The Psychological Impact of Motor Vehicle Accidents: A New Zealand Study

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ABSTRACT

The present research attempted to identify those factors which predispose victims of severe motor vehicle accidents to develop PTSD, and explored the relationship between mental health and health care utilisation. A multistage probability sample of 167 New Zealand victims of motor vehicle accidents were included for analysis, the data being obtained as part of a larger nation-wide study looking at trauma and health care utilisation. Past research has identified factors which predispose the development of PTSD, such as prior psychological disorders, prior trauma, intensity, and extent of injury. The main statistical technique employed was multiple regression analysis, with the dependant variables being mental health and health care utilisation of the victims. Findings indicated that victims of MVAs are more likely to experience physical and mental health difficulties. The results showed a relationship between experience of trauma and the existence of PTSD, with victims of motor vehicle accidents suffering from more ill-health and PTSD-related symptoms than non-victims. Adverse life events, disclosure of feelings, extent of injury, and especially physical symptoms were all significant predictors of PTSD symptoms, however experience of previous trauma and intensity of the accident were not. A relationship between PTSD symptoms and health care utilisation also exists, with accident victims having more days confined to bed.

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1. INTRODUCTION

1.1 Motor Vehicle Accidents And New Zealand Society

According to the Land Transport Safety Authority (1994) there were 10, 994 reported casualty vehicle accidents in New Zealand in 1993. These accidents resulted in 600 deaths and 15,108 injuries, at a rate of 429 injuries per 100,000 population. On average, one person was killed every 14.6 hours and one person injured every 35 minutes during 1993 (Land Transport Safety Authority, 1994). More recent figures show a modest improvement, with the 1995 death toll standing at 581 fatalities (Barton, 1996). Forty percent (230) of those killed in 1995 were rural people, although they make up only 15 percent of the population (Barton, 1996).

In 1991, road crashes were the single biggest potential cause of loss of life for both males and females below the age of 65 in New Zealand. In 1993, nearly seven thousand casualties of motor vehicle accidents were hospitalised, resulting in over 57,000 total days stay in hospital, with the average stay being 8 days (Land Transport Safety Authority, 1994). The hospitalisation rate for motor vehicle accidents in 1992 stood at 336 people per 100,000 population. The hospitalisation rate for vehicle accidents among Maori was twice as high as that for non-Maori (Statistics New Zealand, 1993). Motor vehicle accidents represent the largest cause of trauma related admissions to Australian hospitals (Gordon, 1995).

An estimated 230,000 people world-wide die on the roads each year, and annually 10 million people are involved in motor vehicle accidents. These motor vehicle accidents are the major cause of death for people under the age of 30 in western societies (Brom, Kleber & Hofman, 1993; Richards, 1996). Travel by road is

indispensable to modern living, however it is one of the most common hazards which brings about much death, injury, pain and damage (Kuch, Cox, Evans & Shulman, 1994).

By international comparison, New Zealand has one of the worst driving records of the western world. The number of people killed per head of population by motor vehicle accidents in New Zealand exceeds that of Australia, the United Kingdom, the U.S.A., Japan, Germany and Canada (Statistics New Zealand, 1995).

The above figures demonstrate the scope of the physical impact of motor vehicle accidents, resulting in much destruction, injury and death each year. However, in the wake of a serious accident, the consequences of such accidents are seldom confined to the physical aspects alone. There is often a complex interaction of many psychological factors subsequent to a traumatic accident, such as feelings of guilt, blame, grief and despair. How an individual deals with these thoughts, feelings and emotions is totally unique, with no two people having exactly the same psychological responses or coping strategies. It is these psychological effects and factors that become the focus of the ensuing review of the effects that motor vehicle accidents have on New Zealand victims.

The following introduction explores and reviews the psychological effects of motor vehicle accidents, including the characteristics and symptoms of Posttraumatic Stress Disorder. The links between the development of Posttraumatic Stress Disorder (PTSD) and subsequent health care utilisation are reviewed and the importance of understanding this linkage is emphasised with respect to limited health care funding, and the need for recognition and rehabilitation of sufferers. Characteristics of both the accident and victim that have been identified in previous research as factors which may make an individual susceptible to the onset of PTSD are presented and reviewed. Finally, a summary is presented, and some

research goals are specified which endeavour to further the understanding of the relationships between motor vehicle accidents, PTSD, and health care utilisation.

