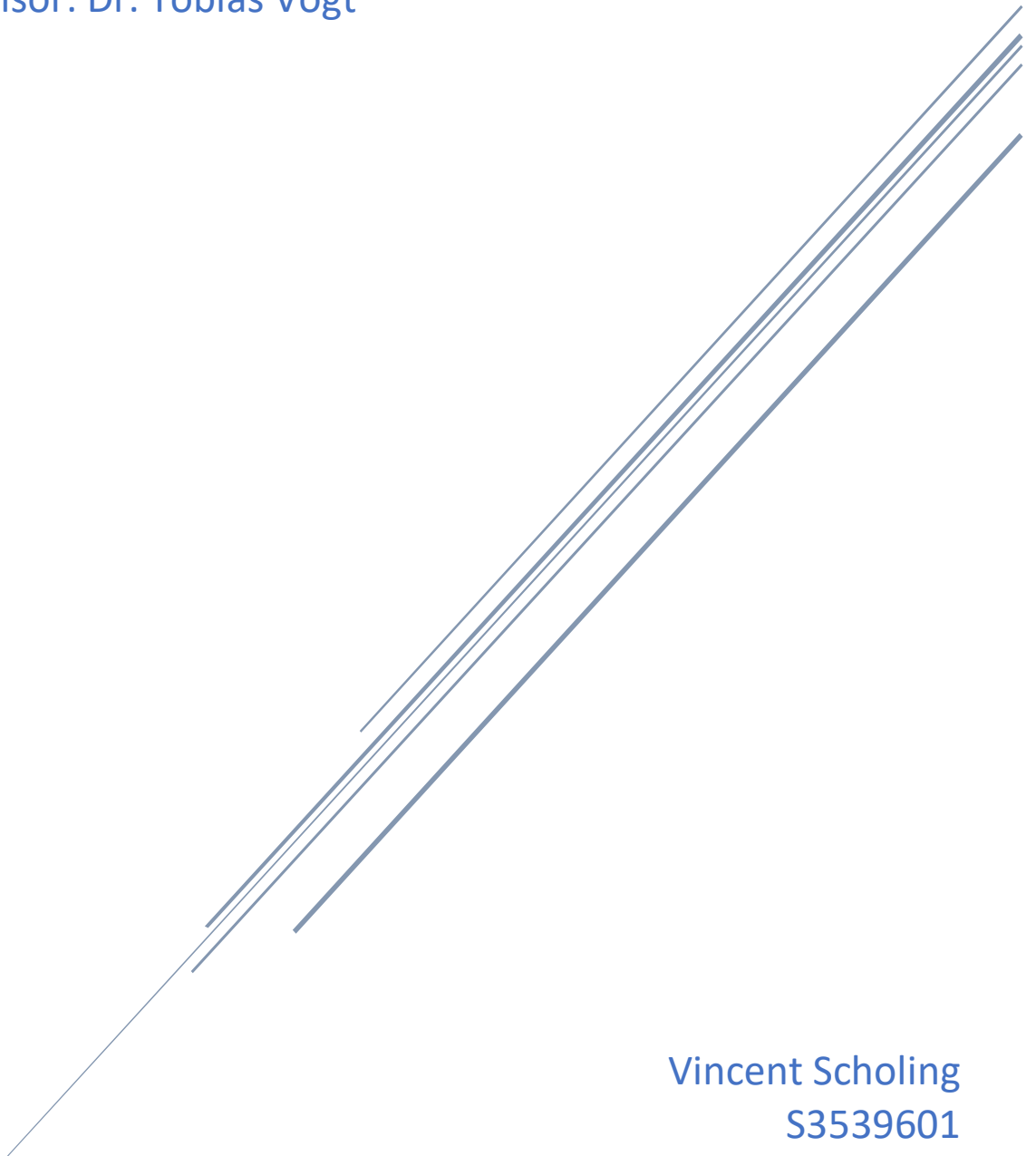# THE IMPORTANCE OF LIFESTYLE FACTORS ON DEVELOPING DEMENTIA AMONG ELDERLY PEOPLE IN THE USA

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Abstract

Dementia is a disease without a cure, and due to the increasingly aging population in the US, it can become a bigger burden on society as a whole. Dementia is most often happening during the later stages of a person's life and is linked to genetics, family history, and other factors.

Some negative/positive factors relating to the likelihood of developing dementia can be prevented/encouraged to reduce the number of dementia cases in society.

This research aims to measure and analyze to what extent smoking, alcohol consumption, physical activity, and BMI influences developing dementia for the elderly of ≥ 65 years old controlling for age, gender, and years of education.

