Association between Cardiac Risk Factors and Perceived Stress in Women with Heart Disease

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Problem Statement

Despite a wealth of research identifying modifiable risk factors, heart disease continues to be the leading cause of early death in Canadian women (Heart and Stroke Foundation of Canada, 2018; Stanner & Coe, 2019). Distinct factors commonly attributed to women, such as higher levels of anxiety, have been shown to have a negative influence on heart health (Aggarwal et al., 2018; Cirelli et al., 2018). However, current evidence does not adequately reflect gender-specific risk factors of heart disease due to a historical underrepresentation of women in research (Heart and Stroke Foundation of Canada, 2023). This lack of inclusion of women has led to inadequate screening and treatment (Nadeau et al., 2023). Another significant gap in understanding is related to how the social determinants of health influence the mental health of women (Raparelli et al., 2022). This finding is concerning because women have a higher likelihood of being affected by health inequality. These disparities, such as low income and stress due to the requirement to fulfill stereotypical gender roles, negatively influence a woman's mental health (Kiely et al., 2019). An increased understanding of the associations between stress and cardiac risk factors, including the influence of the social determinants of health, would contribute to the development of cardiac guidelines that reflect the unique needs of women with heart disease.

The purpose of this quantitative cross-sectional study was to describe the characteristics of women with heart disease who experience life stress. Furthermore, this study will examine the relationship between perceived stress and cardiovascular risk factors in women with heart disease.

Background

Women are at high risk of experiencing negative effects on heart health as a result of stress. One reason for this is that women often report higher levels of stress when compared to men (Cirelli et al., 2018; Slade et al., 2011). Additionally, pregnancy-related hormone changes can increase the risk for mood changes such as post-partum depression (O'Neil et al., 2021). The effects of this stress lead to decreased oxygen perfusion to the heart, damaging endothelial tissue in the blood vessels, a precursor to plaque development in the arteries (Henein et al., 2022). High levels of circulating cortisol, often found in women, further contribute to damaging the blood vessel walls (Henein et al., 2022).

Miley et al. (2023) analyzed the relationships between mental illness and individuals with heart disease and found that being a woman was a significant predictor of increased incidence of having an adverse cardiac event. However, the results were collected within an American hospital system and due to differences in health administration processes, they may not apply to the Canadian context. The study also focused on what is often referred to in the literature as severe mental illness and, therefore, may not apply to common forms of mental illness such as anxiety and depression. While the influence of dual diagnosis of severe mental health disorders and heart disease concurrently has received significant attention in the literature (Kumar et al., 2022; Minhas et al., 2022; Rodevand et al., 2022), the relationship between more common mental disorders such as anxiety in women is limited.

Focusing on individual risk factors common to heart disease fails to recognize the complexities of the influence of social determinants of health (Mehta et al., 2023). When modifiable risk factors such as obesity, poor nutrition, and a sedentary lifestyle play a role (Stanner & Coe, 2019) are presented as solely within the control of the individual, women have reported feeling a sense of shame when discussing heart health and will avoid attending appointments with practitioners if they have gained weight (Bairey Merz et al., 2017).

Furthermore, a study of the impact on genetic predictors of heart disease found that using genetic markers was limiting as the variances of predictors were attributed to socioeconomic factors (Hamad et al., 2022).

Acknowledging the influence of structural inequities on patient outcomes is embedded within the holistic philosophy of nursing; nonetheless, there continue to be significant skill deficits and stigma that negatively influence care for people with mental health challenges (Knaak et al., 2017). A systematic review of randomized control trials aimed to compile studies on nurse-led interventions for mental health (Dickens et al., 2023). Within the sample of n=49 studies that met inclusion criteria, only n=10 studies focused on interventions specific to people with common mental disorders. Of the 11 studies, a small percentage of outcome variables (34.2%) showed significant improvements ($p < .01$), with overall results pointing to a deficit in interventions specific to anxiety or depression. Nurses play a key role in caring for patients who have heart disease as well as in prevention efforts (Mattioli & Gallina, 2023); however, barriers to accessing mental health services, such as insufficient resources (Moroz et al., 2020), make providing it challenging to provide adequate care. Analyzing how factors of health inequality influence mental health in women can provide evidence to support population-based health initiatives that prioritize mental health and inform the development of future nursing interventions.

Theoretical Framework

This study design and variable selection was guided by a framework developed by O'Neil et al. (2021) which theorizes the intersections between mental health and heart disease in women. This framework developed by O'Neil et al. (2021), was adapted from the *Framework of Proposed Pathways by Which the Cardiovascular Health of US Women Is Deteriorating* (O'Neil et al., 2020). The foundations of the model emphasize the structural factors such as social class and ethnicity that influence mental wellness and heart health in women. Within this model, modifiable risk factors are framed within a population health approach, where blame is not placed on the individual for their disease, but rather there is recognition that efforts to remove structural barriers that lead to women experiencing mental health challenges will have a positive influence on the heart health.

