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Association of Socioeconomic Status and Mental Health Characteristics and Participant Attrition in a Cohort Study

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**ASSOCIATION OF SOCIOECONOMIC STATUS AND MENTAL HEALTH
CHARACTERISTICS AND PARTICIPANT ATTRITION IN A COHORT STUDY**

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ABSTRACT

The cohort study is an essential design for investigating associations between a variety of risk factors or exposures and a plethora of health outcomes. However, one of their biggest weaknesses is participant attrition, which can introduce bias and impact validity. Understanding whether this attrition is related to exposure and outcome is a critical aspect of assessing the potential for selection bias. The Women and Their Children's Health (WaTCH) study is a prospective cohort study designed initially to examine the health impacts of exposure to the Deepwater Horizon oil spill. The study has undergone two waves of data collection and is in the middle of a third round of interviews and blood collection. Therefore, examining how loss to follow-up is affected by key baseline characteristics is essential to understand the potential for bias in subsequent analyses. This capstone project sought to examine the association between baseline demographic characteristics, mental health markers (CES-D and K6), physical health, multimorbidity, and exposure to the oil spill with loss to follow-up at Wave 2 of the WaTCH study. We analyzed data from 2,769 Wave 1 participants. Age, race, marital status, income, education and multimorbidity were significantly associated with loss to follow-up between Wave 1 and 2 of the study. High depressive symptoms and high psychological distress were not statistically significantly associated with a higher likelihood of dropping out of the study. These results suggest the possibility that attrition patterns in the WaTCH study may be affected by various demographic factors, which warrants additional research. For a valid longitudinal research design with an accurate interpretation of results, it is essential to comprehend the dynamics of participant retention.

DEDICATION

To the Divine Creator and Source of all Life, with deep reverence and boundless gratitude, I offer this dedication to You, the guiding force that permeates every aspect of existence. You have been my constant companion, providing me with strength, guidance, and boundless love throughout my journey. In Your presence, I find solace and purpose, and for that, I am eternally grateful.

To my beloved parents, Thampi Mathew and Saleena K.J., your unwavering love, sacrifices, and unwavering support have shaped my character and nourished my spirit. Your ceaseless encouragement and belief in my abilities have propelled me forward on this path of life. I dedicate this journey to you, as a testament to your unending love and dedication.

To my cherished sister, Anooja Thampi, you have been a constant source of inspiration and support. Your unwavering presence and understanding have given me strength and courage during the toughest of times. This dedication is a heartfelt expression of my love and gratitude for your unwavering faith in me.

To all my dear friends and esteemed professors at the University of Nebraska Medical Center, you have been invaluable companions and mentors on my educational path. Your guidance, friendship, and shared experiences have shaped my professional growth and inspired me to reach new heights. I extend this dedication to each one of you, as a tribute to the profound impact you have had on my life.

In the presence of God, my loving parents, supportive sister, beloved to-be wife, and dear friends and professors, I dedicate myself to a life of purpose and service. I vow to utilize the knowledge and skills I have acquired to make a positive difference in the lives of others. May my actions always reflect the love and blessings bestowed upon me by each one of you.

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INTRODUCTION

Cohort studies are crucial for comprehending the intricate interactions between diverse risk factors or exposures and how they affect health outcomes. These studies prospectively follow participants from various demographics and gather information from various time points to monitor changes in the variables of interest. However, the attrition of participants over follow-up waves is a potential limitation. Attrition is the loss of study units from a sample, and it can introduce bias, undermine the reliability of study results, impair representativeness, and even alter the associations that have been identified. Loss-to follow-up if differential with respect to the exposure and outcome in a cohort study is a type of selection bias and a major threat to the study's validity.

In a cohort study, if a sampled person cannot respond to a survey altogether (unit nonresponse) or partially (item nonresponse), it is referred to as nonresponse. Unit nonresponse and item nonresponse can decrease study power and sample size. Nonresponse bias, a form of selection bias, can result from differences between respondents and nonrespondents (Bethlehem et al., 2011). Attrition can cause some specific subpopulations to be over- or under-represented, leading to low study power and bias in estimates in specific analyses. Each study wave may increase attrition, resulting in a final sample with characteristics completely different from the original cohort (Spiers et al., 2018).

No matter the condition being investigated, the location of the study, or the age of the community, nonresponse to epidemiologic studies has been seen to rise recently (Hartge et al., 2006). The Behavioral Risk Factor Surveillance System (BRFSS) is a survey with national representation designed to track changes in behavioural risk factors, health screenings, and

access to healthcare at the population level. It is well known that the BRFSS participation rate has generally decreased. The median BRFSS participation rate ranged from 71.4% in 1993 to 48.9% in 2000 to 51.1% in 2005 (Galea et al., 2007). The Survey of Consumer Attitudes (SCA), conducted by the Research Center of the University of Michigan since the 1950s and performed monthly since 1978, has documented a similar decrease in participation rates (Galea et al., 2007). Galea et al also reported that the participation rates in the National Health Interview Survey (NHIS) have decreased from 91.8% in 1997 to 86.9% in 2004. Mortan et al. also observed that the proportion of non-participation in case-control studies has been steadily rising at 1.18% in cases and 1.49% in controls per year from 1970 to 2003 (Morton et al., 2006). A similar article that studied the response rate to a telephone-based survey reported the response rates decreased from 72% to 48% from 1979 through 2003 (Curtin et al., 2005). It was also found from a 1-year follow-up in a longitudinal study of adolescent drug and alcohol use, that nearly 25% of the original cohort had disappeared (Botvin et al., 1990). The participation rate for the General Social Survey decreased to 70% in 2000, compared to 74% in 1975 and 82% in 1998 (Curtin et al., 2005).

