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Type 2 diabetes health beliefs of college students

Emily Spindler

Introduction

As of 2019, Type 2 Diabetes (T2D) affects approximately 37.3 million people in the United States; this is 11.3% of the country's population (American Diabetes Association [ADA], 2022). T2D costs the nation an estimated total of $327 billion per year (ADA, 2022). The Centers for Disease Control and Prevention (CDC) states that T2D is characterized by impaired insulin sensitivity and increased blood glucose (2023). Insulin sensitivity is how well the body's muscle, fat, and liver cells respond to insulin, the pancreatic hormone which regulates blood glucose uptake (Cleveland Clinic, 2021). Impaired insulin sensitivity can be caused by being overweight, inactivity, and having a family history of T2D (CDC, 2022, June 20). Although T2D is most prevalent among older adults, rates are increasing in college-age adults (San Diego & Merz, 2022). 84.1 million individuals ≥ 18 years old have prediabetes in the U.S. (Antwi et al., 2020). Prediabetes can be attributed to health behaviors common among the age group which increase the risk of T2D (Antwi et al., 2020; San Diego & Merz, 2022).

Developing T2D at a young age can lead to negative health outcomes (Arslanian, 2018). Depression and disordered eating are common in youth with T2D (Arslanian, 2018). Youth with T2D often experience increasing severity of obesity and diabetes complications with aging (Arslanian, 2018). According to the CDC, diabetes complications include heart disease, chronic kidney disease, nerve damage, hearing loss, and vision loss (2022, November 3). In addition, diabetes can negatively impact foot, oral, and mental health (CDC, 2022, November 3).

Purpose

College students of health-related majors are sometimes assumed to have greater health literacy due to taking classes that discuss health problems, diseases, risk factors, medical management, nutrition, and exercise. How often T2D is discussed in classes is unknown;

therefore, the amount of knowledge health students have about T2D is undetermined. In addition, T2D health knowledge of non-health-related majors is unknown; therefore, questions about T2D knowledge and behavioral risk factors among various college majors arise. Do college students' majors impact their knowledge of T2D? Do their majors affect their health beliefs about T2D? Do their majors influence their engagement in health behaviors which increases the risk of T2D? The objective of this study was to discover the answers by examining a mid-size regional public university's students' majors, health beliefs about T2D, and engagement in behavioral risk factors.

Significance

Various health behavior theories recognize that the awareness of the relationship between a behavior and a disease is the first step in encouraging individuals to modify behaviors to improve their health (Waters & Hawkins, 2018). Collecting students' T2D health beliefs and behavioral risk factors could be used to develop educational material specifically tailored for the university students. The material might aid the students in becoming more aware of the link between their behaviors and risk of T2D. This would encourage behavioral modification to decrease their likelihood of developing T2D.

In addition to uncovering the link between behavior and risk of T2D, considering the college majors of the participants is important. Evaluating the T2D beliefs and behavioral risk factors of students from various academic fields will indicate if university studies courses should increase T2D education efforts among their students (San Diego & Merz, 2022). To decrease T2D prevalence in college-age adults, university students of all majors should learn how their lifestyle influences their risk of developing the condition.

College-aged adults are society's emerging professionals, and transitioning from students to employees is a critical period regarding food intake, exercise, and other health behaviors (Sogari et al., 2018). This age group must have a better understanding of their health to behave appropriately. Without the knowledge of their risk of T2D, their behavioral risk factors will prevail, and the prevalence of T2D in the U.S. will continue to increase. To help halt the U.S. T2D epidemic, students' health beliefs about the condition and behavioral risk factors must be evaluated so college educators may emphasize the modifiability of behaviors while providing T2D education (San Diego & Merz, 2022).

Review of literature

Health beliefs

Health beliefs are an individual's certainties of health conditions which can predict health-related behaviors (Rural Health Information Hub, 2018). Health fatalism and family history are common health belief themes relating to T2D (Antwi et al., 2020; Cunningham et al., 2020; San Diego & Merz, 2022).

Health fatalism

A study examined college students' diabetes knowledge, health fatalism, and how this influenced T2D preventive behavior (San Diego & Merz, 2022). Health fatalism is the belief that health outcomes are uncontrollable (San Diego & Merz, 2022). The research found that individuals who consumed a healthier diet had higher diabetes knowledge and low health fatalism while individuals who consumed a poorer diet had moderate or high diabetes knowledge and high health fatalism (San Diego & Merz, 2022). This indicated that students who believed developing T2D was outside of their control were more likely to participate in behavioral risk factors (San Diego & Merz, 2022).

Family history

Family influences diabetes-related health beliefs, and the beliefs influence lifestyles, health behaviors, and coping strategies (Cunningham et al., 2020). Family members' beliefs and experiences transform how individuals view T2D due to witnessing the condition's effect on family members; participants in various studies watched family members receive amputations, become blind, undergo strokes, and/or die due to T2D (Cunningham et al., 2020). Witnessing negative consequences made some individuals believe to have a greater awareness of the condition and effects compared to family members and, in turn, had greater control over the condition (Cunningham et al., 2020). Others believed to be destined to develop the disease if a family member had T2D due to unavoidable genetic components (Vaja et al., 2021). Understanding university students' health beliefs and the beliefs' origins is needed to encourage healthy lifestyle behaviors.

Behavioral risk factors

Studies have found multiple behavioral risk factors for T2D that are common among college students: lack of physical activity, sedentary behavior, and unhealthy dietary habits (Antwi et al., 2020; San Diego & Merz, 2022).

Lack of physical activity

One of the most common risk factors found in university students was a lack of physical activity (Antwi et al., 2020). Adults are recommended to complete 150 to 300 minutes a week of moderate-intensity physical activity or 75 to 150 minutes a week of vigorous-intensity aerobic physical activity (U.S. Department of Health and Human Services [HHS], 2018). According to the American College Health Association (ACHA), only 42.6% of college students meet the weekly physical activity recommendations (2018). Physical activity helps to reduce risk factors

for diseases such as obesity, and this decreases the risk of T2D (HHS, 2018). Exercise aids in improving insulin sensitivity (HHS, 2018). Physical activity can also decrease depressive symptoms which are common in youth with T2D (Arslanian, 2018; HHS, 2018).

Sedentary behavior

Sedentary behavior is defined as the expenditure of 1.5 metabolic equivalents of task (MET)s or less of energy while in a lying, reclining, or sitting posture (Katzmarzyk et al., 2019). In most research studies, sitting time and television viewing is considered sedentary behavior (Katzmarzyk et al., 2019). Sedentary lifestyles are becoming more prevalent among the U.S. population; the U.S. National Health and Nutrition Examination Survey (NHANES) reports that the U.S. population expends about 55% of their waking behavior (7.7 hours per day) being sedentary (Katzmarzyk et al., 2019). Research shows that individuals who sit for greater than eight hours a day without physical activity have a risk of death comparable to the risk posed by smoking and obesity (Laskowski, 2022). Sedentary lifestyles are associated with negative health-related outcomes including diabetes (Castro et al., 2018; Katzmarzyk et al., 2019). University students have an increased risk of being sedentary; a significant portion of their time is spent in class or studying (Castro et al., 2018). Evidence indicates that the sedentary behavior of undergraduate students equals or exceeds that of desk-based workers (Castro et al., 2018). Due to this, college students have an increased risk of experiencing negative health-related outcomes such as T2D.

Unhealthy dietary habits

U.S. college students are known for their unhealthy eating practices which leads to weight gain. Studies have shown that college students gain more weight than individuals who do not attend university; this can be attributed to a variety of factors such as time constraints,

unhealthy snacking, stress, convenient high-calorie food, easy access to junk food, and high prices of healthy food (Sogari et al., 2018). Furthermore, as university students transition into adulthood and gain more independence, making healthful food choices may be unfamiliar (Sogari et al., 2018). Young adults understanding the consequences of unhealthy dietary habits is of utmost importance; weight gain causes a decrease in insulin sensitivity which can lead to T2D (Cleveland Clinic, 2021). Adult diseases are due to health risk behaviors that begin during adolescence which is why unhealthy habits should be limited and healthy behaviors enabled (Sogari et al., 2018). Collecting students' behavioral risk factors for T2D will aid in determining how to discourage this behavior.

College majors' influence on health beliefs and behaviors

In a study examining the health literacy of college students, students had adequate health literacy skills (Dolezel, 2020). College major, healthcare work experience, and healthcare credentials were not predictors of health literacy (Dolezel, 2020). Research has not compared the health beliefs and behaviors of various majors, especially the health beliefs and behaviors relating to T2D.

Study questions

What are the T2D health beliefs of undergraduate students? What are undergraduate students' behavioral risk factors for T2D? Do T2D health beliefs and behavioral risk factors vary between academic majors?

Methodology

Design

The study used a quantitative, non-experimental, survey design. The objective was to observe undergraduate students' T2D health beliefs and behavioral risk factors and compare

between academic majors. Convenience sampling was used to obtain responses. Inclusion criteria was undergraduate students over the age of 18 at the university. Students in the student center were asked to complete a survey containing questions about demographic data, college major, T2D health beliefs, and T2D behavioral risk factors.

Sample, population, setting

The participant sample was voluntary undergraduate students at a mid-size regional public university. The population was all undergraduate students at the university. The setting for the study was the university student center. Graduate students, faculty, and staff of the university were not included.

Data collection

Data were collected through surveys completed voluntarily by undergraduate students. A tabling booth was set up at the student center on two separate days for two consecutive hours. The booth contained educational posters requesting students to fill out a survey. Two responses were discarded; the students did not indicate their academic major. The survey answers were transferred to an Excel file with a column for each survey question.

Measurement

The survey included questions regarding gender, age, race/ethnicity, academic year, academic major, T2D family history, familial impact on T2D health beliefs, health fatalism, physical activity, sedentary behavior, and dietary habits. The final question was open response and invited students to write additional, relevant information. Students who participated received a survey with Consent to Participate information on the cover page. The instructions included the study title, investigator and faculty sponsor information, nature/purpose of the project, explanation of procedures, discomforts/risks, confidentiality notice, refusal/withdrawal

information, and contact information. The Consent to Participate information described that participation was voluntary, students could withdraw at any time without penalty, and turning in the survey conveyed approval to use the responses. After reading through the Consent to Participate information, the students could fill out the survey. The survey responses were not examined until both data collecting sessions concluded.

Results

General

Of the 99 respondents, the average age was 19.60 with a median age of 20.5, range of 11, and standard deviation of 1.56. The average academic year was 2.31 with a median of 2, range of 3, and standard deviation of 1.08. When asked for gender, 30.30% of respondents identified as male and 69.70% as female. When asked for race/ethnicity, 1.01% of students were American Indian or Alaskan Native, 3.03% were Asian or Pacific Islander, 5.05% were Non-Hispanic Black, 5.05% were Hispanic or Latino, 83.84% were Non-Hispanic White, and 3.03% indicated other. One student indicated multiple races/ethnicities.

