The association between lifestyle, socio-economic factors and depression-diabetes co-morbidity

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Outline

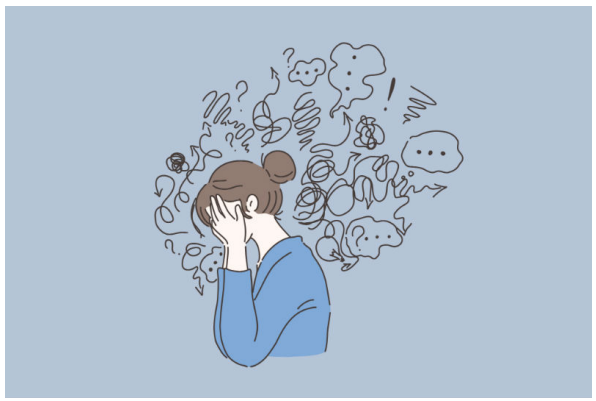
Introduction

What is Co-morbidity?

Co-morbidity is defined as presence of or coexistence of more than one health conditions.

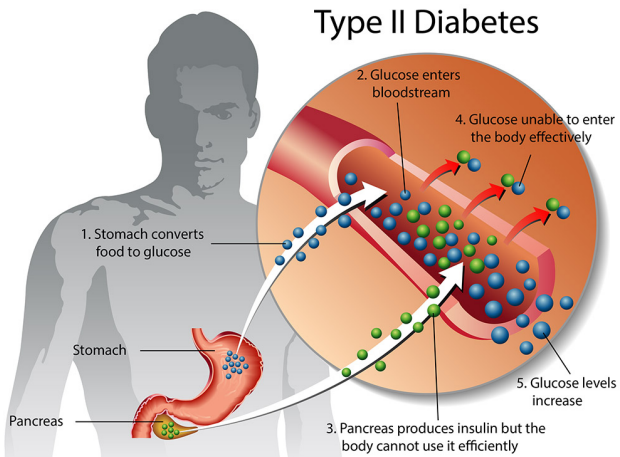
Example

coexistence of diabetes, blood pressure and depression in same person



Diabetes and Depression

- Affects almost 422 million[1]
- Steady increasing
- important determinant of premature-death, disability, morbidity [2, 3].
- Increased health-system costs [3, 4]



- Affects almost 264 million[5]
- Drastically increasing
- Leading cause of suicide
- Most don't receive treatment
- Risk factor for other health conditions[6, 3]