To address this research question, a Binary Logistic regression will be done from the Health and Retirement study (HRS) accompanied to this; a literature review will be done to look into the effects of these factors.

The results imply that smoking is not related to developing dementia while the literature suggests a relationship, but this relationship fades after quitting smoking for a longer time. Alcohol consumption has a positive effect on light- and moderate-drinkers compared to non-drinkers but negatively affects heavy-drinkers compared to non-drinkers; this corresponds to the literature. Physical activity has a very positive effect of not developing dementia, according to the data and literature.

Finally, a higher BMI is associated with a lower risk of developing dementia for people ≥ 65 but the risk is higher for people below that age.

Dementia cases can be curbed if certain interventions like quitting smoking or encouraging physical activity are implemented.

Background

Developing dementia is most prevalent among the older population in the United States (USA) (U.S Department of Health & Human Services, 2017). The average life expectancy is growing globally; 16.9% of the total population is aged 65 years or older (Statista, 2020). This is expected to keep rising in the coming years; this increases the risk of a higher number of dementia cases in the coming years if nothing is done about it.

Dementia is an umbrella term used for a more advanced stage of cognitive decline. The most known type of dementia is Alzheimer's disease. This type of dementia also occurs between 60% and 80% of people with dementia have Alzheimer's disease (Alzheimer's association, 2020). Furthermore, there are several other types of dementia, including vascular dementia and Lewy body disease, which are after AD most prevalent

According to a census study of Hebert, et al. (2013), which looks at the current trend of dementia cases and the aging population, suggests that the number of dementia cases will increase rapidly. While in 2010, 'only' 4.7 million people were estimated to have, in this case, Alzheimer's disease (AD) (the most common type of dementia). The study projects that by 2050 an estimated 13.8 million people will have AD in The United States if there will not be more preventative measures developed.

In this case, with higher numbers of people with dementia, there will be increased pressure on the US healthcare system, the number of individuals with dementia, and the individual's environment with dementia, according to the World Health Organization (2012). This fact makes this research of high importance to look into factors that can be influenced positively due to the possible increasing burden for society if nothing will be done against the negative factors of developing dementia.

While the greatest factors of developing dementia or AD are age, genetics, and the person his/her family history of dementia (The Alzheimer's Association, 2020), these are factors that are harder to influence through policy or interventions. However, there are also other possible factors done daily that can positively or negatively influence the development of dementia. A variant of those factors is 'lifestyle factors,' which are already relevant from childhood to elderhood.

This research will add another insight to look into to what extent multiple lifestyle factors can influence the risk of developing dementia. By doing this a clearer strategy to reduce the number of dementia cases can be suggested for policy makers in the USA. There are many factors, but only a certain number of important factors will be looked upon for this study. These factors include smoking, drinking alcoholic beverages, physical activity, and the Body Mass Index (BMI). All these factors can be influenced by the individual itself and possibly its environment.

As mentioned before, there are certain other factors that can influence the development of dementia too. According to Livingston, et al., (2017), these factors include gender, age, years of education, hypertension, hearing loss, depression, social isolation, and diabetes. In this research, only three are chosen to act as 'control' variables; these are gender, years of education, and age.

In this paper, these factors will be researched through quantitative data analysis and a review of the existing literature on how these factors may positively or negatively affect the development of dementia at the later stage of an individual's life. Both methods will be analyzed together to conclude what lifestyle factors mainly influence the development of dementia among the elderly in the US.

Research problem

       This research aims to measure and analyze to what extent smoking, consumption of alcohol, physical activity, and BMI influences developing dementia for elderly of ≥ 65 years; this analysis is also considering the importance of age, gender, and years of education. Additionally, this research aims to review the literature to what extent these factors through the life course can influence developing dementia in the later stages of an individual's life. This is necessary to be able to give appropriate suggestions to reduce dementia numbers in the future.

To accomplish these aims, a few central/secondary questions have been formulated.
The main research question is:

- To what extent does smoking, the BMI, consumption of alcohol, and physical activity influence the risk of developing dementia for an individual through their life course

To answer this research question, several sub-questions have been developed; these include:

- To what extent does smoking, the BMI, consumption of alcohol, and physical activity influence the risk of developing dementia for elderly who are at the age of ≥ 65 or older.
- To what extent does smoking, the BMI, consumption of alcohol, and physical activity influence the risk of developing dementia during earlier stages of an individual's life, e.g., childhood or midlife adulthood.
- To what extent does age, years of education, and gender influence dementia for the elderly of ≥ 65 years old.