Table 1
Participants' Demographics (N=99)

Characteristic	**Mean (SD)**
Age	19.60 (1.56)
Academic year	2.31 (1.08)
Characteristic	***n* (percent)**
Gender: Male	30 (30.30)
Female	69 (69.70)
Race/Ethnicity: American Indian or Alaskan Native	1 (1.01)
Asian or Pacific Islander	3 (3.03)
Non-Hispanic Black	5 (5.05)
Hispanic or Latino	5 (5.05)
Non-Hispanic White	83 (83.84)
Other	3 (3.03)

Academic major/college

The university offers 148 academic programs which are organized into seven academic colleges. The academic colleges include: the Center for Adult and Regional Education; School of Agriculture; College of Business; College of Education and Human Services; College of Humanities and Fine Arts, School of Nursing and Health Professions; and College of Science, Engineering, and Technology. Health-related majors are included in the School of Nursing and Health Professions, and non-health related majors are organized into the other six academic colleges. The data included responses from students from 41 academic majors from seven academic colleges. Four of the students indicated more than one major, but only one of the four students had majors in two academic colleges.

Of the 99 respondents, the percent of participants' academic majors were: 19.19% communication disorders, 11.11% nursing, 5.05% biology, 5.05% occupational safety and health, 5.05% psychology, 4.04% construction management, 4.04% dietetics, 3.03% chemistry, 3.03% design engineering technology, 3.03% elementary education, 3.03% exercise science, 2.02% business administration, 2.02% computer science, 2.02% education, 2.02% engineering physics, 2.02% mathematics, 2.02% pre-veterinary technology, and 2.02% social work. The remaining 23 academic majors each belonged to one participant.

Of the respondents, 1.01% of the participants were from the Center for Adult and Regional Education; 4.04% were from the School of Agriculture; 10.10% were from the College of Business; 29.29% were from the College of Education and Human Services; 10.61% were from the College of Humanities and Fine Arts; 17.68% were from the School of Nursing and

Health Professions; and 27.27% were from the College of Science, Engineering, and Technology.

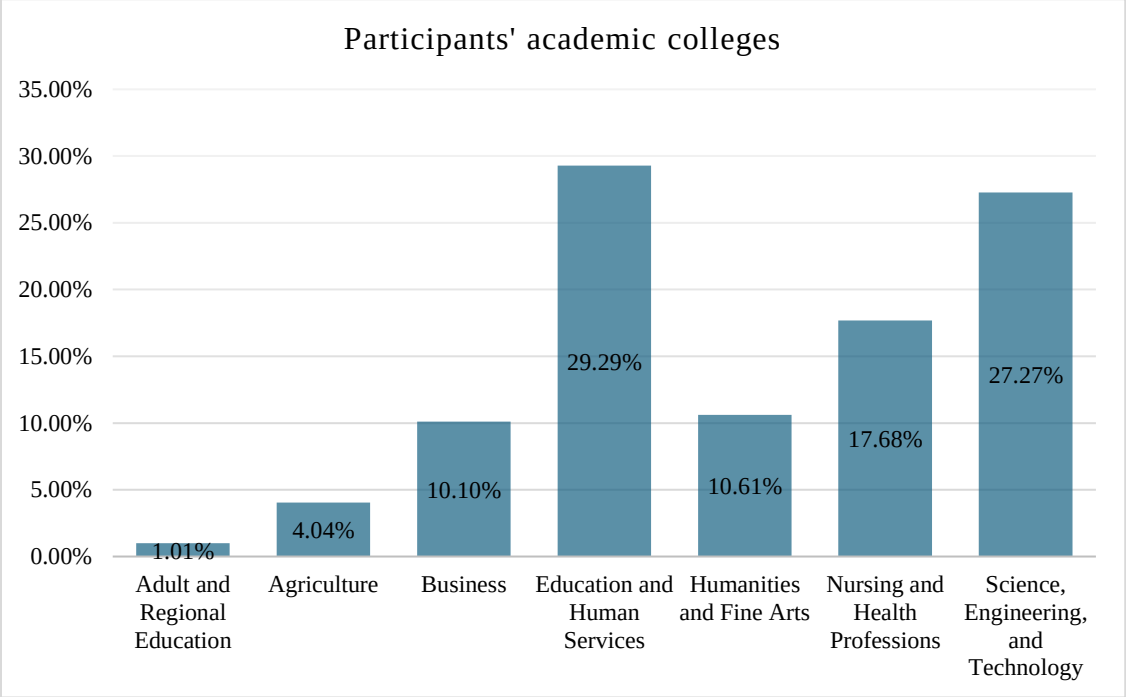

Figure 1: Participants' Academic Colleges

Family history

Of the sample, 40.40% of students had relatives with T2D, 49.49% did not have relatives with T2D, and 10.10% were unsure.

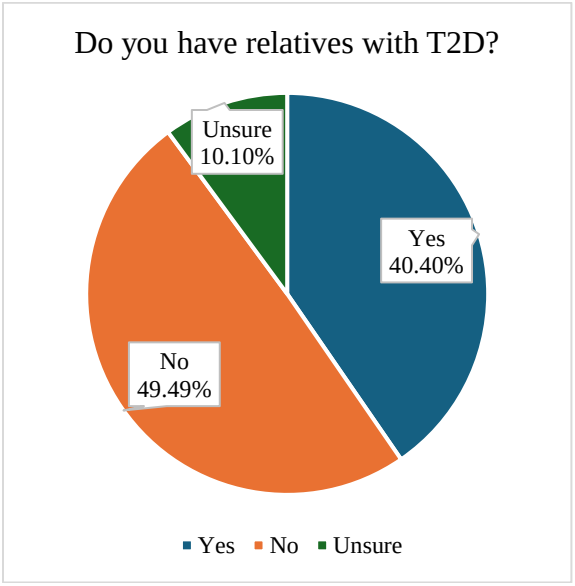

Figure 2: College students' T2D family history

When asked what the participants learned about T2D from relatives, 32.77% answered T2D is hereditary, 25.21% said T2D is preventable, 31.09% believed T2D leads to other complications, 6.72% thought T2D is not a serious health condition, and 4.20% indicated learning other information. While students were instructed to select one answer for the survey questions, the majority of respondents indicated multiple answers for what relatives taught about T2D.

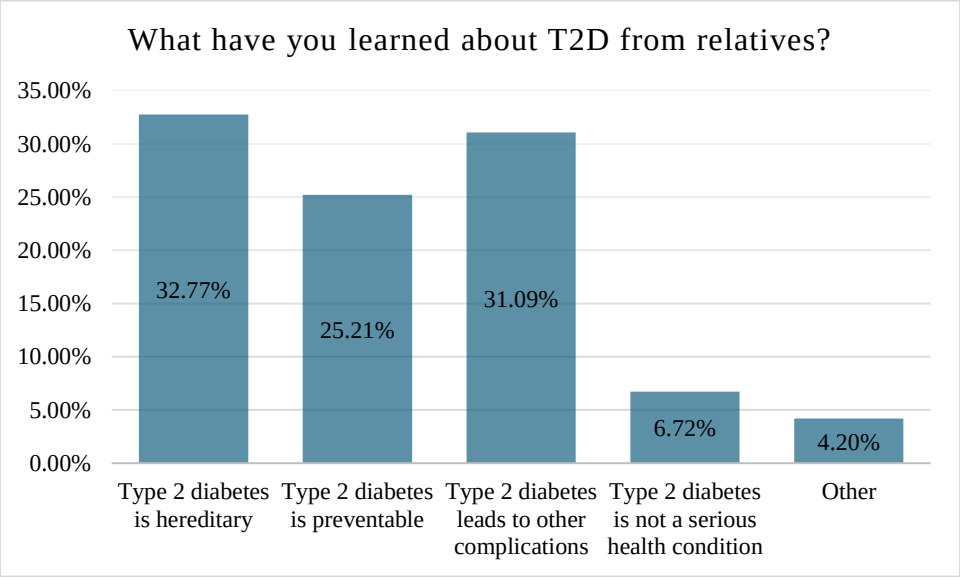

Figure 3: College students learning from relatives with T2D

Academic focus and family history

The student of the Center of Adult and Regional Education did not have relatives with T2D. Of the agriculture students, 50.00% had a relative with T2D and 50.00% did not have a relative with T2D. The College of Business responses indicated 30.00% of students had a relative with T2D and 70.00% of students did not. Of the College of Education and Human Services sample, 48.28% of students had a relative with T2D, 44.83% did not, and 6.90% were unsure. The College of Humanities and Fine Arts had 36.36% of students with relatives with T2D, 45.45% without relatives with T2D, and 18.18% were unsure. The responses of the School of Nursing and Health Professions indicated 50% of students had a relative with T2D, 44.44%

did not have a relative with T2D, and 5.56% were unsure. Of the responses from the College of Science, Engineering, and Technology, 37.04% had a relative with T2D, 44.44% did not, and 18.52% were unsure.

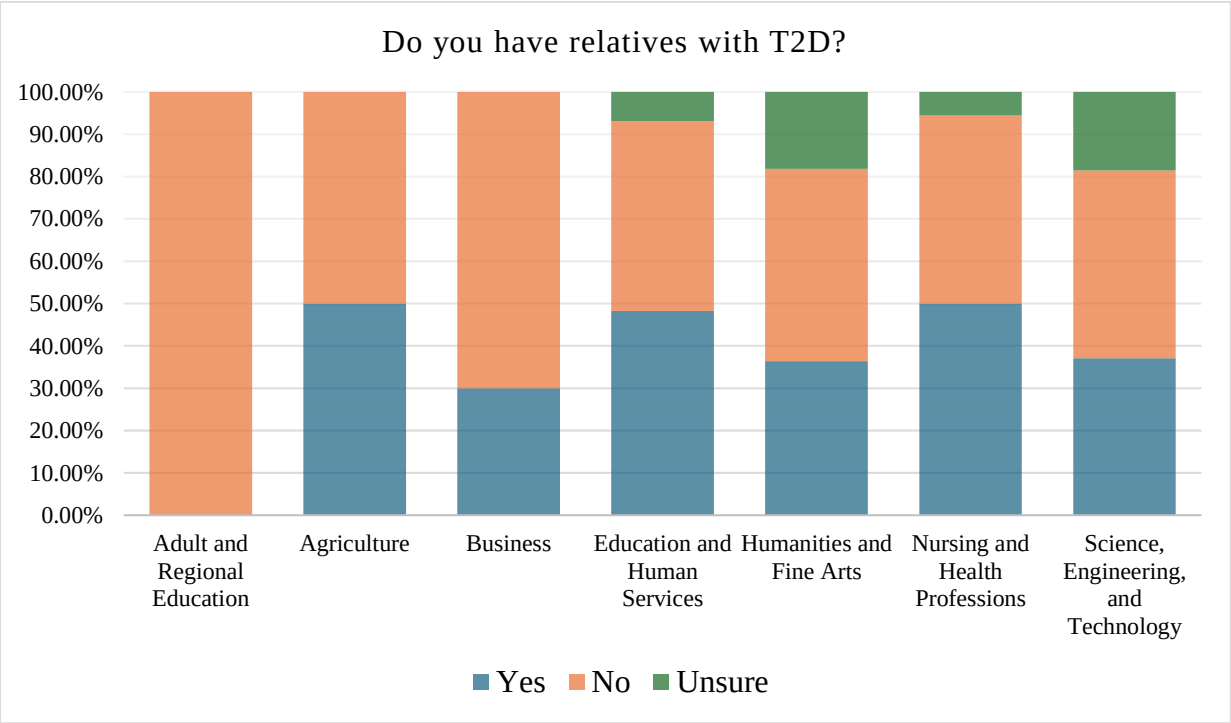

Figure 4: College students' academic focus and T2D family history

The student of the Center of Adult and Regional Education did not learn information from relatives about T2D. Of the agriculture respondents, 20.00% thought T2D was hereditary, 40.00% learned T2D was preventable, 20.00% indicated T2D leads to other complications, and 20.00% stated T2D is not a serious health condition. The College of Business had 22.22% of respondents state T2D is hereditary, 33.33% said T2D is preventable, 33.33% learned T2D leads to other complications, and 11.11% thought T2D is not a serious health condition. Of the College of Education and Human Services, 21.43% of the respondents thought T2D is hereditary, 28.57% believed T2D is preventable, and 50.00% said T2D leads to serious health conditions. The College of Humanities and Fine Arts had 42.86% of respondents state T2D is preventable, 28.57% learned T2D leads to other complications, 14.29% said T2D is not a serious health

