

Help-Seeking Behavior Following a Community Tragedy: An Application of the  
Andersen Model

Brian L. Cowart

Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State  
University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy  
In  
Psychology

Jack Finney, Co-Chair  
Russell Jones, Co-Chair  
Michael Hughes  
Jungmeen Kim-Spoon  
Angela Scarpa-Friedman

November 15, 2013  
Blacksburg, Virginia

Keywords: healthcare use, posttraumatic stress, mass shootings, college students

Help-Seeking Behavior Following a Community Tragedy: An Application of the  
Andersen Model

By

Brian Cowart

**Abstract**

For healthcare agencies and other professionals to most efficiently provide aid following large scale community tragedies, agencies and professionals must understand the determinants that lead individuals to require and seek various forms of help. This study examined Andersen's Behavioral Model of Healthcare Use and its utility in predicting service use in a population of students at Virginia Tech following the shootings on April 16, 2007. Data were gathered from surveys given to students at Virginia Tech three months following the shootings and at a one year follow-up. Logistic regression was used to determine variables that predicted service use. Female gender, prior exposure to traumatic events, higher pre-event functioning, higher social support, higher levels of posttraumatic stress and higher psychological distress were found to be predictive of higher probability of service use. Exploratory hypotheses related to the prediction of outcomes as well as service use as a mediator between predictors and outcomes were also examined. Implications for the use of Andersen's model in predicting service use and equitable and efficient distribution of services are discussed.

## Acknowledgements

I would like to thank several people for their help throughout the process of completing this project. First, I would like to thank Dr. Jack Finney, my advisor and chairman of this dissertation committee. I would also like to thank Dr. Russell Jones for his aid and support in this process, as well as for serving as co-chair on the committee. I would also like to express my appreciation to my other committee members, Dr. Michael Hughes, Dr. Jungmeen Kim, and Dr. Angela Scarpa. Their guidance and support throughout this process has been invaluable. I would also like to extend my gratitude to Dr. Ronald Kessler, Dr. Robert Pynoos, and Dr. Melissa Brymer for their work on the project that originated the data set used in this dissertation. Finally, I would like to thank James Hadder, Dr. Christopher Immel, and Dr. Marshaun Glover for their work in data collection for this project.

Table of Contents

Abstract.....

    Acknowledgements.....iii

Table of contents.....vi

List of tables and figures.....ix

1. Introduction.....1

    1.a. Hypotheses.....10

2. Methods.....11

    2.a. Participants and procedures.....11

    2.b. Measures.....13

        2.b.i. Predisposing, enabling, and need factors.....14

        2.b.ii. Help-seeking.....18

        2.b.iii. Health outcomes.....19

3. Results.....19

    3.a. Impact of attrition.....20

    3.b. Correlations.....21

    3.c. Prediction of help-seeking.....22

        3.c.i. Prediction of help-seeking by race.....22

        3.c.ii. Prediction of help-seeking by gender.....23

        3.c.iii. Prediction of help-seeking by vulnerability.....23

        3.c.iv. Prediction of help-seeking by social support.....25

        3.c.v. Prediction of help-seeking by access to health insurance.....26

        3.c.vi. Prediction of help-seeking by posttraumatic stress.....27

        3.c.vi. Prediction of help-seeking by psychological distress.....28

3.c.vi. Prediction of help-seeking by full model.....	29
3.d. Exploratory analyses.....	29
3.e. Prediction of self-reported health.....	30
3.f. Prediction of self-reported change in health.....	31
3.g. Prediction of psychological distress.....	33
3.h. Prediction of posttraumatic stress.....	34
3.i. Mediation.....	36
3.i.i Service use as a mediator between gender and self-reported health at T2.....	37
3.i.ii Service use as a mediator between gender and psychological distress at T2.....	38
3.i.iii Service use as a mediator between prior trauma and self-reported health at T2.....	38
3.i.iv Service use as a mediator between prior trauma and psychological distress at T2.....	39
3.i.v Service use as a mediator between pre-event functioning and self-reported health at T2.....	40
3.i.vi Service use as a mediator between pre-event functioning and psychological distress at T2.....	40
3.i.vii Service use as a mediator between social support and self-reported health at T2.....	41
3.i.viii Service use as a mediator between social support and psychological distress at T2.....	41

3.i.ix Service use as a mediator between psychological distress at T1 and Self-reported Health at T2.....	42
3.i.x Service use as a mediator between psychological distress at T1 and psychological distress at T2.....	42
3.i.xi Service use as a mediator between posttraumatic stress at T1 and self-reported health at T2.....	43
3.i.xii Service use as a mediator between posttraumatic stress at T1 and psychological distress at T2.....	44
4. Discussion.....	44
4.a. Implications.....	54
4.b. Recommendations for future research.....	56
4.c. Limitations .....	57
4.d. Conclusion.....	59
References.....	62
Appendix.....	118

## List of Tables and Figures

Figure 1: Andersen’s behavioral model of health services use (Andersen, 1995).....	69
Figure 2: Hypothesized model for current study.....	70
Figure 3: Path models for the indirect (a) and direct (b) effects of gender on self-reported health.....	71
Figure 4: Path models for the indirect (a) and direct (b) effects of gender on psychological distress.....	72
Figure 5: Path models for the indirect (a) and direct (b) effects of prior trauma on self-reported health.....	73
Figure 6: Path models for the indirect (a) and direct (b) effects of prior trauma on psychological distress.....	74
Figure 7: Path models for the indirect (a) and direct (b) effects of pre-event functioning on self-reported health.....	75
Figure 8: Path models for the indirect (a) and direct (b) effects of pre-event functioning on psychological distress.....	76
Figure 9: Path models for the indirect (a) and direct (b) effects of social support on self-reported health.....	77
Figure 10: Path models for the indirect (a) and direct (b) effects of social support on psychological distress.....	78

Figure 11: Path models for the indirect (a) and direct (b) effects of psychological distress on self-reported health.....	79
Figure 12: Path models for the indirect (a) and direct (b) effects of psychological distress at T1 on psychological distress at T2.....	80
Figure 13: Path models for the indirect (a) and direct (b) effects of posttraumatic stress on self-reported health.....	81
Figure 14: Path models for the indirect (a) and direct (b) effects of posttraumatic stress on psychological distress.....	82
Table 1: Means, standard deviations, and internal consistency coefficients of measures.....	83
Table 2: Frequencies and perceptions of dichotomous variables.....	84
Table 3: Zero-order correlations among variables.....	85
Table 4: Logistic regression analysis of race as a predictor of any service use.....	86
Table 5: Logistic regression analysis of race as a predictor of mental health service use.....	87
Table 6: Logistic regression analysis of race as a predictor of general medical service use.....	88
Table 7: Logistic regression analysis of race as a predictor of non-healthcare service use.....	89



Table 8: Logistic regression analysis of gender as a predictor of any service use.....	90
Table 9: Logistic regression analysis of gender as a predictor of mental health service use.....	91
Table 10: Logistic regression analysis of gender as a predictor of general medical service .....	92
Table 11: Logistic regression analysis of gender as a predictor of non-healthcare service use.....	93
Table 12: Logistic regression analysis of vulnerability as a predictor of any service use.....	94
Table 13: Logistic regression analysis of vulnerability as a predictor of mental health service use.....	95
Table 14: Logistic regression analysis of vulnerability as a predictor of general medical service use.....	96
Table 15: Logistic regression analysis of vulnerability as a predictor of non-healthcare service use.....	97
Table 16: Logistic regression analysis of social support as a predictor of any service use.....	98
Table 17: Logistic regression analysis of social support as a predictor of mental health service use.....	99

Table 18: Logistic regression analysis of social support as a predictor of general medical service use.....	100
Table 19: Logistic regression analysis of social support as a predictor of non-healthcare service use.....	101
Table 20: Logistic regression analysis of access to health insurance as a predictor of any service use.....	102
Table 21: Logistic regression analysis of access to health insurance as a predictor of mental health service use.....	103
Table 22: Logistic regression analysis of access to health insurance as a predictor of general medical service use.....	104
Table 23: Logistic regression analysis of access to health insurance as a predictor of non-healthcare service use.....	105
Table 24: Logistic regression analysis of posttraumatic stress as a predictor of any service use.....	106
Table 25: Logistic regression analysis of posttraumatic stress as a predictor of mental health service use.....	107
Table 26: Logistic regression analysis of posttraumatic stress as a predictor of general medical service use.....	108
Table 27: Logistic regression analysis of posttraumatic stress as a predictor of non-healthcare service use.....	109

Table 28: Logistic regression analysis of psychological distress as a predictor of any service use.....	110
Table 29: Logistic regression analysis of psychological distress as a predictor of mental health service use.....	111
Table 30: Logistic regression analysis of psychological distress as a predictor of general medical service use.....	112
Table 31: Logistic regression analysis of psychological distress as a predictor of non-healthcare service use.....	113
Table 32: Logistic regression analysis of full model predicting any service use.....	114
Table 33: Logistic regression analysis of full model predicting mental health service use.....	115
Table 34: Logistic regression analysis of full model predicting general medical service use.....	116
Table 35: Logistic regression analysis of full model predicting non-healthcare service use.....	117

## **Introduction**

To provide healthcare in an efficient and equitable way, providers and agencies must be able to predict which consumers are likely to need and access healthcare services. One of the ways that healthcare workers may identify and predict healthcare use is by engaging healthcare utilization models. Prior to the 1960's, most of these models focused on factors involving large-scale cultural and social differences between groups. However, these models were often criticized for failure to take into account important social and psychological factors that may play important roles in determining help-seeking behaviors (Anderson and Bartkus, 1973). The need to take into consideration more psychosocial factors in predicting healthcare use was explicitly stated by Mechanic (1968) who made the case that the development of a social psychological model would help give a more complete and accurate view of the processes that determine help-seeking behavior.

Several researchers have developed models or examined psychosocial factors that may assist in the determination of healthcare use. Franklin and McLemore (1970) developed a model to predict healthcare use employing a sample of university students. The purpose of the model was to determine predictors of student use of university health services versus private health services. Several psychosocial factors were taken into consideration, including attitudes towards healthcare alternatives, perceptions of others' attitudes towards these services, students' autonomy, and access to different healthcare options. The researchers found that attitudes towards health services played an important role in determining use. While this study did take into account several important psychosocial factors involved in help-seeking, the focus of this investigation was in

determining healthcare use between different options and may not be as valuable in understanding predictors of healthcare use in general.

Suchman (1965) developed a model of healthcare use that took into consideration social group forces as well as demographic characteristics and attitudes (orientation) towards healthcare. This research studied a sample of individuals from a community within New York City to determine factors that may impact health status and medical care. Suchman found that social groups, dichotomized as Cosmopolitan and Parochial, influenced medical orientation. This medical orientation in turn impacted healthcare use. It was also found that several demographic factors, such as race, age, and socio-economic status significantly impacted medical orientation. This finding has become important in the development of psychosocial models of healthcare use, as it shows the importance of demographic factors in prediction of help-seeking behavior.

One widely used model of healthcare use is Andersen's Behavioral Model of Healthcare Use (Andersen, 1968). This model was initially developed for several purposes. First, the initial goal of the model was to help explain why families used healthcare services, as well as to predict such use. Secondly, the model was used to measure equality in health care use distribution. Andersen also posited that the model would be used to assist in developing policies to ensure equality in access to healthcare (Andersen, 1995). The use of the model at the level of policy and distribution of healthcare is beyond the scope of the current research, but Andersen's behavioral model of healthcare use has been influential in research on help-seeking since its inception.

The behavioral model of healthcare initially used the family as the subject of healthcare utilization. Andersen proposed that many of the demographic, economic, and psychosocial factors employed in the model were directly related to one's family situation. In later analyses, Andersen altered the concept of the model to predict an individual's healthcare use because of the difficulty in accounting for intrafamily differences in many of the predicting factors (Andersen, 1995).

The most recent update of Andersen's model (Andersen, 1995, as seen in Figure 1) utilizes three factors to predict healthcare use. These factors are predisposing characteristics, enabling resources, and need factors. A large amount of research has been conducted examining either Andersen's model in its entirety or variations of the model. While these studies tend to operationalize the three factors differently, they all address each of the components. Some of the changes in the operational definitions of these factors are due to specialized topics or populations in the particular studies. Andersen stated that the relative importance of each of the components in this model may differ based on the type of health service being utilized and the specific situations under which the healthcare use might be needed. For instance, when examining veterans' healthcare use following traumatic experiences in wars, one researcher included combat status as a predisposing factor (Elhai et al., 2007). Each of the three components will be described below.

The first component of Andersen's model is predisposing factors. These are characteristics that exist prior to the onset of specific episodes of illness. Andersen stated that these characteristics make it more likely that health services will be used, but are not directly responsible for health service use (Andersen, 1968). Examples of these factors

include demographics such as age, race, and gender (Andersen, 1968). In addition, other individual factors such as education and occupation are also encompassed. Andersen labeled these factors as social structure and included them in the model as predisposing factors. The final component of predisposing factors include beliefs and attitudes towards healthcare, knowledge that an individual may have concerning healthcare and related topics, as well as values. Other studies have considered more diverse characteristics under the predisposing factor component of the model (Elhai et al., 2007, Rodriguez & Kohn, 2008), including marital status, socioeconomic status, an individual's smoking and drinking behaviors, and combat status.

The second component that Andersen (1968) described in his model of healthcare use is enabling resources. Andersen defined enabling conditions as a condition which permits one to act upon a value or satisfy a need. Andersen further described this factor as the availability of means for using health services. This component also encompasses a large number of factors. First and foremost, health services must be available, including both facilities and personnel. A second enabling resource related to health service availability is ability to pay and access to health insurance. Another important factor subsumed under this component would be quality of social support networks and community resources.

The final component in the model, need, was defined by Andersen (1968) as the perception of illness or its possibility. Andersen stated that this need component represents "the most immediate cause of health service use" (Andersen, 1968). This encompasses any factors that contribute to the need for healthcare services, such as illness or injury (Andersen, 1995). Andersen further delineated need factors into

perceived need versus evaluated need. Perceived need is need determined by the individual who may be seeking services. Evaluated need is actual need as determined by health service personnel. Other factors may be included may be determined by the specifics of the situation. For instance, level of exposure to traumatic events may differentially impact the perceived or evaluated need for healthcare services following a tragedy (Rodriguez & Kohn, 2008).

This model has also been used to predict healthcare utilization in populations exposed to violent large-scale traumatic events. One such use of Andersen's model involves the treatment of soldiers returning from wars (Elhai et al., 2007). A second and increasingly important type of violent large-scale trauma that has made use of Andersen's model is in the area of treatment of victims of terrorist attacks such as the attack on the World Trade Centers in 2001 (Adams, Ford, & Dailey, 2001; Ford, Adams, & Dailey, 2006).

In the last several decades, mass shootings at schools and universities in the United States have become frighteningly common. In the time period between 1997 and 1999, no less than seven of these tragic mass shootings took place (Jordan, 2003). These events have been defined as "catastrophic school events" (Roberts, 2000). According to Roberts, these events are characterized by an acute localized violent event that produces trauma in those exposed to the event, either directly or indirectly. These events involve the victimization of large groups of people and often result in multiple fatalities.

One recent example of these school shootings is the incident that occurred at Virginia Tech on April 16, 2007. On that date, a senior undergraduate student shot 49 individuals and killed 33, including himself. Like the mass shootings that have preceded



the incident at Virginia Tech, this incident had a vast impact on the victims and on the community at large. The mental health resources at Virginia Tech and in the surrounding community quickly mobilized to treat the victims of this deadly attack.

The literature in the area of mass shootings reveals that the victims of these incidents may experience long-lasting detrimental health changes requiring clinical intervention (Koopman et al., 1995). Unsurprisingly, one of the most consistently found outcomes involves the development of stress disorders in the victims. These stress reactions include acute stress reactions as well as more long-lasting effects such as posttraumatic stress disorder.

Research indicates that a significant number of individuals exposed to interpersonal violence, such as school shootings, experience acute stress reactions immediately following the incidence of violence. Gore-Felton and colleagues (1999) examined such reactions in individuals who had experienced or observed episodes of extreme interpersonal violence, including mass shootings, terrorist attack, and other forms of homicide. Using a meta-analysis of research conducted following a large number of these violent acts, Gore-Felton and colleagues (1999) found a significant incidence of acute stress and related symptoms in the victims.

The research conducted by Gore-Felton and colleagues (1999) revealed two other implications that may be important to take into consideration when providing services following incidents of mass shootings and other extreme forms of violence. First, the presence of acute stress symptoms represented a significant predictor of the development of posttraumatic stress disorder in the victims. Second, the researchers suggested that indirect exposure, such as simply observing violent acts, may be sufficient to cause

severe psychological distress. The researchers concluded that early intervention in the time period following incidences of violence may be important to most effectively treat individuals experiencing acute stress symptoms.

Further research shows that the psychological distress caused by exposure to mass shootings has a long-term impact on victims. Johnson, North, and Smith (2002) examined the long-term effect of a mass shooting incident at a courthouse. Using a longitudinal design, individuals exposed to this incident were examined for PTSD and other distress symptoms. The researchers assessed the victims in a time frame six to eight weeks following the shooting, and reassessed them at one- and three-year follow-ups. Although a small percentage of victims (5%) met diagnostic criteria for PTSD immediately following the event, the vast majority of victims (96%) reported some symptoms of PTSD. In addition to the 10% of victims who met criteria for PTSD following the incident, another 15% of victims in the study reported clinical levels of other psychological disorders, such as depression. Again, it is important to note that, while the formal diagnostic criteria for psychiatric disorders were met in only 25% of victims, nearly all reported some level of symptoms. Highlighting the long-term effects of the disorder, a larger percentage of the victims (10%) met criteria for PTSD at either the one-year or three-year follow-up assessment. This finding points to the importance of predisposing factors in the development of PTSD and other psychological dysfunction following incidences of mass violence.

A study by North, Smith, and Spitznagel (1997) showed an even greater incidence of PTSD in survivors of a mass shooting. These researchers conducted a one-year follow-up investigating the effects of a mass shooting at a restaurant in Killeen, Texas in 1991.

North and colleagues found that 28% of the survivors of this shooting met criteria for PTSD immediately following the shooting, while another 18% of the survivors met criteria for another diagnosis, such as major depression (10.3%), panic disorder (2.3%), and alcohol abuse (7.5%). At the on-year follow-up, 25% of the participants reported symptoms consistent with diagnostic criteria for a psychological diagnosis. The results of this study were consistent with the results of the study conducted by Johnson et al. (2002), and reinforced the importance of predisposing factors in the etiology of psychological problems following mass violence, noting that previous lifetime diagnosis of mental illness was the best indicator of mental illness following the shooting.

Further research supports the idea that direct victimization is not necessary for victims to experience psychological distress following extreme interpersonal violence. For instance, Fallahi and Lesik (2009) examined the effects of vicarious exposure to the mass shootings at Virginia Tech on April 16, 2007 via television news coverage of the event. These researchers surveyed undergraduate and graduate students enrolled in psychology courses at Virginia Tech at the time of the shootings. The results indicated that an increase in viewing of television coverage of the event led to a greater probability of experiencing a number of acute stress symptoms.

Several factors have been found to influence the incidence of psychological disturbance following mass shootings. As indicated by the results of Johnson et al. (2002) and North et al. (1997), one significant predictor of the psychological impact of these mass shootings was the presence of psychological disturbance prior to the traumatic event.

The rates of help-seeking behavior in veterans following exposure to traumatic events has been examined by several researchers. For instance, Rosen et al. (2011) found that 81% of veterans sought treatment for PTSD following the diagnosis of that disorder. These researchers looked at several variables that may have contributed to the veterans' help-seeking. Particularly, need variables, as defined by veterans' scores on several measures of PTSD and other mental health disturbances. Rosen et al. (2011) found that these need factors predicted initiation of mental health services. In addition, attitudes such as satisfaction with care and the desire for help were found to predict initiation of treatment. Predisposing factors that were associated with higher use included race, with Caucasians and African-Americans seeking treatment at higher rates than Hispanics, and gender, with males seeking treatment at higher rates than females. Spont et al. (2009) found that 64% of veterans received treatment for PTSD within one year of diagnosis. They also found that veterans' race did not contribute to the rate of service utilization. Neither of these studies examined enabling factors such as access to services or insurance status as possible predictors of service utilization. However, this can be attributed to the nature of the populations studied. The participants were involved in the Veteran's Administration system and, therefore, access to treatment and insurance was available to all participants. This homogeneity in these characteristics makes it difficult to study differential effects of enabling resources in this population.