Research Questions and Hypotheses

The proposed research aims to answer the following research questions:

1. Are there differences in perceived stress between females with heart disease to females without heart disease?

The null hypothesis (H_0): Levels of perceived stress do not differ between females who have heart disease and females who do not have heart disease.

The alternative hypothesis (H_a): Levels of perceived stress will be significantly higher in females who have heart disease in comparison to females without heart disease.

2. What is the association between cardiac risk factors (biological, behavioral and structural) and perceived life stress in women with heart disease?

The null hypothesis (H_0): Biological factors and behavioral factors will not be significant contributors to self-perceived life stress in women with heart disease. The addition of socioeconomic factors will not provide more explanatory power for the model.

The alternative hypothesis (H_a): Biological factors and behavioral factors will be considered significant contributors to self-perceived life stress in women with heart disease. The addition of socioeconomic factors will significantly increase the explanatory power of the model.

Methods

Research Design

The design for this research was a retrospective, non-experimental, population-based study. The research is observational in nature and used the Canadian Community Health Survey (CCHS) 2017-2018 cross-sectional database. The CCHS is a routinely collected nationwide dataset initiated by Statistics Canada with the aim of providing an accurate representative sample of the Canadian population. Data for this survey has been collected every two years since 2000.

Population

The Canadian Community Health Survey (CCHS) source population targets all Canadians over the age of 12. The most recent Canadian census data in 2021 indicates that the total adult population is over 22 million, with approximately 51% identifying as female (Statistics Canada, 2023b). The average age of the entire Canadian population is 41.5 years; however, females are disproportionately represented in the population over the age of 65 (Statistics Canada, 2021). Canada has a diverse population, with a quarter of the population identifying as entering the country through an immigration process (Statistics Canada, 2022) and 5% of the Canadian population identifies as Indigenous (Statistics Canada, 2023a).

CCHS Database Sample

Type of sampling method

The sampling method used to collect data for adults over 18 was an area frame sample. This complex data sampling process involves a multi-step sample frame that aims for an equal sample distribution based on approxately100 pre-designated provincial health regions (Statistics Canada, 2020). The sampling selection did not include individuals living on reserves, members of the Canadian Armed Forces, and individuals who reside in institutional settings.

Data collection procedure

Data was collected through telephone and in-person interviews. After contacting the selected household, interviewers were directed to ask questions about demographics within the family unit and from there, one person was selected to complete the interview. Participants were encouraged to answer questions away from other members of the family to allow for accurate responses that were not influenced by others in the vicinity. Data was entered by trained interviewers into an automatic computer system that reduced errors by prompting interviewers of the potential for inaccurate data entry. While language diversity is not a specific goal of the CCHS, household members who did not speak the interviewer's language were assigned to someone fluent in their preferred language. Data was collected in all ten provinces and three territories within Canada between January 2017 and December 2018. If households refused to be interviewed, they would be contacted by a senior manager who would reinforce the data's value and encourage survey participation.

Study Sample

Inclusion and exclusion criteria

This study focuses on women with heart disease; therefore, anyone identifying as male or other was not included. Women under the age of 18 were also removed from the dataset as the focus of this study is on the adult population. While women who report having a diagnosis of heart disease are the focus of this study, women who did not identify as having heart disease were retained in the dataset to allow for comparisons to be made. To be considered as having a diagnosis of heart disease, Participants were asked to self-identify if they had heart disease by responding yes or no to the question “Do you have heart disease?” (Statistics Canada, 2020, p. 21). See Appendix A for a flow diagram of the determination of the final sample size for this study.

Sample size

The total CCHS database population was 113,290 participants during the 2017-2018 dataset collection period. Each province and territory was represented in this sample, and the target number of participants per area met the criteria for a power allocation of 0.75 (Statistics Canada, 2020). Within the database population, 60,888 participants self-identified as female. For the purposes of this study, the sample size was further reduced to a population of 3,322 females over the age of 18 who identified as having a self-reported diagnosis of heart disease. Data from all provinces and territories was represented in the study dataset. See Appendix A for a table comparing the demographic variables of both groups**.**

Setting

All Canadian provinces and territories were included in the study sample. The population of women with heart disease represented in the dataset was too small to analyze data for a specific province or territory on an individual level.