condition, and 14.29% indicated learning other information. The student who indicated other was a student in both the College of Humanities and Fine Arts and the School of Nursing and Health Professions. The student wrote "This condition requires a lot of monitoring." Of the nursing and health professions respondents, 21.88% thought T2D is hereditary, 31.35% believed T2D is preventable, 31.25% said T2D leads to other complications, 9.38% indicated T2D is not a serious health condition, and 6.25% said other. A nursing and health professions student wrote that they learned more about T2D treatment from classes such as medical nutrition therapy and pathophysiology. The College of Science, Engineering, and Technology had 20.00% of respondents indicate T2D is hereditary, 25.00% said T2D is preventable, 40.00% thought T2D leads to other complications, 10.00% said T2D is not a serious condition, and 5.00% said other. The student who indicated other wrote they did not learn anything from their relative with T2D.

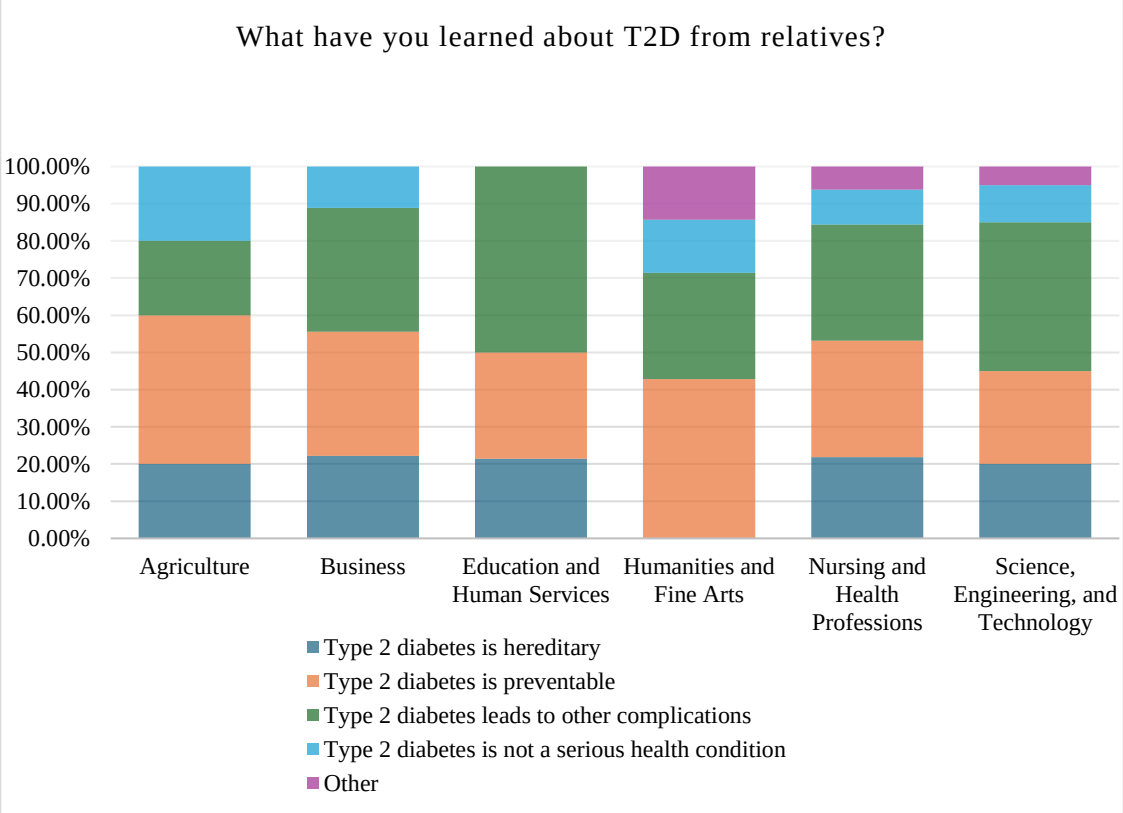

Figure 5: College students' academic focus and learning from relatives with T2D

Risk perception

Of the 99 respondents, 12.12% of students indicated they believed they were at risk for T2D, 67.68% did not believe they were at risk, and 20.20% were unsure.

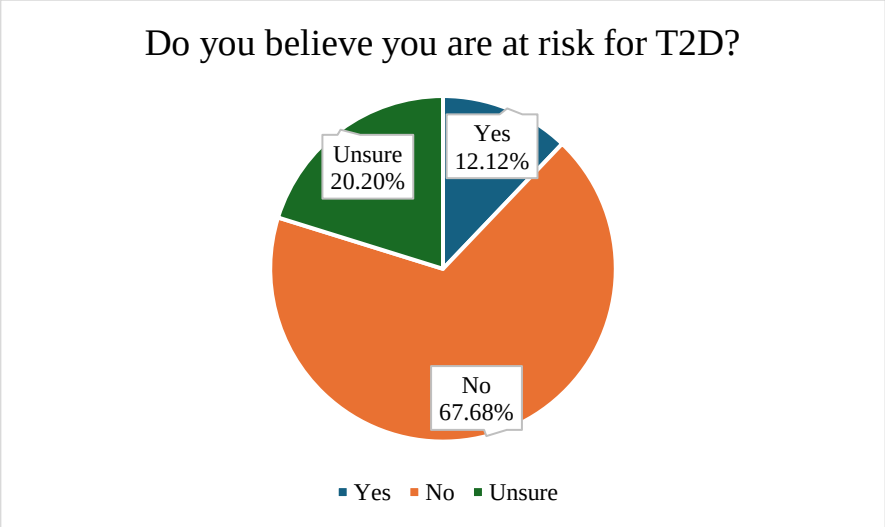

Figure 6: Colleges students' risk perception of T2D

Academic focus and risk perception

The student of the Center of Adult and Regional Education did not believe to be at risk of developing T2D. Of the agriculture students, 25.00% believed to be at risk of T2D and 75.00% did not believe to be at risk. The College of Business had 10.00% of respondents think to be at risk for T2D, 60.00% indicate to not be at risk, and 30.00% were unsure. The College of Education and Human Services had 20.69% of students believe to be at risk of T2D, 58.62% did not think to be at risk, and 20.69% were unsure. Of the College of Humanities and Fine Arts, 90.91% did not think to be at risk of T2D and 9.09% were unsure. The School of Nursing and Health Professions had 16.67% of students indicate to be at risk of T2D, 61.11% believe to not be at risk, and 22.22% were unsure. Of the College of Science, Engineering, and Technology, 3.70% of students thought to be at risk of developing T2D, 74.07% did not think to be at risk, and 22.22% were unsure.

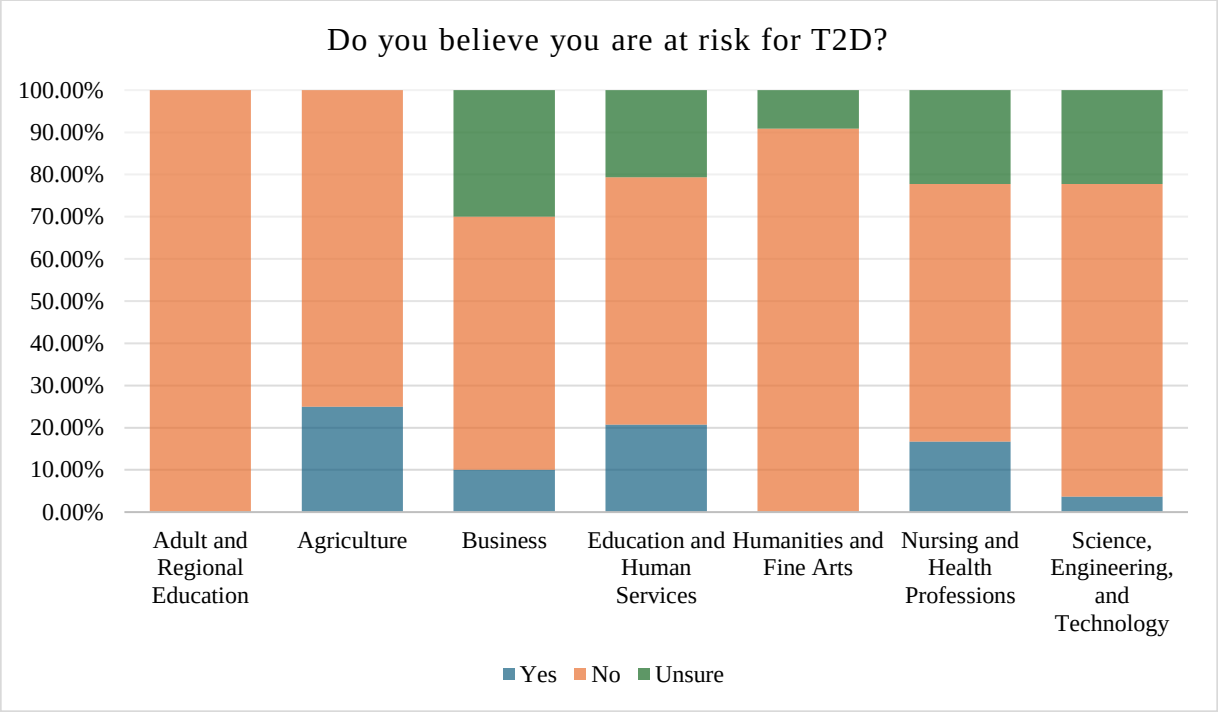

Figure 7: College students' academic focus and risk perception of T2D

Health fatalism

Of the sample, 28.57% of students believed if one is meant to develop T2D the individual will develop the disease no matter what and 71.43% disagreed with the health fatalism statement. One student opted to not answer the question.