Cohort studies may experience attrition for several reasons, such as participant refusal or incapacity to continue their participation, contact information changes, relocation, and mortality. Individuals' socioeconomic, behavioural, and occupational traits may impact the causes of attrition. It is essential to comprehend how these characteristics relate to attrition in order to interpret study findings properly and to develop novel efforts for reducing loss to follow-up. Many theories prevail for the current increase in participant non-response in observation studies. A lack of social responsibility and an increasing concern for personal or privacy issues have made individuals more reluctant to participate in surveys (Kessler et al., 1995). Another

important issue that led to people's reluctance is the growing distrust of science and research (Yancey et al., 2006, Shavers et al., 2002). Some other potential reasons are loss of interest, moving, and changes in life situations (Ashton et al., 2004). Among older individuals, the most common issue was found to be study fatigue. Much research has been conducted to ascertain which individuals are more likely to be non-respondents or drop-outs. Individuals with lower levels of education, jobless, single, or lower socioeconomic status are less likely to participate in research studies. Age-related findings are less consistent, with some studies showing younger people have lower engagement propensities than older people while others show the opposite (Galea et al., 2007). Non-respondents typically tend to be individuals who are less advantaged and in worse health (Howe et al., 2013). The traits of non-respondents are comparable. Studies have also found that attrition is higher for males, those with lower levels of education, those who aren't married, those with smaller households, those who identify as an ethnic minority, and those who live in metropolitan areas (Lugtig, 2014).

_____ Another important factor that was investigated is the effect of age on attrition. Some studies reported increased attrition with old age and some others did not find an association (Watson et al., 2009). It was found from the Baltimore longitudinal study that older age, low education, and longer distance between the study centre and the participant's residence affected attrition (Sharma et al., 1986). In another longitudinal study it was found that increasing age and cognitive impairment were consistently related to increased attrition (Chatfield et al., 2005). Another important factor that needs to be considered is the physical and mental health of the participants. Individuals who have stress or depressive symptoms are prone to a variety of adverse health outcomes like poor lipid profile, and poor blood pressure control. People who experienced a stroke or a heart attack are also more likely to have poor mental health (Liu et al.,

2018). Liu et al in their research reported that people with depressive symptoms and stress are associated with higher attrition rates (Liu et al., 2018).

Numerous approaches have been suggested to reduce participant nonresponse. It has been demonstrated that financial incentives and advance notice can boost participation (Silva et al., 1990). Increasing the number of interviews conducted in the evenings might improve contact. Reminder letters can be issued to let the participant know when they will be contacted. The way interviewers engage with potential participants may have an impact on refusals; as a result, teaching interviewers how to modify their conduct during recruitment may help reduce refusals. Putting together community outreach activities, employing interviewers of many races, and offering a toll-free number may help draw in non-European American participants and foster and uphold trust. Attrition can also be reduced by providing incentives, sending postcards, and setting up phone reminders (Boys et al., 2003). In longitudinal studies with longer follow-up periods, gathering complete participant contact information and collecting contact information for a family member or friend at each wave may be extremely helpful, and newsletters may be utilized to keep study participants informed about study progress between waves and reduce attrition. Attrition has also been found to be decreased via community participation, tracking non-contacts, using diverse survey modes, and offering incentives (Boys et al., 2003).

Identifying the personal characteristics related to an increased risk of dropout in clinical and observational research studies is of great importance.

The aim of this capstone study is:

- o To examine the association of select baseline sociodemographic characteristics (e.g., age, race, education, income) and physical and mental health (multimorbidity, depression, and stress) with participant loss to follow-up in wave 2 of The Women and Their Children's Health (WaTCH)

study. I will test the hypothesis that lesser affluence, depression, stress, and multi-morbidity are associated with a higher likelihood of non-response in wave 2 of the WaTCH study.

BACKGROUND AND SIGNIFICANCE

The Women and Their Children's Health (WaTCH) study is a cohort study designed to investigate the mid to long-term physical, mental, and behavioural health effects of exposure to an oil spill among women and children in southeast Louisiana (Peters et al., 2017). On April 20, 2010, the British Petroleum (BP) Deepwater Horizon exploded and burned for almost 36 hours before sinking, causing a massive oil spill in the northern Gulf of Mexico, 41 miles off the Mississippi River Delta in Louisiana. From April 22, 2010, until the sea floor wellhead was capped on July 15, 2010, crude oil was released into the Gulf of Mexico at a rate ranging from 53,000 barrels per day to 62,000 barrels per day for a total crude oil spill of 5 million barrels over an area up to 68,000 square miles (180,000 km²). This oil spill was the largest accidental oil spill in the history of the petroleum industry. It dwarfed all prior oil tanker spills in magnitude and impacted environments, causing extensive damage to marine and wildlife habitats. It contaminated over 800 miles of beach and marsh shoreline from Texas to Florida and threatened the viability of the northern Gulf's commercial fishing and tourism industries. The impact was especially pronounced among the seven southeast Louisiana Parishes of Orleans, St. Bernard, Jefferson, Plaquemines, Lafourche, Terrebonne and St. Mary (Peters et al., 2017). Even though over 350 oil spills totalling more than 700 tons have occurred since the early 1970s, many of which directly harmed land and coastal communities, little research has been done on the long-term health impacts of oil spills. The few studies that have been done thus far on the impacts of oil spills, dispersants, and airborne particulate matter on human health have mostly concentrated on the immediate physical, physiological, and mental repercussions. The health of adult women and their children who live in Louisiana's most severely damaged areas is the focus of the WaTCH study. Adult women's initial eligibility criteria included being

between the ages of 18 and 80, being able to finish the study interview in English, being free of cognitive impairment, and residing in one of the study parishes on April 20, 2010. Wave 1 (W1) interviews took place between August 2012 and June 2014, and Wave 2 (W2) interviews occurred between September 2014 and May 2016, with an average of two years between interviews. Wave 3 (W3) interviews₂ started in January 2023₁ are ongoing. In W1, 2,852 women completed the baseline interview with 2,788 women completing the full interview; 64 women completed over 50% of the questions, but not the entire interview. Of the 2,852 women, 1,231 participated in a home visit in which blood was obtained from 1058 women (37%), and urine were obtained from 1176 women (41%); 221 women provided a saliva sample (8%). The mean age of participants in W1 was 45.7 years. During W2, a telephone survey was implemented from September 2014 to May 2016 in which 2030 women were interviewed (72%) (Peters et al., 2017). To date, 82 participants have participated in the ongoing W3 of the WaTCH study.