Prevalence of Diabetes

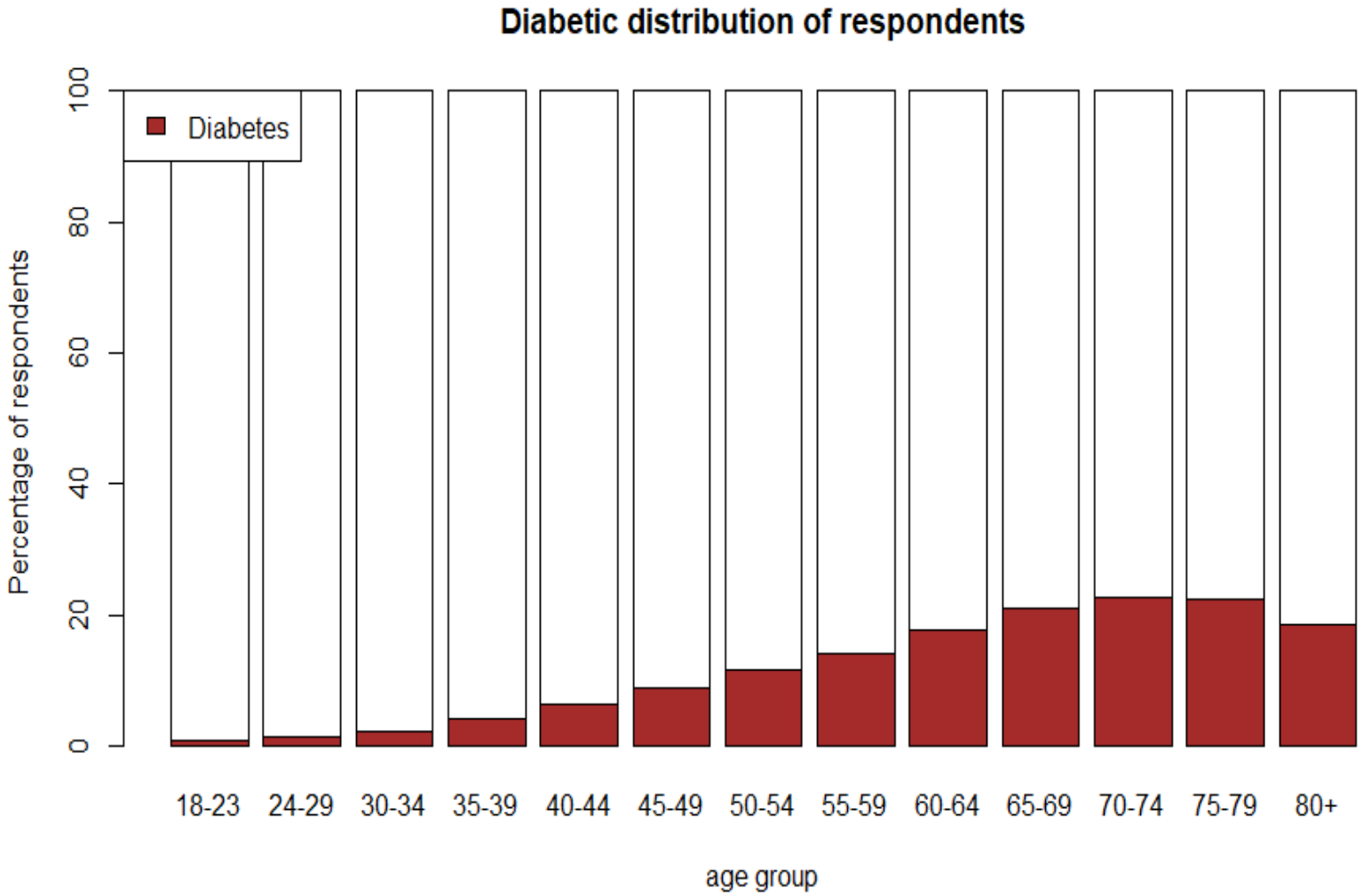


Figure 1: Graph representing the prevalence of Diabetes in different age group in absolute values and percentage (Data Source: BRFSS, CDC, USA)

Prevalence of Depression

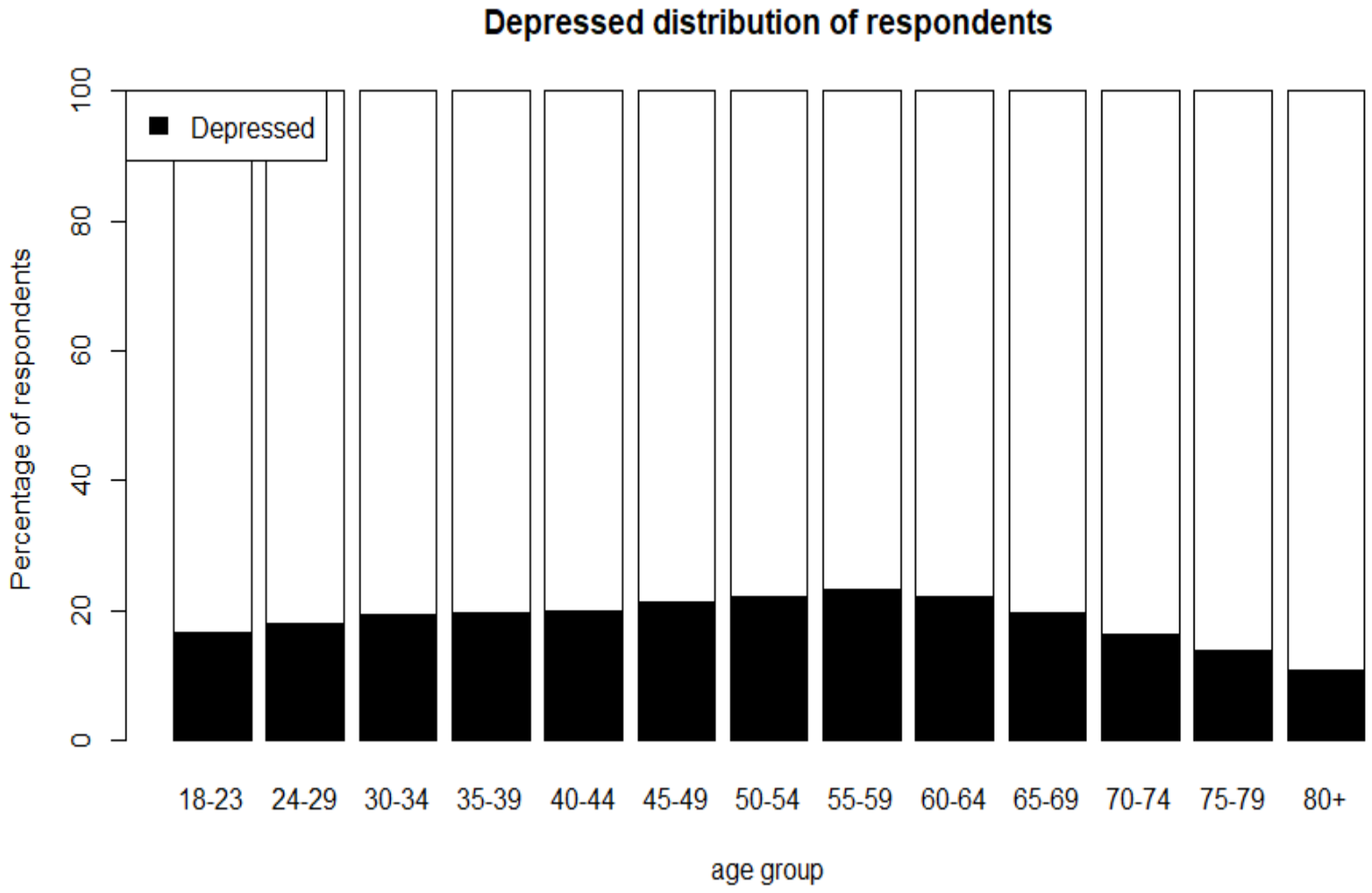


Figure 2: Graph representing the prevalence of Depression in different age group in absolute values and percentage (Data Source: BRFSS, CDC, USA)