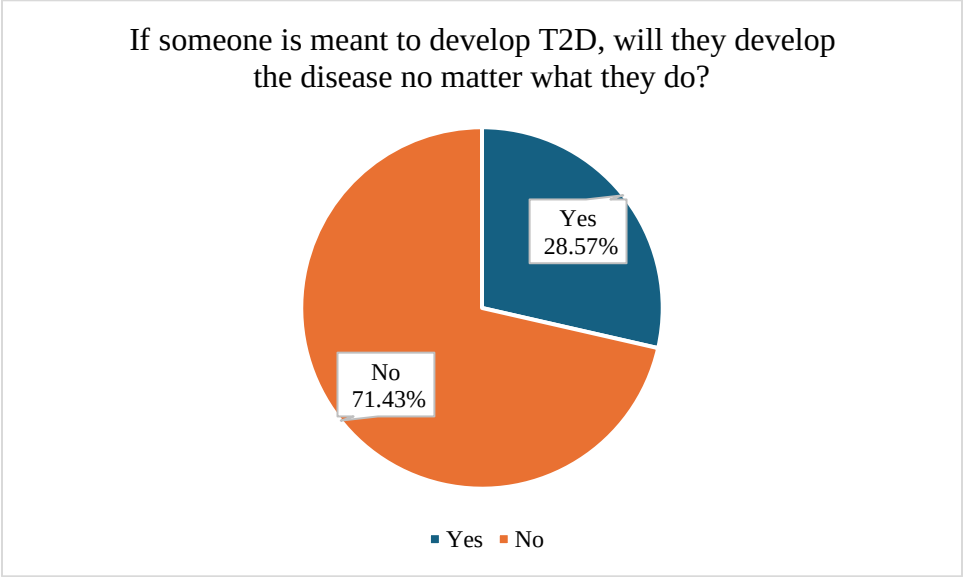

Figure 8: College students' T2D health fatalism

Academic focus and health fatalism

The student of the Center of Adult and Regional Education did not believe an individual will develop T2D no matter what. The School of Agriculture had 50.00% of students believe in health fatalism and 50.00% did not. Of the business students, 10.00% agreed with the health fatalism statement and 90.00% disagreed. Of the College of Education and Human Services, 39.39% of students believed an individual could develop T2D no matter what and 60.71% disagreed with the statement. The College of Humanities and Fine Arts had 27.27% of students believe the health fatalism statement to be true and 72.73% of students disagree with the statement. Of the nursing and health professions students, 16.67% agreed with the T2D health fatalism statement and 83.33% disagreed. Of the College of Science, Engineering, and Technology respondents, 33.33% thought someone meant to develop T2D would develop the condition and 66.67% disagreed with the statement.

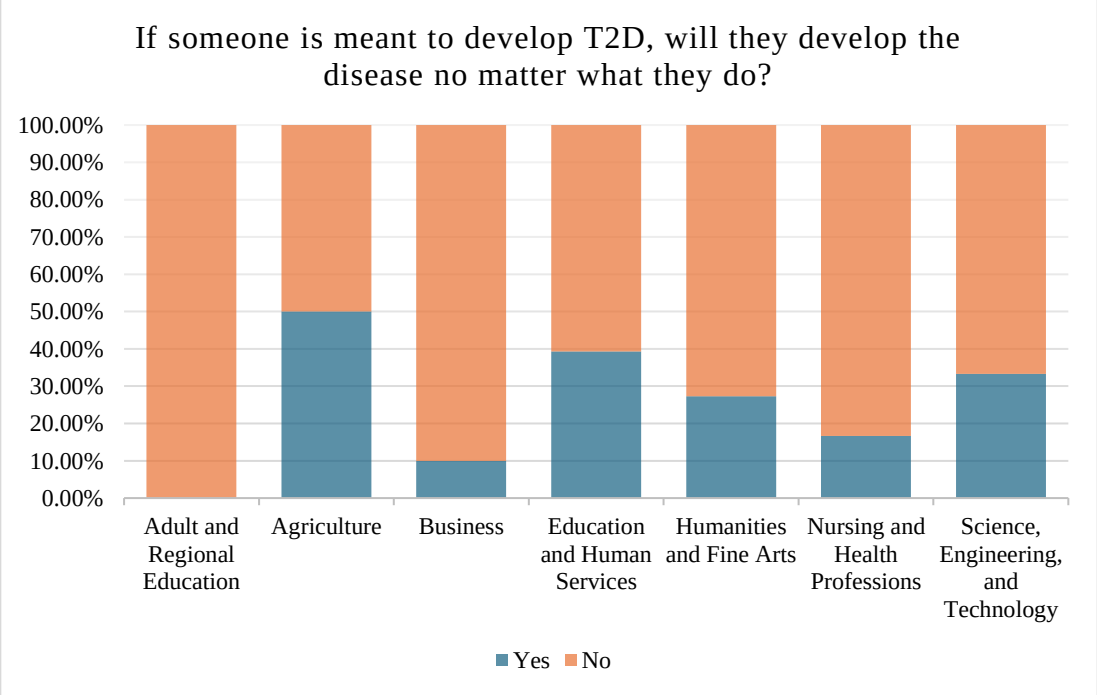

Figure 9: College students' academic focus and T2D health fatalism

Physical activity

Of the 99 respondents, 57.58% claimed to exercise for 30 minutes a day at least five days a week, and 42.42% did not participate in physical activity as frequently.

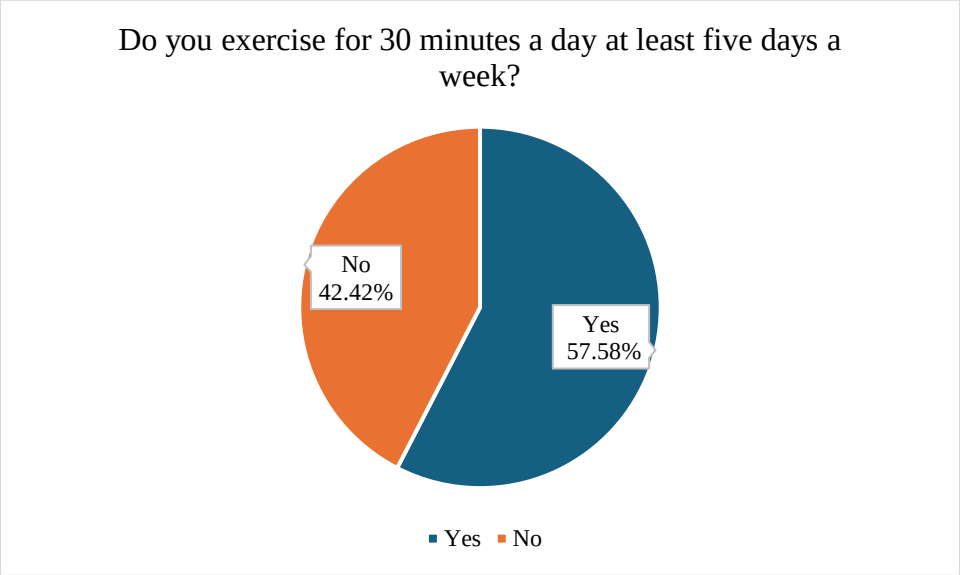

Figure 10: College students' physical activity

Academic focus and physical activity

The student of the Center of Adult and Regional Education claimed to meet the physical activity recommendations. Of the agriculture students, 75.00% exercised at least 30 minutes a day five days a week and 25.00% did not. The business respondents indicated 50.00% met the physical activity recommendations and 50.00% did not. Of the College of Education and Human Services, 41.38% of students believed to meet the exercise recommendations and 58.62% did not. The respondents of the College of Humanities and Fine Arts indicated 63.64% of students exercised at least 30 minutes a day five days a week and 36.36% of students did not. Of the nursing and health professions students, 77.78% said to meet the physical activity recommendations and 22.22% did not. The College of Science, Engineering, and Technology had 59.26% of respondents meet physical activity recommendations and 40.74% did not.

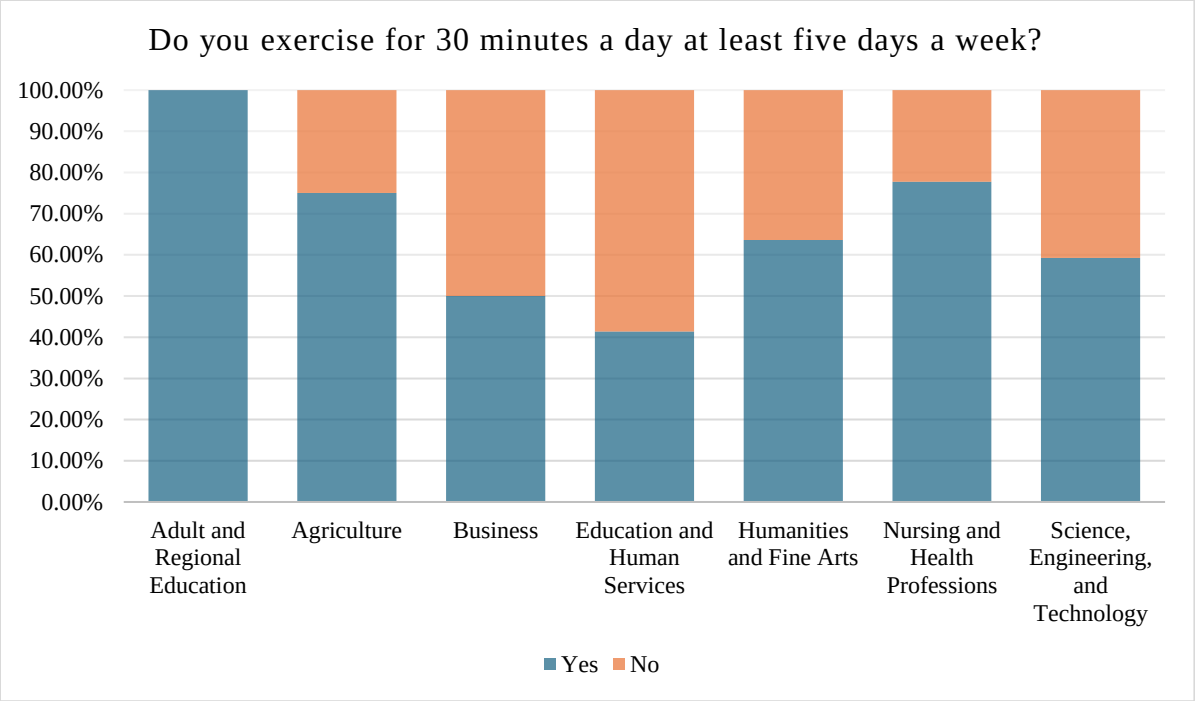

Figure 11: College students' academic focus and physical activity

Sedentary behavior

Of the 74 numerical responses, the average amount of hours per day spent sitting down was 7.22 with a median of 6.5, range of 18, and standard deviation of 3.59. The 25 other responses consisted of ranges, minimum amounts, and written statements; one student indicated sitting four to six hours a day, seven students said five to six hours a day, four students claimed six to seven hours a day, one student wrote at least seven hours a day, three students indicated six to eight hours a day, two students claimed at least eight hours a day, one student said eight to 10 hours a day, one student wrote nine to 10 hours a day, one student indicated at least 12 hours a day, three students wrote "a lot," and one responded, "I don't know."