This capstone project seeks to identify the potential relationships with demographic factors, mental health and also oil spill exposures on withdrawal or non-response (drop-out) between W1 and W2 of the WaTCH study. This project should help explain some of the dynamics of participant retention in cohort studies by filling in the gaps in the existing literature and exploring the relationship between socioeconomic, behavioural, and medical factors and attrition. The results will advance our capacity to perform robust longitudinal research by having significant implications for study design, participant involvement, and the interpretation of study results.

METHODS

Study Population

A total of 2852 women were enrolled in the study. The study inclusion criteria for the WaTCH study included several factors, including age range between 18 and 80 years, aptitude in English and absence of cognitive impairment to facilitate interview completion and residency within one of the designated study parishes at the time of the oil spill. After 6 months of data collection, the upper age limit was lowered to 50 years in order to increase the participation of younger participants. Interviews were initiated by the research staff at Louisiana State University Health Sciences Center School of Public Health. All the participants were asked to participate in a home visit after the telephone interview for collecting blood and urine samples. The WaTCH study protocol was approved by the Institutional Review Board at the LSU School of Public Health.

Data Collection and measurements for the WaTCH study

The WaTCH study recruited female participants by mailing them an introduction letter mentioning the topic of the study and inviting them to participate. The addresses of the participants were provided by a company called Marketing Systems Group. The introductory letter also provided information about the study's procedures such as the telephone interview, home visit, blood and urine collection, and payment. After two weeks, a trained interviewer called to conduct a screening interview. The interviewer checked to see if an adult woman living at the location was available, gave her further information about the study, and formally requested her participation. To ensure standardization, all interviewers underwent training and quality control procedures were put in place. Interviewers were instructed to call each number at least 12 times until an eligible participant was reached. Additionally, calls were made again after

commercial tracing software was used to update the contact information. Calls were made to 42,649 numbers between August 2012 and June 2014 to contact women who would be willing and qualified to take part in the WaTCH study.

Women who verbally consented to participate in the study completed a computer-assisted telephone interview (CATI). Utilizing Redcap (Research Electronic Data Capture) electronic data capture methods, study data were gathered and managed at the Epidemiology Data Center at the LSU School of Public Health. Detailed questions on demographics, physical and mental health history, exposure to the oil spill or its cleanup, medication use, lifestyle factors (e.g., diet, smoking, drinking, and physical activity), occupational history, and exposure to previous hurricanes and data were all included in the interview. Additionally, there were inquiries about healthcare accessibility, social capital, loss of resources, financial or economic difficulty, and other resilience-related factors. The study's participants were compensated for their time. Initial compensation for phone interviews was \$25, house visits were \$20, mother interviews were \$15, and child interviews were \$15. The payment to the adult women was increased to \$40 for the phone interview and \$25 for gathering anthropometric data and biospecimens after around six months. Participant data were stored in REDCap, which was used to track participation across each type of data collection and study wave.

Primary Outcome

The primary outcome of interest in the capstone study was withdrawal, non-response, or loss of follow-up. The following description highlights the measurement of this outcome variable, including censoring time and the event of participation in the W2 interview.

Event: Participation in the W2 Interview. This event occurs when a participant completes the scheduled interview at W2, giving essential data for analysis. The primary outcome focuses on

the duration between the W1 interview and the occurrence of this event, signifying the period during which researchers can assess changes in women and their children's health over time.

Censoring Time: Censoring time represents the duration for which complete information is available for each participant. In this study, the censoring time is calculated as the time from the W1 interview to the point of withdrawal from the study. Participants who withdrew from the study before the W2 interview had their censoring time recorded as of their withdrawal date. This censoring time is essential for the accurate analysis and interpretation of the study's results, accounting for potential biases that may arise due to participant attrition. Censoring time for passive withdrawals was considered to be one week after the scheduled interview.

Active and Passive Withdrawals: Active withdrawals are the people who expressed their disinterest in participating in further waves of WaTCH study to the interviewers at Wave 2.

Passive withdrawals are the people who were not able to be contacted by the interviewer. In this study, I considered both active and passive withdrawals as censored in this analysis.

Variables for analysis

CES-D: The Center for Epidemiologic Studies Depression Scale (CES-D) is a widely used self-reporting instrument designed to measure depressive symptoms in the general population (Carleton, 2013). Participants were asked to complete the CES-D questionnaire. Levels of CES-D were defined as low for less than 16 and high for more than 16. This was considered a categorical variable in this analysis.

K6: The Kessler Psychological Distress Scale (K6) is a screening tool that is commonly employed to evaluate an individual's level of non-specific psychological distress (Prochaska, 2012). It consists of six questions that capture non-specific psychological distress symptoms, such as anxiety and mood disorders. The K6 was employed to assess the participants' overall

psychological well-being. Levels of K6 were defined as low for less than 13 and high for more than 13. This was considered a categorical variable in this analysis.

Demographic Details: The study collected data on age, race, education, income, and marital status. These variables were used to assess any potential patterns that may influence withdrawal from the study. Age was considered as a continuous variable and race, education, income, and marital status were considered as categorical variables.

Physical Health: Physical health is a prime variable for overall well-being. This variable aimed to explore the relationship between physical health and mental health outcomes. This was considered a continuous variable.

Multimorbidity: In this study, the presence and severity of chronic conditions were assessed to understand their association with the attrition of participants in W2. Multimorbidity is considered a significant determinant of mental health outcomes. In this study, a score was assigned for multimorbidity, and it was named the WaTCH Multimorbidity Score (WMS). The WMS is a cumulative score that accounts for specific comorbidities answered affirmatively, allowing us to comprehensively evaluate the impact of comorbidities on our research outcomes. This was considered a continuous variable.

Oil Spill Exposure: The study also investigated the potential effects of oil spill exposure on withdrawal. Under this category, the physical exposure and economic exposure of participants were examined and their association on attrition was also studied. Participants were asked about their history of exposure to the Deepwater Horizon Oil Spill, including direct or indirect contact, to find the relationship between such exposure and attrition in W2. Economic exposure (income loss, property loss) was also used in the analysis to find if there is an association with attrition in W2. These variables were considered continuous variables.