Prevalence of comorbidity of across gender

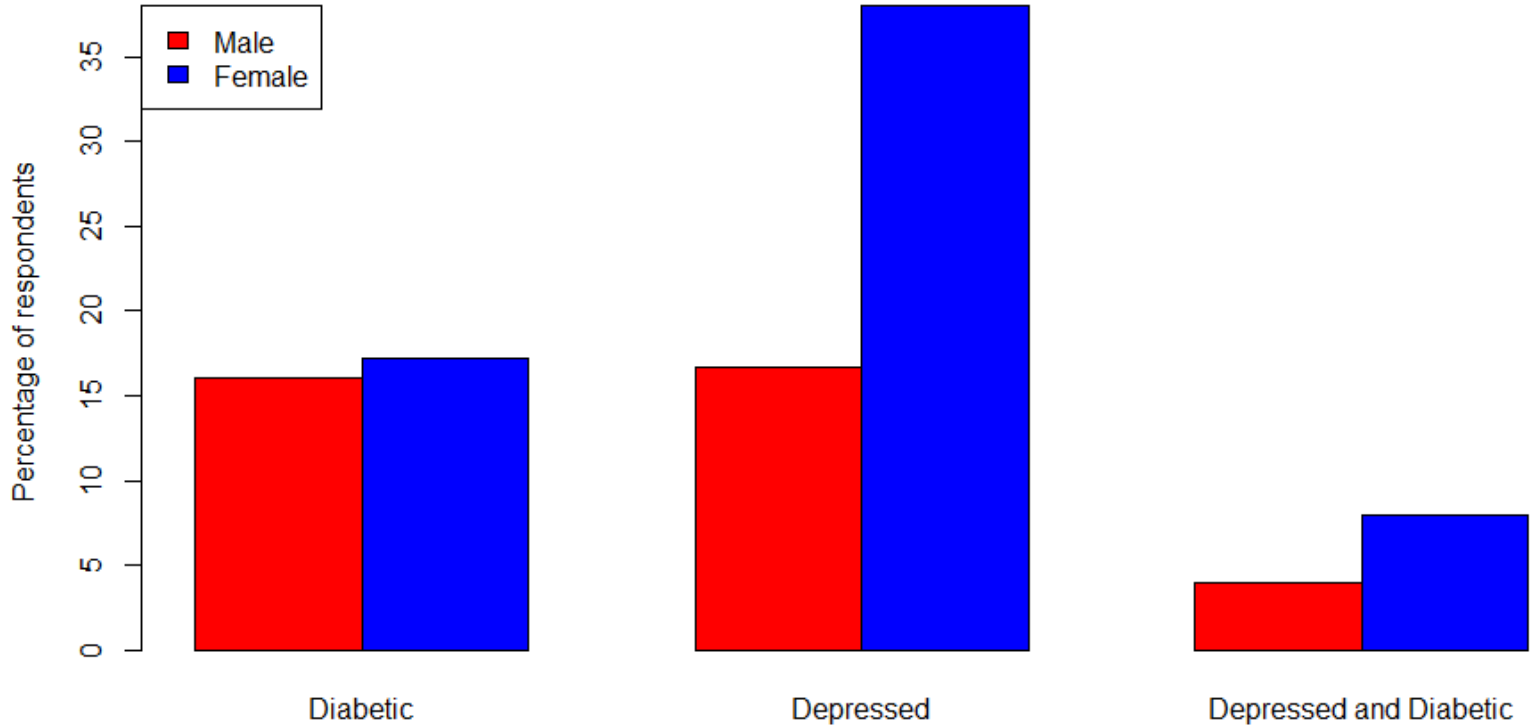


Figure 3: Graph representing the prevalence of Comorbidity across gender (Data Source: BRFSS, CDC, USA)

Motivation

Primary Reasons

- Comorbid condition of diabetes and depression adversely affects quality of life of people and lead to disability, morbidity, increased health care cost and mortality [3, 4].
- Diabetes and depression are often diagnosed together [7, 8]
- Identification of diabetic-depression comorbidity could elivate quality of life [7, 9]

Secondary Reasons

- Co-morbidity demands different clinical and medical approaches to treatment, creates different conditions requiring varied approach.
- Understanding of factors associated with co-morbidity that could potentially help in it's prevention and management.

Literature Review

- Systematic Reviews and Meta-analysis studying diabetes and depression, associated diabetes to be a risk factor for depression [3, 10, 11, 12, 13, 14, 15]
- Depression was two times more prevalent in individual with diabetes than without it. [13, 3]
- Diabetes is a risk factor for almost 9.5 million depression cases world wide [3]
- Individual with both diabetes and depression rate their health low compared to other chronic conditions [14, 3]
- Aarts et al. [15] showed increase association of depression after diabetes based on the participant's gender, age, level of education, martial status and practitioner's code. The education level was found to be significant indicator.
- Asamsama et al. [12] created sociodemographic characteristic to study relationship between diabetes and depression. It was based on gender, ethnicity, martial status and education. BMI was found to be intermediate indicator for both diabetes and depression.