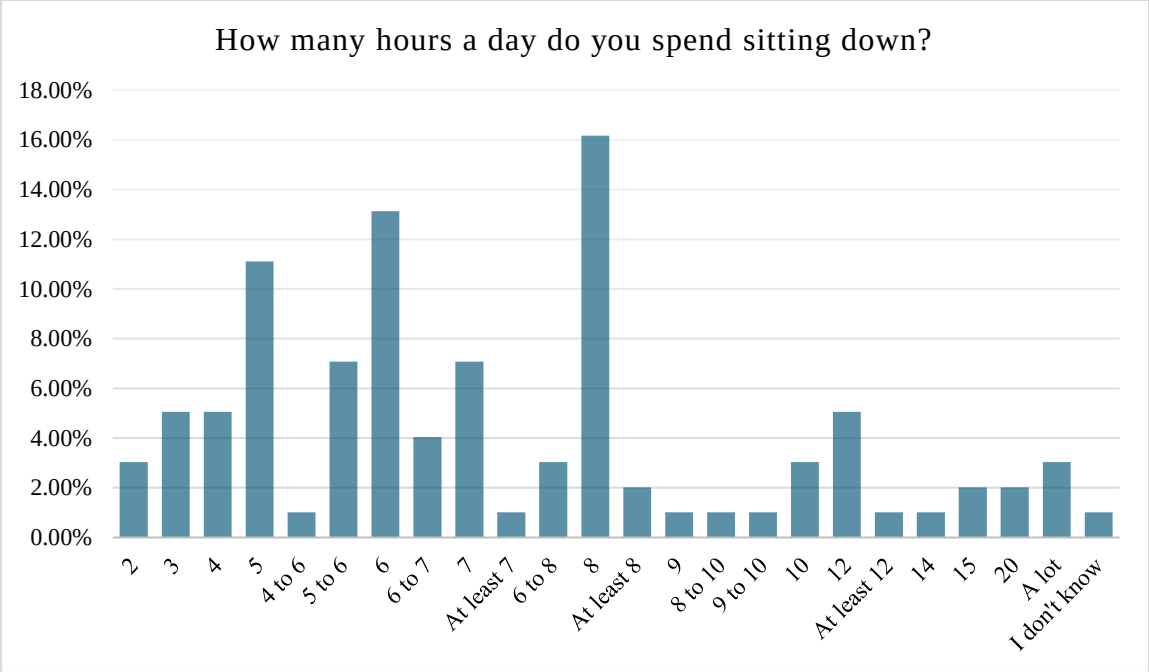

Figure 12: College students' sedentary behavior

Academic focus and sedentary behavior

The student of the Center of Adult and Regional Education claimed to sit eight hours a day. The School of Agriculture students had 25.00% of students sit for 5 hours a day, 50.00% for six hours, and 25.00% for seven hours. Of the College of Business, 10.00% sat for three hours a day, 10.00% for five hours, 10.00% for seven hours, 40.00% for eight hours, and 20.00% for 12 hours, and 10.00% wrote "a lot." The education and human services respondents indicated 10.34% of students sat for four hours a day, 10.34% for five hours, 20.69% five to six hours, 10.34% for six hours, 3.45% for six to seven hours, 6.90% for seven hours, 13.79% for eight hours, 3.45% for eight to 10 hours, 3.45% for 10 hours, 3.45% for 14 hours, 6.90% for 15 hours, and 6.90% wrote "a lot." Of the College of Humanities and Fine Arts, 18.18% of students indicated sitting for three hours a day, 9.09% said four hours, 27.27% for five hours, 9.09% for six hours, 9.09% for seven hours, 18.18% for eight hours, and 9.09% for nine hours. Nursing and health professions respondents indicated 5.56% sat for four hours a day, 5.56% for five hours,

5.56% for four to six hours, 11.11% for six hours, 5.56% for six to seven hours, 5.56% for seven hours, 11.11% for six to eight hours, 27.78% for eight hours, 5.56% for nine to 10 hours, 5.56% for 10 hours, 5.56% for 12 hours, and 5.56% for 20 hours. Of the College of Science, Engineering, and Technology students, 11.11% sat for two hours a day, 7.41% for three hours, 7.41% for five hours, 3.70% for five to six hours, 18.52% for six hours, 7.41% for six to seven hours, 3.70% for seven hours, 3.70% for at least seven hours, 3.70% for six to eight hours, 3.70% for eight hours, 7.41% for at least eight hours, 3.70% for 10 hours, 7.41% for 12 hours, 3.70% for at least 12 hours, 3.70% for 20 hours, and 3.70% said "I don't know."

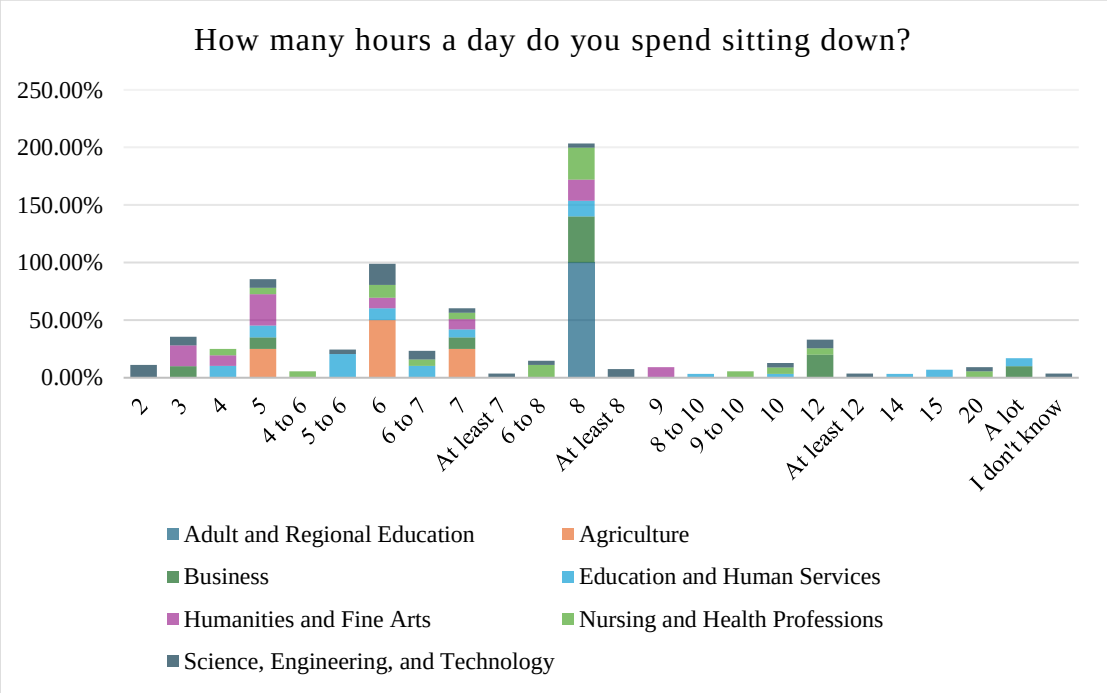

Figure 13: College students' academic focus and sedentary behavior

Eating habits

When asked what changes occurred in eating habits since starting college, 24.27% of the sample ate healthier meals, 58.25% ate less healthy meals, and 17.48% said other. Four students indicated multiple answers.

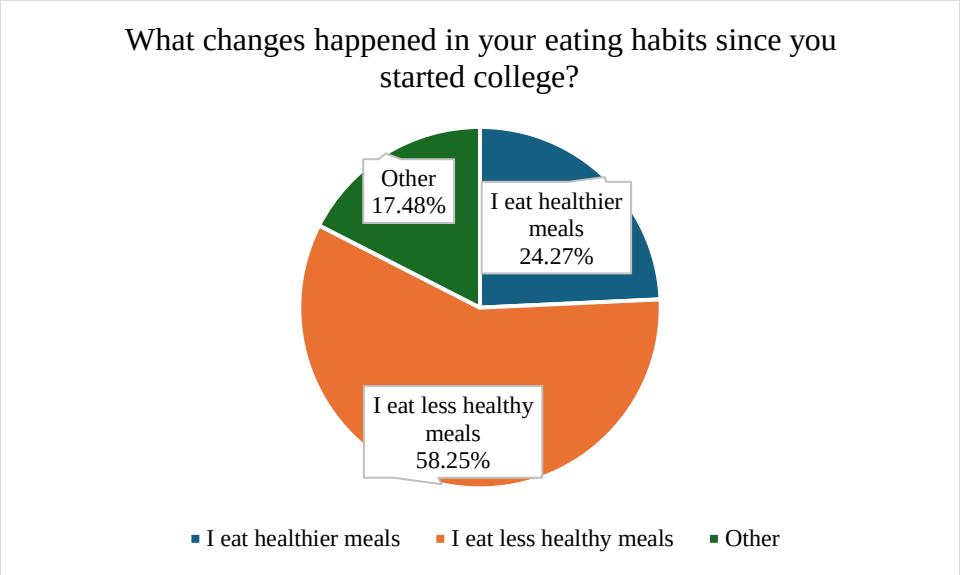

Figure 14: Changes in college students' eating habits

Academic focus and eating habits

The student of the Center of Adult and Regional Education indicated eating less healthy meals since beginning college. Of the agriculture students, 50.00% said to eat healthier meals, 25.00% claimed to eat less healthy meals, and 25.00% indicated other. The student who indicated other wrote, "I eat healthier foods but less balanced meals." Of the College of Business, 20.00% ate healthier meals, 60% ate less healthy meals, and 20% wrote other. Of the students indicating other, one indicated a diet with a mix of healthy and unhealthy foods, and another indicated having a neutral diet. Of the College of Education and Human Services, 17.24% believed to eat healthier meals and 82.76% claimed to eat less healthy meals. The responses of the College of Humanities and Fine Arts indicated 33.33% of students ate healthier, 41.67% ate less healthy meals, and 25.00% stated other. A student in both the College of Humanities and Fine Arts and the School of Nursing and Health Professions stated, "I eat at more regular times." A student of the College of Humanities and Fine Arts wrote, "I eat less," and another student responded, "I just eat." Of the nursing and health professions students, 21.05% ate healthier meals, 57.89% ate less healthy meals, and 21.05% indicated other. Of the

students indicating other, the responses included, “I eat less in general,” “Combination of fast food and meal prep,” and “I eat larger portions and more fast food.” The College of Science, Engineering, and Technology had 31.03% eat healthier meals, 41.38% eat less healthy meals, and 27.59% indicate other. Of the responses indicating other, three students claimed to eat less, two said the eating habits were the same, and one student worked out and ate more.