1.2 The Psychological Effects Of Motor Vehicle Accidents

The effects that motor vehicle accidents can have on people are somewhat disturbing. Not only are there the physical injuries that are customarily sustained in major crashes, but they also often bring with them significant psychological complications (Scotti et al., 1992; cited in Taylor & Koch, 1995). Motor vehicle accidents (MVAs) are unfortunately a common phenomenon, and any ensuing psychological problems often far outlast the physical injuries themselves. Whilst medical and technological advances have increased survival rates among injured patients, such advances have resulted in a rise in the number of survivors confronted with the task of long term physical and psychological recovery (Gordon, 1995). This problem is emphasised by a recent report (Vasil, 1996) which stated that the number of people hurt in motor vehicle accidents continues to grow in New Zealand, despite a much praised drop in the road-death toll.

People have been found to frequently develop acute stress reactions after being involved in a MVA, even when they suffer only slight physical injuries or even no injuries at all (Nguyen, 1995). According to Richards (1996), accident victims often suffer a variety of afflictions, including driving phobias, headaches when no overt head trauma has occurred, and pain problems as a result of injuries received. Depressive symptoms, insomnia, increased arousal and flashbacks have also been found to be prevailing problems (Malt, Høivik & Blikra, 1993; Nguyen, 1995).

One of the most noticeable effects of MVAs is the effect on driving itself. Driving phobias are a common consequence of motor vehicle accidents and are the most

prevalent ensuing anxiety disorder (Ehlers, Hofmann, Herda & Roth, 1994; Nguyen, 1995). Driving phobia is characterised by an avoidance or reduction in driving, or the tolerance of driving only with marked discomfort after a MVA (Blanchard, Hickling, Taylor & Loos, 1995; Nguyen, 1995). Further evidence suggests that those who suffer from PTSD show greater subjective distress and greater impairment of role function. Their lives are curtailed by avoidance of discretionary travel as either a driver or passenger. Many also endure substantial subjective discomfort to carry out essential travel (Blanchard, Hickling, Taylor & Loos, 1995; Burnstein, 1989). This is a largely ignored group of people in need of assistance.

Victims of motor vehicle accidents have reported a variety of psychological symptoms which include affective disturbances, generalised and phobic anxiety and avoidance, feelings of irritability and resentment, intrusive and disturbing recollections and dreams, and poor concentration and attention (Nguyen, 1995). Behavioural changes such as social withdrawal and substance abuse may also emerge. In its more severe and chronic form, a symptom pattern may emerge which warrants a formal psychiatric diagnosis of Posttraumatic Stress Disorder.

Clearly a great deal of anxiety and stress is associated with motor vehicle accidents. As Feinstein and Dolan (1991) point out, the majority of individuals can deal with these symptoms by themselves, and over time, the problems cease to become an intrusion into everyday functioning. But what of the longer term effects of motor vehicle accidents? Psychological reactions involving acute stress or anxiety reactions are be to expected within a relatively short time after a serious accident, especially one which involves serious injury or death. However, for many individuals these debilitating symptoms do not dissolve with time, and in some cases these symptoms become worse as time from the event passes, greatly affecting their normal everyday functioning.

These individuals are a minority in the population, indeed a minority amongst those that have been subject to a serious MVA, but their numbers are still significant to warrant much further study to identify any universal problem areas, so that help is quickly targeted towards those individuals who need it.

1.2.1 The long term consequences: Posttraumatic Stress Disorder

The emphasis now moves away from the initial anxiety, phobias and fears suffered as the result of a traumatic event, and turns toward the long term effects of motor vehicle accidents. Posttraumatic Stress Disorder (PTSD) is the diagnosis bestowed upon those people who are still severely affected by a traumatic event months or even years after its occurrence. What constitutes PTSD is outlined shortly, but Green (1993) describes PTSD as a combination of intrusive and avoidant thoughts, and physiological arousal symptoms that arise following extremely stressful events. The severely disabling effects of PTSD should not be underestimated, despite having received little empirical investigation (Bryant & Harvey, 1996).

Vincent, Long and Chamberlain (1991) provided some insightful research as to the New Zealand prevalence of PTSD in Vietnam war veterans, but there is limited data available on the prevalence of this disorder in general population New Zealand, especially with respect to motor vehicle accidents.

The first step in understanding the relationship between motor vehicle accidents and PTSD is the understanding of what constitutes PTSD symptoms. Therefore, the following section outlines the criteria for identifying PTSD. This section is then followed by a comment on the limitations of defining individuals in such a manner, and the importance of accurate diagnosis.