Research Gap

- Literatures reviewed for study involved use of demographic variables (Age,Gender, Ethnicity) or Lifestyle Variable (Exercise, BMI).
- But the Social and economic status of respondents, which play a large role in determining the access to privileges, resources and health care [16] is not explored.
- Aarts et al. [15] tried to asses participant's social economic status by the answer to the question "difficulty meeting family expenses for basic needs in last year".
- But a SES is based on many underlying factors like Household income, education etc making it highly accurate.
- There is much work needed in selection and interpretation of underlying indicators of SES, and study it's variance.

Objective

Explore the association between lifestyle, socio-economic factors and depression-diabetes co-morbidity

Sample

- The study is based on a cross-sectional sample drawn from the Behavioral Risk Factor Surveillance System (BRFSS) [17] survey.
- BRFSS is an equal representation and cross sectional survey conducted annually by the Center of Disease Control and Prevention (CDC) , a main component of the United States Department of Health.
- The datasets comprise of telephonic interviews with adults, comprising standardized questionnaires over landlines and cellular phones.
- It collects data regarding risk behavior prevalence and preventive health practices that determine the health status.
- The data collected in the survey is of year 2012 to 2015 as these were the years for which concerned variables were available.

Variable Definition

Variable	Value
Age group	3=(30,34), 4=(35,39),5=(40,44),6=(45,49), 7=(50,54),8=(55,59), 9=(60,64), 10=(65,69), 11=(70,74), 12=(75,79), 13=80+
Gender	1=Male, 2=Female
Ethnicity	1=White, 2=Black, 3=Hispanic, 4=Other race, 5=Multiracial
BMI	17.49 to 46.06
Exercise	1=yes, 0=No
Education Level	1=No school, 2=grade 1 to 8, 3=grade 9 to 11 4=grade 12, 5=College 1 to 3 years 6=College 4 years or more
Employment Status	1=Employed for wages, 2=self-employed, 3=Homemaker, 4=Student, 5=Out of work for $<$ 1 year, 6=Out of work for $>$ 1 year, 7=Retired, 8=Unable to work

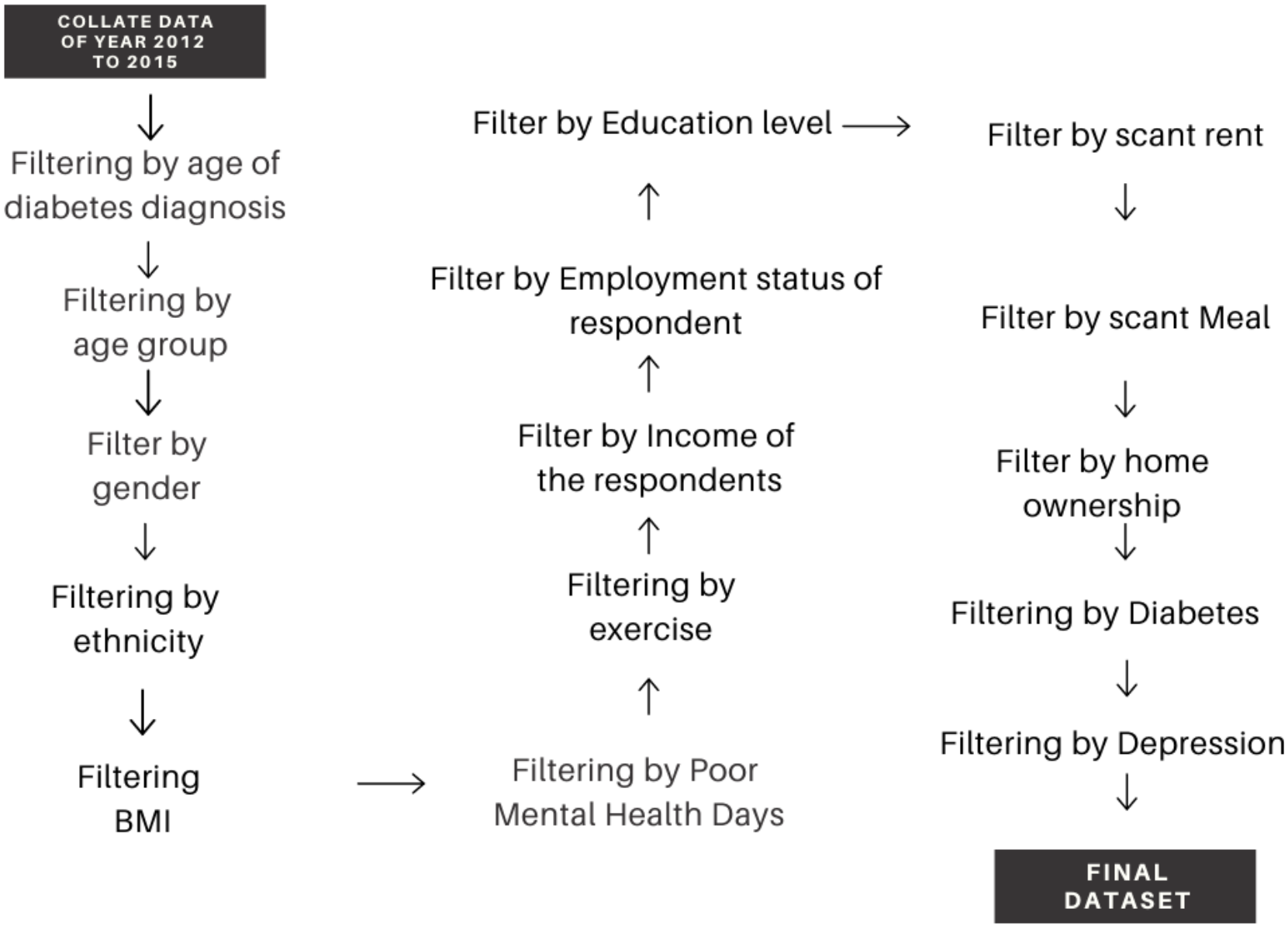
Table 1: Table representing definition of all the variables (part 1)