Theoretical framework

The life course perspective

The Life Course perspective views health as the product of risk behavior (Yu, 2006); this perspective provides a construct of how people's experiences and actions in the present and past (childhood or adulthood) influence their health in elderhood. It is not only the degenerate qualities that comes with becoming older, it implies the experiences that shaped a person in both the past and present by his/her social, economic and cultural context. (WHO, 2000)

This is further expressed by Gee, et al., (2012) which claims that biological and developmental significance is not the only function of age or time. You may be physically older, but at certain points in your life, you are allowed to do more things by society like smoking or drinking alcohol. This is because it is found acceptable by the societal context of the specific individual.

Dementia is as mentioned before a health condition that occurs most often during the later stages of an individual's life e.g., elderhood. (U.S Department of Health & Human Services, 2017). Thus, age and lifestyle choices have an influence on an individual's cognitive functioning in the later stages of their life. Mild cognitive impairment is a possible outcome for individuals, according to Kazui, et al., (2005), this is a below level memory performance for a person's age. This below level memory performance can often develop into Alzheimer's disease or another form of dementia over time.

Smoking

Smoking is generally linked to many different types of cancers and coronary heart disease (Freund, et al., 1993). Nevertheless, the question is, to what extent does smoking influences the risk of developing a type of dementia?

The general literature suggests that there is a distinct link between developing dementia and smoking. According to Rusanen, et al., (2011), smoking increased the chance of developing dementia in most cases. The higher the number of cigarettes per day smoked, the higher the chance of developing a type of dementia during mid-adulthood (most prevalent was Alzheimer's disease). Only in the case of smoking less than half a pack of cigarettes, there was no significant difference with not smoking. Lu, et al., (2020) suggests that smokers have a higher risk of developing dementia, but if a smoker quits for more than 3 years, they will pose the same risk as a non-smoker.

Consumption of alcohol

Drinking is like smoking, generally linked to negative health outcomes in the short/long term like alcohol poisoning, accidents, strokes, and certain types of cancer (Centers for Disease Control and Prevention, 2020).

According to the literature, light or moderate alcohol consumption reduces the risk of developing dementia compared to a non-drinker. Thus, the literature suggests a positive outcome for the consumption of alcohol. However, the literature does not fully agree, while it does agree upon light to moderate drinking (1 to 3 drinks per day) was associated with a lower risk of dementia (Ruitenberg, et al., 2002). According to an annual review (Hendriks, 2020), there was a positive effect of light and moderate drinking of not developing dementia compared to non-drinkers but increased risk heavy-drinkers and binge-drinkers. Another review also suggests the lower risk of developing dementia for light and moderate drinkers (Lee, et al., 2010), but frequent-drinkers and non-drinkers did have an elevated risk of developing dementia.

Physical activity

Being physically active is a great way to stay healthy among all age groups. It is recommended for adults in the US to have 250-500 minutes of moderate physical activity (which in this case is walking at a moderate pace) per week (U.S. Department of Health and Human Services, 2018).

The academic literature also emphasizes the general benefits of physical activity, which relates to a decreased chance of developing dementia. According to a review (Hammer & Chida, 2008), physical activity reduced the risk of dementia & Alzheimer's disease by 28% and 45%, respectively. This was compared to people with low to no physical activity in their daily life.

However, (Larson, et al., 2006) suggests that daily physical exercise delays the onset dementia and Alzheimer's disease, but it does not rule it out because someone is physically active.

While most often, being physically active relates to going to the gym or running. There are also findings that regular walking among elderly men has a reduced risk of dementia (walking more than 2 miles per day) than inactive elderly men (walking less than 0,25 miles per day). (Abbott, et al., 2004) This paper suggests that promoting an active lifestyle while men are still physically capable could help later life.

The systematic review of Baumgart, et al., (2015) agrees with the reduced risk of dementia by doing mild physical activity. This systemic review emphasizes that an important factor is regularly exercising, but it is not clear what frequency is optimal.

Body Mass Index

The BMI of a person reflects their weight – height ratio. A higher BMI, especially among children and adults, poses several risks, the same counts for being underweight. According to the National Heart, Lung, and Blood Institute (2020), overweightness and Obesity pose a risk to diabetes, high blood cholesterol, different types of cancers, and sleep disorders. While being underweight can pose risks towards a weakened immune system, fragile bones, and feeling tired (NHS, 2020).

According to the academic literature, in general, a higher BMI protects elderly people from dementia. In the research of Atti, et al., (2008), subjects above the age of 75 years had a lower risk of developing dementia with a BMI higher than 25 compared to a BMI lower than 25. This shows that a BMI higher than 25 can have a protective effect on older people. The same outcome was observed in a study by Dahl, et al., (2008)

In one article, a lower BMI < 23 and a higher risk of dementia was associated with each other, but this is not significant when the 1 and 3 years follow up were removed. Thus, a possible explanation could be that a low BMI is a clinical sign of Alzheimer's disease rather than a factor in it (Nourhashemi, et al., 2003).