Unfortunately, the help-seeking behavior of victims of school shootings such as the shootings that took place at Virginia Tech has not been well-researched. Much of the research following tragedies school shootings have focused on posttraumatic stress and other psychiatric symptoms and disorders. Additionally, the extant research involving

recent school shootings has focused on the deleterious effects on victims and communities, or on the psychosocial factors that lead to individuals committing these acts of violence. However, there is less research focusing on healthcare use and other help-seeking behaviors following these events or the outcomes of such help-seeking. Differences in the characteristics of veterans and college students may make the model less valuable in predicting help-seeking behavior in the victims of the shootings at Virginia Tech. An examination of Andersen's model of healthcare use in this population is warranted.

### **Hypotheses**

The purpose of this study was to examine the factors that may lead to health care use and other forms of service use. Using Andersen's model of healthcare, the research examined several constructs related to predisposing, enabling, and need factors as they relate to service use following the shootings at Virginia Tech. Additionally, hypotheses regarding the relationship between service use and outcomes were examined. The conceptual model upon which these hypotheses are based is presented in Figure 2.

First, hypotheses regarding the prediction of help-seeking behavior were examined. A total of seven such hypotheses were made, using various predisposing, enabling, and need factors. These hypotheses are as follows:

- 1) Race will be predictive of help-seeking, with Caucasian participants being more likely to engage in help-seeking behavior than non-Caucasian participants.
- 2) Gender will be predictive of help-seeking, with female participants being more likely to engage in help-seeking behavior than male participants.

- 3) Prior vulnerabilities, as operationalized as prior trauma and lower pre-event functioning, will be predictive of more help-seeking behavior.
- 4) Social support will be predictive of more help-seeking behavior.
- 5) Access to health insurance will be predictive of more help-seeking behavior.
- 6) Higher rates of posttraumatic stress will be predictive of more help-seeking behavior.
- 7) Higher rates of psychological distress will be predictive of more help-seeking behavior.

In addition to these hypotheses, exploratory hypotheses regarding the prediction of outcomes at the time of the follow-up interview were examined. These hypotheses are as follows:

- 8) Help-seeking will be predictive of lower Posttraumatic Stress at T2.
- 9) Help-seeking will be predictive of lower Psychological Distress at T2.
- 10) Help-seeking will be predictive of higher self-reported health at T2.
- 11) Help-seeking will be predictive of a more positive change in health between T1 and T2.

The conceptual model shown in Figure 2 also implies mediation effects in the model. Specifically, this model implies that service use acts as a mediator in the relationships between the predictors of help-seeking and the outcomes measured at T2. These possible mediating relationships were also examined in this study.

## **Methods**

### **Participants and procedures**

The target sample of this study was all VT students who were enrolled at the

Blacksburg campus on April 16, 2007, the day of the shooting. Each of these students had an email active email address provided by VT, including those who had been seniors at the time of the shooting, and who had recently graduated from VT. Additional contact information for these individuals, including a home phone number, was obtained from VT administration.

Participants were recruited via an email survey administered by the Virginia Tech Center for Survey Research. The survey was sent out on July 10, the Tuesday after the July 4 holiday. Prior to this mailing, an advance email message was sent notifying all potential respondents that the survey was going to be carried out, encouraging them to participate, and assuring them of the confidentiality of the information obtained. Potential respondents who explicitly declined participation were not contacted further. However, other non-respondents (i.e., those who neither submitted the completed questionnaire nor responded to the informed consent protocol) were sent reminder emails once per week until August 13. Data collection via this initial email ended on August 19. At the close of the survey on August 19, 20% of the targeted sample of 23,214 students had completed the survey, .1% refused, and 79.9% provided no response. The final sample of participants who completed this survey consisted of 4,639 respondents. These participants consisted of 54.6% females (45.4%). Of these participants, 87.0% were Caucasian, 2.3% were African American, 6.6% identified as Asian, 1.2% were Native American, 0.7% identified as Pacific Islander, and 2.2% identified as “other,” a category encompassing all other possible races. The participants who completed this survey ranged in age between 18 years and 68 years ( $M = 21.83$ ,  $SD = 4.42$ ).

A follow-up survey was sent out one year following the initial survey. All respondents to the initial survey were invited to respond. In total, 18.5% of the participants who had completed the initial survey also completed the second survey. This sample included 860 participants. Of these, 94.6% were Caucasian, 1.3% identified as Native American, 1.2% identified as African American, and 0.9% identified as Pacific Islander. Another 2.0% identified their ethnicity as “other”. This sample consisted of 63.5% female (36.5% male). The participants ranged in age between 19 years and 55 years ( $M = 22.44$ ,  $SD = 4.25$ ). Only data from participants who had completed both surveys were included in the analyses in this study.

## **Measures**

The online survey used in this study consisted of an 86-item questionnaire. This questionnaire included questions about various demographic characteristics of respondents, as well as factors that may predispose respondents to seek services following the incident, such as attitudes about various healthcare and psychological services and the utility of these services. Additionally, the survey included information on several enabling factors such as the participants’ access to various services, participant insurance status, and the availability or lack of social support. The items included in the questionnaire were primarily based on questionnaires used in previous studies of large-scale traumatic events. Additionally, preliminary focus group interviews with experts and Virginia Tech students and employees were conducted to determine if any other relevant questions should be added. These focus group interviews were also important in determining stressors and other important variables that may have been specific to the incident at Virginia Tech and that would not have been captured in previous studies.



### **Predisposing, enabling, and need factors**

Items from the questionnaire were chosen to represent constructs of predisposing, enabling, and need factors suggested by Andersen's model. The items were based on their face validity of the construct of interest.

The first of the predisposing factors used in this study are demographic variables. These include race and gender. The next predisposing factor used in the analyses was vulnerability. Two items from the survey reflecting vulnerability were used. The first was a measure of the respondents' pre-event functioning in the year prior to the shootings. The following item from the T1 survey was used to determine this: "How would you rate the way things were going for you before April 16 in each of the following areas of your life?" This item required that the respondent rate eight aspects of their lives on a five-point Likert scale, ranging from "Excellent" to "Poor." Examples of these aspects include school work, job or occupation, and social life. A single scale encompassing the eight aspects was developed by first assigning a numerical value to responses (i.e., 1=poor, 5=excellent, etc.). The answers given in each of the aspects were then added together for a total score, ranging from 8 to 40. This item was found to have good internal consistency ( $\alpha = 0.85$ ). The second item reflecting the construct of vulnerability was a measure of prior traumatic events that the respondent had experienced. This item, also taken from the T1 survey, was as follows: "In the year prior to April 16, did you experience any of the following stressful events?" This item required that the respondent answer separately for nine potentially negative events, such as a serious financial loss or a physical or sexual assault. A scale was developed by simply adding the total number of such events that the respondent had experienced. This scale was found to have acceptable internal consistency

( $\alpha = 0.52$ ).

The second group of factors to be examined, enabling factors, was represented by two constructs. These constructs are access to medical insurance and perceived social support. The first construct, access to health insurance, was measured by the following item: "Do you have medical insurance that covers mental health treatment?" This was a dichotomous item that required the respondent to simply answer yes or no. The second enabling-related factor was a measure of the respondents' perceived social support. This construct was measured by a composite drawn from four related items on the T1 questionnaire: "How much do any of these people really care about you?", "How much can you rely on any of them for help if you need it?", "How much do any of them understand the way you feel about things?", and "How much can you open up to any of them if you need to talk about your problems?" Each of these items is measured on a 4-point Likert scale ranging from "A lot" to "Not at all". A scale was developed from these items by first assigning a numerical value to responses (i.e., 1=Not at all, 4=A lot, etc.). The answers given in each of the four items was then added together for a total score, with a possible range from 4 to 16. This measure was shown to have good internal consistency ( $\alpha = 0.78$ ).

The first two variables related to need factors examined in this study were reflective of psychological symptoms reported by participants at the time of the first survey. Two types of psychological symptoms were examined: posttraumatic stress and psychological distress.

Symptoms of posttraumatic stress in participants at T1 were measured using a modified version of the Trauma Screening Questionnaire (TSQ). The TSQ is a brief, ten

item questionnaire used to screen for PTSD symptoms. Specifically, the TSQ includes items related to re-experiencing and arousal symptoms of PTSD. For the purpose of screening for PTSD symptoms, the TSQ has been found to be more efficient than other such measures, including the PTSD checklist, the Post-traumatic Diagnostic Scale, and the Davidson Trauma Scale (Brewin et al., 2002).

Six items used in posttraumatic stress measure in this study are derived from the TSQ. These items include the following: “When something reminded you of the shootings, you got very upset or afraid,” “You had dreams about April 16 or other bad dreams,” “You had more trouble than usual going to sleep or woke up often during the night,” “You had more trouble than usual concentrating or paying attention,” “You had upsetting thoughts, pictures, or sounds of what happened come into your mind when you did not want them,” and “You felt more irritable or easily angered than usual.” These items indicate re-experiencing and hyperarousal symptoms. In order to capture symptoms of avoidance and numbing, a number of items were added to the measure. These include: “You tried not to talk about, think about, or have feelings about what happened,” “You tried to stay away from people, places, or things that made you remember what happened,” “You felt more emotionally distant or not close to other people than usual”, and “You worried more than usual about bad things that might happen to you or your loved ones in the future.” Each of these items was rated on a 5-point Likert-type scale (1 = *never* and 5 = *just about every day*). A scale was developed by adding the scores for each of these items, giving a minimum score of 10 and a maximum score of 50. The internal consistency of this measure was found to be good ( $\alpha = 0.90$ ).

Symptoms of psychological distress at T1, including depression and anxiety, were measured using the Kessler 6-item Psychological Distress Scale (K6, Kessler et al, 2002). The K6 is a 6-item short-form version of the K10, a longer screening measure for psychological distress also developed by Kessler and colleagues (2002). The K6 asks respondents to answer questions regarding how often they experienced specific symptoms of distress over the previous month. Five possible responses range from “none of the time” to “all of the time.” These responses are then scored from 1 to 5, and all items are summed to determine a total score, with a minimum value of 6 and a maximum value of 30. The K6 has been found to be a useful screening measure for both depression and anxiety disorders (Cairney et al, 2007; Furukama et al, 2003). The K6 measure at T1 was shown to have good internal consistency ( $\alpha = 0.87$ ).

Measures of posttraumatic stress and psychological distress were also obtained at T2. In order to measure psychological distress at T2, the same items from the K6 were included in the T2 survey. The K6 measure at T2 was also shown to have good internal consistency ( $\alpha = 0.87$ ). Items from the posttraumatic stress measure used in the T1 survey were included in the T2 survey in such a way that the measure does not reflect respondents’ symptoms at T2. Instead, respondents were asked to rate their symptoms “in the worst month” since the shootings. Due to this discrepancy in the way that T2 posttraumatic stress data were collected, a slightly more complex process was used to provide a measure of current posttraumatic stress at T2. First, a scale was developed in the same manner as the T1 measure of posttraumatic stress, using the analogous items from the T2 survey. In order to ensure that the data reflected only current symptoms of posttraumatic stress at T2, a second item in the T2 survey was used as a filter. This item

asked respondents to name the last time that they had experienced significant posttraumatic stress symptoms. The final measure of posttraumatic stress at T2 therefore consisted of a scale similar to the scale used to measure posttraumatic stress at T1, with a minimum score of 10 and a maximum score of 50. Additionally, only individuals who had endorsed having symptoms of posttraumatic stress within the previous month of the T2 survey (having responded “Within the last two weeks” or “March 2008” on the filter variable) were included in this measure. This measure of posttraumatic stress at T2 was shown to have good internal consistency ( $\alpha = 0.87$ ).

### **Help-seeking**

A measure of help-seeking behavior was derived by asking respondents to identify a number of professional services that they may have used since the shootings. In order to accurately identify individuals who had used services since the time of the shooting, two items were used. The first item came from the T1 survey: "What kind of professional did you see?" This item included various kinds of service utilization, including counseling, medical services, and other services that the participants may have been involved in following the shootings, such as "Psychiatrist," "Social worker," "Primary care doctor," and "Religious counselor." A second item, from the T2 survey, was also used. This item asked respondents to identify services that they had used since the time of the first survey, and included the same possible services that had been included in the item from the T1 survey. In order to determine services used since the time of the shooting, a dichotomous variable was created, derived from responses at both T1 and T2, that indicated whether a particular service had been used at any point since the time of the shootings. Using this method, a number of types of service utilization

were examined, based on the procedure used by Wang and his colleagues (2005). The primary category used in this study encompasses all services, and is called “Any Service Use.” Other categories were created by taking individual services by type. These categories included “Health Care,” “Non-Health Care,” and “Mental Health Specialty.” A list of the specific services included in each category is included in the Appendix.

### **Health Outcomes**

Two items from the T2 questionnaire were used to examine self-reported health outcomes. The two health outcome items are: “In general, how would you rate your health?” and “Compared to one year ago, how would you rate your health in general now?” These items were chosen due to their face validity to the construct of health outcome. The first of these items, “In general, how would you rate your health?” required that respondents rate their health on a five-point Likert scale ranging from 1= “poor” to 5= “excellent”. The second of these items, “Compared to one year ago, how would you rate your health in general now?” required that respondents answer on a Likert scale ranging from 1= “Much worse now than one year ago” to 5= “Much better now than one year ago.” Additionally, one item from the T1 questionnaire, “In general, how would you rate your health?” was used as a control variable for analyses involving self-reported health at T2. This item used a scale ranging from 1= “Poor” to 4= “Excellent.”

### **Results**

The analyses in this study followed several steps in order to test the hypotheses regarding the prediction of help-seeking behavior, as well as hypotheses related to the prediction of outcomes and the mediating role that service use may play in the relationship between enabling, predisposing, and need factors and the various outcome

measures. Before conducting the analyses, the data were analyzed to determine the effects of attrition. Specifically, it was necessary to determine if any systematic factors impacted the respondents' likelihood of completing the second interview. Next, statistical properties of the data were examined. Descriptive statistics were obtained for each of the variables to be included in the analyses. Sample sizes, means, standard deviations, and internal consistency coefficients were obtained for each of these variables, as appropriate (see Table 1). Frequencies for categorical variables were also obtained (see Table 2). Correlations between each of the variables were examined in order to assess bivariate relationships. Continuous variables were centered at the minimum observed score to improve interpretability of effects. Next, analyses were conducted to test individual hypotheses. The specific types of analyses varied as appropriate. These analyses are presented in detail below in the appropriate sections.

### **Impact of Attrition**

The data were analyzed to determine if the respondents who completed both rounds of the survey differed in important ways from the respondents who did not complete the second survey. The purpose in doing so was to determine if there was a systematic difference that would act as a confounding variable in the analyses in this study. The procedure used to recognize systematic differences in attrition was based on the procedure recommended by Penne (2009). Penne also provided recommendations for adjusting for differences in attrition if such a difference is found.

The procedure recommended by Penne involved using regression analyses to determine the effects of attrition. First, a dichotomous variable was created to differentiate individuals who had completed the second survey from those who had not.

Next, several variables were used in a logistic regression analysis to determine if the variables significantly predicted whether a respondent had completed the second survey or not. Demographic characteristics, including race, age, and gender were first examined. Insignificant effects were found for both race,  $\chi^2(1, 4639) = 0.11, p = 0.740$  and age,  $\chi^2(1, 4639) = 0.74, p = 0.391$ . Gender was found to be a significant predictor of completing the second survey,  $\chi^2(1, 4639) = 34.39, p < 0.001$ . The odds ratio indicates that the effect of gender was both statistically and clinically significant (common odds ratio = 1.57,  $p < 0.001$ ). Analyses were then conducted to determine if respondents who completed the survey differed significantly from those who did not on measures of psychological distress or posttraumatic stress. No significant effects were found for either psychological distress,  $\chi^2(1, 4639) = 0.00, p = 0.987$ , or posttraumatic stress,  $\chi^2(1, 4639) = 3.71, p = 0.054$ .

Because the effect of gender was found to be a statistically significant predictor of completion of the second interview, the next step was to determine if this effect was clinically significant. The odds ratio for the analysis indicated that the effect of gender was also clinically significant (common odds ratio = 1.57,  $p < 0.001$ ). Due to this clinical significance, the analyses in this study were required to be adjusted to take these differences into account. This was done by using gender as a control in the analyses, as recommended by Penne (2009).

## **Correlations**

Correlations between measures of pre-event functioning, prior exposure to traumatic events, access to medical insurance, social support at T1, posttraumatic stress at T1, psychological distress at T1, gender, total service use, use of mental health



professional services, use of general medical services, non-healthcare service use, psychological distress at T2, posttraumatic stress at T2, self-reported change in health at T2, self-reported health at T1, and self-reported health at T2 were obtained. These correlations can be found in Table 3.

### **Prediction of Help-Seeking**

After examining the statistical properties of the data, each of the hypotheses regarding the prediction of help-seeking behavior were examined using regression analyses. Specifically, binary logistic regression analyses were used, due to the categorical, dichotomous nature of the help-seeking variables. This report will present the chi-square test of significance for each analysis in order to assess statistical significance. Additionally, odds ratios for each of the significant tests will be presented, as an indicator of effect size. In logistic regression, the odds ratio represents the change in the odds of the occurrence of the dependent variable, given each unit of change in the independent variable.

### **Prediction of Help-Seeking by Race**

To test the hypothesis that race is predictive of help-seeking, logistic regression analyses were conducted. Gender was included in each of these analyses as a control variable. The overall model examining the relationship between race and any service use was insignificant,  $\chi^2(5, 819) = 10.01, p = 0.075$  (Table 4). This result indicates that race is not a significant predictor of any service use.

The model examining the relationship between race and mental healthcare use was also insignificant,  $\chi^2(5, 816) = 9.27, p = 0.099$  (Table 5). This result indicates that race is not a significant predictor of mental health service use.

The model examining the relationship between race and general medical service use was not significant,  $\chi^2(5, 816) = 6.31, p = 0.278$  (Table 6). This result indicates that race is not a significant predictor of general medical service use.

The model examining the relationship between race and non-healthcare service use was not significant,  $\chi^2(5, 816) = 3.76, p = 0.584$  (Table 7). This result indicates that race is not a significant predictor of non-healthcare service use.

### **Prediction of Help-Seeking by Gender**

Logistic regression analyses were conducted to determine if gender is predictive of help-seeking behavior. The results indicated that gender is a significant predictor of any service use,  $\chi^2(1, 860) = 10.54, p = 0.001$  (Table 8). The odds ratio indicates that females were more likely to seek services (common odds ratio = 1.87,  $p = 0.002$ ).

Further analysis indicated that gender was also a significant predictor of seeking mental health services,  $\chi^2(1, 857) = 9.67, p = 0.002$  (Table 9). The odds ratio indicates that females were more likely to seek services (common odds ratio = 1.84,  $p = 0.003$ ).

Additionally, gender was found to be a significant predictor of seeking general medical services,  $\chi^2(1, 857) = 5.13, p = 0.024$  (Table 10). The odds ratio indicates that females were more likely to seek services (common odds ratio = 2.45,  $p = 0.036$ ).

Gender was not found to be a significant predictor of seeking non-healthcare services,  $\chi^2(1, 857) = 2.96, p = 0.085$  (Table 11).

### **Prediction of Help-Seeking by Vulnerability**

Logistic Regression analysis was conducted to test the hypothesis that vulnerability is predictive of help-seeking behavior. The model included pre-event functioning as well as prior exposure to traumatic events. Additionally, gender was

included as a control in these analyses. The model testing the predictive ability of participants' prior vulnerabilities on their use of any type of services was significant,  $\chi^2(3, 860) = 41.07, p < 0.001$  (Table 12). Pre-event functioning was found to be a significant predictor in the model (common odds ratio = 1.08,  $p < 0.001$ ), as was prior exposure to traumatic events (common odds ratio = 1.20,  $p = 0.005$ ). This result indicates that both pre-event functioning and prior experiences of traumatic events are significant predictors of any service use.

The model testing the predictive ability of participants' prior vulnerabilities on their use of mental health services was significant,  $\chi^2(3, 857) = 40.70, p < 0.001$  (Table 13). Pre-event functioning was found to be a significant predictor in the model (common odds ratio = 1.08,  $p < 0.001$ ), as was prior exposure to traumatic events (common odds ratio = 1.23,  $p = 0.002$ ). This result indicates that both pre-event functioning and prior exposure to traumatic events are significant predictors of mental health service use.

The model testing the predictive ability of participants' prior vulnerabilities on their use of general medical services was significant,  $\chi^2(3, 857) = 17.43, p = 0.001$  (Table 14). Pre-event functioning was found to be a significant predictor in the model (common odds ratio = 1.12,  $p = 0.001$ ). However, prior exposure to traumatic events was not found to be a significant predictor in the model (common odds ratio = 1.09,  $p = 0.473$ ). This result indicates that pre-event functioning is a significant predictor of general medical service use, but that prior exposure to traumatic events is not a predictor of general medical service use.