Variable Definition

Variable	Value
Income	1=(<10,000), 2=(10,000 to 14,999), 3=(15,000 to 19,999), 4=(20,000 to 24,999) 5=(25,000 to 34,999), 6=(35,000 to 49,999) 7=(50,000 to 79,999), 8=(>75,000)
Scant Rent	1=always, 2=Usually, 3=Sometimes, 4=Rarely, 5=Never
Scant Meal	1=always, 2=Usually, 3=Sometimes, 4=Rarely, 5=Never
Home ownership	1=Own, 2=Rent
Diabetes	1=yes, 3=no
Depression	1=yes, 2=no

Table 2: Table representing definition of all the variables (part 2)

Data preprocessing



Creation of SES and Morbidity measure

After looking at the variable definition and literature on SES we derived the formula

$$\text{SES} = \text{Income} + 1_{\overline{Homeownership}} + \text{Education Level} + \text{Scant Meal} + \text{Scant Rent} + 1_{\overline{Employmentstatus}}$$

$$\text{Comorbidity} = \begin{cases} 1;\ \text{Diabetes} = 1,\ \text{Depression} = 1 \\ 0;\ \text{Diabetes} = 1,\ \text{Depression} = 0 \end{cases}$$

Distribution of SES

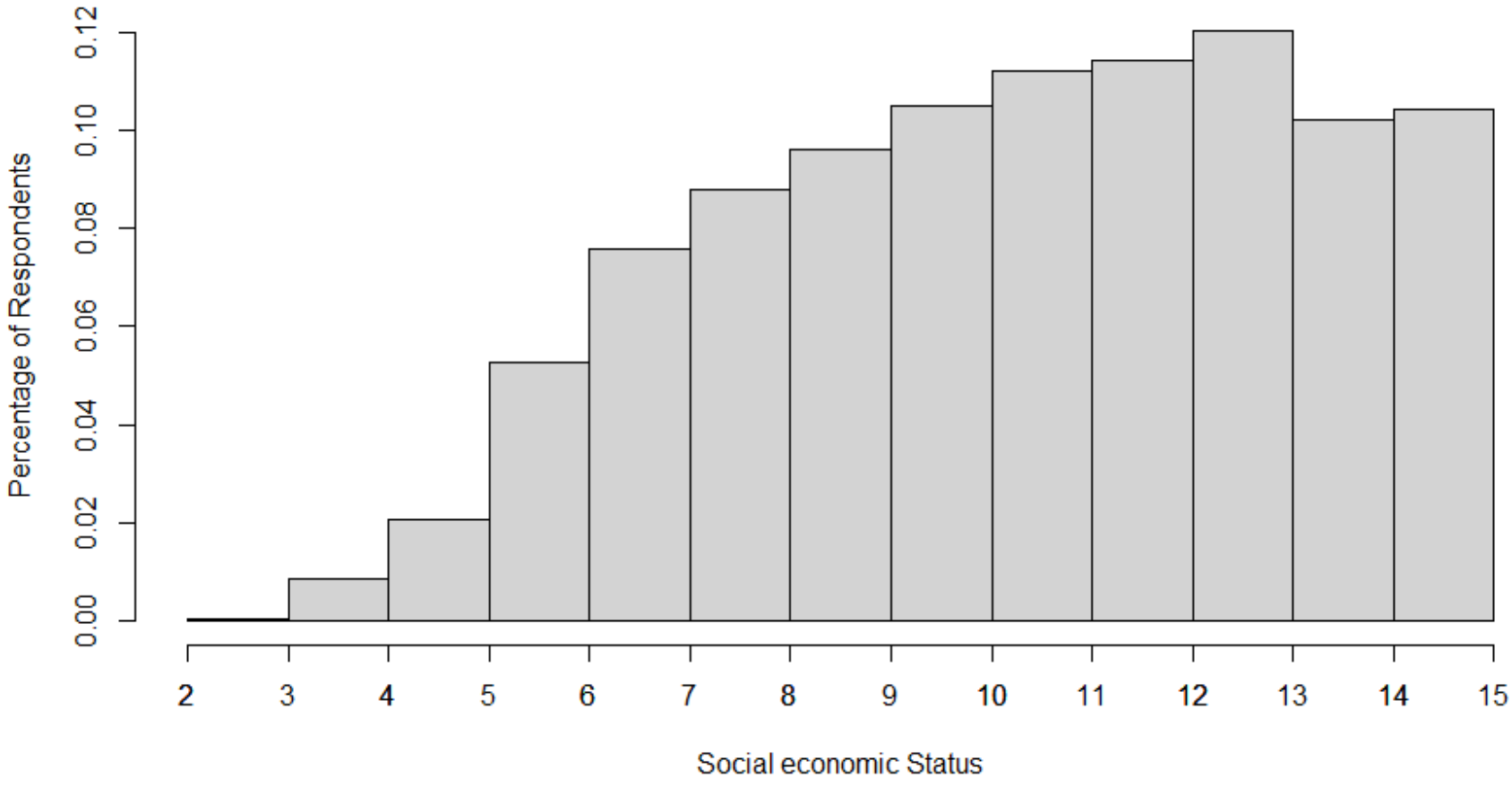


Figure 4: Distribution of SES in the respondents(Data Source: BRFSS, CDC, USA)