Analytical Plan

Measures

Perceived Life Stress

The main dependent variable of interest for this study was perceived life stress. This variable was selected for this study because perceived life stress has been shown to be associated with cardiovascular disease progression (O'Neil et al., 2021). Participants' responses on the perceived life stress variable were coded on a five-point Likert scale: 1 (*not at all stressful*), 2 (*not very stressful*), 3 (*a bit stressful*), 4 (*quite a bit stressful*), and 5 (*extremely stressful*). The full five categories were used for descriptive statistics to describe the degree of stress experienced. The variable was also recoded into a binary variable with a bit stressful, quite a bit stressful and extremely stressful combined to indicate a yes response to perceived stress.

Covariates

Independent variables were selected based on cardiac risk factors found in O'neil (2021) conceptual model as well as availability within the CCHS dataset. All independent variables are categorical, with two or more categories representing the variable of interest. Categorical variables with more than two categories were recoded into binary variables to better represent the study's desired focus. Reference categories for all variables were set as the absence of the risk factor of interest.

Biological Factors

Biological factors considered within this study were age, diagnosis of a comorbidity (COPD or Diabetes), high blood pressure, high cholesterol, and body mass index (BMI). This study uses the World Health Association (WHO) definition of obesity, which determines anyone with a BMI greater than 30 as obese (World Health Organization, 2024). The BMI variable was recoded into a binary variable of obese (yes/no).

Behavioural Factors

Behavioural factors for this study included drinking alcohol daily, smoking cigarettes and meeting Canadian government guidelines for recommended level of physical activity. All variables were recoded into binary variables, indicating the absence or presence of the behaviour.

Structural Factors

The structural factors for this study include immigration status, Indigenous status, sexual diversity, and social class. Immigration status and Indigenous status are binary variables. Sexual diversity variable was recoded to a binary variable that indicates whether the individual is heterosexual (yes/no). The variable of family income level represented social class. Cirelli et al.

(2018) investigated the relationship between income and stress in patients with heart failure. They found that when family income was less than minimum wage, stress levels increased; therefore, the cut of income level indicates being a lower-class member. The federally set lowest minimum hourly wage is $16.65 (Government of Canada, 2023), with a person working full-time making approximately $25,000 after taxes; therefore, the binary variable for an individual's social class was coded into a binary variable of family income under $25,000 and family income over $25,000

Statistical Analysis

Descriptive and inferential statistics were computed using SPSS version 29.0.2. Demographic differences were computed using chi-square and percentages for women with heart disease and those without heart disease. All variables used within the study were categorical. Significance for all p values was set at $< .05$. Logistic regression with the dependent variable of perceived life stress coded as a binary variable of Yes or No. Independent variables for the regression model were broken into three categories, each split by type of risk factor (biological, behavioural, and structural). Bivariate analysis was used to test the assumption of multicollinearity. Each independent variable was then analyzed individually with the dependent variable to determine if there was a significant association. Variables with a significant association were added to the multivariate model.

A hierarchical approach was used to add variables to the multivariate logistic regression model. Three blocks of variables were entered into the regression model. Block one included biological cardiac risk factors: age, comorbidities, high cholesterol, and obesity. The second block added daily drinking, smoking, and physical activity to the model. In the third block, social class was added. When new variables were added to the model at each step, variables from previous steps were retained. Nagelkerke R Square was used to report the percentage of variance of the dependent variable that was explained by the model. The model coefficient was compared at each step to assess if subsequent blocks of independent variables improved the fit of the model. Model fit was also assessed using the Hosmer-Lemeshow goodness-of-fit test. See Appendix B for a Directed Acyclic Graph of the predicted associations between perceived stress and cardiac risk factors.

Results

Descriptive Statistics

A total of 56,464 females were included in the initial descriptive analysis. Among these participants, a total of 3,322 women under the age of 18 identified as having a diagnosis of heart disease. The majority of these women identified as non-immigrant (n= 2813, 85.4%) and non-Indigenous (n= 3148, 93.9 %). Income disparities were noted in the participant characteristics, with a higher number of women with heart disease reporting an income level below the poverty line (n=523, 15.8%) compared to the entire population of women in the sample (n=5,666, 10%).

A disproportionate number of women who had heart disease (82%) were over the age of 60, with the remaining 14.3 % between the ages of 40-59 and 3.2 % between 18-39 years of age. In comparison, a significant difference was noted in women without heart disease, with only 38.8% of women without heart disease being over the age of 60 ($p= .000$). Another area where a significant difference in populations was noted was with marital status where women with heart disease were more likely to report being widowed/divorced/separated (n= 1726, 52%, $p <.001$) whereas only 26% of women without heart disease fell into this category. Women with heart disease were also less likely to have a post-secondary education (n=1,428 [44%] vs n= 32,554 [62.1%], $p= <.001$), be a smoker (n=85 [2.9%] vs 2,005 [4.3%]) or drink daily n=1206 [36.3%]

vs n=2,005 [4.3%]. While women with heart disease were more likely to report having a co-morbidity. See Appendix C for further details related to descriptive statistics.