The literature suggests that a higher BMI can be a protective factor compared to a lower BMI at an older age. Having a very high BMI (obesity) can have negative consequences in midlife adulthood for developing dementia. According to Kivipelto, et al., (2005), being obese (BMI ≥ 30) is associated with having a higher chance of developing dementia and Alzheimer's disease later in life. Whitmer, et al., (2005) also suggests an increased chance of developing dementia while being obese in mid-adulthood (74% increased chance in comparison to a normal/healthy weight (BMI 18,5 – 24,9). This study also suggests that people being overweight (BMI 25-29,9) have an increased chance of 35% to develop dementia later in their life in comparison to a normal/healthy weight.

Years of education

The years of education implies the length a person received schooling in years. A meta-analysis on general health for education suggests that an increase in educational attainment reduces mortality, smoking, and obesity and may reduce the prevalence of hypertension (Hamad, et al., 2018). This outcome suggests an improvement in multiple cardiovascular risk factors.

According to the general literature on dementia, years of education are a significant factor in reducing the risk of developing a form of dementia according to this summary of evidence (Baumgart, et al., 2015). This is also confirmed the other way around by Evans, et al., (1997), where fever years of education are associated with a higher risk of developing Alzheimer's Disease.

Gender

Gender is an often-used indicator in the literature, whether there is a difference between male and female sex. For most studies previously mentioned, gender has been often used as a 'control' variable. According to Helme, et al., (1993) which specifically looked into gender differences, there was no significant difference between gender-related to developing a form of dementia. Though, it is mentioned that possibly the different survival rates of men and women (women tend to become older) may affect a different number of dementia cases between women and men on average.

Age

A person's age is a very consistent indicator of health because, in general, children have better resistance to illness than elderly people.

According to The Alzheimer's Association (2020) and as mentioned before, age is one of the most important predictors for developing dementia. This has to do with the fact that dementia or Alzheimer's disease is an in general 'older age' disease. The majority of the population (starts to) develop(s) dementia above the age of 65. This increases the older individual gets.

Conceptual model

The conceptual model (figure 1) shows how all these different factors can influence an individual through their life. While certain factors like smoking is in the USA only 'accepted' from adulthood. Factors can also influence each other like how physical activity can influence the BMI in a negative way if the person does not exercise at all or the other way around if the person exercises as recommended by experts.
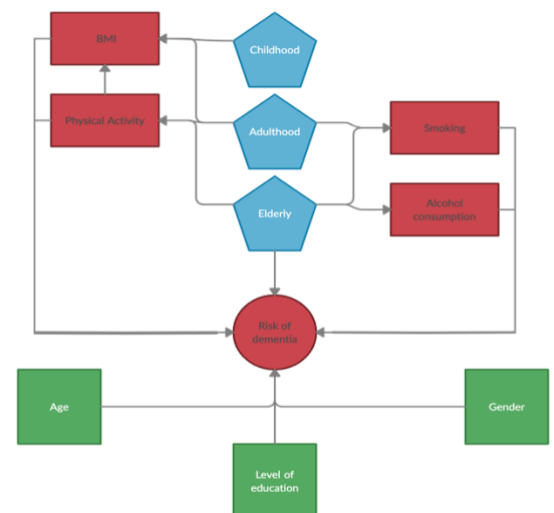

Figure 1 Conceptual model on the factors for dementia through the life course

Methodology

Considerations of the dataset

For this research, a secondary data collection method was chosen to find quantitative data. The choice for this type of research method has to do with the nature of the goal of this research. Which is to look into how lifestyle behaviours influence the risk of developing dementia. A large-scale survey would be a very efficient and least time-consuming approach. The dataset that was in accordance with these criteria is the Health and retirement study (HRS). This survey has been chosen for the wide range of questions it asks, especially whether or not the respondent was diagnosed with dementia/Alzheimer's before. The Institute of Social Research of the University of Michigan has conducted this household survey. The survey relates to different aspects of the US population including health perspectives like physical capabilities and demographic perspectives like family structure; thus, finding information about and possibly relating to dementia will be very beneficial. The dataset includes multiple waves (in total 13). In this study, only the final wave (which was conducted in 2016) will be used to look into explanatory variables of developing dementia. The dataset from HRS is specifically designed to be used by researchers efficiently.

Ethical considerations

Due to the long record (started in 1992 and still ongoing) of this survey and the design of the dataset by the University, the quality of the dataset was assessed very high.
The codebook (which is associated with the dataset) included multiple ethical considerations. For example, each person had their own unique code that corresponded to them. Another example would be that for the variable "number of children ever born," there was a maximum of 10 to protect respondents their identity. While this variable will not be used in this research, it shows the researchers' care anonymising the respondents.