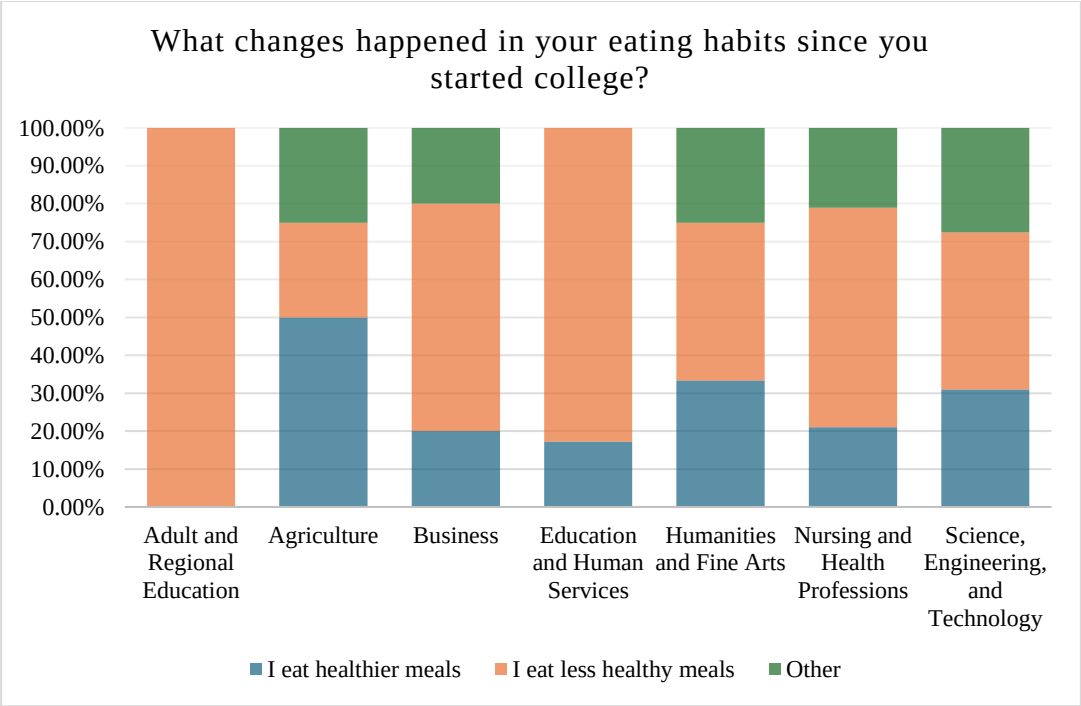

Figure 15: College students’ academic focus and changes in eating habits

Additional information

The final question of the survey asked if the students had additional information for the researchers; 13.13% of the sample responded. Respondents commented on the difficulties of eating healthy and exercising while in college; a nursing and health professions student stated college made healthy eating difficult while a science, engineering, and technology student wrote, “Being in college has made me turn to cheaper foods which are often less healthy. Also, being in college, it is hard to find time to exercise.” Another science, engineering, and technology student

stated, “I am vegetarian and very health conscious. In college it is hard to prioritize exercise when I am so busy!” A student from the College of Business described the difficulty of eating healthily at the campus dining hall. Other respondents commented on family histories and personal health; a science, engineering, and technology student said, “I have PCOS, so I automatically assume I will develop T2D even though it doesn’t run in my family.” Another science, engineering, and technology respondent said they did not have a history of T2D. Another science, engineering, and technology student said to have a lack of involvement in relatives’ health. An education and health services student described having health issues while trying to maintain a preventative lifestyle. A student from the College of Nursing and Health Professions wrote, “I actually am a type 1 diabetic already.”

Discussion

Of the 99 respondents, 40.40% had relatives with T2D, 49.9% did not have relatives with T2D, and 10.10% were unsure. Family history influences health behaviors, beliefs, and coping strategies (Cunningham et al., 2020). Because of this, students with relatives with the condition were asked what relatives taught about T2D. Of those who answered, 32.77% said T2D is hereditary, 25.21% indicated T2D is preventable, 31.09% claimed T2D leads to other complications, 6.72% declared T2D is not a serious health condition, and 4.20% said other. The highest percentage of respondents believed T2D is hereditary. While both genetics and age are uncontrollable factors in the development of T2D, controllable factors such as lifestyle, obesity, eating habits, and exercise habits also influence whether one develops the condition (ADA, n.d.). Believing the origin of T2D is solely genetics is harmful; the belief can cause one to not participate in preventative behaviors. To further understand respondents who answered T2D is hereditary, a follow-up question could be asked to determine if they thought genetics was the

sole cause of the condition. The second-highest percentage of respondents indicated T2D leads to other complications; the health belief is accurate, as T2D can lead to heart disease, chronic kidney damage, and other long-term conditions (CDC, 2022, November 3). About one-fourth of participants thought T2D is preventable; acknowledging that T2D can be prevented is essential in motivating oneself and others to take part in preventative health behaviors. A small portion of respondents claimed T2D is not a serious condition. The thought is worrisome, as T2D can lead to various chronic health conditions which decrease one's quality of life (CDC, 2022, November 3). Acknowledging the seriousness of the condition is of utmost importance to decrease participation in health risk behaviors.

When asked if a person meant to develop T2D will develop the condition no matter what, 28.57% of the respondents agreed with the statement and 71.43% disagreed. The question was a health fatalism statement which revealed respondents' beliefs of whether health outcomes are controllable. Health fatalism is important to examine, as students with the belief that developing T2D is out of one's control are more likely to participate in behavioral risk factors (San Diego & Merz, 2022). A study examining T2D knowledge, fatalism, and T2D-preventive behavior in college students used the Fatalism Scale, a 20-item measure of health-related fatalism, to determine the average health fatalism score (FS) (San Diego & Merz, 2022). The scores could range from 20-100. Of the study's 345 participants, the average FS was 42.55 (San Diego & Merz, 2022). The study suggests that increasing knowledge about T2D and health behaviors (of both risk and preventative behaviors) can lower health fatalism and increase participation in preventative behavior (San Diego & Merz, 2022); therefore, college educators can emphasize the causes of T2D and importance of preventative behaviors to lower health fatalism and increase healthy behaviors of students.

Overall, 42.42% of the sample did not meet weekly physical activity recommendations and 57.58% met recommendations. The result varies with the ACHA report where 57.4% of American college students did not meet the physical activity guidelines and 42.6% met the recommendations (2018). In comparison, a study of students attending an upstate New York college found 61.4% of the sample to be physically inactive while 38.6% met recommendations (Antwi et al., 2020). The results suggest the students from this university are more active in comparison to the national average as well as the percentage students of the New York study. The increased physical activity could be due to a variety of factors; the university offers students free membership to the on-campus wellness center. The wellness center is located on the residential side of campus, so students living in dormitories can easily access the gym. The university is located near numerous lakes which allows students to participate in exercise opportunities such as swimming, hiking the trails, and kayaking. The sample sizes of the various studies should also be noted; the ACHA study included 88,178 respondents, the New York study had 132 participants, and the sample size of mid-size regional public university was 99. Because the sample size of the study was smaller, more responses would better represent the population and yield more accurate results.

Of the 74 numerical responses, the average amount of hours per day spent sitting down was 7.22 hours. The amount is consistent with the NHANES report; the U.S. population expends 7.7 hours being sedentary (Katzmarzyk et al., 2019). The sedentary behavior can be due to spending a significant portion of time in class or studying (Castro et al., 2018). While the responses of the study agree with the national average, some students voiced their confusion with the survey question during data collection; some questioned if time spent sleeping should be included in their answers. As a result, 1.01% of the respondents claimed to sit for 14 hours a day,

2.02% indicated sitting for 15 hours a day, and 2.02% claimed to sit for 20 hours a day; the answers appear to include time spent sleeping. The survey question could be altered to, “How many hours of the day do you spend sitting down while you are awake?” to avoid confusion. In addition, not all the responses included numerical answers; students wrote in responses such as “A lot” and “I don’t know.” Others indicated ranges or minimum values. Because of this, not all the responses could be utilized in calculating the average, median, range, and standard deviation. The survey question could be changed to multiple-choice with only numerical answer options so all the responses would be in number format.

Of the sample, 24.27% indicated eating healthier since starting college, 58.25% said to eat less healthily, and 17.48% said other. The responses are comparable to a study conducted with 35 Cornell University students; the research included focus group interviews with the participants (Sogari et al., 2018). The students were asked questions regarding eating habits such as, “What changes happened in your cooking habits since starting college” (Sogari et al., 2018). Cornell University respondents explained eating healthily was challenging due to the convenience of fast food (Sogari et al., 2018). The majority of students never helped in the kitchen before moving to college (Sogari et al., 2018). Due to the lack of experience with meal preparation, some turned to fast food for meals instead of cooking (Sogari et al., 2018). Other barriers discovered were lack of time, snacking, the increased cost of healthy food, stress, and easy access to high-calorie food (Sogari et al., 2018). The listed barriers of the Cornell University students are most likely similar to the challenges faced by the students attending the mid-size regional public university. The obstacles explain why over half of the respondents have eaten less healthily since beginning college. The Cornell University study also revealed enablers to healthy eating: meal planning, being physically active, improved food knowledge and

education, and involvement in food preparation (Sogari et al., 2018). Noting the enablers of healthy eating is valuable; college educators could emphasize the topics to students to aid in making better health decisions.

When students were asked about risk perception for T2D, 12.12% thought to be at risk for T2D, 67.68% did not think to be at risk, and 20.20% were unsure. The risk perception responses can be compared to the T2D behavioral risk factor responses regarding physical activity, sedentary behavior, and eating habits. The majority of college students met the weekly physical activity guidelines, so the risk perception for T2D is likely low for the active students; however, many students indicated spending eight hours sitting each day and eating less healthy meals since returning to college. While the majority of students participated in unhealthy eating habits and high levels of sedentary behaviors, the risk perception for T2D was minimal. A study examining the perception and risk factors of T2D among New York college students found that 70.00% of students at risk for T2D (had impaired fasting glucose levels) also believed themselves to be at low risk for T2D (Antwi et al., 2020). The study referenced various other research findings where students also underestimated risks (Antwi et al., 2020). The results regarding T2D perceived risk are interesting, and an explanation has not been discovered; perhaps students do not know eating unhealthily or sitting for long periods can increase one's risk for T2D. Respondents might assume young individuals are not at risk, so the behaviors do not hold importance. Students need to know certain behaviors do increase the risk of T2D despite young age.

When asked to share additional information, the main themes discussed were the difficulties of eating healthy during college due to time restraints, food selections at the dining hall, and high food costs; not having time for exercise; and how current health conditions/family

history impacts the risk of T2D. The statements were similar to other studies; research conducted on other college students portrayed how the dining hall and convenience foods influenced eating habits (Sogari et al., 2018). A student in a study conducted at Cornell University stated, “I eat irregularly, like sometimes for dinner I just don’t want anything in the dining halls, and I’ll just eat cookies or the ice cream” (Sogari et al., 2018). Another Cornell University student explained how dining halls are comparable to an “all-you-can-eat buffet” which contributes to weight gain (Sogari et al., 2018). The struggle to make healthy food choices and control portion sizes were present in students of both studies.

The responses from students of each academic college varied. When asked what was learned about T2D from relatives, the College of Humanities and Fine Arts was the only institution where students did not indicate T2D to be hereditary and had the greatest percentage of respondents indicate T2D to be preventable. The College of Education and Human Services did not have any respondents say that T2D is not a serious health condition. The humanities/fine arts and education/human services students seemed to have the most accurate understanding of T2D compared to the other academic colleges.

When asked about risk perception of T2D, the College of Adult and Regional Education and the College of Humanities and Fine Arts were the only institutions where none of the students believed themselves to be at risk for T2D. The School of Agriculture had the greatest percentage of students believe themselves to be at risk (25.00%) followed by the College of Education and Human Services (20.69%), and the School of Nursing and Health Professions (16.67%). The agriculture, education/human services, and nursing/health professions students might have a greater risk perception because they better understand how negative health

behaviors can increase the risk of developing T2D, or perhaps the students believe T2D is genetic/destined and increases risk.

The College of Adult and Regional Education was the only institution where 100% of respondents disagreed with the statement regarding health fatalism. The School of Agriculture had the greatest percentage of respondents believe developing T2D might be inevitable (50.00%) followed by the College of Education and Human Services (39.39%), and the School of Science, Engineering, and Technology (33.33%). The students may believe in health fatalism due to decreased knowledge of T2D and health behaviors. Health fatalism is also tied to religious and philosophical thought and whether fatalism can be reduced is unknown (Maercker et al., 2019; San Diego & Merz, 2022).