The model testing the predictive ability of participants' prior vulnerabilities on their use of non-healthcare services was not significant,  $\chi^2(3, 857) = 3.28, p = 0.350$

(Table 15). This indicates that pre-event functioning and prior exposure to traumatic events are not significant predictors of non-healthcare service use.

### **Prediction of Help-Seeking by Social Support**

Logistic regression analyses were conducted to test the hypothesis that social support is predictive of help-seeking behavior. Gender was included in each of these analyses as a control variable. The overall model examining the relationship between social support and any service use was significant,  $\chi^2(2, 856) = 14.33, p = 0.001$  (Table 16). Social support was found to be a significant predictor in the model (common odds ratio = 1.10,  $p = 0.044$ ). This result indicates that social support is a significant predictor of any service use.

The model examining the relationship between social support and mental health service use was also significant,  $\chi^2(2, 853) = 12.33, p = 0.002$  (Table 17). However, social support was not a significant predictor in the model (common odds ratio = 1.08,  $p = 0.091$ ). This result indicates that social support is not a significant predictor of mental health service use.

The model examining the relationship between social support and general medical service use was significant,  $\chi^2(2, 853) = 6.94, p = 0.031$  (Table 18). However, social support was not a significant predictor in the model (common odds ratio = 1.13,  $p = 0.157$ ). This result indicates that social support is not a significant predictor of general medical service use.

The model examining the relationship between social support and non-healthcare service use was not significant,  $\chi^2(2, 853) = 3.26, p = 0.196$  (Table 19). This result indicates that social support is not a significant predictor of non-healthcare service use.

## **Prediction of Help-seeking by Access to Health Insurance**

To test the hypothesis that access to health insurance is predictive of help-seeking, logistic regression analyses were conducted. Gender was included in each of these analyses as a control variable. The overall model examining the relationship between access to health insurance and any service use was significant,  $\chi^2(2, 860) = 12.86, p = 0.002$  (Table 20). However, access to health insurance was not a significant predictor in the model (common odds ratio = 1.35,  $p = 0.133$ ). This result indicates that access to health insurance is not a significant predictor of any service use.

The model examining the relationship between access to health insurance and mental healthcare use was also significant,  $\chi^2(2, 857) = 12.45, p = 0.002$  (Table 21). However, access to health insurance was not a significant predictor in the model (common odds ratio = 1.40,  $p = 0.101$ ). This result indicates that access to health insurance is not a significant predictor of mental health service use.

The model examining the relationship between access to health insurance and general medical service use was significant,  $\chi^2(2, 857) = 7.61, p = 0.022$  (Table 22). However, access to health insurance was not a significant predictor in the model (common odds ratio = 1.90,  $p = 0.136$ ). This result indicates that access to health insurance is not a significant predictor of general medical service use.

The model examining the relationship between access to health insurance and non-healthcare service use was not significant,  $\chi^2(2, 857) = 3.39, p = 0.184$  (Table 23). This result indicates that access to health insurance is not a significant predictor of non-healthcare service use.

## **Prediction of Help-seeking by Posttraumatic Stress**

To test the hypothesis that posttraumatic stress is predictive of help-seeking behavior, logistic regression analyses were conducted. Gender was included in each of these analyses as a control variable. The overall model examining the relationship between posttraumatic stress at T1 and any service use was significant,  $\chi^2(2, 860) = 38.45$ ,  $p < 0.001$  (Table 24). Posttraumatic stress at T1 was found to be a significant predictor in the model (common odds ratio = 1.05,  $p < 0.001$ ). This result indicates that posttraumatic stress is a significant predictor of any service use.

The model examining the relationship between posttraumatic stress at T1 and mental healthcare use was also significant,  $\chi^2(2, 857) = 39.88$ ,  $p < 0.001$  (Table 25). Posttraumatic stress was found to be a significant predictor in the model (common odds ratio = 1.05,  $p < 0.001$ ). This result indicates that posttraumatic stress is a significant predictor of mental health service use.

The model examining the relationship between posttraumatic stress and general medical service use was significant,  $\chi^2(2, 857) = 10.19$ ,  $p = 0.006$  (Table 26). Posttraumatic stress was found to be a significant predictor in the model (common odds ratio = 1.04,  $p = 0.020$ ). This result indicates that posttraumatic stress is a significant predictor of general medical service use.

The model examining the relationship between access to posttraumatic stress and non-healthcare service use was significant,  $\chi^2(2, 857) = 19.95$ ,  $p < 0.001$  (Table 27). Posttraumatic stress was found to be a significant predictor in the model (common odds ratio = 1.07,  $p < 0.001$ ). This result indicates that posttraumatic stress is a significant predictor of non-healthcare service use.

## **Prediction of Help-seeking by Psychological Distress**

To test the hypothesis that psychological distress is predictive of help-seeking behavior, logistic regression analyses were conducted. Gender was included in each of these analyses as a control variable. The overall model examining the relationship between psychological distress at T1 and any service use was significant,  $\chi^2(2, 860) = 55.89, p < 0.001$  (Table 28). Psychological distress at T1 was found to be a significant predictor in the model (common odds ratio = 1.14,  $p < 0.001$ ). This result indicates that psychological distress is a significant predictor of any service use.

The model examining the relationship between psychological distress at T1 and mental healthcare use was also significant,  $\chi^2(2, 857) = 56.57, p < 0.001$  (Table 29). Psychological distress was found to be a significant predictor in the model (common odds ratio = 1.15,  $p < 0.001$ ). This result indicates that psychological distress is a significant predictor of mental health service use.

The model examining the relationship between psychological distress and general medical service use was significant,  $\chi^2(2, 857) = 16.38, p < 0.001$  (Table 30). Psychological distress was found to be a significant predictor in the model (common odds ratio = 1.12,  $p < 0.001$ ). This result indicates that psychological distress is a significant predictor of general medical service use.

The model examining the relationship between access to psychological distress and non-healthcare service use was significant,  $\chi^2(2, 857) = 12.87, p = 0.002$  (Table 31). Psychological distress was found to be a significant predictor in the model (common odds ratio = 1.11,  $p = 0.001$ ). This result indicates that psychological distress is a significant predictor of non-healthcare service use.

### **Prediction of Help-seeking by Full Model**

Further analyses were conducted using a model that incorporated all of the predictor variables in a single analysis. Logistic regressions were again used. The prediction model included race, gender, prior trauma, pre-event functioning, social support at T1, access to medical insurance, psychological distress at T1, and posttraumatic stress at T1 as predictor variables. This model was shown to significantly predict any service use,  $\chi^2(11, 790) = 59.34, p < 0.001$  (Table 32). In this full model, only prior trauma (common odds ratio = 1.07,  $p = 0.003$ ) and posttraumatic stress (common odds ratio = 1.05,  $p < 0.001$ ) were found to be significant predictors of any service use. The full model was also found to significantly predict mental health service use,  $\chi^2(11, 787) = 60.68, p < 0.001$  (Table 33). Prior trauma (common odds ratio = 1.06,  $p = 0.009$ ) and posttraumatic stress (common odds ratio = 1.05,  $p < 0.001$ ) were found to be significant predictors of mental health service use. The full model was found to significantly predict general medical service use,  $\chi^2(11, 787) = 23.71, p = 0.014$  (Table 34). Prior trauma (common odds ratio = 1.13,  $p = 0.003$ ) and posttraumatic stress (common odds ratio = 1.04,  $p = 0.036$ ) were found to be significant predictors of general medical service use. The full model was found to significantly predict non-healthcare health service use  $\chi^2(11, 787) = 23.86, p = 0.013$  (Table 35). Only posttraumatic stress (common odds ratio = 1.09,  $p < 0.001$ ) was found to be a significant predictor of non-healthcare service use.

### **Exploratory Analyses**

A series of exploratory analyses were conducted in order to examine the relationship between help-seeking behavior following the shootings and various



outcomes. These outcomes included self-reported health, self-reported change in health in the year proceeding the time of the second interviews, symptoms of posttraumatic stress, and symptoms of psychological distress. These hypotheses were tested using a procedure similar to the procedure used to test hypotheses related to the prediction of help-seeking. Regression analyses were conducted in order to examine these relationships. Rather than using logistic regression, as was used in the analyses related to the prediction of help-seeking behaviors, linear regression was used in these analyses. This difference in analysis was appropriate due to the continuous nature of the outcome variables. This report presents the results of the F tests of significance for each analysis in order to assess statistical significance.  $R^2$  statistics are presented as a percentage of variance accounted for, as an indicator of effect size.

### **Prediction of Self-reported Health**

A multiple linear regression analysis was conducted to examine the relationship between any service use and self-reported health outcome at T2. Self-reported health at T1 and gender were included in the model as control variables. The overall model was found to be significant,  $F(3, 857) = 104.11, p < 0.001$ . The overall model explained 26.8% of the variance, which is a 0.6% improvement over the model that included only the control variables. Any service use was found to be a significant predictor in the model,  $b = 0.12, SE = 0.05, p = 0.011$ . This suggests that individuals who sought help following the shootings were likely to endorse a higher level of health at T2.

A multiple linear regression analysis was conducted to examine the relationship between mental healthcare use and self-reported health outcome at T2. Self-reported health at T1 and gender were included in the model as control variables. The overall

model was found to be significant,  $F(3, 854) = 103.90, p < 0.001$ . The overall model explained 26.8% of the variance, which is a 0.5% improvement over the model that included only the control variables. Mental healthcare use was found to be a significant predictor in the model,  $b = 0.12, SE = .05, p = 0.012$ . This suggests that individuals who sought mental healthcare services following the shootings were likely to endorse a higher level of health at T2.

A multiple linear regression analysis was conducted to examine the relationship between general medical service use and self-reported health outcome at T2. Self-reported health at T1 and gender were included in the model as control variables. The overall model was found to be significant,  $F(3, 854) = 101.08, p < 0.05$ . The overall model explained 26.3% of the variance, which is not an improvement over the model that included only the control variables. General medical service use was not found to be a significant predictor in the model,  $b = 0.03, SE = 0.09, p = 0.764$ . This suggests that use of general medical service was not a predictor of health at T2.

A multiple linear regression analysis was conducted to examine the relationship between non-healthcare service use and self-reported health outcome at T2. Self-reported health at T1 and gender were included in the model as control variables. The overall model was found to be significant,  $F(3, 854) = 101.12, p < 0.001$ . The overall model explained 26.3% of the variance, which is not an improvement over the model that included only the control variables. Non-healthcare use was not found to be a significant predictor in the model,  $b = 0.04, SE = 0.09, p = 0.677$ . This suggests that use of non-healthcare service was not a predictor of health at T2.

### **Prediction of Self-reported Change in Health**

A multiple linear regression analysis was conducted to examine the relationship between any service use and self-reported change in health in the year preceding the T2 survey. Gender was included as a control variable. The overall model was found to be statistically insignificant,  $F(2, 858) = 2.90, p = 0.055$ . The results of this analysis indicate that any service use was not a predictor of change in health at T2.

A multiple linear regression analysis was conducted to examine the relationship between mental health service use and self-reported change in health in the year preceding the T2 survey. Gender was included as a control variable. The overall model was found to be statistically insignificant,  $F(2, 855) = 2.88, p = 0.057$ . The results of this analysis indicate that mental health service use was not a predictor of change in health at T2.

A multiple linear regression analysis was conducted to examine the relationship between general medical service use and self-reported change in health in the year preceding the T2 survey. Gender was included as a control variable. The overall model was found to be statistically insignificant,  $F(2, 855) = 1.86, p = 0.157$ . The results of this analysis indicate that general medical service use was not a predictor of change in health at T2.

A multiple linear regression analysis was conducted to examine the relationship between any non-healthcare service use and self-reported change in health in the year preceding the T2 survey. Gender was included as a control variable. The overall model was found to be statistically insignificant,  $F(2, 855) = 0.93, p = 0.393$ . The results of this analysis indicate that any non-healthcare service use was not a predictor of change in health at T2.

## **Prediction of Psychological Distress**

A multiple linear regression analysis was conducted to examine the relationship between any service use and psychological distress at T2. Psychological distress at T1 and gender were included as control variables. The overall model was found to be statistically significant,  $F(3, 839) = 61.20, p < 0.001$ . The overall model explained 18% of the variance, which is a 1.7% improvement over the model including only the control variables. Any service use was found to be a significant predictor in the model,  $b = -1.51, SE = 0.37, p < 0.001$ . The results of this analysis indicate that individuals who sought help following the shootings were likely to endorse fewer symptoms of psychological distress at T2.

A multiple linear regression analysis was conducted to examine the relationship between mental health service use and psychological distress at T2. Psychological distress at T1 and gender were included as control variables. The overall model was found to be statistically significant,  $F(3, 836) = 60.64, p < 0.001$ . The overall model explained 17.9% of the variance, which is a 1.6% improvement over the model including only the control variables. Mental health service use was found to be a significant predictor in the model,  $b = -1.53, SE = 0.37, p < 0.001$ . The results of this analysis indicate that individuals who sought mental healthcare services following the shootings were likely to endorse fewer symptoms of psychological distress at T2.

A multiple linear regression analysis was conducted to examine the relationship between general medical service use and psychological distress at T2. Psychological distress at T1 and gender were included as control variables. The overall model was found to be statistically significant,  $F(3, 836) = 55.54, p < 0.001$ . The overall model

explained 16.7% of the variance, which is a 0.4% improvement over the model including only the control variables. General medical service use was found to be a significant predictor in the model,  $b = -1.40$ ,  $SE = 0.70$ ,  $p = 0.047$ . The results of this analysis indicate that individuals who sought general medical services following the shootings were likely to endorse fewer symptoms of psychological distress at T2.

A multiple linear regression analysis was conducted to examine the relationship between non-healthcare service use and psychological distress at T2. Psychological distress at T1 and gender were included as control variables. The overall model was found to be statistically significant,  $F(3, 836) = 58.74$ ,  $p < 0.001$ . The overall model explained 17.5% of the variance, which is a 1.2% improvement over the model including only the control variables. Non-healthcare service use was found to be a significant predictor in the model,  $b = -2.33$ ,  $SE = 0.67$ ,  $p = 0.001$ . The results of this analysis indicate that individuals who sought non-healthcare services following the shootings were likely to endorse fewer symptoms of psychological distress at T2.

### **Prediction of Posttraumatic Stress**

A multiple linear regression analysis was conducted to examine the relationship between any service use and posttraumatic stress at T2. Posttraumatic stress at T1 and gender were included as control variables. The overall model was found to be statistically significant,  $F(3, 274) = 66.47$ ,  $p < 0.001$ . The overall model explained 42.4% of the variance, which is a 0.2% improvement over the model including only the control variables. However, any service use was found to be insignificant in the model,  $b = 1.06$ ,  $SE = 1.00$ ,  $p = 0.291$ . The results of this analysis indicate that any service use was not a significant predictor of posttraumatic stress at T2.

A multiple linear regression analysis was conducted to examine the relationship between mental health service use and posttraumatic stress at T2. Posttraumatic stress at T1 and gender were included as control variables. The overall model was found to be statistically significant,  $F(3, 272) = 65.41, p < 0.001$ . The overall model explained 42.2% of the variance, which is a 0.2% improvement over the model including only the control variables. However, any service use was found to be insignificant in the model,  $b = 1.05, SE = 1.02, p = 0.304$ . The results of this analysis indicate that mental health service use was not a significant predictor of posttraumatic stress at T2.

A multiple linear regression analysis was conducted to examine the relationship between general medical service use and posttraumatic stress at T2. Posttraumatic stress at T1 and gender were included as control variables. The overall model was found to be statistically significant,  $F(3, 272) = 65.05, p < 0.001$ . The overall model explained 42.0% of the variance, which is not an improvement over the model including only the control variables. However, general medical service use was found to be insignificant in the model,  $b = -1.16, SE = 1.76, p = 0.512$ . The results of this analysis indicate that general medical service use was not a significant predictor of posttraumatic stress at T2.

A multiple linear regression analysis was conducted to examine the relationship between non-healthcare service use and posttraumatic stress at T2. Posttraumatic stress at T1 and gender were included as control variables. The overall model was found to be statistically significant,  $F(3, 272) = 65.15, p < 0.001$ . The overall model explained 42.1% of the variance, which is a 0.1% improvement over the model including only the control variables. However, non-healthcare service use was found to be insignificant in the

model,  $b = 1.30$ ,  $SE = 1.66$ ,  $p = 0.433$ . The results of this analysis indicate that non-healthcare service use was not a significant predictor of posttraumatic stress at T2.

### **Mediation**

Further exploratory analyses were conducted to examine possible mediational relationships between predictors of help-seeking and outcomes. Only possible mediation relationships in which the IV and the DV had been shown to be significantly related to the mediating variable in prior analyses in this study were examined. Traditionally, tests of mediation have used a procedure requiring multiple analyses, such as the process presented by Shrout and Bolger (2002). This process requires that several conditions be met in order to establish a mediational relationship. First, a significant relationship must be shown between the IV and the DV ( $c$ ). A significant relationship must also be shown between the IV and the potential mediator variable ( $a$ ). A significant relationship should then be established between the potential mediator variable and the DV ( $b$ ). Next, the indirect effect of the IV on the DV via the potential mediating variable must be significant ( $a \times b$ ). Finally, a significant relationship between the IV and the DV, while holding constant the potential mediating variable, should be established ( $c'$ ).

More recently, Preacher and Hayes (2004) described and advocated for a strategy for testing mediation requiring only two steps: that a significant direct effect exists between the IV and the DV, and that an indirect effect exists between the IV and the DV, via the Mediator. This two-step process was used in the present study to establish mediation relationships.

In the analyses in this study, direct effects were tested using logistic and linear regressions, as appropriate. For all analyses in which the DV is a dichotomous variable,

logistic regressions were used, while analyses in which the DV is continuous used linear regressions. Preacher and Hayes (2004) advocated for the use of a bootstrapping method in the testing of the indirect effect. Preacher and Hayes describe bootstrapping as “a nonparametric approach to effect-size estimation and hypothesis testing that makes no assumptions about the shape of the distributions of the variables or the sampling distribution of the statistic” (Preacher & Hayes, 2004, pp. 721-722). Bootstrapping is accomplished by taking a large number of samples from the original data (with replacement) and computing the effect in each sample. Confidence intervals can then be computed as a test of statistical significance. This bootstrapping method was used to test the indirect effects in the mediation tests in the current study.

The present study will present effect sizes and tests of statistical significance for  $a$ ,  $b$ ,  $c$ ,  $c'$ , and  $a \times b$  in each of the tests of mediation. Unstandardized effect sizes will be presented in the text. Additionally, figures representing each of the mediational relationships will be provided. Standardized effect sizes will be provided in these figures. As with the previous analyses in this study, gender will be included in each of the analyses as a control variable.

### **Service Use as a Mediator Between Gender and Self-reported Health at T2**

No significant direct effect was found between gender and self-reported health at T2,  $b = 0.05$ ,  $t(855) = 1.19$ ,  $SE = 0.04$ ,  $p = 0.223$ . A significant direct effect was found between gender and service use,  $b = 0.63$ ,  $\chi^2(860) = 9.88$ ,  $SE = 0.17$ ,  $p = 0.002$ . Service Use was found to be a significant predictor of self-reported health at T2,  $b = 0.12$ ,  $t(853) = 2.56$ ,  $SE = 0.05$ ,  $p = 0.011$ . Gender was not found to be a significant predictor of self-reported health at T2 when the effect of service use was controlled,  $b = 0.03$ ,  $t(854) =$



0.77,  $SE = 0.04$ ,  $p = 0.440$ . The indirect effect of gender on self-reported health at T2 through service use was found to be significant,  $z = 0.04$ ,  $SE = 0.02$ ,  $p = 0.017$  [95% CI, 0.01; 0.08]. Because no significant direct effect was found between gender and self-reported health at T2, these results indicate that service use is not a mediator in that relationship (Figure 3).

### **Service Use as a Mediator Between Gender and Psychological Distress at T2**

A significant direct effect was found between gender and psychological distress at T2,  $b = -1.24$ ,  $t(837) = -3.94$ ,  $SE = 0.32$ ,  $p = 0.001$ . A significant direct effect was also found between gender and service use,  $b = 0.63$ ,  $\chi^2(860) = 9.88$ ,  $SE = 0.17$ ,  $p = 0.002$ . Service use was found to be a significant predictor of psychological distress at T2,  $b = -1.51$ ,  $t(835) = -4.14$ ,  $SE = 0.37$ ,  $p < 0.001$ . Gender was found to be a significant predictor of psychological distress at T2 when the effect of service use was controlled,  $b = -1.04$ ,  $t(836) = -0.11$ ,  $SE = 0.31$ ,  $p = 0.001$ . The indirect effect of gender on psychological distress at T2 through service use was found to be significant,  $z = -0.44$ ,  $SE = 0.16$ ,  $p = 0.006$  [95% CI, -0.82; -0.01]. These results indicate that service use is a mediator in the relationship between gender and psychological distress at T2 (Figure 4).