Statistical Analysis

This description outlines the statistical analysis conducted in this project aimed at examining the relationship between sociodemographic variables, mental health variables (CES-D and K6), multimorbidity, and attrition in the WatCH study from W1 to W2. The analysis involved three main components: descriptive statistics, comparison of withdrawal groups, and survival analysis. This description provides an overview of each step, including the statistical tests employed.

Descriptive Statistics and Comparing Demographic Variables with Mental Health Variables:

This analysis involved computing descriptive statistics, including frequencies, for each variable.

This allowed for an understanding of the distribution and characteristics of the sample.

Specifically, the demographic variables (age, race, education, income, marital status) were compared to the exposure variables (CES-D and K6).

Comparison of W2 retained and lost to follow-up participants by sociodemographic variables, multimorbidity, oil spill exposures, and mental health: I examined the characteristics of individuals who withdrew from the WaTCH study to those who did not, focusing on the sociodemographic variables, multimorbidity, mental health, and also oil spill exposure variables. This comparison aimed to identify differences between the two groups. For continuous variables (age, income, WMS, oil spill exposures), a two-sample t-test was employed to find the association between the withdrawal and continuous variables. Categorical variables (race, education, marital status) were compared using a chi-square test to assess differences in proportions. Additionally, the comparison included assessing the distribution of physical health by chi-square test, comorbidity, and oil spill exposure with the withdrawal group by two sample T-test.

Univariate Survival Analysis and Kaplan Meir Plots: I used univariate survival analysis to examine the relationship between withdrawal and the exposure variables (CES-D and K6). This analysis aimed to assess the impact of each variable on the likelihood of withdrawal. Initially, survival analysis was performed separately for CES-D and K6. Then, analysis was conducted by considering both variables together. Secondly, multivariable, survival analysis was conducted to adjust for demographic variables to assess their potential influence on the likelihood of withdrawal. The demographic variables adjusted for included age, race, income, marital status, and education. Finally, survival analysis was conducted by adjusting risk factors such as exposure to oil spills, income loss, and loss of property to find any association with mental health factors on withdrawal. The survival analysis was done with event time set as the number of days. Kaplan-Meier estimates were calculated assuming that the event of interest is participation in W2. Kaplan Meir plots were produced or obtained to determine and compare the two levels of CESD and K6. All analyses were conducted with a statistical significance of 0.05 and all analyses were performed using SAS 9.4.

RESULTS

Study population and descriptive data

Of the 2852 participants, full data was available for 2769 participants in W1 and were included in the final analysis. Table 1 provides a description of the baseline study population stratified by dichotomized depressive symptoms and psychological distress scores. From the analysis, we observed at baseline that women with high depressive symptoms had a mean age of 45.04 and women with high psychological distress had a mean age of 46.01. It was observed that those with high depressive symptoms and high psychological distress were more likely to be white women with lower levels of education, income and poor level of physical health. Women with high depressive symptoms and psychological distress had a mean comorbidity score of 2.74 and 3.15 respectively which is considerably higher than people in the low depressive symptom group and psychological distress group. High depressive symptoms and psychological distress were also found to be higher in women with higher physical and economic exposure.

Participation Status at Wave 2

Table 2 presents a comparison of baseline characteristics by study status at W2. Among women with high depressive status, 73.24% completed the wave 2 interview, 2.30% were active withdrawals and 24.46% were passive withdrawals. Considering the psychological distress, it was understood that 72.38% completed wave 2 interviews, 2.49% were active withdrawals and 25.14% of women were passive withdrawals. It was found from Table 2 that 73.24% of people had high depression who participated in wave 2.

From Table 3, Most of the baseline characteristics apart from physical health and oil spill exposures were found to be significantly associated with withdrawal from wave 2 of the WaTCH study. It was observed that there is a significant difference in the mean age among respondents

and non-respondents. The mean age of people who did not respond to wave 2 of the study was 43.11 years while the mean age of respondents was 46.59 (p-value = 0.0001). We found that the non-respondents were a higher percentage of women who were white (61.81%), had lower education (high school – 41.22%), had income under \$30,000 (31.29%), and who are married or living with a partner (65.26%) compared to continued participants. The analysis revealed that race exhibited statistical significance in relation to withdrawal from the study (p value=0.02). Among the women who chose to withdraw from the study, the racial distribution was as follows: white (61.81%), black (30.77%), and others (74.2%). Furthermore, the study indicated that women with lower education levels had a higher likelihood of withdrawal, and education demonstrated statistical significance (p-value = 0.01). Compared to the number of graduates who were non-respondents, the number of participants who attended only high school and vocational school had a higher attrition rate. Considering the income of women who enrolled in the study, it was found that participants who had lower income had higher chances to withdraw from the study (p-value = 0.01). Married or partnered individuals had a slightly higher attrition rate (27.50%) compared to those who never married (23.38%). The marital status of the participants had a significant association with withdrawal from wave 2 of the WaTCH study (p-value = 0.01). Multimorbidity was analyzed with a score assigned for each comorbidity and it was named the WaTCH Multimorbidity Score (WMS). This was found to be statistically significant. From the analysis, it can also be concluded that the physical health of the participants, and oil spill exposures were not affecting the withdrawal from the WaTCH study.

Survival Analysis

Table 4 presents crude and adjusted models for the association between mental health variables with study attrition. Relative to those in the low depressive symptom category (CESD), women

with high depressive symptoms have a hazard ratio of 1.03[9 5% confidence interval (CI) 0.94, 1.35]. From the confidence interval, it was clear that there was no association of depressive symptoms with withdrawal from the study. Similarly, the participants with high psychological stress (K6) relative to those in the lower stress group had a hazard ratio of 0.991 (95% CI 0.87, 1.12). This was also found to be not statistically significant.