Distribution of BMI

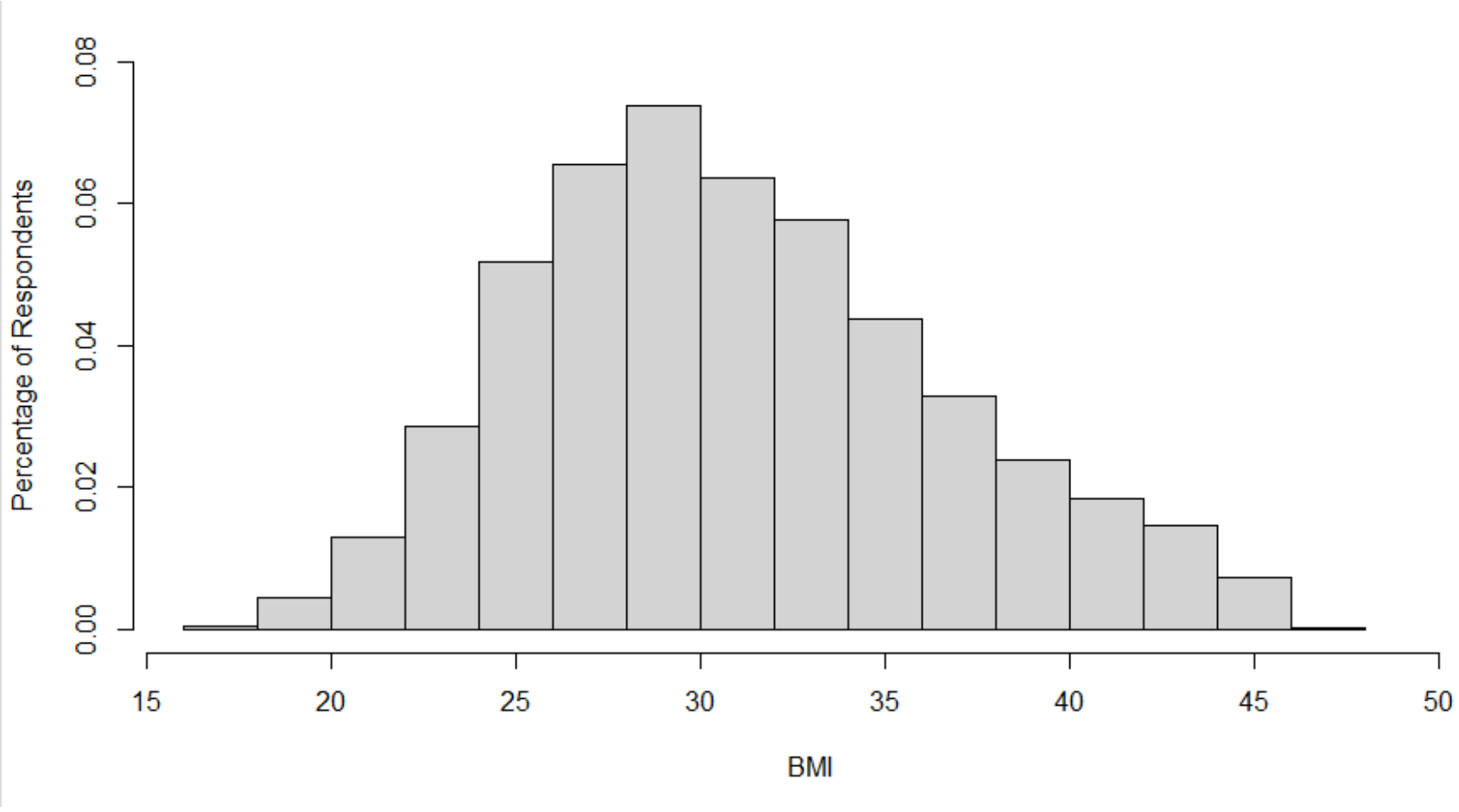


Figure 5: Distribution of BMI in the respondents (Data Source: BRFSS, CDC, USA)

Final Variables used for Analyses

Independent Variable	Dependent Variable
Age Gender Ethnicity BMI Exercise Poor Mental Health SES SES Category	Diabetes Depression