Dependent variables

For this research, many different variables were looked into to explain a relationship with developing dementia.
The dependent variable was the question of whether or not the respondent was diagnosed with a form of dementia/Alzheimer's by a doctor. This variable consisted previously of 2 variables, which only focused on dementia or only on Alzheimer's. Both variables were put together and transformed into a new variable where if for the Alzheimer or dementia variable, the answer was 'yes,' this variable was automatically set to yes too.

Independent variables

The other independent variables included whether or not the respondent smokes currently and smoked previously. The number of alcoholic drinks per week (this variable was computed through combining days per week the respondent would drink, multiplying it with a number of drinks if the respondent would drink). This variable was also categorized with 0 drinks meaning the respondent does not (abstinent) 1 – 14 drinks per week, or more than 14 drinks per week. The frequency of light physical activity (this includes vacuuming, laundry, and home repairs), moderate physical activity (this includes walking at a moderate speed, gardening, and dancing) & vigorous physical activity (this includes running, swimming, and gym workouts). The Body Mass Index (BMI) of the respondent, this variable is categorized into underweight, which is < 18,5, normal/healthy weight, which is 18.5 – 24.9, overweight 25 – 29.9, and obese, which is a BMI $\geq$ 30.

Control variables

This analysis also includes 3 control variables, which are gender where female = 1 and males = 0, age of the respondent, and the number of years of education of the respondent. This is done because the control variable may be associated with both the predictor of interest and the outcome; thus, this can possibly change the result in a more confident way.

Binary logistic regression

The dependent variable is analyzed to compare it to other independent variables using a binary logistic regression. The choice for this type of regression has to do with the dependent variable, which is a 'yes' or 'no' question. The most suitable test would be, in that case, a Binary logistic regression.

Results

Descriptive statistics

Dependent variable

9986 people responded whether or not they have been diagnosed with dementia or AD (table 1). Of these people 692 people (6.9%) indicated that they have been diagnosed with a form of dementia by a doctor as is shown in figure 2. Of those respondents 59.4% are female and 40.6% is male.

	Dementia		
Frequency	9986		
No	9294		
Yes	692		
Percent of yes	6.9		
Gender	Frequency	Percent	
Male	4052	40.6	
Female	5934	59.4	
Total	*9986*	*100*	

Table 1 descriptive statistics of dementia cases and gender

The average age of the respondents is 76 where the oldest respondent is 107 and the youngest is 65 (table 2). On average the respondents had 12 to 13 years of education over their life with a high of 17 years and a low of no education in their life.

	N	Min	Max	Mean	Std. Deviation
Years of education	9962	0	17	12.63	3269
Age	9986	65	107	76	7715

Table 2 descriptive statistics of years of education and age

9916 people have reported whether or not they have smoked previously in their life (table 3 55% of the respondents reported that they have smoked previously. 9912 people also reported whether they still smoked. A much lower percent of 7.8% reported here that they still smoked when this survey was conducted which is 777 people.

	Ever smoked	Currently smoking
Frequency	9916	9912
No	4462	9135
Yes	5454	777
Percent of yes	55	7.8

Table 3 descriptive statistics of smoking

The highest percent of people reported that they never exercise vigorously (table 4) (62.8%) of 9929 respondents, 7.9% of the people report that they exercise vigorously 1 – 3 times per month, 27.1% says they do it at least once a week and the lowest percent of 2.2 claim that they exercise every day.

The respondents claim to be more active with Moderate exercise on average. This time 28.9% of 9929 respondents say that they never exercise, 11,7% claim to only exercise 1 to 3 times a month. Of the total number of people more than half (51.3%) claim to do moderate activity once a week and 8.1% of the respondents claim to do it every day.

Finally, for light physical activity the fewest number of respondents claim to never do light exercise which is 18.3% of 9950 respondents. 9.1% of respondents only do it 1 to 3 times a month. The highest percent of respondents (64.2%) do light exercise at least once a week and 8.3% of respondents do it every day.

Vigorous activity	Frequency	Percent	Moderate activity	Frequency	Percent
Every day	220	2.2	Every day	800	8.1
At least once a week	2691	27.1	At least once a week	5099	51.3
1 - 3 times a month	785	7.9	1 - 3 times a month	1159	11.7
Never	6233	62.8	Never	2874	28.9
Total	9929	100	Total	9932	100
Light activity	**Frequency**	**Percent**			
Every day	824	8.3			
At least once a week	6392	64.2			
1 - 3 times a month	909	9.1			
Never	1825	18.3			
Total	9950	100			

Table 4 descriptive statistics of physical activity

The BMI of respondents mainly lies a higher (table 5). Only 2.2% of the 9855 respondents report that they are underweight. 29.4% have a healthy weight. Most people are overweight or obese with 37.8% and 30.5% respectively.