Table 1 shows the differences in reported perceived life stress scores between women with heart disease and women without heart disease. Fewer women with heart disease (n=1,858 [56.4%]) reported the presence of life stress. This number included all individuals who reported a little bit of stress, quite a bit of stress or extreme life stress. In comparison, 61.9% of women without heart disease (n=32,766) reported experiencing life stress. This finding was statistically significant (X^2=29.56, p <.001). An odds ratio calculation showed that the likelihood of reporting life stress was decreased for women who indicated a diagnosis of heart disease (OR= .796, 95% CI [.742- .855], B= -.228, p <.001). However, when women with heart disease reported life stress, they were more likely to rate it as being extreme when compared to women without heart disease (n=142, [4.3%] vs n=1787, [3.1%], p= <.001). The number of women who reported that their stress was “quite a bit” was comparable with 20% of women with heart disease (n=662) reporting quite a bit of stress in comparison to 20.7% of women without heart disease (n=11,904) at a significance level of p <.001.

Table 1

	Women with Heart Disease	Women without Heart Disease	Total Women	X^2	P Value
Perceived Life Stress				70.85	<.001*
Extremely stressful	n=142 (4.3%)	n=1,787 (3.1%)	n=1,929 (3.2%)		
Quite a bit stressful	n=520 (15.7%)	n=10,117 (17.7%)	n=10,637(17.6%)		
A bit stressful	n=1,217(36.7%)	n=23,255 (40.7%)	n=24,473 (40.5%)		
Not very stressful	n=870 (26.2%)	n=14,394 (25.2%)	n=15,264 (25.3%)		
Not at all stressful	n=569 (17.1%)	n=7,537 (13.2%)	n=8,106 (13.4 %)		

* indicates a significant difference

Inferential Statistics

Univariate Analysis

Table 2 identifies the unadjusted odds ratio analysis for each independent variable included in the model. Age, comorbidities, daily smoking, daily drinking, physical exercise, social class, high cholesterol and obesity all showed significant associations with perceived life stress ($p = < 0.05$). Immigrant status, Indigenous status, and sexual diversity did not show significant associations with perceived stress and were, therefore, not included in the model for multivariate analysis.

Table 2

Independent Variable	B	Unadjusted Odds Ratio [95% CI]	P	B	Adjusted Odds Ratio Final Model [95% CI]	P
Biological Risk Factors						
Age						
< 60 n=1261	-1.06	.35 [.22- .56]	<.001*	-2.2	.11 [.03- .37]	<.001*
< 75 n=1479	-1.33	.27 [.16- .42]	<.001*	-2.39	.09 [.03- .31]	<.001*
COPD n=3237	.43	1.54 [1.27- 1.85]	<.001*	.42	1.5 [1.24- 1.85]	<.001*
Diabetes n=3316	.23	1.25 [1.07- 1.47]	.006*	.19	1.21 [1.01- 1.45]	. 036*
High Cholesterol n= 3236	.25	1.28 [1.11- 1.48]	<.001*	.27	1.3 [1.12- 1.52]	<.001*
Obesity n=3322	.23	1.26 [1.08- 1.47]	.004*	.06	1.06 [.89- 1.25]	.517
Behavioural Risk Factors						
Alcohol Daily n=3322	-.14	.870 [.75- 1.00]	.05*	-.19	.82 [.70- .96]	.014*
Cigarettes Daily n=2945	.54	1.72 [1.37- 1.54]	<.001*	.23	1.25 [.76- 1.53]	.370
Meets Exercise Requirements n=3322	.25	1.28 [1.10- 1.49]	.001*	.12	1.144 [.96- 1.33]	.169
Structural Factors						
Social Class n=3,322	.56	1.74 [1.48- 2.05]	<.001*	.22	1.25 [1.04- 1.5]	.020*

* indicates a significant difference

Multivariate Analysis

Bivariate analysis between the independent variables showed an $R^2 < .85$, indicating the absence of multi-collinearity. A hierarchical logistic regression was conducted to examine the associations between cardiac risk factors and perceived stress in women with heart disease. Table 3 presents the model coefficients, R^2, and Hosmer-Lemeshow test result with the addition of each block. Findings showed that with the addition of each block, the model coefficient (X^2) improved and that each model was determined to be significant at $p <.001$. All models reported a non-significant Hosmer-Lemeshow test result, which provides further evidence to support the goodness of fit of each block. In relation to the research question indicating whether the addition of structural factors would significantly improve the model fit, it was found that including social class increased the model coefficient from 170.82 (X^2) to 176.29 (X^2). A slight increase was also noted in the variance explained by the model from 7.2% to 7.3%.