Table 3: Table representing the final variables used for analyses

Model I

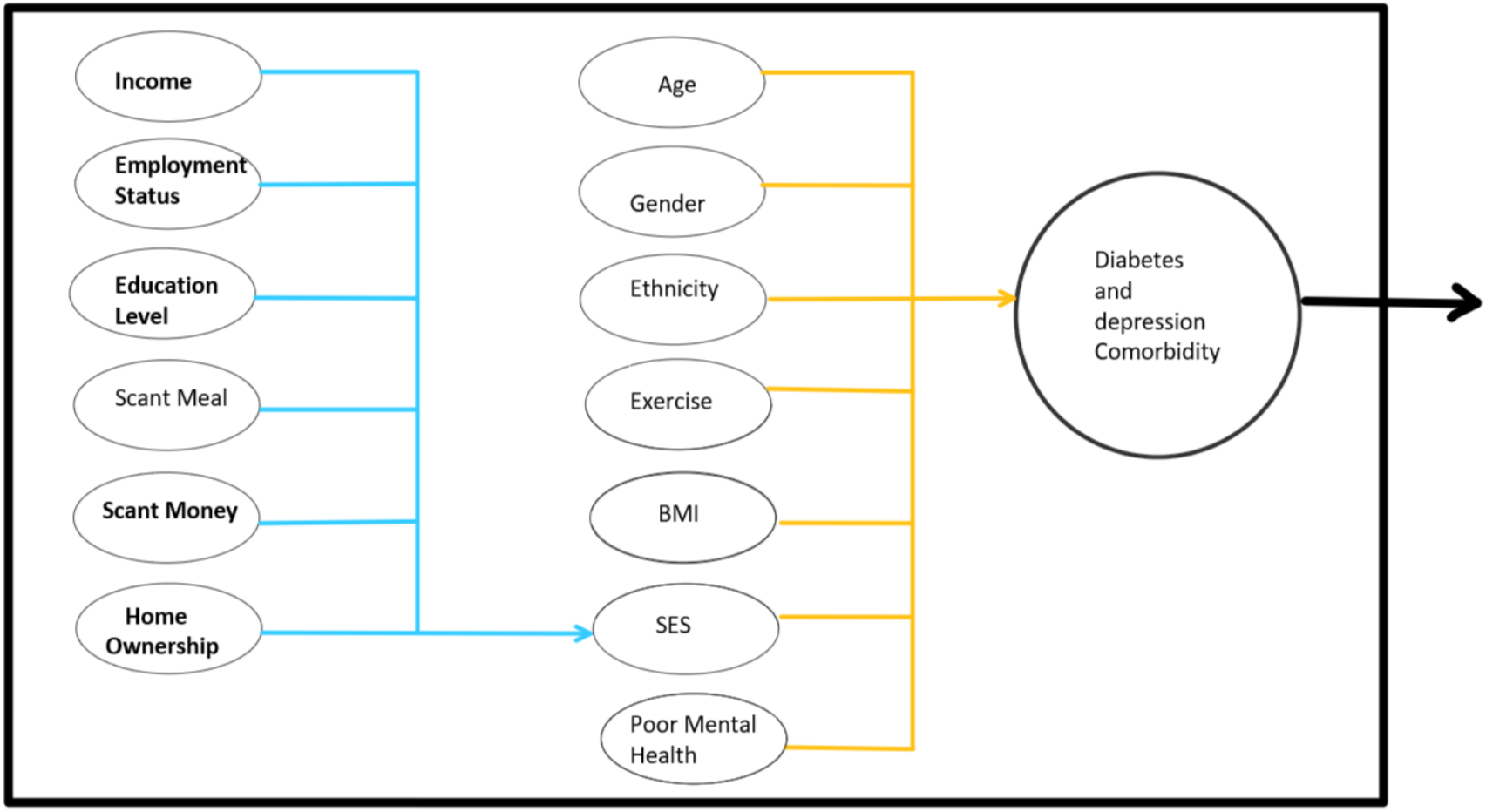
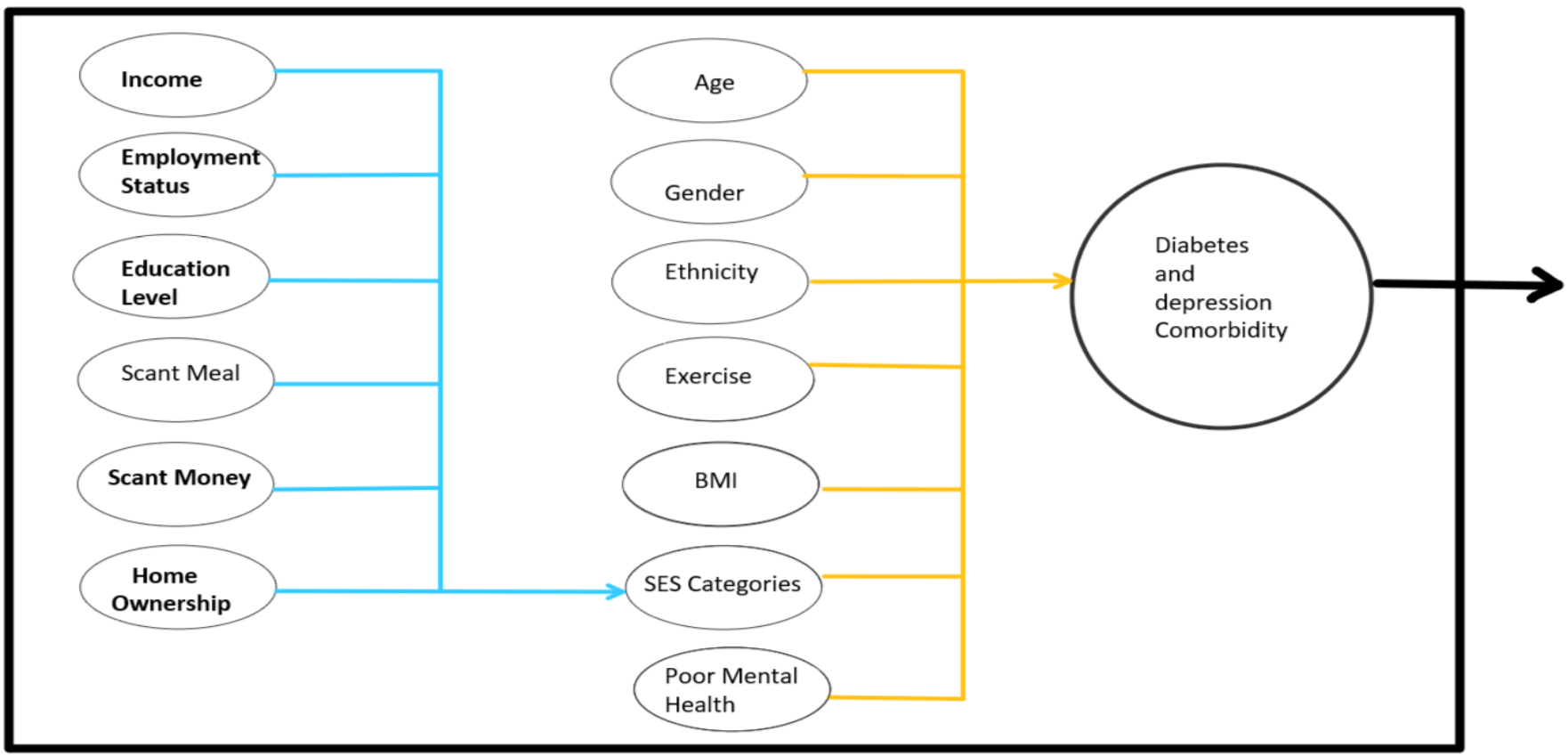