Body Mass Index	Frequency	Percent
Underweight	221	2.2
Normal/healthy weight	2896	29.4
Overweight	3730	37.8
Obese	3008	30.5
Total	9855	100

Table 5 descriptive statistics of the BMI

Finally, for the number of drinks per week (table 6), most people claim to be abstinent with 66.8% of a total of 9986 respondents. 30.6% drink between 1 to 14 drinks per week and the fewest people drink more than 14 drinks per week with only 250 respondents drinking so many (2.5%).

Number of drinks	Frequency	Percent
Abstinent	6636	66.8
1 - 14 drinks per week	3041	30.6
> 14 drinks per week	250	2.5
Total	9986	100

Table 6 descriptive statistics of number of alcohol consumptions per week

Inferential statistics

The model fit is significant which means the variables are an improvement in explaining if someone is diagnosed with dementia or not (table 7)

Omnibus Tests of Model Coefficients		Chi-square	df	Sig.
Step 1	Step	89.220	3	.000
	Block	89.220	3	.000
	Model	1.192.768	19	.000

Table 7, Omnibus tests of model coefficients

Gender

For the control variable gender, while being positively skewed it is just barely insignificant (P-value of 0,59) (table 8)
While just insignificant the relationship is positive.
This is in line with the literature, which often uses gender as a control variable. Also, according to (Helme, et al., 1993) which specifically looked into gender differences came to the suggestion that females may have a slightly higher risk even though the study also had an insignificant result for the relationship between gender and dementia. This test indicates that women have a higher risk of developing a type of dementia, males are 17% less likely to develop dementia. It should be mentioned that this should be carefully considered because dementia gets more common the older a person gets. Women also tend to become older, which may explain the positive unstandardized coefficient for females.

Education

Education has a significant outcome in the data with a P-value of 0,001 (table 8). For each year of formal education, the odds of developing dementia is 0,957. This concretely means that for each year of formal education, the relative chance to develop dementia decreases by 4,3% in the population. This is supported by academic literature as mentioned before that education is a significant indicator by (Baumgart, et al., 2015) & (Evans, et al., 1997)
The reason for this outcome that education is an important variable in reducing risk of dementia may have to do with the reduced risk in multiple cardiovascular diseases and other reasons like less likely to make unhealthy life choices that can affect dementia development (Groot & Maassen van den Brink, 2006).

Age

According to literature, a person's age is one of the most important explanatory variables considering dementia. This has to do with dementia getting more relevant the older a person gets (The Alzheimer's Association, 2020). The statistical outcome of the Binary Logistic regression comes to the same conclusion. The test is significant with a P-value of 0.000 (table 8), the odds ratio indicates that for each year of age, the chance to develop dementia increases by 1.051. What this means is that the relative chance to develop dementia increases each year with 5,1%. That is why especially among elderly people, dementia is also more relevant because each year, the 'relative chance' of developing dementia increases.

Variable	B	Sig.	Exp(B)
Age of the respondent	.050	.000	1.051
Gender: female (0) male (1)	-.187	.059	1.205

	-.044	.001	.957

Table 8, Age, Gender and Years of education

Smoking previously in life

      Looking at the results of the Binary Logistic Regression, having previously smoked in life is insignificant (table 9). While for the sample, it increases the chance of developing a form of dementia. Due to this reason, nothing can be said the population through this test. The literature confirms the negative effects of smoking on dementia (Rusanen, et al., 2011) & (Lu, et al., 2020) but both sources also mention the limitation of this variable. This has to do with the number of cigarettes smoked and the number of years the person has smoked last. According to Rusanen, et al., (2011), the risk of developing dementia was higher when 2 packs of cigarettes were smoked every day. But after at least three years of not smoking cigarettes, there was no significant difference between ex-smokers and non-smokers. This variable only asks, "whether the respondent has smoked previously in their life". This classification is extensive, which may be a reason for the insignificance of this variable.