Table 2 presents the adjusted odds ratio for the final model, as this was the model that was determined to be the best fit for the variables under study. The model of best fit revealed that daily alcohol use was associated with a decrease in odds that a woman would report perceived life stress (AOR = .82, 95% CI [.70–.96], p=0.14]). An increased likelihood of perceived life stress was associated with increased age (AOR= .09, 95% CI [.03- .31], high cholesterol (AOR= 1.3, 95% CI [1.12-1.52] p<.001), reporting a diagnosis of COPD (AOR= [1.24-1.85], p<.001), and reporting a diagnosis of diabetes (AOR= 1.21, 95% CI [1.01-1.45], p<.036. Obesity, daily smoking, and meeting Canadian government exercise requirements were not found to be associated with perceived life stress in the model of best fit.

Table 3

Logistic Regression Models	Model Coefficient	P Value	R^2	Hosmer-Lemeshow
Model 1- Physiological Risk Factors (Age, comorbidities, high cholesterol, obesity)	161.54	<.001*	.067	.889
Model 2- Behavioural Model (Smoking, drinking, physical activity)	170.82	<.001*	.071	.363
Model 3- Socioeconomic Factors (Social class)	176.29	<.001*	.073	.819

* indicates significant difference

Discussion

The first objective of this study was to determine if women with heart disease had higher levels of perceived stress when compared to women without heart disease. Descriptive statistics determined that women with heart disease were less likely to report life stress when compared to women without heart disease. This is contrary to the alternate hypothesis that indicated women with heart disease would report higher levels of life stress. The study did find that women with heart disease were more likely to report extreme perceived life distress (n=142, 4.3%) when compared to women without heart disease (n=1,787, 3.1%), which was a significant finding at $p < .001$. This may be due to the higher number of women with heart disease who reported an income under $25,000. According to Cirelli et al. (2018), family income below minimum wage have been associated with high stress levels.

The second objective of this study was to determine the association between cardiac risk factors and perceived stress in women with heart disease. An increase in age was found to be a significant factor that increased the odds that a woman would report life stress. The influence of age on mood is common due to decreased levels of estrogen in the body. The role of estrogen is to protect the endothelial tissue; therefore, as estrogen declines, a diagnosis of heart disease is more likely (Humphries et al., 2017). When added to the model, meeting the Canadian Government-recommended physical activity guidelines was not significantly associated with perceived life stress. This finding is contrary to the common understanding that exercise decreases stress. Univariate analysis of the association between exercise and perceived life stress was significant. Therefore, future research can utilize a stepwise approach to logistic regression to find a model that explains more of the variance of the dependent variable.

The results of this study showed that drinking alcohol daily decreased the odds that women with heart disease would report perceived life stress (AOR=.82 95% CI [.70- .96], p= .014). This initial finding is concerning as alcohol use has been associated with an increased risk of mortality in people with heart disease (Stanner & Coe, 2019). However, women with heart disease were less likely to report drinking daily (n=1206, 36.3%) when compared to women without heart disease (n=33,228 (56.9%). There is currently a debate that is questioning the long-held belief that low to moderate drinking has protective factors against heart disease progression (Yoon et al., 2020). A meta-analysis by researchers Luceron-Lucas-Torres et al. (2023) found that wine consumption had an inverse effect on cardiovascular mortality, which was not influenced by gender. Although there were challenges in determining what is considered a protective dose of alcohol. It may be possible that the impact of stress on the body can be counteracted by drinking. Future research could look at whether interventions such as non-alcoholic drinks may produce the same stress-relieving results in women, as this would remove the risk of damage to the body from alcohol.

It was hypothesized that the model which included structural factors would be the best-fitting model. While this was the case, the increase in variance explained by the model only increased by 1%. A meta-analysis that aimed to review the impacts of socioeconomic status on the body's physiological response to general stressors also did not find a link (Boylan et al., 2018). Boylan et al. (2018) did find a link between acute short-term stressors and low socioeconomic status. The use of these findings to support the influence of structural factors are limited due to social class being the only variable added to this block.

The results of this study did not show an association between obesity and perceived life stress. This finding was supported by Geda et al. (2022), who also were unable to find a significant association between obesity and perceived life stress. In prior research, a significant association has been found between binge eating and perceived life stress (Klatzkin et al., 2019). Although Geda et al. (2022) did not find an association between obesity and life stress, their cross-sectional study found an association between perceived work stress and obesity. It is possible that the variable that used BMI created limitations in presenting accurate results. BMI has been shown to be a poor indicator of obesity in women of ethnic minority groups (Mehta et al., 2023). Researchers have also shared concerns about the limitations of using BMI in isolation from other health indicators. For example, Staiano et al. (2012) found that individuals who have a high BMI but have a small waist circumference are at a decreased risk of adverse heart-related events.