### **Service Use as a Mediator Between Prior Trauma and Self-reported Health at T2**

The direct effect between prior exposure to traumatic events and self-reported health at T2 was found to be significant,  $b = 0.04$ ,  $t(854) = 10.63$ ,  $SE = 0.00$ ,  $p < 0.001$ . A significant direct effect was found between prior exposure to traumatic events and service use,  $b = 0.09$ ,  $\chi^2(1, 860) = 22.15$ ,  $SE = 0.02$ ,  $p < 0.001$ . Service use was found to be a significant predictor of self-reported health at T2,  $b = 0.12$ ,  $t(853) = 2.56$ ,  $SE = 0.05$ ,  $p = 0.011$ . Prior exposure to traumatic events was found to be a significant predictor of self-

reported health at T2 when the effect of service use was controlled,  $b = 0.04$ ,  $t(853) = 10.12$ ,  $SE = 0.00$ ,  $p < 0.001$ . The indirect effect of prior exposure to traumatic events on self-reported health at T2 through service use was found to be significant,  $z = 0.00$ ,  $SE = 0.00$ ,  $p = 0.036$  [95%CI, 0.00; 0.01]. These results indicate that service use is a mediator in the relationship between prior exposure to traumatic events and self-reported health at T2 (Figure 5).

### **Service Use as a Mediator Between Prior Trauma and Psychological Distress at T2**

The direct effect between prior exposure to traumatic events and psychological distress at T2 was found to be significant,  $b = -0.24$ ,  $t(836) = -7.67$ ,  $SE = 0.03$ ,  $p < 0.001$ . A significant direct effect was found between prior exposure to traumatic events and service use,  $b = 0.09$ ,  $\chi^2(1, 860) = 22.15$ ,  $SE = 0.02$ ,  $p < 0.001$ . Service use was found to be a significant predictor of psychological distress at T2,  $b = -1.51$ ,  $t(835) = -4.14$ ,  $SE = 0.37$ ,  $p < 0.001$ . Prior exposure to traumatic events was found to be a significant predictor of psychological distress at T2 when the effect of service use was controlled,  $b = -0.22$ ,  $t(835) = -6.98$ ,  $SE = 0.03$ ,  $p < 0.001$ . The indirect effect of prior exposure to traumatic events on psychological distress at T2 through service use was found to be significant,  $z = -0.05$ ,  $SE = 0.02$ ,  $p = 0.002$  [95%CI, -0.09; -0.24]. These results indicate that service use is a mediator in the relationship between prior exposure to traumatic events and psychological distress at T2 (Figure 6).

### **Service Use as a Mediator Between Pre-event Functioning and Self-reported Health at T2**

The direct effect between pre-event functioning and self-reported health at T2 was found to be significant,  $b = 0.06$ ,  $t(854) = 3.57$ ,  $SE = 0.02$ ,  $p < 0.001$ . A significant direct effect was found between pre-event functioning and service use,  $b = 0.18$ ,  $\chi^2(1, 860) = 7.87$ ,  $SE = 0.06$ ,  $p = 0.005$ . Service use was found to be a significant predictor of self-reported health at T2,  $b = 0.12$ ,  $t(853) = 2.56$ ,  $SE = 0.05$ ,  $p = 0.011$ . Pre-event functioning was found to be a significant predictor of self-reported health at T2 when the effect of service use was controlled,  $b = 0.05$ ,  $t(853) = 3.10$ ,  $SE = 0.02$ ,  $p = 0.002$ . The indirect effect of pre-event functioning on self-reported health at T2 through service use was found to be significant,  $z = 2.45$ ,  $SE = 0.01$ ,  $p = 0.014$  [95%CI, 0.01; 0.03]. These results indicate that service use is a mediator in the relationship between pre-event functioning and self-reported health at T2 (Figure 7).

### **Service Use as a Mediator Between Pre-event Functioning and Psychological Distress at T2**

The direct effect between pre-event functioning and psychological distress at T2 was found to be significant,  $b = -0.53$ ,  $t(836) = -4.60$ ,  $SE = 0.12$ ,  $p < 0.001$ . A significant direct effect was found between pre-event functioning and service use,  $b = 0.18$ ,  $\chi^2(1, 860) = 7.87$ ,  $SE = 0.06$ ,  $p = 0.005$ . Service use was found to be a significant predictor of psychological distress at T2,  $b = -1.51$ ,  $t(835) = -4.14$ ,  $SE = 0.37$ ,  $p < 0.001$ . Pre-event functioning was found to be a significant predictor of psychological distress at T2 when the effect of service use was controlled,  $b = -0.36$ ,  $t(835) = -0.46$ ,  $SE = 0.12$ ,  $p < 0.001$ . The indirect effect of pre-event functioning on psychological distress at T2 through

service use was found to be significant,  $z = -2.87$ ,  $SE = 0.05$ ,  $p = 0.004$  [95%CI, -0.27; -0.66]. These results indicate that service use is a mediator in the relationship between pre-event functioning and psychological distress at T2 (Figure 8).

### **Service Use as a Mediator Between Social Support and Self-reported Health at T2**

A significant direct effect between social support and self-reported health at T2 was found,  $b = 0.05$ ,  $t(851) = -4.77$ ,  $SE = 0.01$ ,  $p < 0.001$ . Additionally, the direct effect between social support and service use was found to be significant,  $b = 0.93$ ,  $\chi^2(1, 856) = 4.05$ ,  $SE = 0.05$ ,  $p = 0.044$ . Service use was found to be a significant predictor of self-reported health at T2,  $b = 0.12$ ,  $t(853) = 2.56$ ,  $SE = 0.05$ ,  $p = 0.011$ . Social support was found to be a significant predictor of self-reported health at T2 when the effect of service use was controlled,  $b = 0.05$ ,  $t(850) = 4.54$ ,  $SE = 0.01$ ,  $p < 0.001$ . The indirect effect of social support on self-reported health at T2 through service use was found to be insignificant,  $z = 1.58$ ,  $SE = 0.00$ ,  $p = 0.114$  [95%CI, 0.00; 0.01]. These results indicate that service use is not a mediator in the relationship between social support and self-reported health at T2 (Figure 9).

### **Service Use as a Mediator Between Social Support and Psychological Distress at T2**

The direct effect between social support and psychological distress at T2 was found to be significant,  $b = -0.385$ ,  $t(834) = -4.75$ ,  $SE = 0.08$ ,  $p < 0.001$ . Additionally, the direct effect between social support and service use was found to be significant,  $b = 0.93$ ,  $\chi^2(1, 856) = 4.05$ ,  $SE = 0.05$ ,  $p = 0.044$ . Service use was found to be a significant predictor of psychological distress at T2,  $b = -1.51$ ,  $t(835) = -4.14$ ,  $SE = 0.37$ ,  $p < 0.001$ . Social support was found to be a significant predictor of psychological distress at T2 when the effect of service use was controlled,  $b = -0.36$ ,  $t(833) = -4.46$ ,  $SE = 0.08$ ,  $p <$

0.001. The indirect effect of social support on psychological distress at T2 through service use was found to be insignificant,  $z = -1.67$  SE = 0.03,  $p = 0.096$  [95%CI, -0.11; 0.00]. Because this indirect effect was found to be insignificant, these results indicate that service use is not a mediator in the relationship between social support and psychological distress at T2 (Figure 10).

### **Service Use as a Mediator Between Psychological Distress at T1 and Self-reported Health at T2**

A significant direct effect between psychological distress and self-reported health at T2 was found,  $b = 0.05$ ,  $t(851) = 4.77$ , SE = 0.01,  $p < 0.001$ . The direct effect between psychological distress at T1 and service use was found to be significant,  $b = -0.08$ ,  $\chi^2(1, 857) = 18.17$ , SE = 0.02,  $p < 0.001$ . Service use was found to be a significant predictor of self-reported health at T2,  $b = 0.12$ ,  $t(853) = 2.56$ , SE = 0.05,  $p = 0.011$ . Psychological distress was found to be a significant predictor of self-reported health at T2 when the effect of service use was controlled,  $b = -0.03$ ,  $t(853) = -5.40$ , SE = 0.01,  $p < 0.001$ . The indirect effect of psychological distress at T1 on self-reported health at T2 through service use was found to be significant,  $z = -2.54$  SE = 0.00,  $p = 0.011$  [95%CI, -0.01; 0.00]. These results indicate that service use is a mediator in the relationship between psychological distress at T1 and self-reported health at T2 (Figure 11).

### **Service Use as a Mediator Between Psychological Distress at T1 and Psychological Distress at T2**

The direct effect between psychological distress at T1 and psychological distress at T2 was found to be significant,  $b = -0.39$ ,  $t(834) = -4.75$ , SE = 0.08,  $p < 0.001$ . The direct effect between psychological distress at T1 and service use was found to be

significant,  $b = -0.08$ ,  $\chi^2(1, 857) = 18.17$ ,  $SE = 0.02$ ,  $p < 0.001$ . Service use was found to be a significant predictor of psychological distress at T2,  $b = -1.51$ ,  $t(835) = -4.14$ ,  $SE = 0.37$ ,  $p < 0.001$ . Psychological distress at T1 was found to be a significant predictor of psychological distress at T2 when the effect of service use was controlled,  $b = 0.21$ ,  $t(835) = 3.01$ ,  $SE = 0.02$ ,  $p < 0.001$ . The indirect effect of psychological distress at T1 on psychological distress at T2 through service use was found to be significant,  $z = 2.97$ ,  $SE = 0.02$ ,  $p = 0.003$  [95%CI, 0.02; 0.09]. These results indicate that service use is a mediator in the relationship between psychological distress at T1 and psychological distress at T2 (Figure 12).

### **Service Use as a Mediator Between Posttraumatic Stress at T1 and Self-reported Health at T2**

A significant direct effect was between posttraumatic stress at T1 and self-reported health at T2,  $b = -0.01$ ,  $t(854) = -4.92$ ,  $SE = 0.00$ ,  $p < 0.001$ . The direct effect between posttraumatic stress at T1 and service use was found to be significant,  $b = 0.05$ ,  $\chi^2(1, 860) = 28.31$ ,  $SE = 0.01$ ,  $p < 0.001$ . Service use was found to be a significant predictor of self-reported health at T2,  $b = 0.12$ ,  $t(853) = 2.56$ ,  $SE = 0.05$ ,  $p = 0.011$ . Posttraumatic stress at T1 was found to be a significant predictor of self-reported health at T2 when the effect of service use was controlled,  $b = -0.01$ ,  $t(853) = -4.26$ ,  $SE = 0.00$ ,  $p < 0.001$ . The indirect effect of posttraumatic stress at T1 on self-reported health at T2 through service use was found to be significant,  $z = -2.61$ ,  $SE = 0.00$ ,  $p = 0.009$  [95%CI, -0.01; 0.00]. These results indicate that service use is a mediator in the relationship between posttraumatic distress at T1 and self-reported health at T2 (Figure 13).

## **Service Use as a Mediator Between Posttraumatic Stress at T1 and Psychological Distress at T2**

The direct effect between posttraumatic stress at T1 and psychological distress at T2 was found to be significant,  $b = 0.22$ ,  $t(836) = 12.14$ ,  $SE = 0.02$ ,  $p < 0.001$ . The direct effect between posttraumatic stress at T1 and service use was found to be significant,  $b = 0.05$ ,  $\chi^2(1, 860) = 28.31$ ,  $SE = 0.01$ ,  $p < 0.001$ . Service use was found to be a significant predictor of psychological distress at T2,  $b = -1.51$ ,  $t(835) = -4.14$ ,  $SE = 0.37$ ,  $p < 0.001$ . Posttraumatic stress at T1 was found to be a significant predictor of psychological distress at T2 when the effect of service use was controlled,  $b = 0.21$ ,  $t(835) = 11.28$ ,  $SE = 0.02$ ,  $p < 0.001$ . The indirect effect of posttraumatic stress at T1 on psychological distress at T2 through service use was found to be significant,  $z = 2.81$ ,  $SE = 0.01$ ,  $p = 0.005$  [95%CI, 0.01; 0.04]. These results indicate that service use is a mediator in the relationship between posttraumatic stress at T1 and psychological distress at T2 (Figure 14).

## **Discussion**

The purpose of the current study was to examine factors that predicted help-seeking behavior following the shootings that took place on April 16<sup>th</sup>, 2007 at Virginia Tech. Using Andersen's Behavioral Model of Healthcare Use (Andersen, 1968) as a guide, several characteristics representing predisposing, enabling, and need factors were examined as possible predictors of help-seeking behavior. The study also examined the utility of help-seeking as a predictor of several outcomes, including posttraumatic stress, psychological distress, self-reported health, and self-reported change in health. It was hypothesized that Caucasian race, female gender, prior exposure to trauma, pre-event

functioning, social support, access to healthcare, posttraumatic stress, and psychological distress would predict higher rates of help-seeking behavior. It was hypothesized that help-seeking behavior following the tragedy would be predictive of lower posttraumatic stress and psychological distress, and more positive self-reported health and change in self-reported health.

The result of this study showed some support for the use of the Andersen model in understanding help-seeking and service use following tragedies such as the shootings at Virginia Tech. However, the results were not wholly consistent with previous research in this area. As hypothesized, gender, social support, posttraumatic stress, psychological distress, prior exposure to traumatic events, and pre-event functioning were found to be significant predictors of help-seeking. However, race and access to health insurance were not found to be significant predictors of help-seeking.

The results were also mixed with regards to help-seeking as a predictor of outcome. Help-seeking was not found to be predictive of posttraumatic stress at T2 or change in self-reported health from T1 to T2. However, help-seeking was found to be predictive of self-reported health and psychological distress.

Finally, the study examined the mediational role that help-seeking may play in the relationships between predictors of help-seeking and outcomes. Help-seeking was examined as a possible mediator in relationships between predictors and outcomes only when the predictors and outcomes had previously been shown to have significant relationships with help-seeking. In the majority of these analyses, help-seeking was found to mediate the relationships between predictor and outcome. However, help-seeking was



not found to mediate the relationship between gender and self-reported health, social support and self-reported health, or social support and psychological distress.

These results are further discussed later in this report. Additionally, implications for the use of the Andersen model in understanding help-seeking following man-made tragedies, as well as with more specific populations, will be examined. Finally, limitations of the current study and suggestions for future research will be discussed.

For the most part, the results of the analyses regarding the prediction of help-seeking behavior were consistent with prior research on the topic. One such result was the finding that gender predicted help-seeking behavior. The results of this study indicated that females were more likely to seek services following the shootings at Virginia Tech than were their male counterparts. Earlier research in this area has found similar results. Gender was, in fact, one of the first of the predisposing factors studied using Andersen's Behavioral Model of Healthcare Use (Andersen, 1968). Female gender has been found to be a predictor of service use following natural disasters (Kohn et al., 2003) as well as following man-made disasters, such as the September 11<sup>th</sup> attack on the World Trade Centers (Boscarino et al., 2003). Interestingly, at least one study involving U.S. veterans has shown the opposite, indicating that male gender was a predictor of service use (Hoff & Rosenheck, 1998). However, another study involving U.S. veterans found results more consistent with the preponderance of evidence in the area, indicating that female gender was predictive of service use (Elhai et al., 2007).

The results of the study also found that social support was a predictor of help-seeking behavior. As hypothesized, it was found that higher levels of social support predicted greater probability of help-seeking. The measure of social support used in this

study took into consideration only an individual's perceived social support. The construct of social support was conceptualized as an enabling factor, per Andersen's model. The result that social support predicted service use is consistent with prior research and theory on the subject (Lam & Rosenheck, 1999; Norris et al., 2008; Sherbourne, 1988). It should be noted, however, that not all previous research has conceptualized social support in the same way. While the current study looked at social support as an enabling factor, some prior research indicates that a lack of social support is directly related to higher rates of psychopathology (Fontana, Rosenheck, & Horvath, 1997). This provides evidence that low social support may be seen as a need factor, rather than an enabling factor.

The results of this study also found need factors to be predictors of help-seeking behavior. The first of these need factors was posttraumatic stress. Posttraumatic stress has been found to be a predictor of service use in the past, for mental health services (Hoge, Auchterlonie, & Milliken, 2006; Switzer, Dew, & Thompson, 1999) as well as medical services (Elhai, North, & Frueh, 2005). There is a key difference between these previous studies and the current research. These previous studies examined differences in service utilization between individuals who had been diagnosed with PTSD versus those who had not been diagnosed with that disorder. The current research examined posttraumatic symptoms as a predictor of service use, rather than the diagnosis of PTSD. The results indicate that posttraumatic stress was predictive of service use. This result has implications for future research and practice. The result implies that level of posttraumatic stress is predictive of service use, even if full criteria for PTSD are not met. This is of practical importance to the allocation of services following tragedies. These results suggest that the use of PTS screening measures may be sufficient in making these

decisions regarding the allocation of resources, even if those screening measures cannot be appropriately used to make PTSD diagnoses.

Psychological distress was also found to be a predictor of service use. Psychological distress has often been examined within the context of need factors within the Andersen model. Prior research has also found psychological distress to be a significant predictor of mental health service use (Deane & Chamberlain, 1994) as well as use of medical services (Manning & Wells, 1992). The results of the current study are consistent with the results of this previous research. These results suggest that psychological distress is an important need factor that must be understood in order to predict service use.

The results of this study showed interesting findings with regard to vulnerabilities as predictors of service use. The findings are consistent with previous research in the area (Boscarino, Adams, & Figley, 2004; Elhai, North, & Frueh, 2005). Both prior exposure to traumatic events and pre-event functioning were found to be predictors of service use. The results showed that, as hypothesized, prior exposure to traumatic events resulted in a high likelihood of service use. However, the results of the analysis regarding pre-event functioning did not support the hypothesis. It was hypothesized that lower levels of pre-event functioning would be predictive of high probability of service use. However, the opposite result was found, that higher levels of pre-event functioning predicted higher probability of service use. This result indicates that pre-event functioning appears to work as an enabling factor. This may be because the individual is more able to focus on the current problem (needs based on the present event) when she has less negative complications to begin with. This finding could also be related to the finding that social

support was predictive of service use. The measure used to assess pre-event functioning in this study included items related to social support. It is therefore likely that the participants' perceived social support influenced their ratings on the pre-event functioning measure.

Perhaps of greater interest are the results of these analyses that are inconsistent with prior research. One such result was the finding that race did not predict service use. A wide range of psychological research has found that race is a predictor of service use in many areas, and that several minority groups are less likely to use services for treatment of psychological problems (Cauce et al., 2002; Padget et al., 1994) as well as medical problems (Adamson et al., 2003; Newacheck, Hughes, & Stoddard, 1996; Weinick, Zuvekas, & Cohen, 2000).

Some researchers have conceptualized race as a proxy variable for characteristics such as socioeconomic status or social class (Williams, 1996; Kawachi, Daniels & Robinson, 2005). The differences among races with regards to seeking services may be more accurately attributed to these other characteristics. In understanding the results of the current study, it is important to consider that the population from which the study's participants were recruited is not representative of the population in general. This population consisted of individuals who were, at the time, attending a public university. The majority of the participants were students at the time of the shootings. Virginia Tech is a relatively expensive school to attend, and it stands to reason that many individuals who are attending the school are from socioeconomic backgrounds above the average in the nation.

Because the study participants were drawn from a more narrow subset of the general population, those attending or working at a university, the population from which the participants were recruited is likely more homogenous than the general population. This means that the differences between races in many areas, such as socioeconomic status and education, are likely to be less pronounced than in the general population. This homogeneity may account for the lack of difference in service use between members of various races.

Also contrary to hypothesis, the results of the current study indicate that access to health insurance that covers mental health treatment was not a predictor of help-seeking behavior. This finding is also inconsistent with previous research in the area, which has shown that access to health insurance increases the rate of service use (Hadley, 2003). Access to health insurance is a characteristic that has been conceptualized as a predisposing factor that is more related to characteristics of the individual's family of origin (Aday & Andersen, 1974; Newacheck, Hughes, & Stoddard, 1996). This is particularly true when the individuals in question are children or adolescents, and children and adolescents have been the focus of much of the prior research involving access to healthcare (Newacheck, Stoddard, Hughes, Pearl, 1998). Although the participants in the current study were typically older than the age range of children or adolescents, the results of these earlier studies are likely applicable to them, because many college age individuals are still carried on their parents' insurance policies. As a result, characteristics of family of origin likely play an important role in their access to health insurance.