When the mental health variables were modelled jointly (including CES-d & K6), depressive symptoms were not statistically associated with study withdrawal, even after adjusting for psychological stress (K6), demographic factors (age, race, education, income, marital status) and additional spill-related risk factors (exposure to oil spill, income loss, loss of property). Similarly, relative to the low psychological stress category, the high-stress symptoms were not statistically associated with withdrawal after adjusting for the depressive category (CESD), demographic factors (age, race, education, income, marital status) and also additional risk factors (exposure to oil spill, income loss, loss of property). Kaplan Meir curves estimated the proportion withdrawn from the WaTCH study by depressive symptoms (CESD) and psychological distress (K6) are shown in Figures 1 and 2 respectively. From the Kaplan Meir plots, the probability of responding to wave 2 interview is similar between both levels of K6, however, a slight difference can be found after 38 months. For CESD, a slight difference can be found after 39 months. Both this analysis concludes that there is no association between mental health status and withdrawal from wave 2 of the WaTCH study.

DISCUSSION

In this study, data from the WaTCH study was used to understand the factors that affect withdrawal between Wave 1 and Wave 2 of the study. The study found that age, race, marital status, income, education and multimorbidity were significant factors in withdrawal. This study found lower age and lower education to be significant factors in the attrition of participants. The attrition rate was also found to be higher in people with income levels above 60,000 and also in white women. This study also found that mental health factors were not important indicators for retention in this study. This is of importance because the aim of the WaTCH study was to understand mental health characteristics. A study conducted in the Netherlands also found similar results as this study in which the significant determinants of attrition were younger age and low education status (Lamers et al., 2012). Lamers et al also found that comorbid conditions significantly affected attrition rates, which aligns with this paper as a comorbidity was a factor that influenced attrition in the WaTCH study. Galea et al., found in their study that lower levels of education, and low socioeconomic status were significant determinants of attrition. Lin et al found that depressive symptoms were associated with attrition which contradicts the findings in this study, and he also found that stress was not affecting attrition. It is of prime importance to understand the pattern and determinants of attrition as this can limit the study outcomes' generalizability. This is also important if the study researchers have to replace the values which are missing using imputation techniques such as multiple imputation (van Buuren et al., 1999). In a study of older participants aimed at identifying the relationship between sociodemographic variables, it was found that the results were in line with the results of this study where education attainment and race were found to be significantly associated (Ashford et al., 2020). They found

that higher educational attainment was related to higher task completion, retention rates, enrollment, and interest.

Limitations

There are a number of limitations to the current study that must be acknowledged. It may be difficult to establish a clear cause-and-effect relationship between the study factors and withdrawal because there aren't any records of changes in mental health just before withdrawal from the study. Second, the unequal participant distribution across racial groups creates a bias that could affect how broadly the results can be applied to various populations. Furthermore, as spirituality and faith can have a big impact on well-being, leaving religious beliefs out of the analysis could omit an important part of a person's mental health. Therefore, it is important to interpret the study's findings cautiously.

Future research

Future research should aim to address these limitations by including a more thorough assessment of mental health changes over time, ensuring a more balanced representation of diverse racial backgrounds, and taking religious beliefs into account as relevant. This could be beneficial for wave 3 of the WaTCH study which is ongoing.

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TABLES

Table 1. Description of baseline participant characteristics by depressive symptom and psychological distress scale categories in wave 1 of WaTCH study.

		Depression Symptom Category (CESD)		Kessler Psychological Distress Scale (K6)	
		Low	High	Low	High
	Total (N, %)	1976 (71.67)	781 (28.33)	2392 (86.86)	362 (13.14)
Demographic Factors					
Age (mean +/- sd)	mean +/- sd	45.87 (12.10)	45.04 (11.71)	45.55 (11.97)	46.01 (11.99)
Race (N, %)	(N, %)				
White	1592 (58.10)	62.12	47.94	58.81	52.23
Black	959 (35.00)	32.13	42.27	34.43	39.66
Other	189 (6.90)	5.75	9.79	6.77	8.10
Education					
High School	1097 (39.79)	35.32	51.09	36.45	62.98
Vocational/ Community School	857 (31.08)	30.39	31.37	31.56	27.07
Bachelors	547 (19.84)	22.42	13.32	21.66	7.73
Graduate school	252 (9.14)	11.08	4.23	10.24	1.63
Other	4 (0.15)	0.20	0.00	0.08	0.55
Income					
Under \$30K	929 (33.70)	26.87	50.96	30.23	56.23
\$30K - \$59,999	663 (24.05)	25.46	20.49	24.83	18.78
\$60K - \$89,999	505 (18.32)	20.39	13.06	19.57	10.22
Over \$90K	472 (17.12)	20.50	8.58	18.52	7.46
Don't Know	91 (3.30)	2.88	4.35	2.97	6.08
Refused	97 (3.52)	3.90	2.56	3.89	0.83
Marital Status					
Married/Living with Partner	1738 (63.06)	68.30	49.81	65.20	48.34
Widowed /Divorced/Separated	536 (19.45)	16.66	26.50	17.90	30.11
Never Married	479 (17.38)	14.94	23.56	16.77	21.55
Refused	3 (0.11)	0.10	0.13	0.13	0.00
Physical Health					
Excellent	294 (10.66)	13.16	4.35	11.87	2.76
Very Good	894 (32.43)	38.21	17.80	35.37	12.98
Good	897 (32.54)	32.39	32.91	33.15	27.35

Fair/Poor	671 (24.34)	16.24	44.81	19.61	56.63
Don't Know	1 (0.04)	0.00	0.13	0.00	0.28
Multimorbidity					
WMS		1.84 (1.71)	2.74 (2.12)	1.93 (1.77)	3.15(2.22)
Oil Spill Exposure					
Physical Exposure (mean +/- sd)	(mean +/- sd)	0.96 (1.064)	1.2125 (1.2051)	0.9824 (1.0836)	1.3591 (1.2536)
Economic Exposure (mean +/- sd)	(mean +/- sd)	0.6248 (0.8496)	0.8617 (0.9192)	0.6558 (0.8658)	0.9364 (0.9109)

Levels of CES-D were defined by the following score <16 (low), Greater than 16 (high). Levels of K6 were defined as <13 (low), Greater than 13 (high). WMS = WaTCH multimorbidity Score.

Physical Exposure = Physical contact with an oil spill. Economic Exposure = Income loss.

Active withdrawal = Women who withdrew from the study when the interviewer contacted them.

Passive withdrawal = Women who withdrew from the study and the interviewer were not able to contact them.