The physical activity question revealed the College of Adult and Regional Education had 100.00% of respondents meet the physical activity guidelines, while the School of Nursing and Health Professions had the next highest percentage of students meet the guidelines (77.78%) followed by the School of Agriculture (75.00%). The students could be more aware of the health benefits of participating in physical activity which is why a higher percentage of respondents met the guidelines.

When asked about eating habits, the College of Adult and Regional Education had the greatest percentage of respondents (100.00%) eat less healthy meals followed by the education/human services students (82.76%), and the business students (60.00%). The agriculture students had the highest percentage of respondents indicate eating healthier meals (50.00%) followed by the humanities/fine arts students (33.33%), and the students of the College of Science, Engineering, and Technology (31.03%). Students who eat healthier meals might have prior cooking experience, more time to prepare meals, portion awareness, and greater knowledge

of healthy food choices (Sogari et al., 2018). Having positive friend/parental pressure and influence on making healthy food choices as well as exposure to healthy food choices at college dining services are other enablers of a healthy diet (Sogari et al., 2018).

Overall, the T2D risk perception and physical activity behaviors of students with health-related majors were the only health belief and behavior which significantly differed from students with non-health-related majors. It is important to note that some academic colleges had a low number of responses; one student (1.01% of respondents) from the College of Adult and Regional Education, four (4.04% of respondents) from the School of Agriculture, 10 (10.10% of respondents) from the College of Business, and 11 (11.11% of respondents) from the College of Humanities responded. The remaining academic colleges had 18 or more students respond to the survey. Because the number of responses for some academic colleges was low, results for some academic colleges were not as accurate.

Implications and recommendations

The findings suggest college students do not understand the difference between controllable and uncontrollable T2D risk factors. The results regarding health fatalism emphasize the need for additional research. The study identified increased sedentary behavior of college students; sedentary behavior is controllable, and decreasing sitting time can reduce T2D risk. Many barriers to healthy eating were discovered among college students, as well as decreased understanding and experience with meal preparation. The results indicate the need for interventions along with additional research.

The first implication is college students should learn the differences between controllable and uncontrollable risk factors. The greatest percentage of students answered T2D was hereditary. While both family history and age are uncontrollable risk factors for T2D, students

should be aware that other controllable factors can decrease the risk of T2D (ADA, n.d.). Explaining how physical activity, weight loss, and healthy eating decreases T2D risk could motivate students to participate in preventative health behaviors (ADA, n.d.). Free education programs could be held in the common areas of dormitories. Informational posters could be put up in the dormitories, dining hall, wellness center, and around campus. Many colleges offer mandatory courses for incoming students to transition them to college life; the courses could include lectures or guest speakers discussing the importance of preventative behaviors and understanding controllable factors to improve health and decrease T2D risk. Students of health-related majors could also act as the guest speakers in the classes; the health professors could approve health students' presentations to ensure the information is accurate. Having health students as guest speakers would ensure health-related majors have a better understanding of T2D and how to present the information to others, and including T2D discussions in courses for all incoming students would ensure students of all academic majors have exposure to T2D knowledge.

Another implication is for additional research regarding health fatalism; while health fatalism of T2D has been identified among participants in various studies, whether fatalism can be limited is unknown (San Diego & Merz, 2022). Increasing knowledge about T2D and health behaviors has been suggested to lower health fatalism, but the results are undetermined (San Diego & Merz, 2022). Decreasing health fatalism for T2D could limit participation in behavioral risk factors, so further research on the subject is important (San Diego & Merz, 2022).

Sedentary behavior is an issue that is controllable; individuals who sit for greater than eight hours a day without physical activity are at greater risk for various health conditions (Laskowski, 2022). College students are likely to have increased sedentary behavior (Castro et

al., 2018). In the study, the average time spent sitting per day was 7.22 hours a day, and 42.42% of respondents did not meet the physical activity guidelines. Providing education of the risks of increased sedentary behavior and recommendations of how to limit the time spent sitting could be helpful; students could take a break from sitting every 30 minutes, try using a standing desk (or high table or counter) while studying, and stand while watching television or on the phone (Laskowski, 2022). The education and recommendations could also be delivered in lectures, through guest speakers, and with posters hung in public areas on campus.

This study emphasized the need to increase healthy eating among college students. A study conducted in college students from the University of Parma suggested varying food products in dining halls, offering student discounts at supermarkets, providing spaces for students preparing meals from home to warm up and eat food, and delivering information on nutrition and healthy diets (Wongprawmas et al., 2022). Allowing students to voice ideas of how to have a healthy diet while in college could aid policymakers, foodservice providers, and educators in creating solutions (Wongprawmas et al., 2022). Surveys or interviews involving college students could be utilized in gathering opinions of how to promote healthy eating.

Conclusion

The research examined college students' T2D health beliefs and behaviors and how this varied between academic majors. The results indicated not all students were aware of the uncontrollable and controllable risk factors of T2D. Health fatalism was identified among participants which increases the likelihood of the students participating in behavioral risk factors. While a greater percentage of respondents met physical activity guidelines compared to the national average, the students had increased sedentary behavior and unhealthy eating habits. Despite participating in risk behaviors, most students did not believe to be at risk for T2D.

Health students' T2D risk perception and physical activity behaviors were the only significant difference compared to students with non-health-related majors. The results emphasized the need to educate college students on controllable/uncontrollable risk factors of T2D and how to reduce sedentary behavior. More research is needed to determine whether health fatalism can be limited. Surveys and interviews gathering opinions of students of how to improve healthy eating can aid in finding solutions to resolve the issue. The study highlighted the risk of T2D among college students and the need for additional education and research to limit the condition beginning in the university setting.

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Appendices

IRB approval letter

MURRAY STATE UNIVERSITY

Institutional Review Board

328 Wells Hall
Murray, KY 42071-3318
270-809-2916• msu.irb@murraystate.edu

TO: Michael Perlow, School of Nursing and Health Professions

FROM: Reigh Kemp, IRB Coordinator and Candace Alvey RK

DATE: IRB Member 10/27/2023

RE: Human Subjects Protocol I.D. – IRB # 24-94

The IRB has completed its review of your student's Exempt protocol entitled *Type 2 Diabetes Health Beliefs of College Students.* After review and consideration, the IRB has determined that the research, as described in the protocol form, will be conducted in compliance with Murray State University guidelines for the protection of human participants.

The forms and materials that have been approved for use in this research study are attached to the email containing this letter. These are the forms and materials that must be presented to the subjects. Use of any process or forms other than those approved by the IRB will be considered misconduct in research as stated in the MSU IRB Procedures and Guidelines section 20.3.

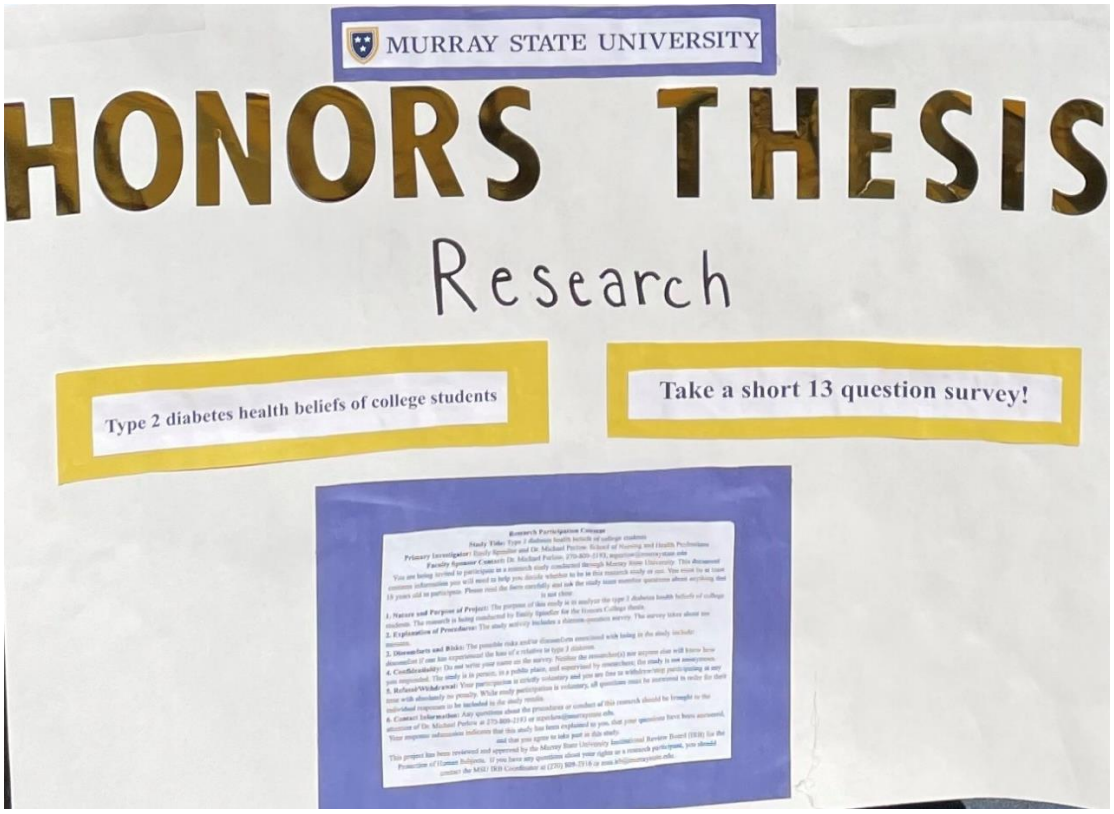
Your stated data collection period is from 10/27/2023 to 10/27/2024.

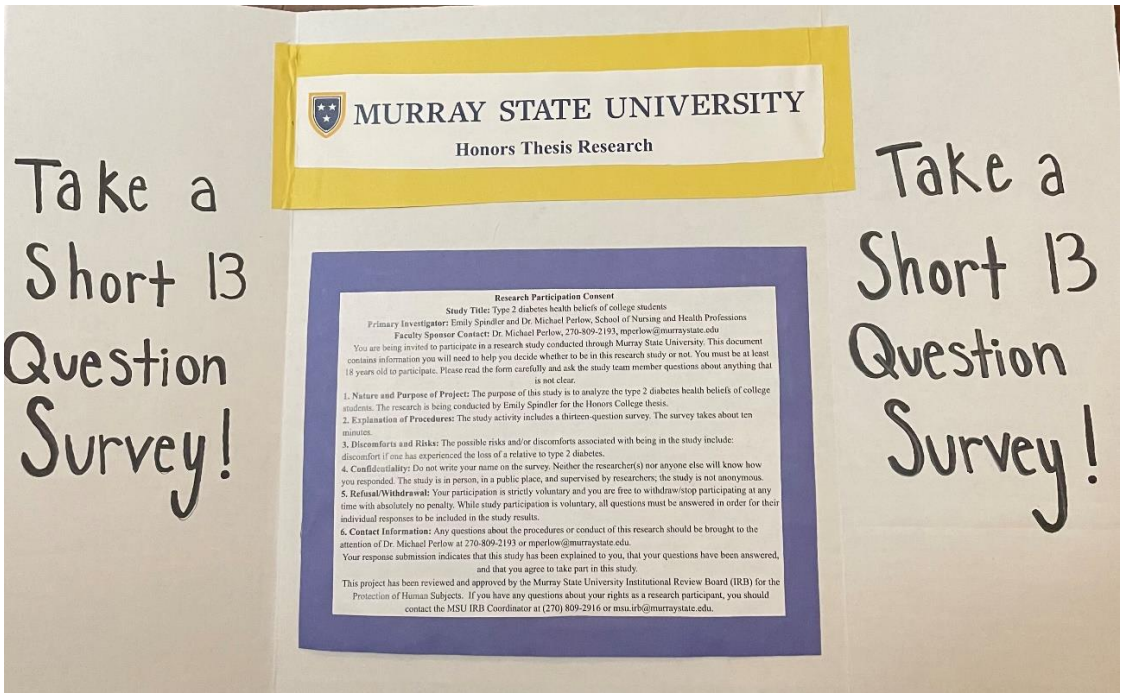
If data collection extends beyond this period, please submit an Amendment to an Approved Protocol form detailing the new data collection period and the reason for the change.
This Exempt from further Review approval is valid until 10/26/2024.