It is important to note that women with heart disease represented only a small percentage 5.8% of the entire population of women in the CCHS database. With heart disease contributing to the leading cause of death in women (Heart and Stroke Foundation of Canada, 2018), a higher number would be expected. It is likely possible that due to the delay women often experience with obtaining a diagnosis (Nadeau et al., 2023), there are women who have heart disease in the database population that are unaware. In future, it may be prudent to use chart reviews to determine medical diagnosis as opposed to self-reported measures.

Limitations

The study results should be taken within the context of its limitations, one being that this study was cross-sectional and therefore, temporal relationships cannot be determined (Woo, 2019). Another limitation was that the Indigenous population may not be adequately represented within this database sample as persons living on reserve were excluded from the data collection process. The use of the variable of perceived life stress may also be a limitation as its use has not been standardized across the heart disease literature. A commonly used scale in the heart disease literature is the Perceived Stress Scale, which is a validated 10-item scale (Cohen et al., 1982). Additionally, the choice of cardiovascular risk factors used was limited due to the availability within the CCHS database and is not an exhaustive list of factors.

Future Implications

While this study provides a brief glimpse into the association between cardiac risk factors and stress in women with heart disease, there is still a significant gap in understanding. Strategies to respond to these gaps in future research could include an analysis of how the chronicity of heart disease influences perceived life stress, as the progression of heart disease symptoms has been shown to increase stress levels (Cirelli, 2018). Future research could also utilize other stress measures to provide a different perspective on the impacts of stress on cardiovascular risk factors. The literature gap regarding women and heart disease continues to negatively impact the identification of interventions specific to the female population (Heart and Stroke Foundation, 2023). To improve heart health for women, we need to continue to explore the various aspects specific to this demographic.

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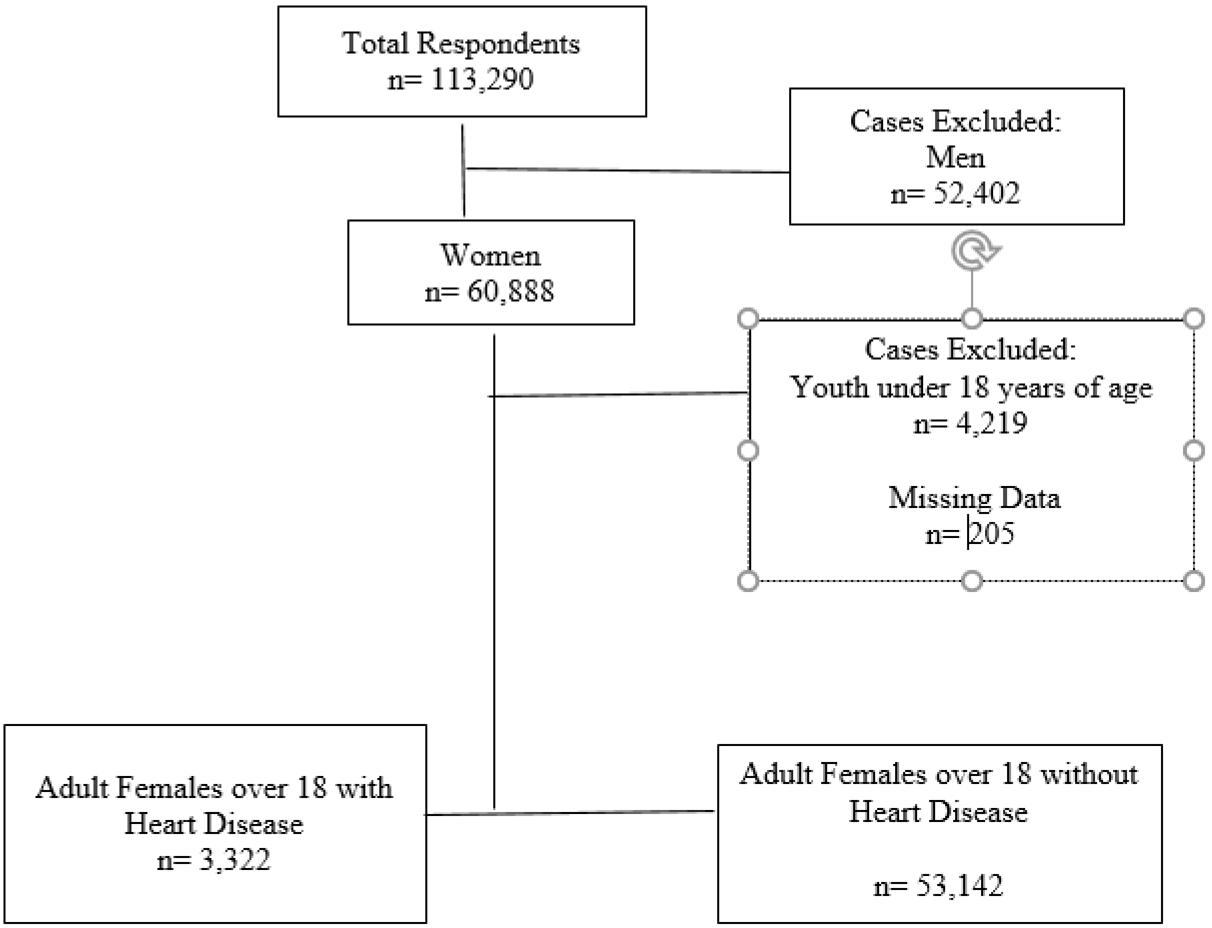
Appendix A