Access to health insurance, or rather, the lack of access to health insurance, has most often been studied as a barrier to treatment in the past. This is likely true for a number of reasons. Individuals who lack insurance may have difficulty finding, securing, and paying for medical as well as mental health services. In order to understand why a lack of health insurance may not have interfered with participants' ability to seek and utilize services in the current study, a discussion of the services available to this population following the shootings is warranted. First, due to the population's affiliation with Virginia Tech, almost all of these individuals would have had access to both medical and mental health treatment at the Schiffert Student Health Center and Cook Counseling Center, both located on the Virginia Tech campus. A second possible explanation involves the response of the community to this tragedy. Following the shootings, counselors from the American Red Cross, Cook Counseling Center, the Clinical Psychology department at Virginia Tech, and other community agencies provided services to students and families in the wake of the shootings free of charge. This unusual availability of resources may have impacted participants' help-seeking behavior in two ways. First, the availability of resources that were done on a pro bono basis may have allowed individuals to seek treatment who otherwise may not have done so due to an inability to pay. Second, the high visibility of community services may have allowed individuals to overcome the initial difficulties they may have otherwise had in finding treatment without health insurance to cover such treatment.

When all of the predictor variables were examined in a single model, only prior traumatic experiences and posttraumatic stress at T1 were found to be significant predictors of service use. Prior traumatic experiences and posttraumatic stress at T1 were

found to be significant predictors of any service use, mental health service use, and general medical service use. Only posttraumatic stress at T1 was found to be a significant predictor of non-healthcare service use. While these results do not discount the results of the analyses involving individual hypotheses, the results may have implications regarding the relative importance of the variables to the prediction of help-seeking following this tragedy.

The findings of the analyses involving help-seeking behavior as a predictor of outcomes at T2 supported some of the hypotheses, but not others. As hypothesized, help-seeking behavior was found to be a significant predictor of both psychological distress at T2 and self-reported health at T2. However, help-seeking was not found to predict change in self-reported health between T1 and T2 or posttraumatic stress at T2. Although help-seeking was found to predict self-reported health and psychological distress at T2, the variance accounted for by these variables was extremely small. Because of the small amount of variance explained in these analyses, the clinical significance of these results is limited.

The finding that help-seeking was not a predictor of posttraumatic stress at T2 is interesting, particularly since help-seeking was found to be a predictor of psychological distress at T2. This difference in outcome may be explained by treatment modalities used in services. While the current study examined use of services in four different areas (any, mental health, general medical, and non-healthcare), the specific modalities used in any of these services was not specified. This information may be important, as it is known that symptoms of posttraumatic stress are more effectively treated with specific modalities, such as behavioral or cognitive behavioral therapies with a component of

exposure (Sherman, 1998; Foa, Keane, & Friedman, 2000). Because the present study did not examine specific treatment modalities, it is impossible to determine if those who sought services for posttraumatic stress symptoms received treatment that would have been effective for those symptoms.

Many studies have looked at various treatments following a traumatic experience and the effect of treatment on outcomes (Foa et al., 2009). The present study differs from these previous studies in that specific treatment effects were not examined. Rather, the current study examined service use as a mediator between predisposing, enabling, and need factors and outcomes at T2. Specifically, the mediation analyses in the study included gender, social support at T1, posttraumatic stress at T1, psychological distress at T1, prior exposure to traumatic experiences, and pre-event functioning as predictors. Two outcomes were examined, self-reported health at T2 and psychological distress at T2.

With three notable exceptions, the results of these analyses provided evidence that service use played a mediating role the relationships between predictors and outcomes. Service use was not found to be a mediator in the relationship between gender and self-reported health, in the relationship between social support and self-reported health, or in the relationship between social support and psychological distress. In order to fully understand these results, one must look at the criteria for mediation put forth by Preacher & Hayes (2004), which was used in this study. This criteria includes two conditions that must be met: first, that there be a direct effect between the predictor and the outcome and, second, that a significant indirect effect be shown.

Service use was not shown to be a mediator in the relationship between gender and self-reported health because the first criterion, direct effect between predictor and



outcome, was not met. Previous research has shown that health disparities between males and females in the age range of the average participant in this study are insignificant (Macintyre, Hunt, & Sweeting, 1996). It is therefore unsurprising that gender would not be a predictor of self-reported health. Additionally, it must be understood that the outcome measured in this analysis is a reflection of an individual's perception of their own health, which is not necessarily an accurate representation of actual health.

In contrast, service use was not shown to be a mediator in the relationship between social support and psychological distress or in the relationship between social support and self-reported health because the second criterion, significant indirect effect between predictor and outcome, was not met. Interestingly, significant direct effects were found in which social support was found to predict psychological distress and self-reported health. This finding is consistent with prior research on the topic, which has found that social support is predictive of more positive mental health and health outcomes (Berkman, 1984; Williams, Ware, and Donald, 1981). However, the results indicate that service use does not play an important role in those relationships.

### **Implications**

The results of the current study present important implications for Andersen's Behavioral Model of Healthcare Use. This study found considerable support for the utility of Andersen's model in predicting service use from predisposing, enabling, and need factors. However, several differences exist between variables in these categories that were found to be significant predictors in the current study and variables that were found to be significant in previous studies. The results of previous studies that have used Andersen's model as a framework for understanding predictors of service use have also

found contradictory evidence in the past.

This body of inconsistent findings is not surprising, given the nature of Andersen's model. Andersen's model provided general categories as predictors of service, rather than specific constructs. This presents difficulty for researchers and service providers in determining specific characteristics by which service use can be predicted. However, the general nature of the model also allows flexibility in the model, and allows the model to be tailored to include specific predictors within the three factors that may be of interest to researchers. This allows Andersen's model to be used as a guideline when designing research programs to examine service use predictors.

Although the flexibility in the model may offer some benefits, the non-specific nature of the factors in the model poses problems for researchers and service providers. This has implications for the utility of the model. One of the purposes for which Andersen's Behavioral Model of Healthcare Use was developed was to identify those who are most likely to use services so that those services can be provided in an efficient and equitable way. This would require that more specific variables be included in the model. However, since different studies in this area have found varying, and sometimes contradictory, results regarding significant predictors, it is difficult to state with certainty which variables would be included in a more specific version of the model.

In order to address the original purpose of Andersen's Behavioral Model of Healthcare Use, more specific models will need to be developed and tested. Andersen's model may be most effectively used as a broader framework on which to base further research into specific predictors of service use. As more information is gathered, Andersen's model can be used to develop more specific and accurate models. The results

of past research suggest that these specific predictors will vary by population characteristics. Additionally, the predictors may vary based on current use. For instance, a model predicting use of all services following a large-scale traumatic event, such as the shootings at Virginia tech, may be different from a model predicting general medical service use in normal circumstances.

### **Recommendations for Future Research**

It will likely be productive for future research to address the issue of treatment modalities in service use. This will likely need to be done in much more targeted and specific studies, given the wide range of treatment options in medical, psychological, and other possible services. A more targeted study of treatment modalities may find important differences in outcomes when empirically-supported treatments are applied to the specific needs of the population. Important differences in service use as a predictor of outcomes may be revealed through such studies. For instance, the finding in the present study that service use did not predict lower posttraumatic stress may not be replicated when treatment modalities that have been shown to be most effective in reducing posttraumatic stress symptoms are specifically studied.

Another area on which future research may focus is in examining barriers to treatment in addition to the predisposing, enabling, and need factors as predictors of service use. Barriers to treatment are factors that inhibit an individual's ability or predilection to seek treatment. In some case, barriers may be thought of as a negative version of or a lack of enabling factors. For instance, while social support has been shown to act as an enabling factor for service use, a lack of social support may be thought of as a barrier. However, not all barriers represent this kind of relationship to enabling

factors and may be conceptually and practically important in and of themselves. For example, a report published by Kim and colleagues (2010) indicated that career implications, stigma, and lack of knowledge regarding available mental health treatments may prevent individuals from seeking treatment following combat-related trauma. The addition of barriers to the model may add additional utility in the ability to predict service use in individuals.

Finally, future research may also be warranted to further examine the more complete model that Andersen has most recently produced (see Figure 1). To date, the majority of research examining Andersen's Behavioral Model of Healthcare Use has focused on the predictors of service use using the three factors outlined in that model. The current study expanded on that research and examined service use as a predictor of outcomes as well as mediators in the relationships between predictors of service use and outcomes. Future research should expand on this and examine other outcomes relevant to study populations. A second component of Andersen's model that has received little research focus is the theorized path by which treatment outcomes impact the predisposing, enabling, and need factors in the model. Future research may address this component. Given the nature of this component, more long-term, longitudinal studies should be conducted to study its effect.

### **Limitations**

One of the limitations of this study involves the concept of causality, which has implications for the kinds of conclusions that can be drawn from the results. In scientific study, a true experimental design is generally considered to be necessary to show causation. Several conditions must be met for research to qualify as a true experimental

design. First, participants must be randomly selected from the population, meaning that no systematic factors contributed to participant selection, which could possibly act as confounding variables. Second, participants must be randomly assigned to groups within the study, again to minimize the effect of confounds on the results. Finally, the study design must include an experimental manipulation. The methodology in the present study did not utilize an experimental design. As such, the results should not be interpreted as demonstration of true causality.

The use of mediational analyses in this study presents a further issue regarding causality. Mediational analyses are, by their very nature, causal (Bolger & Stine, 2004). However, when used to analyze non-experimental data, as done in the present study, even the causal relationships implied by the mediational analyses are suspect. Bolger and Stine stated that, when used in such a way, the causal relationships implied by these analyses are “suggestive, rather than definitive.”

A second limitation of the study deals with the issue of attrition from T1 to T2. Approximately 18.5% of participants who completed the T1 surveys completed the T2 survey. Attrition poses two problems for researchers. The first of these problems is the possibility of a bias in the final participant sample. This is because non-random factors may play a role in determining whether a participant will complete the study. The second problem associated with attrition is simply a lack of data on the full population.

Earlier research has shown that bias may become a concern in research studies when the attrition rate is higher than 20% (Polit & Hungler, 1995). In the current study, a gender bias was found in determining completion of the study. Specifically, females were found to be more likely to complete the T2 survey after having participated in the T1

survey. This bias was somewhat ameliorated in the analyses by controlling for the effects of gender.

The second problem associated with attrition is the lack of information. One of the methods for dealing with the lack of data brought about by attrition is imputation of missing values. However, this method was deemed inappropriate, as over 80% of the data for the T2 survey was missing. As such, the imputed values would likely have been grossly inaccurate. Rather than using an imputation approach, the data in the current study was analyzed using a listwise deletion. This resulted in participants' data being used only if they had completed both the T1 and T2 survey. This allowed the data to be analyzed in a meaningful and accurate way, albeit with a smaller sample size.

Fortunately, the sample size used in this study was still sufficiently large to appropriately run the planned analyses.

Another limitation in this study involves the retrospective nature of many of the variables studied. Many of the items on the surveys, including both the initial and follow-up surveys, required that the participants answer questions relating to symptoms and other important characteristics that may have occurred a year or more prior. Because of this, some of this information may be confounded by recall bias.

## **Conclusion**

The present study is important because it applied Andersen's Behavioral Model of Healthcare Use in a population and situation that has been understudied in relation to that model. The results of the present study provided support for using Andersen's model in this context. While race was not found to be predictive of help-seeking, gender, the other demographic factor examined in the study, was found to be an important predictor of

help-seeking behavior. Additionally, the two measures of vulnerability, prior experience of trauma and pre-event functioning, were found to be important predisposing factors in the prediction of help-seeking behavior. Of the two enabling factors examined in this study, social support and access to insurance covering mental health treatment, only social support was found to be predictive of help-seeking. Finally, evidence was found that need factors were useful in the prediction of help-seeking behavior. The two need factors in this study were psychological distress and posttraumatic stress.

Much of the research using Andersen's model has focused on use of general healthcare, use of services in veterans following service-related PTSD, or use of services following mass shootings. The application of this model to college student populations following school shootings is important for two reasons. First, it is known that school shootings produce symptoms of psychological illness, including depression and PTSD (Johnson, North & Smith, 2002; Koopman, et al., 1995; L. Suomalainen et al., 2011). Second, when these shootings take place on a large scale such as the shootings at Virginia Tech, this is likely to produce a level of need in the community that can be overwhelming to service providers.

Building on the previous studies in the area, the present study was able to look at characteristics in a population that, due to some of the factors detailed earlier, may have different needs than the general population or in the populations studied in the earlier studies of the Andersen model. While some of the findings of the current study were consistent with findings in previous studies of the model, the differences found in the predictors of use in this population are enlightening for those seeking to provide services to such a population. This knowledge may help service providers to more effectively

respond to community tragedies such as the tragedy that took place on April 16, 2007 at Virginia Tech.

The use of the Andersen's Behavioral Model of Healthcare Use in the context of school shootings is consistent with recommendations for responding to disasters made by Jones and colleagues (Jones et al., 2012). These recommendations consist of a multi-staged plan. Andersen's Behavioral Model of Healthcare Use may be of use in the second stage of this proposed response plan. This stage consists of four recommended activities: to coordinate existing services, to identify gaps in existing services, to develop new services, and to implement prevention models. By using Andersen's Behavioral Model of Healthcare Use to identify those most likely to use services and the types of services most in demand, these activities can be facilitated.



## References

- Adamson, J. Ben-Shlomo, Y., Nish Chaturvedib, N., & Donovana, J. (2003). Ethnicity, socio-economic position and gender—do they affect reported health—care seeking behaviour? *Social Science and Medicine*, 57(5), 895-904.
- Aday, L.A. & Andersen, R. (1974). A Framework for the Study of Access to Medical Care. *Health Services Research*, 9(3), 208–220.
- Andersen, R.M. (1968). *Behavioral Model of Families' Use of Health Services*. Research Series No. 25. Chicago, IL: Center for Health Administration Studies, University of Chicago.
- Andersen, R.M. (1995). Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health and Social Behavior*, 36 (March), 1-10.
- Anderson, J.G. & Bartkus, D.E. (1973). Choice of medical care: A behavioral model of health and illness behavior. *Journal of Health and Social Behavior*, 14(4), 348-362.
- Berkman, L.F. (1984). Assessing the physical health effects of social networks and social support. *Annual Review of Public Health*, 5, 413-432.
- Boscarino, J.A., Adams, R.E., & Figley, C.R. (2004). Mental health service use 1-year after the World Trade Center disaster: implications for mental health care. *General Hospital Psychiatry*, 26(5), 346-358.
- Cauce, A.M., Domenech-Rodríguez, M., Paradise, M., Cochran, B.N., Shea, J.M., Srebnik, D., & Baydar, N. (2002). Cultural and contextual influences in mental health help seeking: A focus on ethnic minority youth. *Journal of Consulting and Clinical Psychology*, 70(1), 44-55

- Deane, F.P. & Chamberlain, K. (1994). Treatment fearfulness and distress as predictors of professional psychological help-seeking. *British Journal of Guidance and Counseling, 22*(2), 207-217.
- Elhai, J.D., Grubaugh, A.L., Richardson, J.D., Egede, L.E., & Creamer, M. (2008). Outpatient medical and mental healthcare utilization models among military veterans: Results from the 2001 National Survey of Veterans. *Journal of Psychiatric Research, 42*, 858-867.
- Elhai, J.D., North, T.C., & Frueh, B.C. (2005). Health service use predictors among trauma survivors: A critical review. *Psychological Services, 2*(1), 3-19.
- Fallahi, C.R. & Lesik, S.A. (2009). The effects of vicarious exposure to the recent massacre at Virginia Tech. *Psychological Trauma: Theory, Research, Practice, and Policy, 1*(3), 220-230.
- Foa, E.B., Keane, T.M., & Friedman, M.J. (2000). Guidelines for treatment of PTSD. *Journal of Traumatic Stress, 13*(4), 539-588.
- Foa, E.B., Keane, T.M., Friedman, M.J., & Cohen, J.A. (2009). *Effective Treatments for PTSD: Practical Guidelines from the International Society for Traumatic Stress Studies*. New York: Guilford Press.
- Fontana, A., Rosenheck, R., & Horvath, T. (1997). Social support and psychopathology in the war zone. *Journal of Nervous and Mental Disease, 185*(11), 675-681.
- Ford, J.D., Adams, M.L., & Dailey, W.F. (2006). Factors associated with receiving help and risk factors for disaster-related distress after the September 11<sup>th</sup> terrorist incidents. *Social Psychiatry and Psychiatric Epidemiology, 41*, 261-270.

- Franklin, B.J. & McLemore, S.D. (1970). Factors affecting the choice of medical care among university students. *Journal of health and social behavior*, 11(4), 311-319.
- Gore-Felton, C., Gill, M., Koopman, C., & Spiegel, D. (1999). A review of acute stress reactions among victims of violence: Implications for early intervention. *Aggression and Violent Behavior*, 4(3), 293-306.
- Hadley, J. (2003). Sicker and poorer—The consequences of being uninsured: A review of the research on the relationship between health insurance, medical care use, health, work, and income. *Medical Care Research and Review*, 60(2), 3S-75S.
- Hoge, C.W., Auchterlonie, J.L. & Milliken, C.S. (2006). Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. *Journal of the American Medical Association*, 295(9), 1023-1032.
- Hughes, M., Brymer, M., Chui, W.T., Fairbank, J.A., Jones, R.T., Pynoos, R.S., Rothwell, V., Steinberg, A.M., & Kessler, R.C. (2011, July 18). Posttraumatic stress among students after the shootings at Virginia Tech. *Psychological Trauma: Theory, Research, Practice, and Policy*. Advance online publication. Doi:10.1037/a0024565.
- Johnson, S.D., North, C.S., & Smith, E.M. (2002). Psychiatric disorders among victims of a courthouse shooting spree: A three-year follow-up study. *Community Mental Health Journal*, 38(3), 181-194.
- Jones, R.T., Donlon, K., Burns, K.D., Schwartz-Goel, K., & Law, M.K. (2012). Tragedy at Virginia Tech: Recommendations for mental health response to crisis on campus. In C. Mears (Ed.), *Reclaiming school in the aftermath of trauma: Advice*

- based on experience* (pp. 153-173).
- Jordan, K. (2003). A trauma and recovery model for victims and their families after a catastrophic school shooting: Focusing on behavioral, cognitive, and psychological effects and needs. *Brief Treatment and Crisis Intervention, 3*, 397-411.
- Kawachi, I., Daniels, N., & Robinson, D.E. (2005). Health disparities by race and class: Why both matter. *Health Affairs, 24*(2), 343-352.
- Kim, P.Y., Thomas, J.L., Wilk, J.E., Castro, C.A., Hoge, C.W. (2010). Stigma, barriers to care, and use of mental health services among active duty and National Guard soldiers after combat. *Psychiatric Services, 61*(6), 1-10.
- Koopman, C., Classen, C., Cardena, E., & Spiegel, D. (1995). When disaster strikes, acute stress disorder may follow. *Journal of Traumatic Stress, 8*(1), 29-46.
- Lam, J.A. & Rosenheck, R. (1999). Social support and service use among homeless persons with serious mental illness. *International Journal of Social Psychiatry, 45*(1), 13-28.
- Macintyre, S., Hunt, K., & Sweeting, H. (1996). Gender differences in health: Are things really as simple as they seem? *Social Science & Medicine, 42*(4), 617-624.
- Manning, W.G. & Wells, K.B. (1992). The effects of psychological distress and psychological well-being on use of medical services. *Medical Care, 30*(6), 541-553.
- Maruyama, G.M. (1998). *Basics of Structural Equation Modeling*. Thousand Oaks: Sage Publications, Inc.
- Mechanic, D. (1968). *Medical Sociology*. New York: Free Press.

- Newacheck, P.W., Hughes, D.C., Stoddard, J.J. (1996) Children's access to primary care: Differences by race, income, and insurance status. *Pediatrics*, 97(1), 26-32.
- Newacheck P.W., Stoddard J.J., Hughes D.C., Pearl M. (1998). Health insurance and access to primary care for children. *New England Journal of Medicine*, 338(8), 513-519.
- Fran H. Norris, F.H, Stevens, S.P., Betty Pfefferbaum, B., Wyche, K.F, & Pfefferbaum, R.L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, 41(1-2), 127-150
- North, C.S., Smith, E.M., & Spitznagel, E.L. (1997). One-year follow-up of survivors of a mass shooting. *American Journal of Psychiatry*, 154(12), 1696-1702.
- Polit, D. & Hungler, B. (1995). *Nursing Research: Principles and methods* (5<sup>th</sup> ed.). Philadelphia: Lippincott.
- Padget, D.K., Patrick, C., Bums, B.J., & Schlesinger, H.J. (1994). Ethnicity and the use of outpatient mental health services in a national insured population. *American Journal of Mental Health*, 84, 222-226.
- Preacher, K.J. & Hayes, A.F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers*, 36(4), 717-731.
- Roberts, A.R. (2000). *Crisis intervention handbook: Assessment, treatment and research* (2<sup>nd</sup> ed.). New York: Oxford University Press.
- Rodriguez, J.J. & Kohn, R. (2008). Use of mental health services among disaster survivors. *Current Opinion in Psychiatry*, 21, 370-378.