Currently smoking

      This result is also insignificant (P-value of 0,214) (table 9) for the population but gave a reduced risk of developing dementia for the sample. The literature, as stated previously, suggests that smoking cigarettes increases the risk of developing dementia. It should be considered that while the outcome is insignificant, this may have to do because the data is underestimated. As seen in the descriptive statistics (table 3) only 7.8% of people reported that they were still smoking which is a low percentage. According to Rusanen, et al., (2011) states that smoking increases the general mortality rate compared to non-smokers. But there may a survival effect which cannot be ruled out because some participants can be 'missing' who may have died due to smoking. If they would have not died because of possibly smoking, they may have developed a form of dementia. Once again, the data should be carefully considered due to the wide interpretation of currently smoking. There is no difference between only smoking half a pack of cigarettes a day or 2 packs of cigarettes per day. There is also no clear indication if smoking cigars is included in this variable. Thus, while the data is insignificant, this may have to do with underestimating the data and uncertainties. But this research would still suggest that smoking is associated with developing dementia due to academic literature proof.

Variable	B	Sig.	Exp(B)
Smoked previously	.112	.246	1.118
Smokes now	-.238	.214	.787

Table 9, Smoking

Physical activity

      Vigorous physical activity (running, swimming working out etc.) as a categorical variable is for 'every day' and 1 to 3 times per month insignificant (P-value of 0,073 & 0,089 respectively) (table 10) while the reference category and at least once a week are both significant (P-value of 0,002 & 0,001 respectively). While only something can be said for vigorous activity once a week in the population. All of the outcomes give a positive effect of not developing dementia compared to no vigorous physical activity. According to the literature being physically active is very important Hammer & Chida (2008) suggests a decrease of 28% and 45% to develop dementia and Alzheimer's disease respectively compared to not being physical active. But another study suggests while being physically

active is very important, it would delay developing dementia instead of not developing it at all (Larson, et al., 2006).

While only something can be said for once-a-week vigorous physical activity in the data, this category says that the chance to develop dementia is around 42% lower (odds ratio = 0,582) analysis that it has a positive effect of not developing dementia. It can be assumed while insignificant that both vigorous physical activity every day and 1 to 3 times per month compared to no vigorous physical activity has a positive effect of not developing dementia according to the literature.

Moderate physical activity (walking at a moderate pace, dancing, gardening etc.) According to the result, being moderately physically active Is a positive indicator of not developing dementia. All categories are significant with a P-value of less than 0,001 only 1 to 3 times per month with a P-value of 0,005 (table 10). All categories have a positive impact on not developing dementia compared to no moderate physical activity. For being moderately active every day it reduces the chance of developing dementia by almost 60% (odds ratio = 0,396) while being at least once a week active and 1 to 3 times a month reduce the chance to develop dementia by around 40% for both (odds ratio = 0.588 and 0,607 respectively).

Finally, light physical activity (walking, vacuuming and laundry) is once more fully significant for all the categories (P-value > 0,001 for all categories) (table 10). This variable also shows the highest dementia reductions for the independent variable in the analysis. For everyday light activity, the risk of developing dementia is reduced by around 77% (odds ratio = 0,233) for at least once a week of physical activity. The reduction of developing dementia is 82% lower than when there is no light physical activity (odds ratio = 0,177). Finally, 1 to 3 times of light physical activity decreases the chance by 77% compared to no light physical activity (odds ratio = 0,228).

Both the data and literature are in agreement that any form of physical activity can be an important determinant of not developing dementia. Even the difference of walking 2 miles each day compared to only 0,25 miles per day already significantly reduces the risk of developing dementia (Abbott, et al., 2004). This may be one reason that shows the importance of walking above the age of 65 but during childhood and adulthood to reduce risks in the later life of developing dementia.

Variable	B	Sig.	Exp(B)
No vigorous activity (reference)		.002	
Every day vigorous activity	-1074	.073	.341
At least once a week of vigorous activity	-.541	.001	.582
1 to 3 times per month vigorous activity	-.446	.089	.640
No moderate activity (reference)		.000	
Every day moderate activity	-.928	.000	.395
At least once a week of moderate activity	-.532	.000	.588
1 to 3 times per month moderate activity	-.500	.005	.607
No light activity (reference)		.000	
Every daylight activity	-1455	.000	.233
At least once a week of light activity	-1731	.000	.177
1 to 3 times per month light activity	-1478	.000	.228
1 to 3 times per month moderate activity	-.500	.005	.607

Table 10, Physical activity

All categories are significant being underweight had a P-value of 0,032 while all other variables had a P-value under 0,001 (table 11). This categorical variable results in that being overweight and obese is a positive influence of not developing dementia while being underweight increases the risk compared to being a healthy weight. Being overweight reduced developing dementia by 42% (odds ratio = 0,579) and being obese reduced developing dementia by around 53% (odds ratio = 0,469) compared to being on a "healthy weight". Being underweight increased the risk of developing dementia according to the Binary Regression. The chance of developing dementia while underweight was around 57% higher compared to being a healthy weight (odds ratio = 1,576).