If data collection and analysis extends beyond this date, the research project must be reviewed as a continuation project by the IRB prior to the end of the approval period, 10/26/2023. You must reapply for IRB approval by submitting a Project Update and Closure form (available at murraystate.edu/irb). You must allow ample time for IRB processing and decision prior to your expiration date, or your research must stop until such time that IRB approval is received. If the research project is completed by the end of the approval period, then a Project Update and Closure form must be submitted for IRB review so that your protocol may be closed. It is your responsibility to submit the appropriate paperwork in a

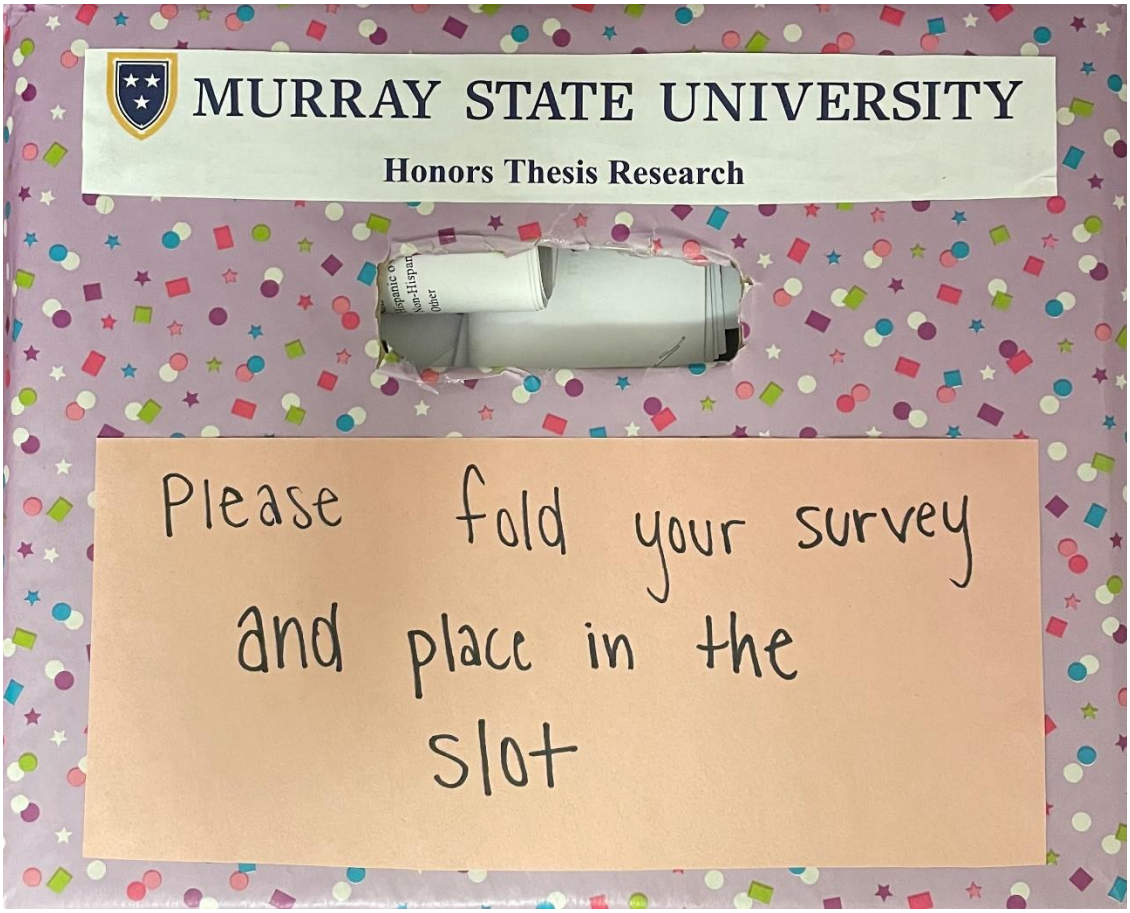
timely manner. The protocol is approved. You may begin data collection now.

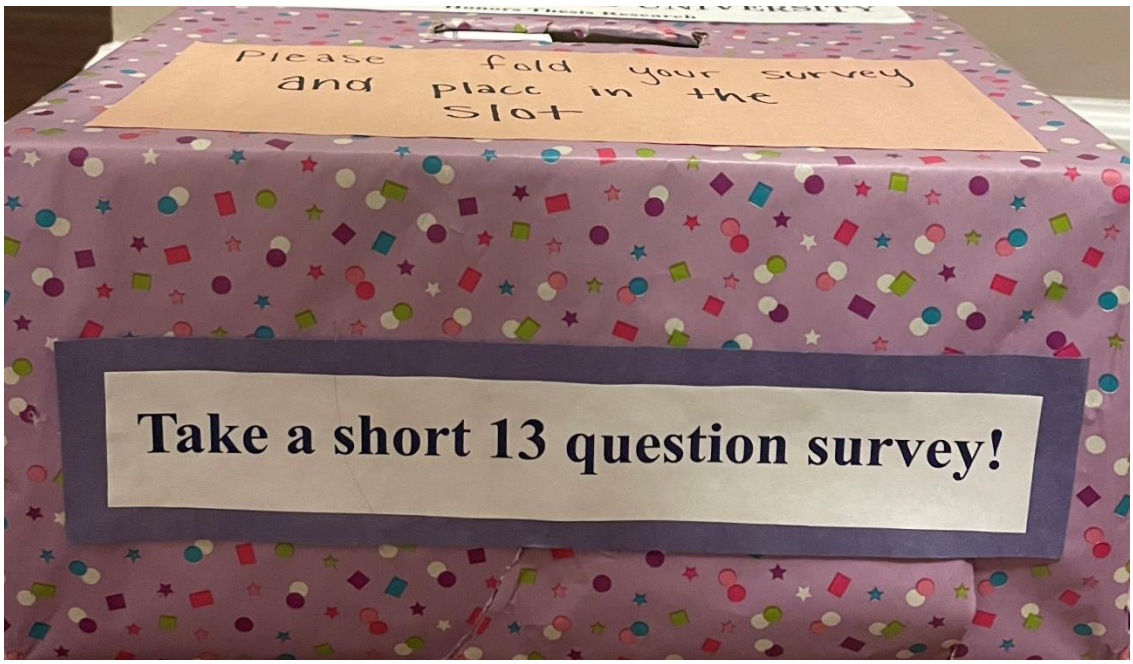
Advertising posters





Data collection box





Consent to participate instructions

MURRAY STATE UNIVERSITY

Research Participation Consent

Study Title: Type 2 diabetes health beliefs of college students

Primary Investigator: Emily Spindler and Dr. Michael Perlow, School of Nursing and Health Professions

Faculty Sponsor Contact: Dr. Michael Perlow, 270-809-2193, mperlow@murraystate.edu

You are being invited to participate in a research study conducted through Murray State University. This document contains information you will need to help you decide whether to be in this research study or not. You must be at least 18 years old to participate. Please read the form carefully and ask the study team member questions about anything that is not clear.

1. Nature and Purpose of Project: The purpose of this study is to analyze the type 2 diabetes health beliefs of college students. The research is being conducted by Emily Spindler for the Honors College thesis.

2. Explanation of Procedures: The study activity includes a thirteen-question survey. The survey takes about ten minutes.

3. Discomforts and Risks: The possible risks and/or discomforts associated with being in the study include: discomfort if one has experienced the loss of a relative to type 2 diabetes.

4. Confidentiality: Do not write your name on the survey. Neither the researcher(s) nor anyone else will know how you responded. The study is in person, in a public place, and supervised by researchers; the study is not anonymous.

5. Refusal/Withdrawal: Your participation is strictly voluntary and you are free to withdraw/stop participating at any time with absolutely no penalty. While study participation is voluntary, all questions must be answered in order for their individual responses to be included in the study results.

6. Contact Information: Any questions about the procedures or conduct of this research should be brought to the attention of Dr. Michael Perlow at 270-809-2193 or mperlow@murraystate.edu.

Your response submission indicates that this study has been explained to you, that your questions have been answered, and that you agree to take part in this study.

This project has been reviewed and approved by the Murray State University Institutional Review Board (IRB) for the Protection of Human Subjects. If you have any questions about your rights as a research participant, you should contact the MSU IRB Coordinator at (270) 809-2916 or msu.irb@murraystate.edu.

Please do not write your name on the questionnaire. Write in the blank spaces to answer the short response questions. Indicate multiple-choice answers by checking the appropriate description. Please check only one description for each question. When you have completed the survey, please return the questionnaire to the box here on the table. Returning the questionnaire conveys approval to use your information.

Type 2 diabetes health beliefs of college students survey

1. **What is your gender? _____**

2. **What is your age? _____**

3. **Please indicate your ethnicity:**
   _____ American Indian or Alaskan Native
   _____ Asian or Pacific Islander
   _____ Non-Hispanic Black
   _____ Hispanic or Latino
   _____ Non-Hispanic White
   _____ Other
4. **Please indicate your academic year:**
   _____ Freshman
   _____ Sophomore
   _____ Junior
   _____ Senior

5. **What is your academic major? _____**

6. **Do you have relatives with type 2 diabetes?**
   _____ Yes
   _____ No
   _____ Unsure

7. **If yes to question 6, what have you learned about type 2 diabetes from these relatives?**
   _____ Type 2 diabetes is hereditary
   _____ Type 2 diabetes is preventable
   _____ Type 2 diabetes leads to other complications
   _____ Type 2 diabetes is not a serious health condition
   _____ Other: _____

8. **Do you believe you are at risk for type 2 diabetes?**
   _____ Yes
   _____ No
   _____ Unsure

9. **If someone is meant to develop T2D, will they develop the disease no matter what they do?**
   _____ Yes
   _____ No

10. **Do you exercise for thirty minutes a day at least five days a week?**
    _____ Yes
    _____ No

11. **How many hours a day do you spend sitting down? _____**

12. **What changes happened in your eating habits since you started college?**
    _____ I eat healthier meals
    _____ I eat less healthy meals
    _____ Other: _____

13. **Is there anything else you would like us to know?**