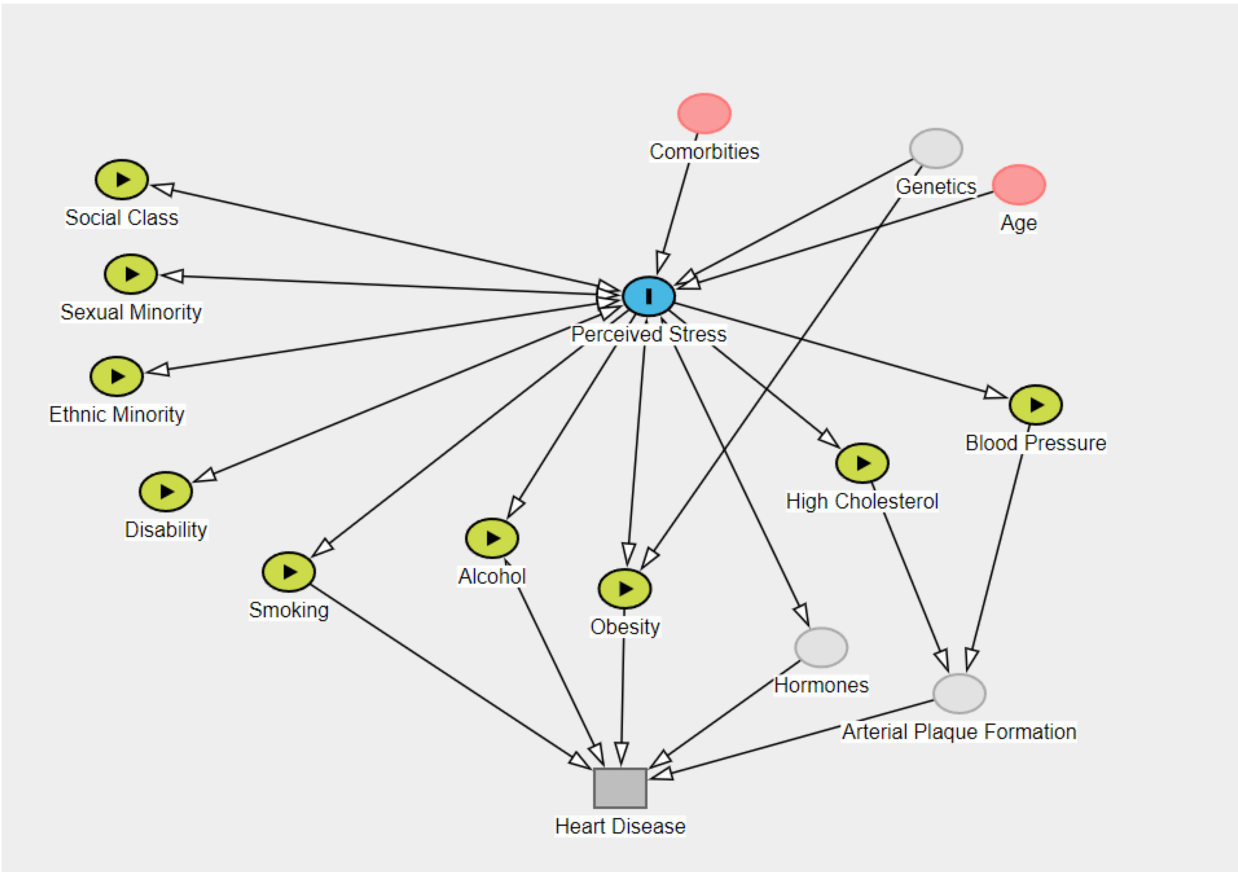
Study Sample Selection Flow Diagram



Appendix B

Directed Acyclic Graph

Predicted Associations Between Cardiac Risk Factors and Stress in Women with Heart Disease