1.3 What is Posttraumatic Stress Disorder?

1.3.1 PTSD outlined

Posttraumatic Stress Disorder is defined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV: American Psychiatric Association, 1994). In short, the criteria for PTSD has four major components: exposure to a recognisable stressor or trauma; recurrent and intrusive recollections or dreams of the stressful event; emotional numbing or withdrawal from the external world; and associated symptoms such as flatness of affect, sleep disturbance, memory impairment, and hyperalertness (Breslau, Davis, Andreski & Peterson, 1991; Long, Chamberlain & Vincent, 1992; McGuire, 1990).

Strict diagnosis of this disorder is not the aim of the present research and is beyond the scope of the study. Indeed much debate exists over the criteria used and the utility of the 'caseness' approach as defined by the DSM-IV (discussed in the next section). The present study looks at PTSD symptoms as indictors of further psychological problems, rather than the rigid DSM-IV criteria.

Summarising several studies of the trauma-PTSD relationship, Green (1994) concluded that on average, about a quarter of individuals given exposure to an extreme stressor go on to develop PTSD, although certain types of exposure, rape for example, routinely produce much higher rates of PTSD. In a break down of potential causes of PTSD, Norris (1992) estimated that the resulting rates of PTSD in the United States general population given exposure to a variety of experiences were 14% from sexual assault, 13% from physical assault, 12% from motor vehicle accidents, 5% from disaster, and 8% from tragic death. In support of such figures, Breslau et al. (1991) found that the lifetime prevalence of PTSD from all traumatic events in their sample of young adults was over 9%. This would place the

diagnosis among the more common psychiatric disorders of young adults, surpassed only by phobia, major depression, and alcohol and drug dependence (Breslau, et al., 1991). However, much discrepancy still exists as to an exact figure. For example, Helzer, Robins and McEvoy (1987) found a 1% PTSD lifetime rate in their sample of the general United States population.

1.3.2 PTSD and the problem of 'caseness'

There are perhaps inherent problems with defining someone as a PTSD 'case' or not. There may well be clinical advantages to this form of classification, however it is only as accurate as the stringent and somewhat binding criteria themselves, and the skills of the diagnostician. The presenting symptoms themselves may well provide an abundance of information which can lead to positive treatment, rather than just ignoring those who fall below the DSM-IV cut-off criteria. It is this rationale which is employed in the present study.

There are also inherent statistical arguments against dichotomising continuous variables, and PTSD is one of those afflictions that affects people both in varying degrees and varying presenting symptoms, making clear distinctions very difficult, if not impossible. This would indicate that PTSD is not a disorder which can be simply classified, and the labelling should be treated as a continuous variable rather than one with a 'cut-off' value.

1.3.3 Diagnosis

Accurate diagnosis of PTSD is not a simple task as there many confounding factors have been identified which may hinder the medical practitioner. For example, accident victims who suffer from PTSD may try to avoid discussion of the trauma

as they often feel too embarrassed to report that they are experiencing psychiatric distress as a result of a motor vehicle accident, which they consider to be a relatively common occurrence (Burnstein, 1989). The diagnosis of PTSD is often complicated by the high proportion of coexisting psychiatric illnesses such as depression, generalised anxiety, phobias and panic disorders that coexist with the disorder (Nguyen, 1995). Also, all too often the patient and the physician are focused on the patient's physical injuries, instead of the traumatic experience and ensuing psychological disturbances (Burnstein, 1989). According to Jones and Peterson (1993), physicians should be aware that PTSD can occur at any age and can result from what is often regarded as relatively minor physical trauma.

Another barrier to the effective diagnosis of PTSD is the potential for its symptoms to be confused with post-concussional effects such as anxiety, irritability, sleep disturbances, and memory and concentration problems (Burnstein, 1989). Posttraumatic Stress Disorder may be overlooked in the hustle and bustle of medical treatment, and it may also be confused with other disorders such as depression and anxiety due to symptom overlap (Burnstein, 1989; Nguyen, 1995). In some cases, PTSD symptoms have been found to actually increase over time following accidental injury (e.g., Roca, Spence & Munster, 1992), therefore follow-up of victims is very important.

1.4 The Symptoms Of PTSD

So what are some of the presenting symptoms characteristic of PTSD? The role that PTSD plays on an individual's health is the fundamental question of importance, with the list of health problems being vast and varied. Insightful research by Friedman and Schnurr (1995) has furthered our understanding the relationship

between stress and physical health, demonstrating that PTSD is a the major mediator between trauma and health.