The literature says that while being 65 or over 65, having a higher weight decreased the chance of developing dementia while being underweight increased the chance of developing dementia over 65. Both (Atti, et al., 2008) & (Dahl, et al., 2008) confirm in their research that having a relatively higher BMI for the first paper it was higher than 25 and the second paper talked about both overweightness and obesity compared to a lower BMI. While this may be so for the elderly, this may have to do that having a higher BMI means that the person is healthier. In a study that looked into being underweight and the dementia risk. It suggested that being underweight in not a factor of developing dementia but a result of it (Nourhashemi, et al., 2003). But while being older decreases the chance of developing dementia while being overweight or obese. the opposite is true for younger people in for example mid-adulthood. According to the literature, there is an increased rate of developing dementia being obese in mid-adulthood (Kivipelto, et al., 2005). Thus, this is in stark contrast with being above 65 and benefitting from it. Whitmer, et al., (2005) also supports the suggestion but adds that being obese in mid-adulthood increases the chance of developing dementia above 65.

Thus, while the data and literature do suggest that being obese (and overweight) reduces the development of dementia. The literature also says that being obese can increase the odds of developing dementia at the later stage of their life during a person's life course. BMI is also related to a person's physical activity and having too high of a BMI may reduce the chance to benefit from being physically active.

Variable	B	Sig.	Exp(B)
Healthy/normal weight (reference)		.000	
Underweight	.455	.032	1.576
Overweight	-.547	.000	.579
Obese	-.758	.000	.469

Table 11, Body Mass Index

Alcohol consumption

All the categorical of consumption of alcohol are significant, more than 14 drinks per week had a P-value of 0,018 (table 12) while the rest of the categories were significant with a P-value of > 0,001

Drinking 1 to 14 drinks per week had a positive effect of not developing dementia. The chance of not developing dementia compared to never drinking alcohol were 44.2% (odds ratio of 0.442)

This positive effect of drinking 1 to 14 drinks per week compared to people who do not consume alcohol is also suggested by most literature. Both (Ruitenberg, et al., 2002) suggest that while heavy drinking its effect is not clear that light alcohol consumption and moderate alcohol consumption protects an individual from developing dementia better than while a person never drinks. While (Lee, et al., 2010) & (Hendriks, 2020) and (Sabia et al., 2018)

agree on the lower risk of developing dementia for light and moderate alcohol consumption. Both papers found a relationship between excessive/heavy drinking and developing dementia. The results suggest also a positive effect for drinking more than 14 drinks per week, but this may have to do with the low number of people who reported that as seen in table 6 only 2.5% of people reported drinking more than 14 drinks per week.

Variable	B	Sig.	Exp(B)
Abstinent (reference)		.000	
1 - 14 drinks per week	-.816	.000	.442
> 14 drinks per week	-1.238	.018	.290

Table 12, Alcohol consumption per week

Conclusion

Dementia is a dangerous illness, and the frequency will grow of it happening in society due to the increase in age in the USA. While dementia has no cure, but while there is no cure, there are certainly certain behaviours that influence the increased or decreased risk of developing dementia. Smoking is a negative influence of developing dementia depending on the number of cigarettes smoked, but research suggests that quitting smoking for a long enough period reduces the risk of developing dementia compared to smokers. Both literature and the results see physical activity as one of the best ways to reduce the risk of developing dementia even doing it not often is already a positive way to reduce the development of dementia compared to no physical activity at all. Consuming alcohol decreases the chance of developing dementia for light and moderate-drinking, and most literature suggests that heavy drinking is increases the chance of developing dementia. While it does not seem that gender influences relative dementia risk according to the data and literature. According to the data and literature, both years of education and age are very important indicators of developing dementia.

According to the literature and the data it is recommended to increase being physically active often, this does not only include more hours of physical activity during school hours. It should be encouraged to walk more often by possibly making more recreational places this is also to reduce the BMI levels which increase the chance to develop dementia during mid-adulthood. This is beneficial not only for the elderly but also for children and adults who benefit from physical exercise. Furthermore, while alcohol consumption is not necessarily bad of not developing dementia, this is probably the case for excessive drinking. While there is a big importance in preventing youth to start smoking, the literature points out that quitting for a longer period of time can reduce the chance of developing dementia to the same as a non-smoker. Thus, it shows the importance not only in prevention but in intervention to quit smoking.

For future research it would be interesting to look into other aspects that through a person's life course would be able to influence to reduce the risk of developing dementia. Furthermore, because this research focuses on the United States, it would be interesting to look into the extent to which physical activity as an important indicator of reducing the risk of developing dementia could be implemented. Another suggestion would be to look into the exact effects of smoking and drink through the life of a person to better understand the effects of this on the life course of an individual.

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