- Sherbourne, C.D. (1988). The role of social support and life stress events in use of mental health services. *Social Science and Medicine*, 27(12), 1393-1400.
- Sherman, J.J., (1998). Effects of psychotherapeutic treatments for PTSD: A meta-analysis of controlled clinical trials. *Journal of Traumatic Stress*, 11(3), 413-435.
- Shrout, P.E. & Bolger, N. (2002). Mediation in experimental and non-experimental studies: New procedures and recommendations. *Psychological Methods*, 7(4), 422-445.
- Suchman, E.A. (1965). Social patterns of illness and medical care. *Journal of Health and Human Behavior*, 6 (Spring), 2-16.
- Suomalainen, L., Haravuoria, H., Berga, N., Kiviriusua, O., & Marttunena, M. (2011). A controlled follow-up study of adolescents exposed to a school shooting – Psychological consequences after four months. *European Psychiatry*, 26(8), 490-497.
- Switzer, G.E., Dew, M.A., Thompson, K., Goycoolea, J.M., Derricott, T., & Mullins, S.D. (1999). Posttraumatic stress disorder and service utilization among urban mental health center clients. *Journal of Traumatic Stress*, 12(1), 25-39.
- Wang, P.S., Lane, M., Olfson, M., Pincus, H.A., Wells, K.B., & Kessler, R.C. (2005). Twelve-month use of mental health services in the United States. *Archives of General Psychiatry*, 62, 629-640.
- Weinick, R.M., Zuvekas, S.H., Cohen, J.W. (2000). Racial and ethnic differences in access to and use of health care services, 1977 to 1996. *Medical Care Research and Review*, 57(Suppl1), 36-54.

Williams, A.W., Ware, J.E., Donald, C.A. (1981). A model of mental health, life events, and social supports applicable to general populations. *Journal of Health and Social Behavior*, 22(4), 224-336.

Williams, D.R. (1996). Race/ethnicity and socioeconomic status: Measurement and methodological issues. *International Journal of Health Services*, 26(3), 483-505

Figure 1. Andersen's Behavioral Model of Health Services Use (Andersen, 1995)

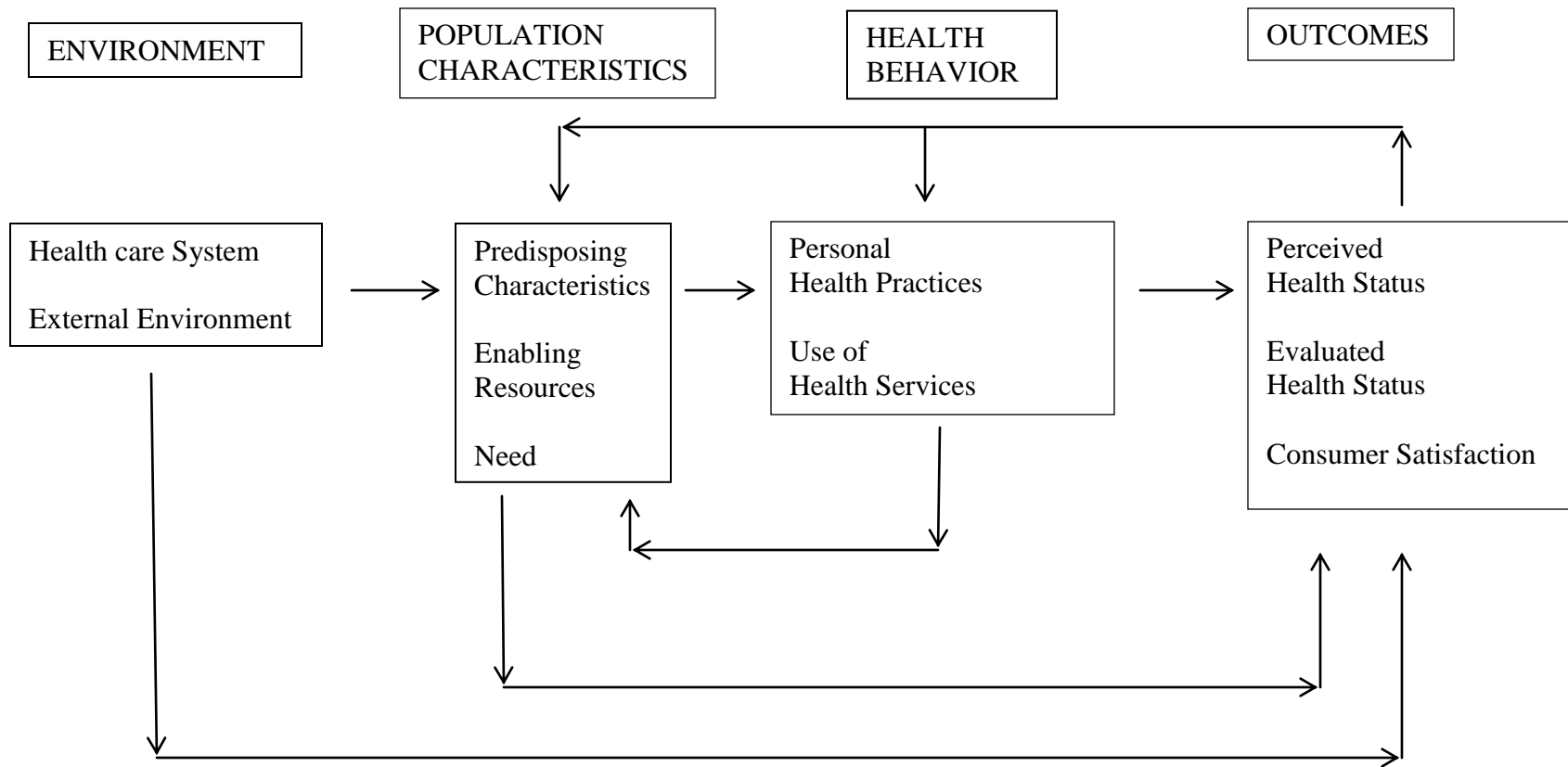




Figure 2. Hypothesized Model for current study

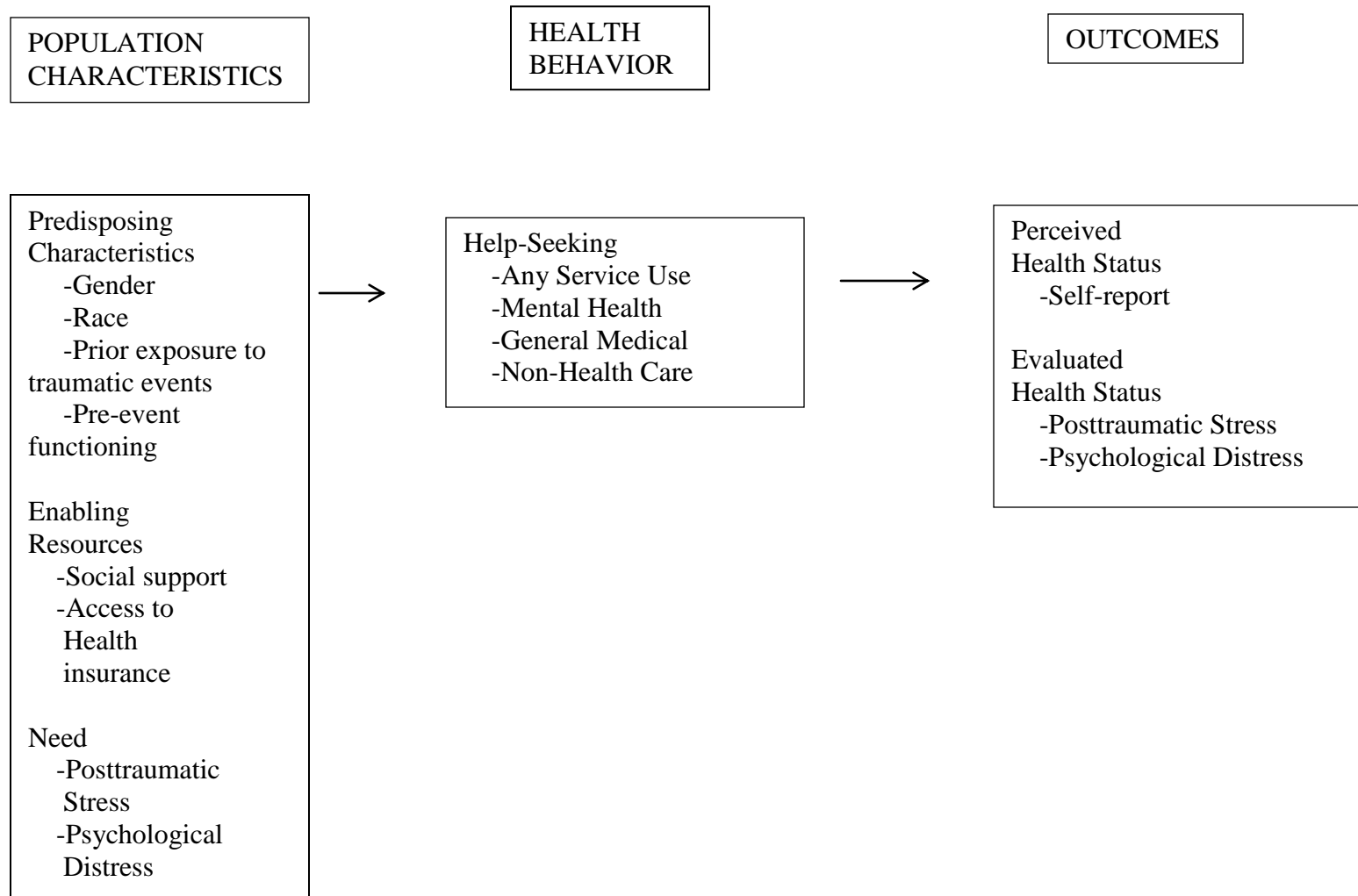
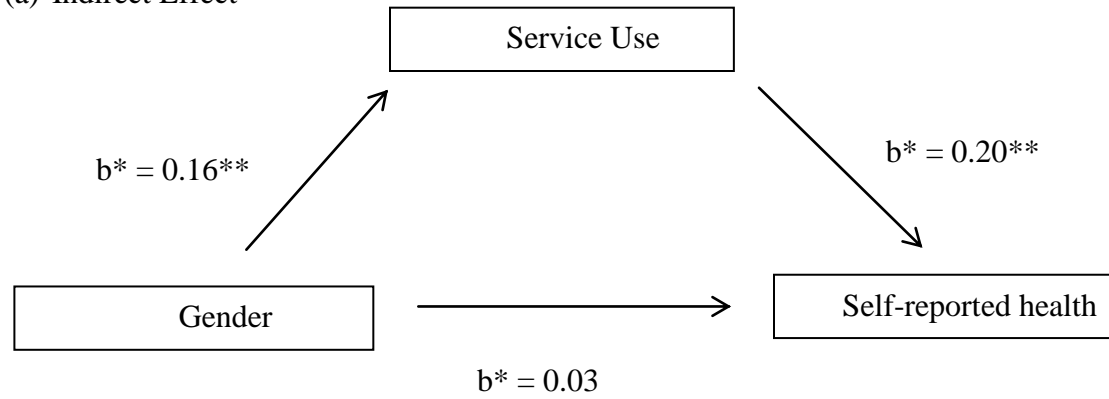
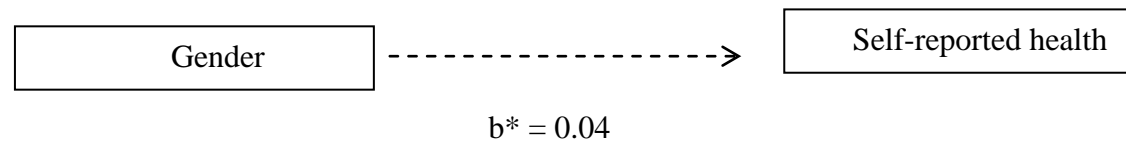


Figure 3. Path models for the indirect (a) and direct (b) effects of gender on self-reported health

(a) Indirect Effect



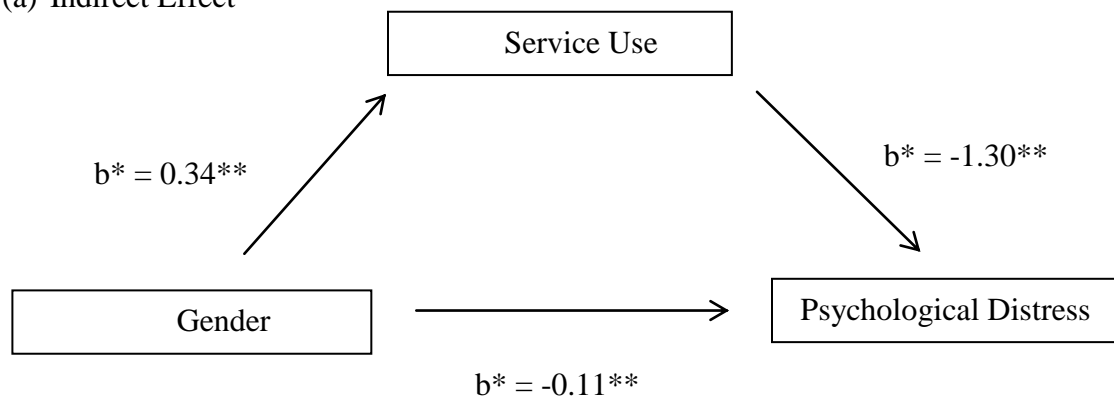
(b) Direct Effect



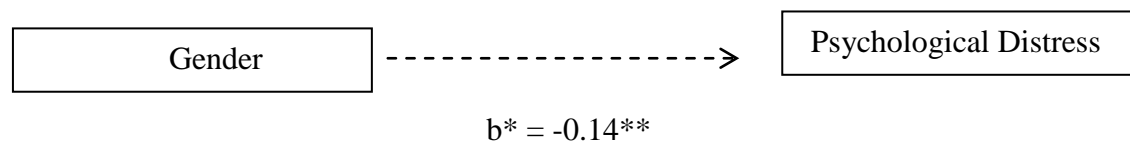
\*\*  $p < 0.05$

Figure 4. Path models for the indirect (a) and direct (b) effects of gender on psychological distress

(a) Indirect Effect



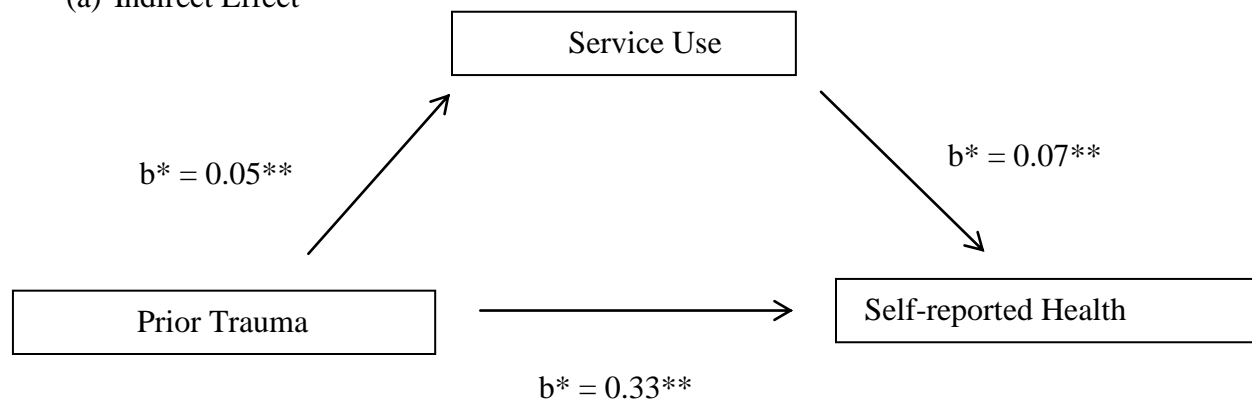
(b) Direct Effect



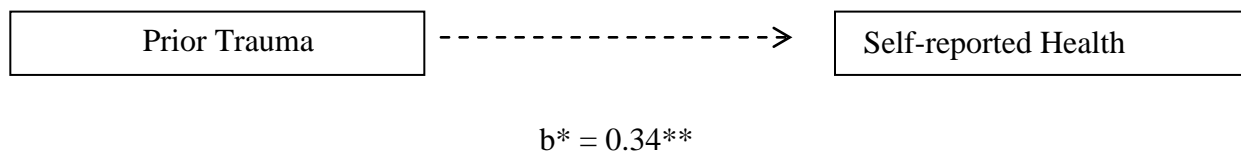
\*\*  $p < 0.05$

Figure 5. Path models for the indirect (a) and direct (b) effects of prior trauma on self-reported health

(a) Indirect Effect



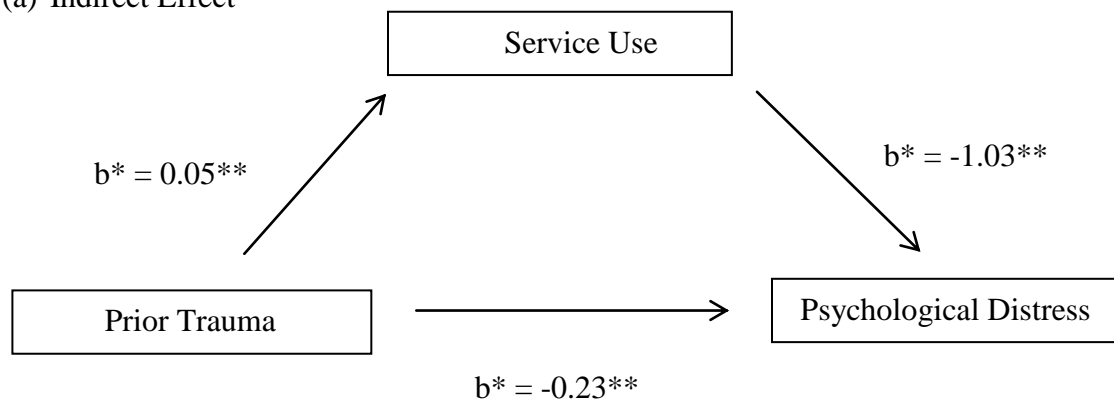
(b) Direct Effect



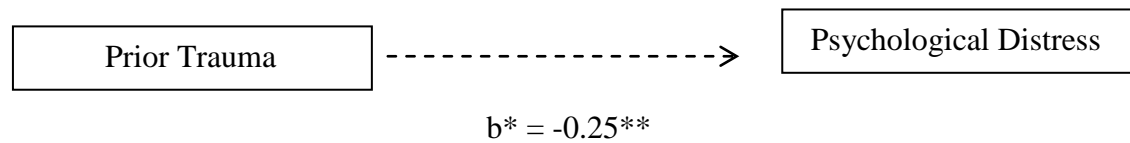
\*\*  $p < 0.05$

Figure 6. Path models for the indirect (a) and direct (b) effects of prior trauma on psychological distress

(a) Indirect Effect



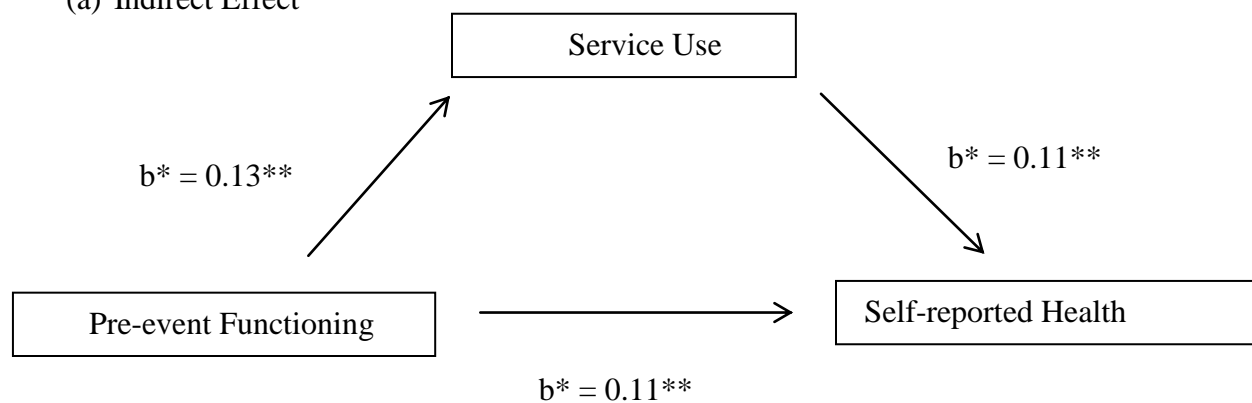
(b) Direct Effect



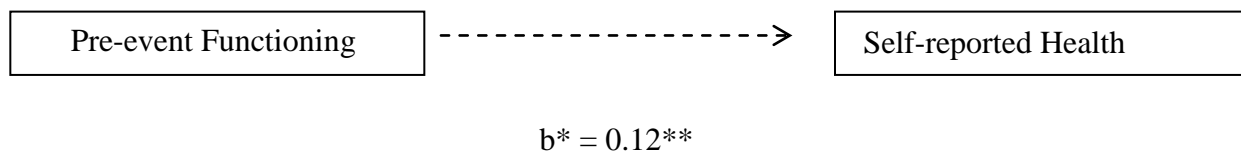
\*\*  $p < 0.05$

Figure 7. Path models for the indirect (a) and direct (b) effects of pre-event functioning on self-reported health