The following sections outline research proposing an array of PTSD symptoms which result after severely distressing events such as motor vehicle accidents.

1.4.1 Presenting symptoms

According to the literature, the most frequently resulting symptoms of PTSD are disturbed sleep including nightmares and insomnia, intrusive recollections, depression, feelings of guilt, feelings of anger and anxiety, behavioural changes, hyperalertness, trouble concentrating, and avoidance of activities prompting a possible recall of the original event (Brom et al., 1993; Helzer et al., 1987; Kuch, Swinson & Kirby, 1985). These debilitating symptoms can continue for months and sometimes even years (Brom et al., 1993), and additional symptoms or behaviours reported include driving phobia, muscle pain, and analgesic or anxiolytic use (Kuch et al., 1985). A study by Burnstein, Ciccone, Greenstein, Daniels, Olsen, Mazarek, et al. (1988) indicated that those classified as having PTSD had an inability to tolerate reasonable levels of everyday stress and reminders of the trauma.

Research suggests that PTSD may be a very long lasting disorder without proper treatment intervention (Green, 1994). Up to half of those who develop the disorder may, without treatment, continue to suffer decades later. On the other hand, rates of PTSD can decline over time, even without treatment, but this decrease may still not be a return to normal levels (Green, 1994). In most cases, MVAs involve a mixture of psychological, medical, and legal consequences that interact in a complex way (Brom et al., 1993).

1.4.2 Comorbidity

Comorbidity occurring in those suffering from PTSD is a major complicating factor in the diagnosis and treatment of this disorder. Comorbidity is the occurrence of other psychiatric disorders such as depression, in a person diagnosed as having PTSD.

There are many varied and complicated interactions that occur when PTSD is presented by an individual. Blanchard, Hickling, Taylor and Loos (1995) found that among the MVA victims in their study, there were strong interrelated mood effects. Those MVA victims with PTSD were much more likely to meet the criteria for current major depression. In fact, 53% of those with full PTSD also met the criteria for current major depression. Eighty-two percent of these depressions began after the accident occurred. However, more of the MVA victims who went on to develop PTSD were significantly depressed at the time of the MVA than victims who had a lesser reaction to the accident. Secondly, development of PTSD was more prevalent in MVA victims who had previously suffered from a major depressive episode (Blanchard, Hickling, Taylor & Loos, 1995).

Davidson, Hughes, Blazer and George (1991) found that 62% of individuals with PTSD resulting from a variety of traumas also suffered from another psychiatric illness, compared to only 15% of their control group. They found PTSD to be significantly associated with the diagnosis of somatisation disorder, schizophrenia, panic disorder, obsessive compulsive disorder, drug abuse, major depression, panic disorder, social phobia, and generalised anxiety. Individuals with PTSD were also 8 times more likely to have attempted suicide, even after controlling for depression (Davidson et al., 1991).

A study by Long et al. (1992) of New Zealand Vietnam veterans, found that sufferers of PTSD reported lower scores on physical and mental health scales than those without PTSD symptoms, indicating poorer health. PTSD sufferers also rated significantly higher on anxiety, depression, loss of control measures, and lower on well-being measures, indicating negative overall health consequences.

The identification of PTSD is clearly very important, as many other psychological problems go hand-in-hand with this affliction. If those who suffer from PTSD-like symptoms could be identified early, and appropriate remedial treatment given, the prevalence of the associated disorders could well be reduced.

1.4.3 Motor vehicle accidents and PTSD

Motor vehicle accidents have been found to be a typical stressor associated with the development of PTSD, and as travel by road is indispensable to modern living, it is one of the most common of all hazards (Blanchard, Hickling, Taylor & Loos, 1995; Kuch et al., 1994). Although PTSD is perhaps best known following experiences such as combat or rape, the DSM-IV (American Psychiatric Association, 1994) recognises motor vehicle accidents as a situation with which PTSD is likely to be associated. The severe trauma of MVAs often results from the threat of death, and the provocation of intense fear, helplessness or horror (Nguyen, 1995). Many theoretical and empirical studies of the psychological effects of serious life events indicate that the disturbances caused by traffic accidents are comparable to the posttraumatic stress disorders that may occur after various situations of extreme helplessness, acute disruption and distress, such as combat stress, bereavement, and acts of violence (Brom et al., 1993).

