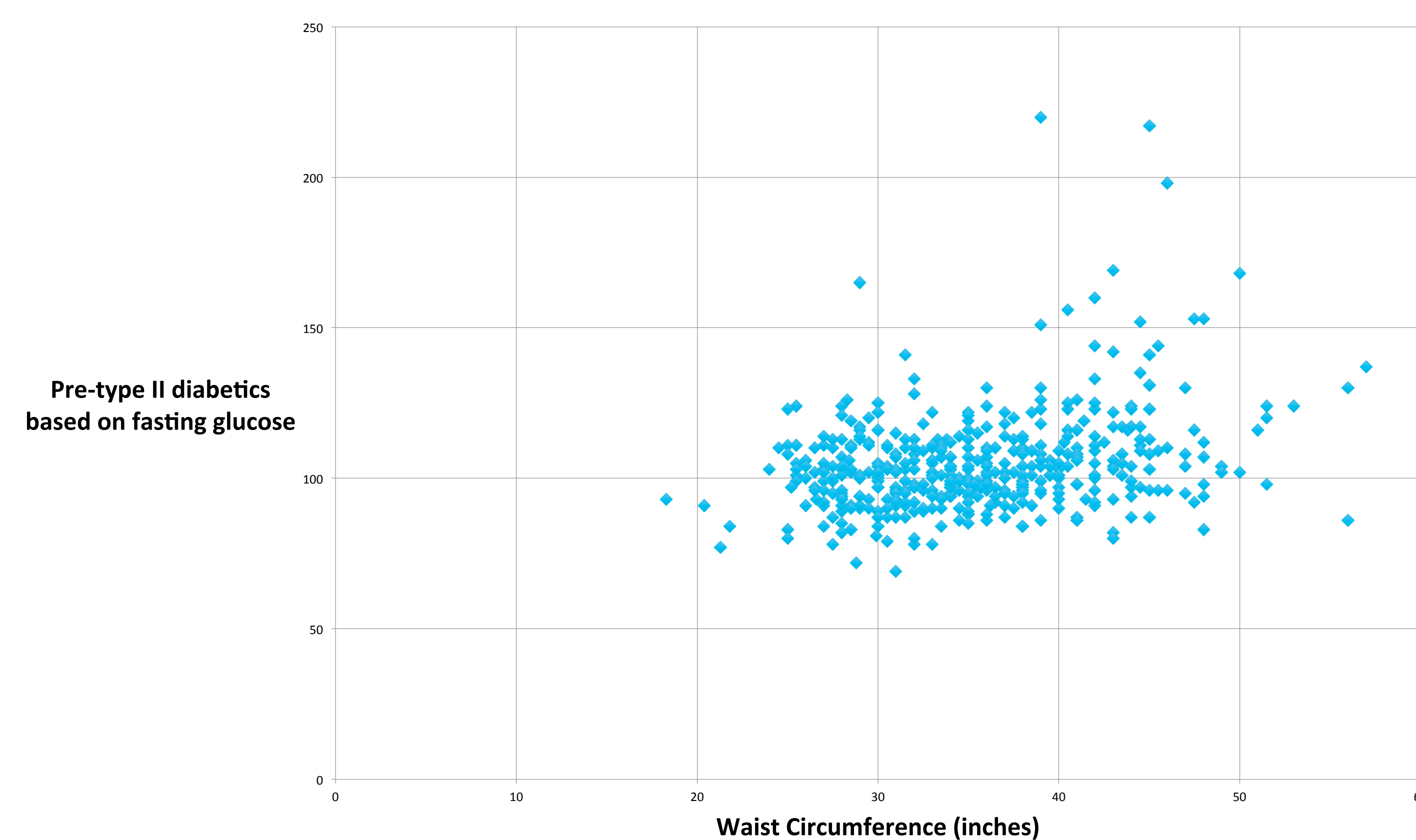
2018 correlation between waist circumference and fasting glucose of 100mg/dL +

R² = 0.302316718



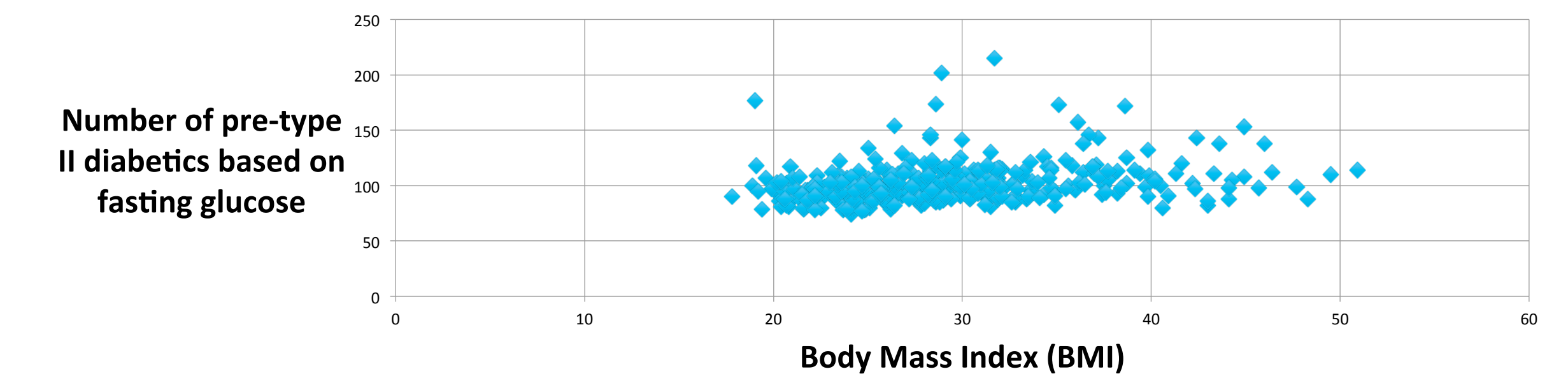
2019 correlation between waist circumference and fasting glucose for 100mg/dL +