Table 2 Description of withdrawal status in Wave 2 of the WaTCH study.

Withdrawal Status		Depression Symptom Category (CES-D)		Kessler Psychological Distress Scale (K6)	
		Low	High	Low	High
W2 Participants	2027(73.52)	73.63	73.24	73.62	72.38
Active Withdrawal	52 (1.89)	1.72	2.30	1.80	2.49
Passive Withdrawal	678 (24.59)	24.65	24.46	24.58	25.14

Table 3 Comparisons of respondents and non – respondents in wave 2 by their characteristics

Characteristics	Respondents (%)	Non-Respondents (%)	p-value	Attrition rate (%)
Age (Mean +/- sd)	46.59 (12.19)	43.11 (11.07)	< 0.00	
Race			0.02	
White	56.62	61.81		28.26
Black	36.56	30.77		23.23
Other	6.82	7.42		28.12
Education			0.01	
High School	39.53	41.22		27.37
Vocational/ Community School	30.24	33.20		28.41
Bachelors	20.21	18.50		24.86
Graduate School	9.98	6.67		19.44
Other	0.05	0.41		0.75
Income			0.01	
Under \$30K	34.66	31.29		24.60
\$30K - \$59,999	24.68	21.90		24.28
\$60K - \$89,999	16.96	21.90		31.82
Over \$90K	17.35	16.33		25.37
Don't Know	3.10	4.08		32.26
Refused	3.24	4.49		33.33
Marital Status			0.01	
Married/Living with Partner	62.09	65.26		27.50
Widowed /Divorced/Separated	19.86	19.07		25.74
Never Married	18.04	15.26		23.38
Refused	0.00	0.41		100
Physical Health			0.57	
Excellent	10.77	10.34		27.76
Very Good	32.25	32.79		26.87
Good	32.55	32.24		26.36
Fair/Poor	24.43	24.49		26.59
Don't Know	0.00	0.14		100
Multimorbidity				
WMS	2.15(1.86)	1.98(1.94)	0.03	
Oil Spill Exposure				
Physical Exposure	1.04 (1.12)	1.00 (1.12)	0.38	

Economic Exposure	0.69 (0.88)	0.71 (0.88)	0.54	
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Non-Respondents = People who did not participate in wave 2 of the WaTCH study. WMS =
WaTCH Multimorbidity score

Table 4: Hazard Ratio (95% confidence intervals) for withdrawal from the study shown for
CESD Depressive symptom score and psychological distress score

Factor	Level	Model 1	Model 2	Model 3	Model 4
CESD	Low	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
	High	1.03 (0.94,1.35)	1.04 (0.93,1.17)	1.02 (0.92,1.13)	1.00 (0.91,1.18)
K6	Low	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
	High	0.99 (0.87,1.13)	0.97 (0.61,1.14)	1.00 (0.87,1.14)	0.95 (0.83,1.09)

1. univariate estimates
2. the joint effect of CESD and K6
3. further adjustment of demographic factors (age, race, marital status, income, education)
4. after additional adjustment for oil spill risk factors (Exposure to oil spill, income loss, loss of property)

FIGURES

Figure 1. Kaplan Meir estimated the participants withdrawing from the WaTCH study by CESD Depressive symptoms. (0 = low, 1 High)