Figure 6: Model I

Model II

To study the the variable of Socio-economic Status and to study it's gradient nature in general. A new model is created called SES categories by categorising into Low, Medium, and High Categories.

Figure 7: Model II



Result and Discussion

Variable	Coefficient	Odd ratio	p-value
Age	-0.151	0.860	<0.001
Female	0.480	1.616	<0.001
Black	-0.804	0.447	<0.001
Hispanic	-0.410	0.663	<0.001
Other race	-0.598	0.550	<0.001
Multiracial	-0.281	0.755	0.052
BMI	0.018	1.018	<0.001
Poor Mental health	-0.158	0.854	<0.001
Exercise	0.097	1.102	<0.001
SES	-0.083	0.920	<0.001

Table 4: Table representing output from Model I

Result and Discussion

Variable	Coefficient	Odd ratio	p-value
Age	-0.140	0.870	<0.001
Female	0.505	1.656	<0.001
Black	-0.772	0.462	<0.001
Hispanic	-0.367	0.693	<0.001
Other race	-0.590	0.554	<0.001
Multiracial	-0.261	0.770	0.052
BMI	0.018	1.018	<0.001
Poor Mental health	-0.183	0.833	<0.001
Exercise	0.098	1.104	<0.001
Medium SES	-0.195	0.823	<0.001
High SES	-0.509	0.601	<0.001

Table 5: Table representing output from Model II

Result and Discussion

- The SES (OR 0.92, $p << 0.005$) of an individual is significant determinant of comorbidity of diabetes and depression, even after controlling for other determinants. .
- The gradient effect on comorbidity was significantly visible with different levels SES. For every unit increase in SES odds of comorbidity decrease by factor of 8%.
- The prevalence of comorbidity tend to decrease with increase in age (OR 0.86, $p << 0.05$). For every 5 years increase in age, the odds of comorbidity is 0.86 times.
- Perhaps with gradual increase in age people get more comfortable and better manage the health condition.
- Women (OR 1.62, $p << 0.05$) in particular tend to be more depressed and thus more prone to comorbidity.

Result and Discussion

- In the dataset 24.9% (N=4047) comorbid individuals were identified
- Ethnicity of Black(OR 0.45, $p << 0.05$), Hispanic(OR 0.66, $p << 0.05$) and other race(OR 0.55, $p << 0.05$) have less significant odds of Comorbid depression. This could be attributed to less emphasis given to mental health in non-whites [18]
- Exercise(OR 0.85,$p << 0.05$) was found to reduce the odds to comorbidity by 15%.
- Higher BMI (OR 1.02,$p << 0.05$) is a risk factor for comorbid condition of diabetes and depression. For every unit increase in BMI there is 2% increase in comorbidity.
- Mental health plays prominent role in defining comorbidiy of diabetes and depression. For every one day increase in poor mental health the comorbidity increase nearly 10%.

Conclusion

- SES was significant predictor of the depression-diabetic morbidity both with absolute case and gradient values. The people in High SES and Medium SES categories are 39.9% and 17.7% less likely to encounter Comorbidity respectively compared to Low SES.
- Women, Individuals with no exercise and belonging Low SES are significantly affected.

Future Scope

- Use of other socio-demographic variables like Marital status, family size etc. need to be investigated for significance.
- work on model to explore for multiple morbidity present in the sample.

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