(a) Indirect Effect



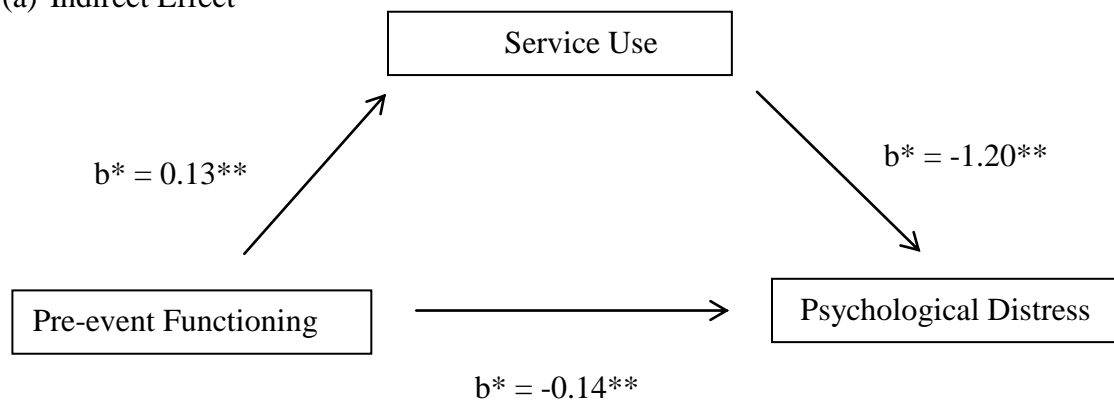
(b) Direct Effect



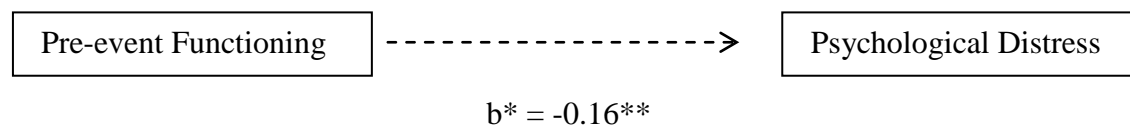
\*\*  $p < 0.05$

Figure 8. Path models for the indirect (a) and direct (b) effects of pre-event functioning on psychological distress

(a) Indirect Effect



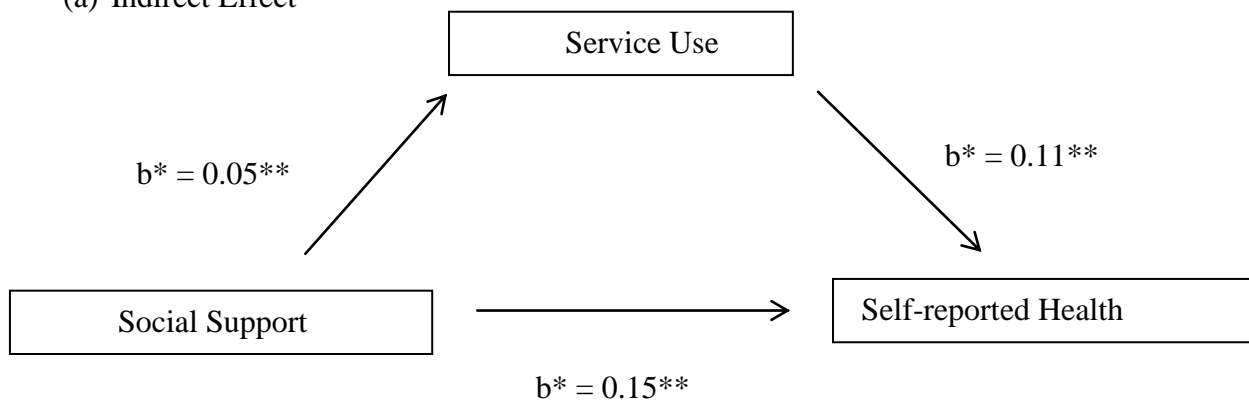
(b) Direct Effect



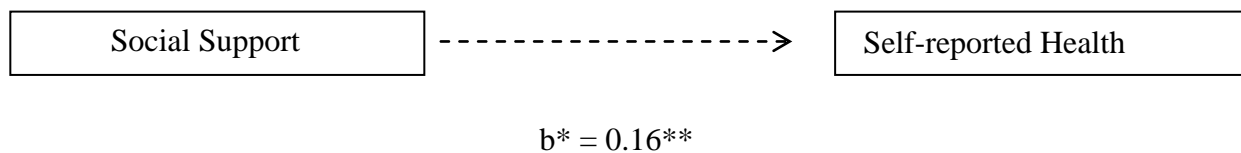
\*\*  $p < 0.05$

Figure 9. Path models for the indirect (a) and direct (b) effects of social support on self-reported health

(a) Indirect Effect



(b) Direct Effect

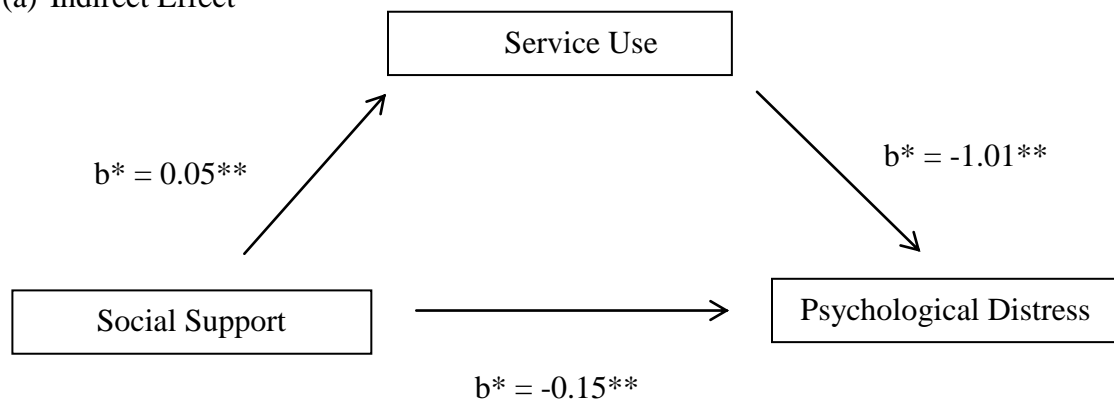


\*\*  $p < 0.05$

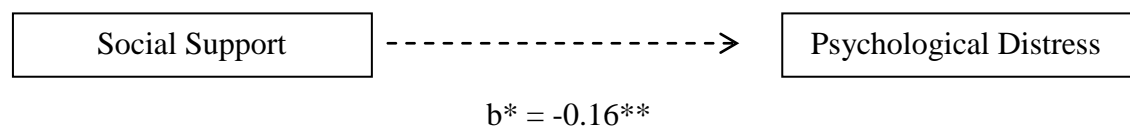


Figure 10. Path models for the indirect (a) and direct (b) effects of social support on psychological distress

(a) Indirect Effect



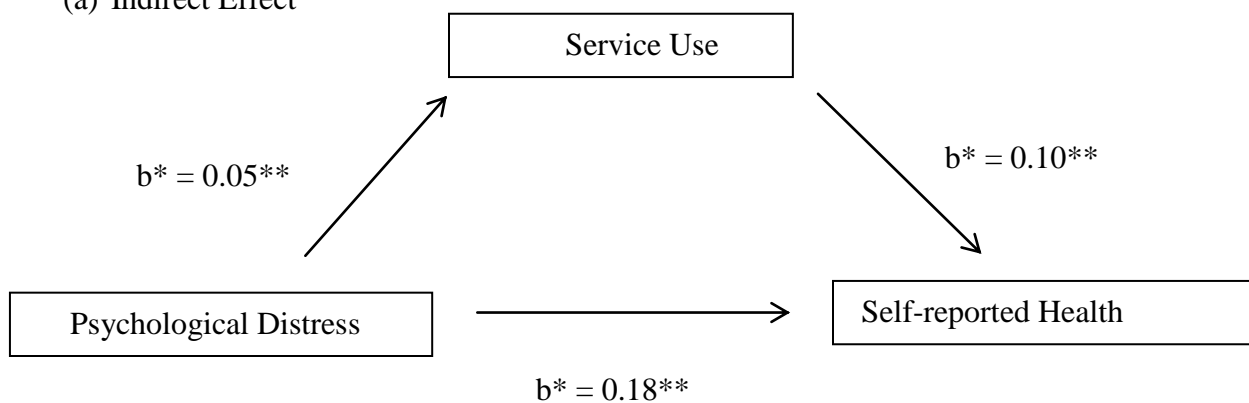
(b) Direct Effect



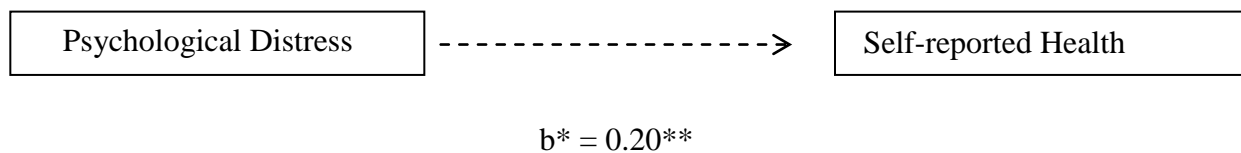
\*\*  $p < 0.05$

Figure 11. Path models for the indirect (a) and direct (b) effects of psychological distress on self-reported health

(a) Indirect Effect



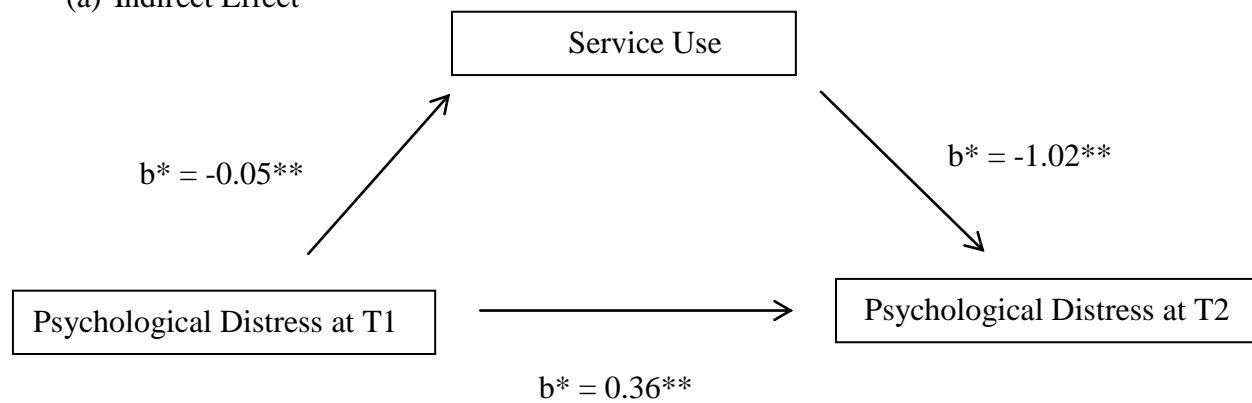
(b) Direct Effect



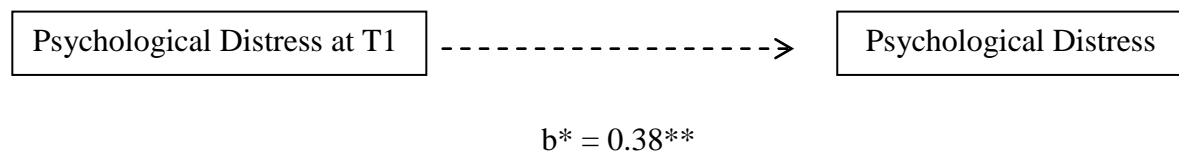
\*\*  $p < 0.05$

Figure 12. Path models for the indirect (a) and direct (b) effects of psychological distress at T1 on psychological distress at T2

(a) Indirect Effect



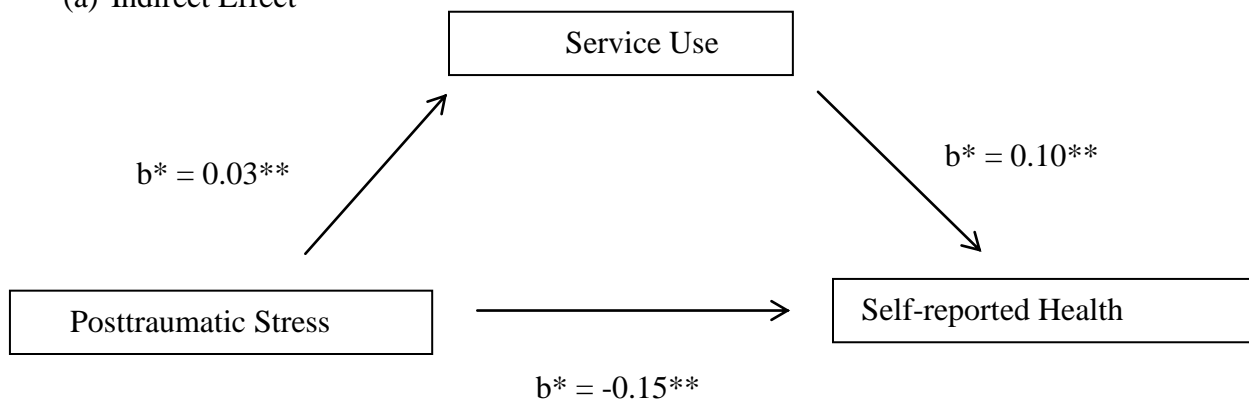
(b) Direct Effect



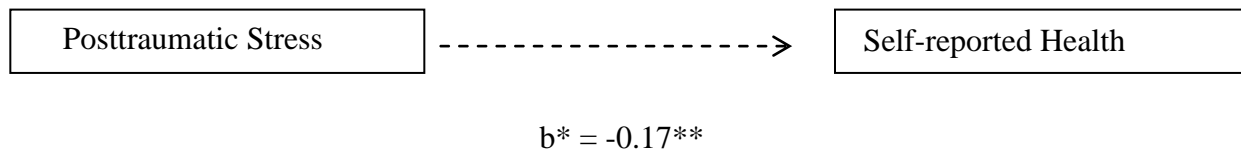
\*\*  $p < 0.05$

Figure 13. Path models for the indirect (a) and direct (b) effects of posttraumatic stress on self-reported health

(a) Indirect Effect

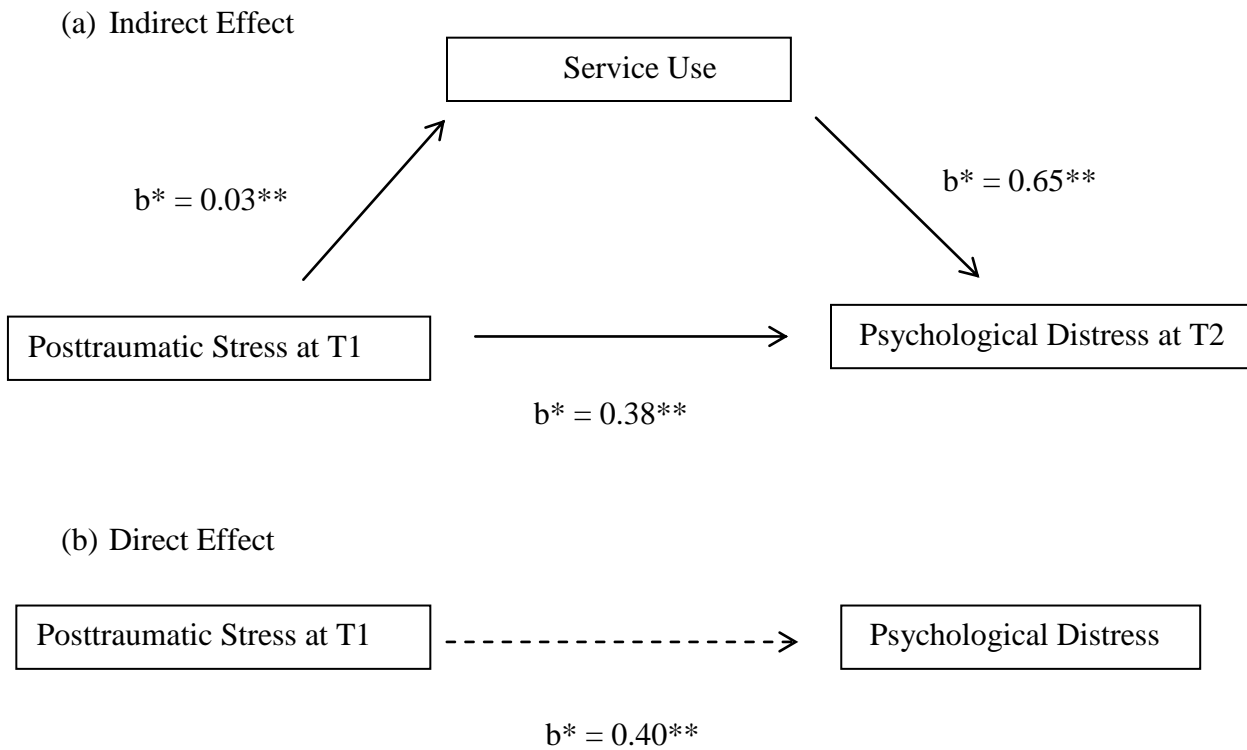


(b) Direct Effect



\*\*  $p < 0.05$

Figure 14. Path models for the indirect (a) and direct (b) effects of posttraumatic stress at T1 on psychological distress at T2



\*\*  $p < 0.05$

Table 1  
*Means, Standard Deviations, and Internal Consistency Coefficients of Measures*

Variable	N	Mean	SD	Range	Alpha
Social Support T1	4571	5.70	1.88	4 – 16	.78
Posttraumatic Stress T1	4639	37.04	8.10	9 – 45	.90
Psychological Distress T1	4639	26.35	4.23	6 – 30	.87
Posttraumatic Stress T2	275	32.32	9.34	11– 50	.87
Psychological Distress T2	840	11.03	4.44	6-30	.87
Pre-event Functioning	4639	17.38	4.90	8 – 36	.85
Prior Trauma	4639	1.12	1.30	0 – 8	.52
Self-reported Health T2	858	3.21	0.61	1 – 4	--
Change in Self-reported Health T2	859	2.79	0.78	1 – 5	--
Self-reported Health T1	4639	3.94	0.81	1 - 5	--

Table 2  
*Frequencies and Percentages of Dichotomous Variables*

Variable		Frequency	Percentage
Access to Insurance	Yes	3017	65
	No	1622	35
Any Service Use	Yes	157	18.3
	No	703	81.7
Mental Health Use	Yes	149	17.4
	No	708	82.6
General Medical Use	Yes	36	4.2
	No	821	95.8
Non-Healthcare Use	Yes	38	4.4
	No	819	95.6

Table 3  
Zero-Order Correlations among Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Gender	1															
2. SRH T1	-.04	1														
3. Social Support	-.12‡	.23‡	1													
4. PTS T1	-.26‡	.19‡	-.10‡	1												
5. PTS T2	-.35‡	.15‡	-.07*	.65‡	1											
6. PD T1	-.05◇	.24‡	-.15‡	.27‡	.29‡	1										
7. PD T2	-.14‡	.26‡	-.14‡	.41‡	.51‡	.38‡	1									
8. SRH T2	.04	-.51‡	-.16‡	.17‡	.18‡	.20‡	.30‡	1								
9. Change in SRH	.04	.11‡	-.09◇	.12‡	.17‡	.03	.19‡	.34‡	1							
10. Access to Ins.	-.09‡	.06	.07‡	.06‡	.08*	.00	.05	.07‡	.09◇	1						
11. Pre-event Functioning	-.04◇	.44‡	.27‡	-.04*	-.08*	-.31‡	-.25‡	.34‡	.10◇	.09‡	1					
12. Prior Trauma	.07‡	-.11‡	.06‡	-.18‡	-.17‡	-.18‡	-.17‡	.13	-.01	-.05‡	.14‡	1				
13. Service Use	.11‡	.12‡	.06	.21‡	-.19‡	.15‡	-.20‡	.14‡	.08*	-.06	.16‡	.14‡	1			
14. MH Use	.10◇	.11‡	.05	.22‡	-.20‡	.16‡	-.20‡	.13‡	.08*	-.06	.16‡	.15‡	.97‡	1		
15. Med Use	.07*	.12‡	.04	.10*	-.09‡	.05	-.10*	.07*	.06	-.06	.12‡	.06	.44‡	.40‡	1	
16. Non-HC Use	.06	-.01	-.02	.18‡	-.16‡	.03	-.13‡	.01	.03	-.03	-.02	.02	.46‡	.42‡	.27‡	1

‡Correlation is significant at the 0.001 level; ◇Correlation is significant at the 0.01 level; \*Correlation is significant at the 0.05 level



Table 4

*Logistic Regression Analysis of Race as a Predictor of Any Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.23	0.77	8.42	1	0.004	0.11
Gender	0.57	0.20	7.93	1	0.005	1.77
Caucasian			1.07	4	0.899	
African-American	0.38	0.77	0.24	1	0.625	1.46
Native American	-0.34	1.30	0.07	1	0.792	0.71
Pacific Islander	0.72	1.02	0.50	1	0.481	2.05
“Other”	0.00	1.32	0.00	1	0.998	1.00
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	10.01	5	0.075			

Cox and Snell  $R^2 = 0.012$ . Nagelkerke  $R^2 = 0.020$ .