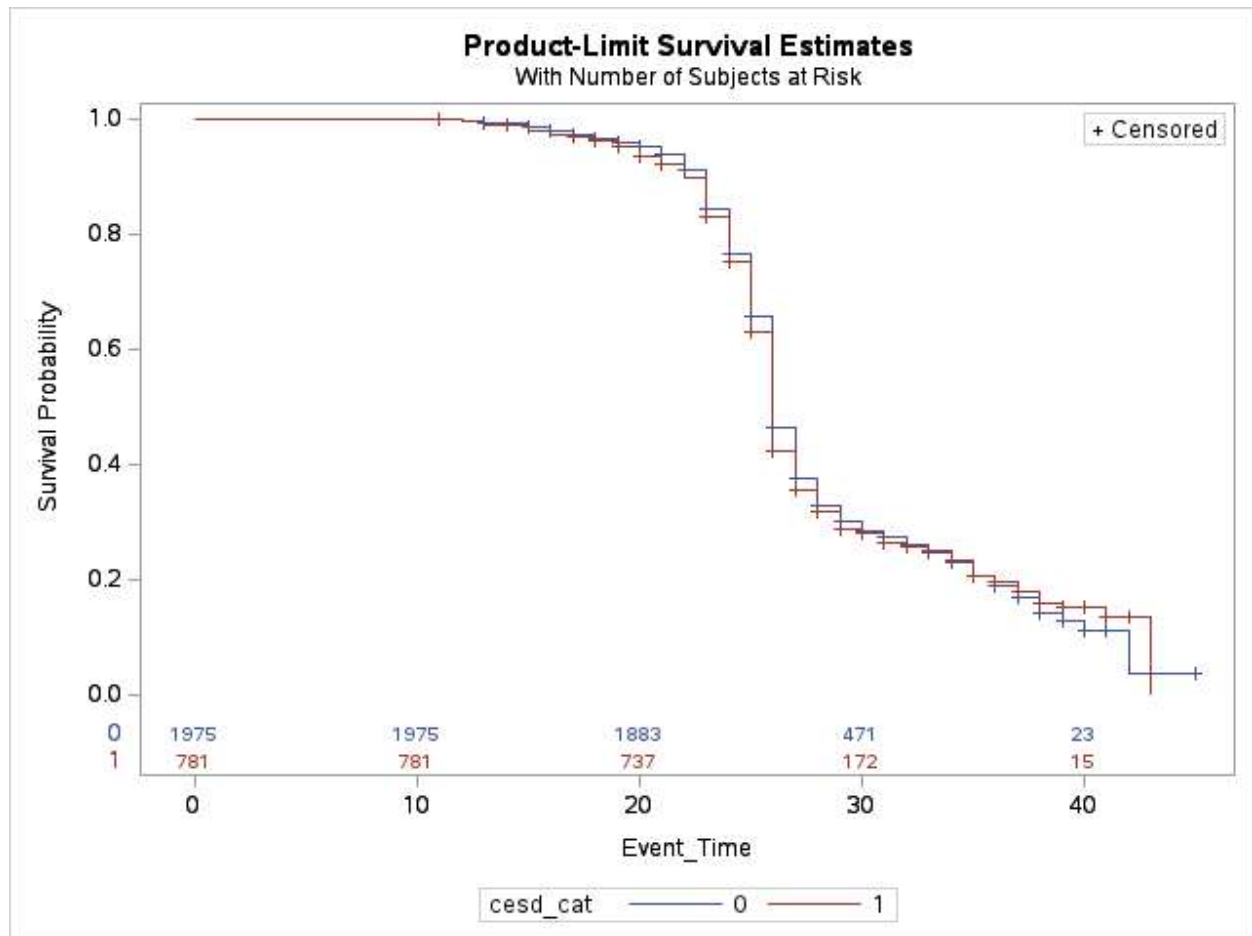
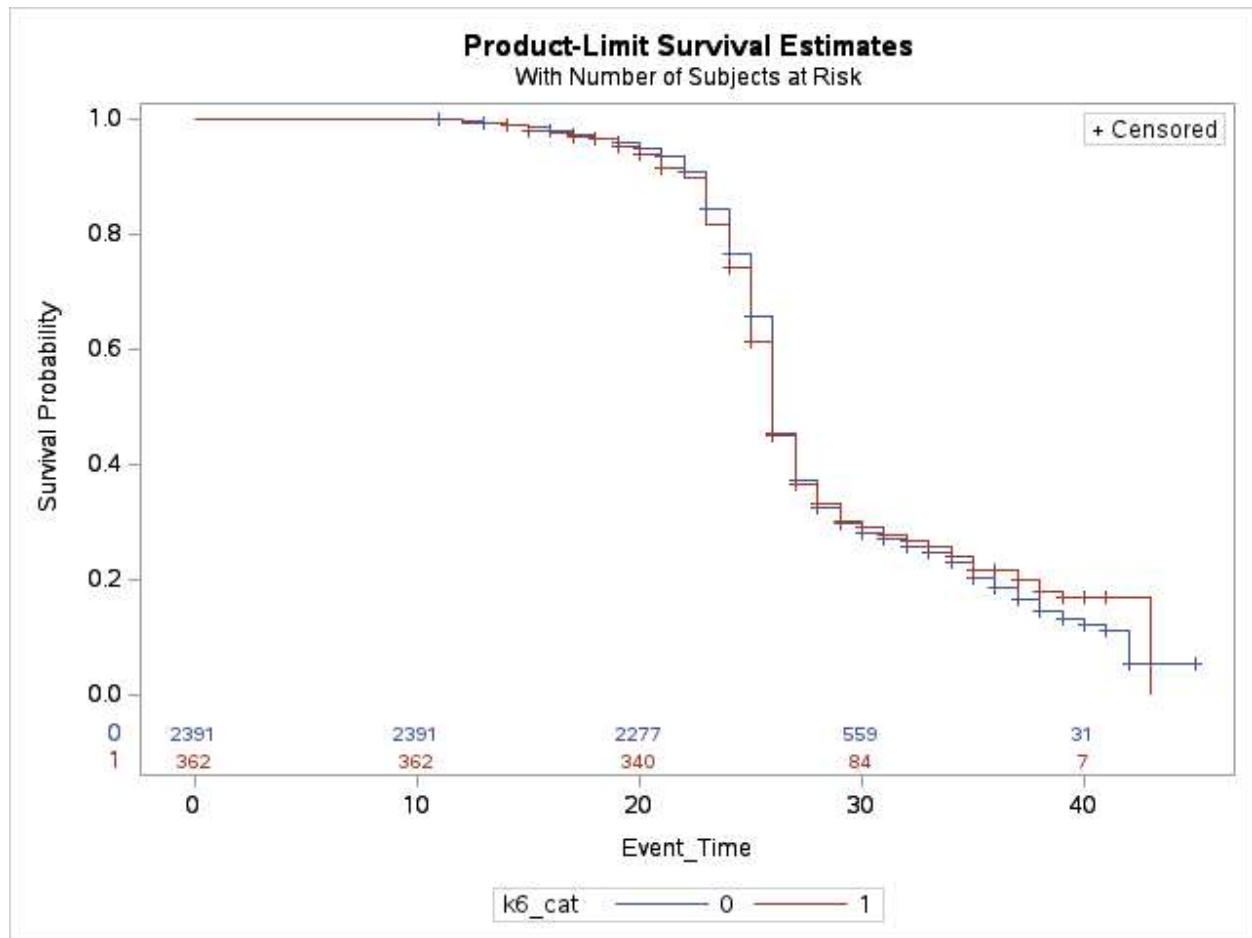


Figure 2. Kaplan Meir estimated the participants withdrawing from the WaTCH study by K6 Psychological distress. (0 = low, 1 High)



APPLICATIONS OF PUBLIC HEALTH COMPETENCIES

MPHF4. Interpret results of data analysis for public health research, policy or practice

I will evaluate the statistical significance, magnitude of association, or effect of sizes of the analyzed data. This will help in future public health research practice.

MPHF1. Apply epidemiological methods to the breadth of settings and situations in public health practice

I will translate the findings of this capstone project into actionable recommendations that can improve public health research outcomes.

EPIMPH4 Utilize analytical approaches to describe, summarize and interpret epidemiologic data.

I will analyze the data in redcap with a suitable analytic approach and find out clear interpretations for this capstone project.

EPIMPH1 Determine strengths and weaknesses of the scientific literature and synthesize the evidence to inform public health practice.

From the interpretations I receive from the data analysis of the capstone, I will identify the strengths and weaknesses of the scientific literature. These interpretations can be used to improve the retention of study subjects in future studies.

EPIMPH3 Analyze datasets using computer software.

I will use the data of wave 2 and wave 3 stored in the redcap and analyze for any association using SAS.