Appendix C

Demographics Table: Women with and without Heart Disease from 2017-2018 CCHS Data

Variables	Total Women in Sample	Heart Disease n (%) Yes	No	X^2	p-Values
Overall	56,464 (100%)	3,322 (5.8%)	53,142 (94.2%)		
Age				3571.29	.000*
18-39	15,995 (28.3%)	106 (3.2%)	15,889 (29.9%)		
40-59	17,083 (30.3%)	476 (14.3%)	16,077 (31.1%)		
60-74	15,474 (27.4%)	1261 (38.0%)	14,213 (26.7%)		
75+	7,912 (14.0%)	1479 (44.5%)	6433 (12.1%)		
Ethnicity				18.73	<.001*
Immigrant	9,649 (17.3%)	480 (14.6%)	9,169 (17.5%)		
Non-immigrant	45,997 (82.7%)	2,813 (85.4%)	43,164 (82.5%)		
Indigenous	3,215 (6.9%)	174 (6.1%)	3,041 (6.9%)	3.08	.079
Relationship status				1136.39	<.001*
Married	23,438 (41.6%)	1,120 (33.8%)	22,318(42%)		
Single	11,403 (20.2%)	318 (9.6%)	11,085 (20.9%)		
Common-law	15,523 (27.6%)	152 (4.6%)	5,811 (11%)		
Widowed/ Divorced/ Separated	11,403 (20.2%)	1,726 (52.1%)	13,797 (26.0%)		
Educational level				884.36	<.001*
Less than secondary school	8,309 (14.9%)	1,058 (32.6%)	7,251 (13.8%)		
No post-secondary education	13,341 (24.0%)	762 (23.5%)	125,579 (24.0%)		
Post-secondary certificate diploma or university degree	33,982 (61.1%)	1,428 (44.0%)	32,554 (62.1%)		
Household income				678.23	<.001*
Less than $20,000	5,666 (10.0%)	523 (15.8%)	5,143 (9.7%)		

$20,000 to $39,999	11,023 (19.5%)	2,042 (31.4%)	9,982 (18.8%)		
$40,000 to $59,999	9,377 (16.6%)	632 (19.0%)	8,745 (16.5%)		
$60,000 to $79,999	7,355 (13.0%)	381 (11.5%)	6,974 (13.0%)		
$80,000 or more	22,979 (40.7%)	742 (22.4%)	22,979 (40.7%)		
Residence				58.24	<.001*
Newfoundland and Labrador	1,663 (2.9%)	111 (3.3%)	1,552 (2.9%)		
Prince Edward Island	982 (1.7%)	66 (2.0%)	916 (1.7%)		
Nova Scotia	2,483 (4.4%)	167 (4.4%)	2,316 (5.0%)		
New Brunswick	1,901 (3.4%)	145 (3.3%)	1,756 (4.4%)		
Quebec	11,835 (21.0%)	716 (20.9%)	11,119 (21.6%)		
Ontario	16,972 (30.1%)	1,048 (31.5%)	15,924 (30%)		
Manitoba	2,747 (4.9%)	157 (4.7%)	2,590 (4.9%)		
Saskatchewan	2,393 (4.2%)	148 (4.2%)	2,245 (4.5%)		
Alberta	6,619 (11.7%)	290 (8.7%)	6,329 (11.9%)		
British Columbia	7,624 (13.5%)	426 (12.8%)	7,198 (13.5%)		
Yukon	445 (0.8%)	19 (0.8%)	426 (0.6%)		
North West Territories	474 (0.8%)	16 (0.9%)	458 (0.5%)		
Nunavut	326 (0.6%)	13 (0.6%)	313 (0.4%)		
Lifestyle Factors					
Smoker (Last 30 days)	2,090 (4.2%)	85 (2.9%)	2,005 (4.3%)	14.02	<.001*
Drinks Daily	31,434 (55.7%)	1206 (36.3%)	33,228 (56.9%)	536.49	<.001*
Comorbidities					
Diabetes	4,703 (8.3%)	810 (24.4%)	3,894 (7.3%)	1193.88	<.001*
COPD	2,725 (6.1%)	563 (17%)	2,162 (5.2%)	776.93	<.001*
High Cholesterol	7,651 (13.7%)	1,242 (38.3%)	6,408 (12.2%)	1775.12	.000*
Obesity	11,837 (21%)	917 (27.6%)	10,920 (20.5%)	93.93	<.001*

* indicates significant difference