Table 5

*Logistic Regression Analysis of Race as a Predictor of Mental Health Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.22	0.77	8.34	1	0.004	0.11
Gender	0.55	0.21	7.10	1	0.008	1.74
Caucasian			1.16	4	0.885	
African-American	0.31	0.77	0.17	1	0.684	1.37
Native American	-0.34	1.30	0.07	1	0.793	0.71
Pacific Islander	0.82	1.03	0.63	1	0.428	2.26
“Other”	0.01	1.32	0.00	1	0.995	1.01
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	9.27	5	0.099			

Cox and Snell  $R^2 = 0.011$ . Nagelkerke  $R^2 = 0.019$ .

Table 6

*Logistic Regression Analysis of Race as a Predictor of General Medical Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.14	1.07	8.58	1	0.003	0.04
Gender	0.82	0.43	3.58	1	0.058	2.27
Caucasian			0.68	4	0.954	
African-American	-0.56	1.06	0.28	1	0.594	0.57
Native American	-18.61	12599.34	0.00	1	0.999	0.00
Pacific Islander	0.12	1.49	0.01	1	0.934	1.13
“Other”	-18.70	15086.92	0.00	1	0.999	0.00
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	6.31	5	0.278			

Cox and Snell  $R^2 = 0.008$ . Nagelkerke  $R^2 = 0.026$ .

Table 7

*Logistic Regression Analysis of Race as a Predictor of Non-Healthcare Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.97	1.06	7.87	1	0.005	0.05
Gender	0.52	0.40	1.75	1	0.186	1.69
Caucasian			1.42	4	0.840	
African-American	-0.51	1.05	0.23	1	0.630	0.60
Native American	0.43	1.48	0.08	1	0.771	1.54
Pacific Islander	0.25	1.49	0.03	1	0.868	1.28
“Other”	-18.63	1.06	15144.48	1	0.999	0.05
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	3.76	5	0.584			

Cox and Snell  $R^2 = 0.005$ . Nagelkerke  $R^2 = 0.015$ .

Table 8

*Logistic Regression Analysis of Gender as a Predictor of Any Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald <i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-1.92	0.17	129.24	1	<0.001	0.15
Gender	0.63	0.20	9.88	1	0.002	1.87
Test	<i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>			
Overall Model Evaluation	10.54	1	0.001			

Cox and Snell  $R^2 = 0.012$ . Nagelkerke  $R^2 = 0.020$ .

Table 9

*Logistic Regression Analysis of Gender as a Predictor of Mental Health Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald <i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-1.98	0.17	130.24	1	<0.001	0.14
Gender	0.61	0.20	9.07	1	0.003	1.84
Test	<i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>			
Overall Model Evaluation	9.67	1	0.002			

Cox and Snell  $R^2 = 0.011$ . Nagelkerke  $R^2 = 0.019$ .

Table 10

*Logistic Regression Analysis of Gender as a Predictor of General Medical Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.74	0.38	97.49	1	<0.001	0.23
Gender	0.90	0.43	4.39	1	0.036	2.45
Test	$x^2$	<i>df</i>	<i>P</i>			
Overall Model Evaluation	5.13	1	0.024			

Cox and Snell  $R^2 = 0.006$ . Nagelkerke  $R^2 = 0.020$ .

Table 11

*Logistic Regression Analysis of Gender as a Predictor of Non-Healthcare Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald <i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.52	0.34	108.08	1	<0.001	0.03
Gender	0.64	0.39	2.70	1	0.101	1.89
Test	<i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>			
Overall Model Evaluation	2.96	1	0.085			

Cox and Snell  $R^2 = 0.003$ . Nagelkerke  $R^2 = 0.011$ .



Table 12

*Logistic Regression Analysis of Vulnerability as a Predictor of Any Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.92	0.27	114.35	1	<0.001	0.05
Gender	0.61	0.20	9.00	1	0.003	1.84
Prior Trauma	0.08	0.02	16.55	1	<0.001	1.08
Pre-event Functioning	0.18	0.06	7.87	1	0.005	1.20
Test	$x^2$	<i>df</i>	<i>P</i>			
Overall Model Evaluation	41.07	3	<0.001			

Cox and Snell  $R^2 = 0.047$ . Nagelkerke  $R^2 = 0.076$ .

Table 13

*Logistic Regression Analysis of Vulnerability as a Predictor of Mental Health Service*

*Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.97	0.28	113.79	1	<0.001	0.05
Gender	0.59	0.21	8.00	1	0.005	1.80
Prior Trauma	0.08	0.02	14.97	1	<0.001	1.08
Pre-event Functioning	0.20	0.07	9.84	1	0.002	1.23
Test	$x^2$	<i>df</i>	<i>P</i>			
Overall Model Evaluation	40.70	3	<0.001			

Cox and Snell  $R^2 = 0.046$ . Nagelkerke  $R^2 = 0.077$ .

Table 14

*Logistic Regression Analysis of Vulnerability as a Predictor of General Medical Service*

*Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-5.08	0.57	80.22	1	<0.001	0.01
Gender	0.91	0.43	4.40	1	0.036	2.48
Prior Trauma	0.11	0.04	10.10	1	0.001	1.12
Pre-event Functioning	0.08	0.12	0.51	1	0.473	1.09
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	17.43	3	0.001			

Cox and Snell  $R^2 = 0.020$ . Nagelkerke  $R^2 = 0.068$ .

Table 15

*Logistic Regression Analysis of Vulnerability as a Predictor of Non-Healthcare Service*

*Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.40	0.47	51.87	1	<0.001	0.03
Gender	0.62	0.39	2.51	1	0.113	1.85
Prior Trauma	-0.02	0.04	0.23	1	0.635	0.98
Pre-event Functioning	0.05	0.13	0.16	1	0.688	1.05
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	3.28	3	0.350			

Cox and Snell  $R^2 = 0.004$ . Nagelkerke  $R^2 = 0.013$ .

Table 16

*Logistic Regression Analysis of Social Support as a Predictor of Any Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald <i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.11	0.20	113.08	1	<0.001	0.12
Gender	0.67	0.20	10.97	1	0.001	1.95
Social Support	0.09	0.07	4.05	1	0.044	1.10
Test	<i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>			
Overall Model Evaluation	14.33	2	0.001			

Cox and Snell R<sup>2</sup> = 0.017. Nagelkerke R<sup>2</sup> = 0.027.

Table 17

*Logistic Regression Analysis of Social Support as a Predictor of Mental Health Service*

*Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.13	0.20	111.35	1	<0.001	0.12
Gender	0.65	0.21	9.91	1	0.002	1.91
Social Support	0.08	0.05	2.85	1	0.091	1.08
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	12.33	2	0.002			

Cox and Snell  $R^2 = 0.014$ . Nagelkerke  $R^2 = 0.024$ .

Table 18

*Logistic Regression Analysis of Social Support as a Predictor of General Medical Service*

*Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-4.03	0.44	85.42	1	<0.001	0.02
Gender	0.95	0.43	4.88	1	0.027	2.59
Social Support	0.12	0.08	2.00	1	0.157	1.13
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	6.94	2	0.031			

Cox and Snell  $R^2 = 0.008$ . Nagelkerke  $R^2 = 0.027$ .

Table 19

*Logistic Regression Analysis of Social Support as a Predictor of Non-Healthcare Service*

*Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.41	0.38	80.82	1	<0.001	0.03
Gender	0.62	0.39	2.49	1	0.115	1.85
Social Support	-0.06	0.10	0.31	1	0.578	0.95
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	3.26	2	0.196			

Cox and Snell  $R^2 = 0.004$ . Nagelkerke  $R^2 = 0.012$ .



Table 20

*Logistic Regression Analysis of Access to Health Insurance as a Predictor of Any Service*

*Use*

Variable	<i>b</i>	<i>SE</i>	<i>Wald</i> <i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-1.52	0.18	70.23	1	<0.001	0.22
Gender	-0.61	0.20	9.38	1	0.002	0.54
Access to Health Insurance	0.30	0.20	2.26	1	0.133	1.35
Test	<i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>			
Overall Model Evaluation	12.86	2	0.002			

Cox and Snell  $R^2 = 0.015$ . Nagelkerke  $R^2 = 0.024$ .

Table 21

*Logistic Regression Analysis of Access to Health Insurance as a Predictor of Mental Health Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-1.61	0.19	74.40	1	<0.001	0.20
Gender	-0.60	0.20	8.57	1	0.003	0.55
Access to Health Insurance	0.34	0.21	2.28	1	0.101	1.40
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	12.45	2	0.002			

Cox and Snell  $R^2 = 0.014$ . Nagelkerke  $R^2 = 0.024$ .

Table 22

*Logistic Regression Analysis of Access to Health Insurance as a Predictor of General Medical Service Use*

Variable	<i>b</i>	<i>SE</i>	<i>Wald</i> <i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.36	0.40	72.16	1	<0.001	0.04
Gender	-0.87	0.43	4.10	1	0.043	0.42
Access to Health Insurance	0.64	0.40	2.22	1	0.136	1.90
Test	<i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>			
Overall Model Evaluation	7.61	2	0.022			

Cox and Snell  $R^2 = 0.009$ . Nagelkerke  $R^2 = 0.030$ .

Table 23

*Logistic Regression Analysis of Access to Health Insurance as a Predictor of Non-Healthcare Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.06	0.34	80.76	1	<0.001	0.05
Gender	-0.63	0.39	2.59	1	0.108	0.54
Access to Health Insurance	0.24	0.38	0.41	1	0.520	1.28
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	3.39	2	0.184			

Cox and Snell  $R^2 = 0.004$ . Nagelkerke  $R^2 = 0.013$ .

Table 24

*Logistic Regression Analysis of Posttraumatic Stress as a Predictor of Any Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-1.92	0.17	134.10	1	<0.001	0.15
Gender	-0.37	0.21	3.14	1	0.077	0.69
Posttraumatic Stress	0.05	0.01	28.31	1	<0.001	1.05
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	38.45	2	<0.001			

Cox and Snell  $R^2 = 0.044$ . Nagelkerke  $R^2 = 0.071$ .

Table 25

*Logistic Regression Analysis of Posttraumatic Stress as a Predictor of Mental Health*

*Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.02	0.17	140.93	1	<0.001	0.13
Gender	-0.34	0.21	2.55	1	0.110	0.71
Posttraumatic Stress	0.05	0.01	30.62	1	<0.001	1.05
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	39.88	2	<0.001			

Cox and Snell  $R^2 = 0.045$ . Nagelkerke  $R^2 = 0.075$ .

Table 26

*Logistic Regression Analysis of Posttraumatic Stress as a Predictor of General Medical Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.38	0.31	119.11	1	<0.001	0.03
Gender	-0.68	0.44	2.41	1	0.120	0.51
Posttraumatic Stress	0.04	0.02	5.42	1	0.020	1.04
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	10.19	2	0.006			

Cox and Snell  $R^2 = 0.012$ . Nagelkerke  $R^2 = 0.040$ .

Table 27

*Logistic Regression Analysis of Posttraumatic Stress as a Predictor of Non-Healthcare Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald <i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.82	0.33	131.56	1	<0.001	0.02
Gender	-0.25	0.41	0.36	1	0.546	0.78
Posttraumatic Stress	0.07	0.02	18.18	1	<0.001	1.07
Test	<i>x</i> <sup>2</sup>	<i>df</i>	<i>p</i>			
Overall Model Evaluation	19.95	2	<0.001			

Cox and Snell  $R^2 = 0.023$ . Nagelkerke  $R^2 = 0.076$ .



Table 28

*Logistic Regression Analysis of Psychological Distress as a Predictor of Any Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.02	0.16	158.74	1	<0.001	0.13
Gender	-0.48	0.21	5.45	1	0.020	0.62
Psychological Distress	0.13	0.02	44.71	1	<0.001	1.14
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	55.89	2	<0.001			

Cox and Snell  $R^2 = 0.063$ . Nagelkerke  $R^2 = 0.103$ .

Table 29

*Logistic Regression Analysis of Psychological Distress as a Predictor of Mental Health*

*Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-2.12	0.17	164.66	1	<0.001	0.12
Gender	-0.46	0.21	4.83	1	0.028	0.63
Psychological Distress	0.14	0.02	46.19	1	<0.001	1.15
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	56.57	2	<0.001			

Cox and Snell  $R^2 = 0.064$ . Nagelkerke  $R^2 = 0.106$ .

Table 30

*Logistic Regression Analysis of Psychological Distress as a Predictor of General Medical Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.56	0.30	139.75	1	<0.001	0.28
Gender	-0.74	0.43	2.95	1	0.086	0.48
Psychological Distress	0.11	0.03	12.53	1	<0.001	1.12
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	16.38	2	<0.001			

Cox and Snell  $R^2 = 0.019$ . Nagelkerke  $R^2 = 0.064$ .

Table 31

*Logistic Regression Analysis of Psychological Distress as a Predictor of Non-Healthcare Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.50	0.29	141.74	1	<0.001	0.03
Gender	-0.49	0.39	1.58	1	0.209	0.61
Psychological Distress	0.11	0.03	11.04	1	0.001	1.11
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	12.87	2	0.002			

Cox and Snell  $R^2 = 0.015$ . Nagelkerke  $R^2 = 0.049$ .

Table 32

*Logistic Regression Analysis of Full Model Predicting Any Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.47	1.22	8.07	1	0.004	0.03
White			3.05	4	0.549	
African-American	0.49	0.81	0.36	1	0.547	1.63
Native-American	-0.85	1.36	0.38	1	0.535	0.43
Pacific Islander	0.12	1.11	0.01	1	0.918	1.12
Other race	-0.83	1.46	0.32	1	0.569	0.44
Gender	0.38	0.22	2.88	1	0.090	1.46
Prior Trauma	0.07	0.02	8.69	1	0.003	1.07
Pre-event Functioning	0.12	0.07	2.64	1	0.105	1.12
Social Support T1	0.03	0.05	0.28	1	0.600	1.03
Access to Medical Insurance	-0.11	0.23	0.21	1	0.648	0.90
Psychological Distress T1	0.02	0.02	1.03	1	0.309	1.02
Posttraumatic Stress T1	0.05	0.01	16.39	1	<0.001	1.05
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	59.34	11	<0.001			

Cox and Snell  $R^2 = 0.072$ . Nagelkerke  $R^2 = 0.116$ .

Table 33

*Logistic Regression Analysis of Full Model Predicting Mental Health Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-3.39	1.22	8.07	1	0.004	0.03
White			2.80	4	0.591	
African-American	0.46	0.81	0.33	1	0.567	1.59
Native-American	-0.85	1.36	0.39	1	0.533	0.43
Pacific Islander	0.27	1.12	0.06	1	0.808	1.31
Other race	-0.85	1.46	0.34	1	0.560	0.43
Gender	0.34	0.23	2.16	1	0.142	1.40
Prior Trauma	0.06	0.02	6.85	1	0.009	1.06
Pre-event Functioning	0.14	0.07	3.66	1	0.056	1.15
Social Support T1	0.01	0.05	0.02	1	0.890	1.01
Access to Medical Insurance	0.01	0.23	0.00	1	0.978	1.01
Psychological Distress T1	0.04	0.02	2.21	1	0.138	1.04
Posttraumatic Stress T1	0.05	0.01	17.36	1	<0.001	1.05
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	60.68	11	<0.001			

Cox and Snell  $R^2 = 0.074$ . Nagelkerke  $R^2 = 0.121$ .

Table 34

*Logistic Regression Analysis of Full Model Predicting General Medical Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-4.89	1.22	8.07	1	0.004	0.03
White			0.27	4	0.992	
African-American	-0.45	1.13	0.16	1	0.689	0.64
Native-American	-18.98	11952	0.00	1	0.999	0.00
Pacific Islander	-0.84	1.64	0.26	1	0.609	0.43
Other race	-19.46	13846	0.00	1	0.999	0.00
Gender	0.65	0.46	2.05	1	0.152	1.92
Prior Trauma	0.13	0.04	8.78	1	0.003	1.13
Pre-event Functioning	0.04	0.13	0.07	1	0.785	1.04
Social Support T1	0.05	0.09	0.27	1	0.607	1.05
Access to Medical Insurance	-0.56	0.48	1.36	1	0.244	0.57
Psychological Distress T1	-0.04	0.05	0.65	1	0.420	0.96
Posttraumatic Stress T1	0.04	0.02	4.41	1	0.022	1.04
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	23.71	11	0.014			

Cox and Snell  $R^2 = 0.030$ . Nagelkerke  $R^2 = 0.097$ .

Table 35

*Logistic Regression Analysis of Full Model Predicting Non-Healthcare Service Use*

Variable	<i>b</i>	<i>SE</i>	Wald $x^2$	<i>df</i>	<i>p</i>	<i>OR</i>
Constant	-4.41	2.09	4.43	1	0.035	0.01
White			0.32	4	0.988	
African-American	-0.36	1.09	0.11	1	0.745	0.70
Native-American	0.09	1.57	0.00	1	0.953	1.10
Pacific Islander	-0.03	1.58	0.00	1	0.987	0.98
Other race	-19.07	14605	0.00	1	0.999	0.00
Gender	-0.00	0.43	0.00	1	0.995	1.00
Prior Trauma	-0.02	0.04	0.34	1	0.559	0.98
Pre-event Functioning	-0.11	0.15	0.50	1	0.482	0.90
Social Support T1	-0.10	0.11	0.85	1	0.357	0.90
Access to Medical Insurance	-0.12	0.45	0.07	1	0.787	0.89
Psychological Distress T1	0.00	0.04	0.01	1	0.936	1.00
Posttraumatic Stress T1	0.08	0.02	18.10	1	<0.001	1.09
Test	$x^2$	<i>df</i>	<i>p</i>			
Overall Model Evaluation	23.86	11	0.013			

Cox and Snell  $R^2 = 0.030$ . Nagelkerke  $R^2 = 0.096$ .



## Appendix

### Services Included in Each Service Use Category

#### Any Service Use-

- 1) Psychiatrist
- 2) Psychologist
- 3) Social Worker
- 4) Mental Health Counselor
- 5) Psychotherapist
- 6) Marriage or Family Counselor
- 7) Drug or Alcohol Counselor
- 8) Primary Care Doctor (e.g., internist, family doctor, GP)
- 9) Other Medical Doctor (e.g., cardiologist, gynecologist)
- 10) Other Health Care Provider (e.g., nurse, occupational therapist)
- 11) Religious Counselor (e.g., minister, priest, rabbi)
- 12) Healer (e.g., herbalist, chiropractor, spiritualist)
- 13) Any other kind of professional

#### Mental Health Service Use-

- 1) Psychiatrist
- 2) Psychologist
- 3) Social Worker
- 4) Mental Health Counselor
- 5) Psychotherapist
- 6) Marriage or Family Counselor

7) Drug or Alcohol Counselor

General Medical Service Use-

- 1) Primary Care Doctor (e.g., internist, family doctor, GP)
- 2) Other Medical Doctor (e.g., cardiologist, gynecologist)
- 3) Other Health Care Provider (e.g., nurse, occupational therapist)

Non-Healthcare Service Use-

- 14) Religious Counselor (e.g., minister, priest, rabbi)
- 15) Healer (e.g., herbalist, chiropractor, spiritualist)