BIOGRAPHY

Mathews Thampi is an international student from India. He is pursuing his Master's in Public Health (MPH) at the University of Nebraska Medical Center (UNMC) with an emphasis on Epidemiology. His interest is in the prevention of communicable and non-communicable diseases with a special interest in hospital-acquired infections. He received his bachelors in Dental Surgery from Rajiv Gandhi University of Health Sciences, Bangalore, India. He had the opportunity to work closely with Dr Edward Peters in his study during his master's. He has volunteered with Sarpy/Cass Health Department and attended several health promotional activities. This experience combined with his term with Dr. Peters motivated him to pursue his career in public health. Due to his interest in Infection prevention, he is interested in infection prevention as a potential future career.

Mathews Thampi

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SUMMARY OF QUALIFICATIONS

An Epidemiologist trained in the principles and practices of disease surveillance, outbreak investigation, and data analysis. Knowledge of epidemiological study design and statistical analysis, with a strong understanding of public health policies and interventions. Experienced in conducting literature reviews and designing and implementing various epidemiological studies. Skilled in effectively communicating complex findings to diverse audiences through reports, presentations, and public speaking engagements. Expertise in outbreak response and emergency preparedness, successfully leading multidisciplinary teams during public health emergencies. Gained valuable experience in project coordination as part of a team working on a NIH funded project.

Experience with/Skilled In: SAS, SPSS, TreeAge Pro, REDCap, LexisNexis,

EDUCATION

Master of Public Health in Epidemiology

August 2023

Nebraska Medical Center (UNMC) College of Public Health, Omaha, NE

Expected
University of

Relevant Coursework: Social epidemiology, Infectious disease Epidemiology, Chronic Disease Epidemiology, Decision making analysis, Economic evaluation of health care programs, Biostatistics, Planning and Evaluation, SAS

Bachelor of Dental Surgery (BDS)

Rajiv Gandhi University of Health Science

January 2020

M R Ambedkar Dental College, Bangalore, India

September 2014 –

PROFESSIONAL EXPERIENCE

Epidemiology Research Assistant

2022 - Present

UNMC, College of Public Health, Omaha, NE

- Provide support to a multi-institutional research team investigating the health status among women affected by an oil spill that occurred in the Gulf of Mexico on April 20, 2010.
- Collect geospatial data from LexisNexis, enter into REDCap, and confirm address with participants as needed to ensure data accuracy
- Work in a team environment with Principal Investigator and other staff members to ensure protocol objectives are being met, including problem solving and providing updates on weekly team meetings
- Pack and send out blood collection specimen kits to study participants weekly.

August

Public Health Intern

December 2022

Sarpy/Cass Health Department, Papillion, NE

August 2022 –

- Provided health education to community members at events such as County Fair and health fair on topics including poison prevention, and home safety.
- Provided additional resources and referrals as needed.
- Communicated with childcare centers to get them involved in grant funded Lead water testing program (Water Infrastructure Improvements for the Nation (WIIN) Act).

- Created an Excel spreadsheet with updated COVID19 vaccine clinic and vaccine availability information for communications department to update public website.

UNMC COVID19 Contact Tracing

January 2022 –

August 2022

UNMC, Omaha, NE

- Initiate prompt communication with people exposed to COVID-19 (contacts) through text, phone calls, email, and other communication platforms as necessary
- Verify the contact's identity during initial communications
- Notify the contact of their exposure to COVID-19, following a script or guidance to provide COVID-19 health education. Conduct notification of exposure in a manner that maintains the confidentiality of the patient (or person who was diagnosed with COVID-19) and ensures that the identity of the patient is NOT disclosed.

Junior Doctor

October 2018

– July 2021

Valiyakulangara Dental Clinic, Ernakulam, India. (February 2020-July 2021)

Dental Concepts Dental Clinic, Bangalore, India. (October 2018-January 2020)

- Performed dental procedures and promoted good oral health and preventive dental care with patients
- Designing and enforcing strict infection control policies and procedures to minimize the risk of cross-contamination and the spread of infectious diseases.
- Proficiently handling and sterilizing dental instruments and equipment using proper techniques, such as autoclaving, chemical disinfection, and instrument packaging.
- Educating staff members on the appropriate use of PPE, including gloves, masks, gowns, and eyewear, and ensuring their availability and proper disposal.
- Maintaining cleanliness in treatment areas, reception areas, waiting rooms, and other clinic spaces, and implementing proper waste management procedures.

Intern

October 2018 –

January 2020

Rural Health Training Center, Kodeigahalli, Karnataka, India. (October 2019 – November 2019)

M R Ambedkar Dental College and Hospital, Bangalore, India. (October 2018-January 2020)

- Promoted dental hygiene among rural population
- Performed Basic Dental Procedures
- Conducted seminars and presentations, and promoted public health and hygiene awareness

Volunteer

June 2019

Polio Vaccination Camp. PhD Department, M R Ambedkar Dental College

Team Leader

Rural Health Training Center Kodeigahalli

October 2019 –

November 2019

Karnataka, India

- Organized groups, instructed fellow colleagues and delegated tasks

- Assisted with a range of administrative duties

LEADERSHIP & VOLUNTEER EXPERIENCE

Volunteer/Member

April

2020 - Present

International Educational Foundation, Philadelphia, PA

- Assisting students with completing education-related applications and forms
- Conducting immunization meeting for prospective international students.

Organizer

April 2019

Blood Donation Camp,

PhD Department,

M R Ambedkar Dental College, Bangalore, India

PRESENTATIONS

Thampi, Mathews., Chirackal, Robin Sunny., Chandra, Srinivasa R. (2022). Role of Endoscopy in Sleep Medicine. [Conference Presentation]. American College of Oral and Maxillofacial Surgeons 2022 Annual Meeting, Las Vegas, NV, United States.

CERTIFICATIONS

DOT BIO/DRY - Shipping Biological Substance and Dry Ice Training, November 2022

Biomedical Research, CITI Program, August 2022

Contact Tracing for Nebraska COVID-19 Response E-Learning

SKILLS

Software: SAS, SPSS, TreeAge Pro, REDCap, LexisNexis, BarTender, Microsoft Office Suite, Google Docs

Languages: Fluent English, Fluent Malayalam, Fluent Hindi, Conversational Tamil, Conversational Kannada