R² = 0.311219065



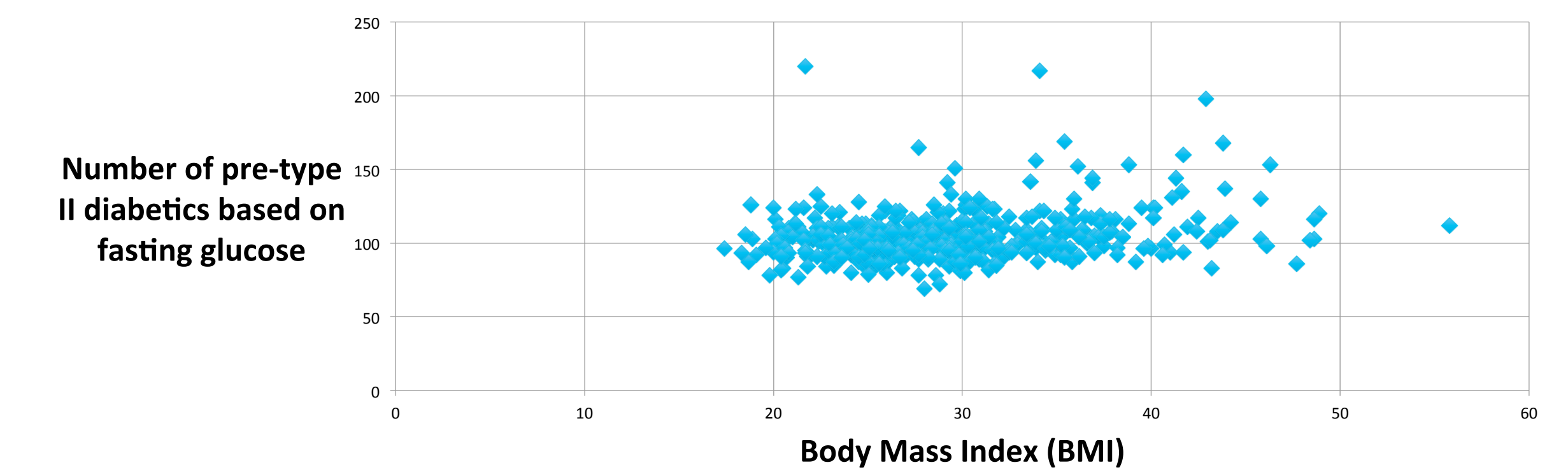
2018 correlation between BMI and fasting glucose of 100mg/dL +

R² = 0.262314695



2019 correlation between BMI and fasting glucose of 100mg/dL +

R² = 0.235768122



Results/Impact

Records from over 500 patients within Bullitt County, Kentucky from each calendar year 2018 and 2019 were extracted from a database of enrollees at the Bullitt County Health Department (BCHD) in the federally funded program for Kentucky employees and their spouses called Go365. After analyzing the patients who presented fasting, the sample size for 2018 was N = 369 and for 2019 was N = 450. The correlation coefficients were calculated by the correlation (r) formula:

$$r = \frac{1}{n-1} \left(\frac{\sum_x \sum_y (x-\bar{x})(y-\bar{y})}{s_x s_y} \right)$$

Analysis of the independent variable on the x-axis (WC) with the dependent variable on the y-axis (pre-type II diabetes) showed a cluster of points above 100mg/dL as waist circumference increased above 30 inches. This trend is seen in both male and female and is present in both the 2018 and 2019 populations. Both graphs show the need focus on abdominal fat in solely or at least along with BMI, as an overall height/weight ratio does not take waistline and its risks into account. Compared to the correlation of BMI to the fasting glucose result, the clusters are stretched over a wider range on the x-axis showing again the lack of focus that abdominal fat has on pre-type II diabetes.

The management of type II diabetes can be stressful. The high or low level of glucose in the body can add stress to an already stressful management process. The stress of complications forming due to type II diabetes can be even more daunting. Diabetes can affect a person’s quality of life and in return, the quality of life of a person can affect their diabetes⁵. Feeling better and being health gives a boost to self-esteem and quality of life. This good quality of life reinforces a positive cycle⁶.

Contact

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