1.5 Why Look At PTSD?

This section examines two key arguments of why more information is needed on the impact and repercussions of PTSD from motor vehicle accidents. These areas are the restraints on health care resources and the existence of possible predisposing factors.

1.5.1 The health care dollar

Accurate predictions of who is likely to develop a mental disorder following a motor vehicle accident could provide the basis for decisions about who is given priority to psychological help as soon as practicable after the event. In Posttraumatic Stress Disorder, where the commonly accepted causal agent is an extremely stressful or traumatic event, anticipation of who is likely to develop PTSD would allow for the optimal allocation of mental health resources (Blanchard, Hickling, Vollmer, Loos, Forneris & Jaccard, 1996; Gordon, 1995). The careful allocation of scarce health care resources is especially important in this time of escalating health care costs and associated efforts to contain health care expenditure, because PTSD often complicates the recovery of accident victims, and is associated with substantial additional personal and public health costs. As previous studies have shown, large numbers of patients do indeed suffer long term disability from trauma associated with motor vehicle accidents.

As seen from the perspective of chronic care and rehabilitation, apparently minor MVAs generate considerable suffering and disproportionally large social costs. The primary reason for this is the psychological consequences that result from being involved in an accident, which often outlast any physical injuries. Blanchard, Hickling, Taylor, Loos and Gerardi (1994) report that they were struck by the

intensity of the psychological responses requiring treatment of individuals who were involved in what one might consider 'minor' MVAs, let alone if the accident involved a fatality. Apparently minor MVAs are often shrugged off as commonplace. Accident-related driving fears are rationalised as 'understandable', and impairment of normal daily living from phobias and PTSD is subsequently ignored (Kuch et al., 1994). The longer these debilitating symptoms go unrecognised, the more time, effort and expense is required to achieve rehabilitation.

Long et al. (1992) reported that individuals classified as PTSD sufferers had substantially more ill-health symptoms, more chronic illness, more disability days, and a lower self-rated health status. They also made nearly three times as many contacts with health care providers, especially psychiatrists, psychologists and counsellors, and they reported more hospital contact (Long et al., 1992). Therefore, illustrating the links between MVAs and PTSD, and their subsequent effect on health care utilisation would provide important information in the attempt to optimise the allocation of scarce health care resources.

1.5.2 Are there factors which could make PTSD more likely?

It is important to keep in mind that not everyone who is involved in a MVA goes on to suffer long term psychological problems. Little is known about why some MVA victims are relatively unaffected, whereas others develop phobias, and others still develop many debilitating PTSD-like symptoms. There has been some suggestion that pre-accident personality traits may play a role, and perceived severity of the stressor is likely to be important. Accidents associated with readily visible injuries and irreparable vehicle damage may also be likely to produce PTSD symptoms (Scotti et al, 1992; cited in Taylor & Koch, 1995), as too the intensity of the

experience and physical proximity to the stressor (American Psychiatric Association, 1994).

Why do some individuals develop PTSD and not others? Case reports and general population surveys indicate that PTSD symptoms such as intrusive memories, avoidance and distress occur in a minority, yet significant number of MVA victims (e.g., Mayou, Bryant & Duthie, 1993; Norris, 1992). Malt et al. (1993) found that symptoms suggesting PTSD occurred in less than 5% of their subjects who had had a serious MVA, and 15% met the criteria for PTSD in a study by Kuch et al. (1994). March (1993) supported this notion, claiming that even under horrific circumstances, the majority of individuals do not develop PTSD.

What factors influence the fact that a minority of individuals who are subjected to a serious motor vehicle accident go on to develop potentially incapacitating post-traumatic symptoms? This question is the driving force behind the present study, and shall be covered in more depth in section 1.6 below.

1.6 Characteristics Of The Victim And Accident That Predispose An Individual To Develop PTSD

This section explores the characteristics of Posttraumatic Stress Disorder, including the complications of associated psychological disorders, and presents a list of predisposing factors that have been identified by past research.

A plethora of personality and psychological factors have been proposed by researchers as precursors of PTSD in certain individuals. This section outlines some of the prominent factors which have been identified in various studies to predispose PTSD. These are broken up into two parts, the first being contextual

and demographic factors, the second part being aspects of the event and its subsequent effects.

1.6.1 Contextual and demographic factors

Gender has been found to be an influencing factor of PTSD. Norris (1992) found that women showed a rate of PTSD more than twice that exhibited by men, as too did Blanchard, Hickling, Taylor and Loos (1995). Breslau et al. (1991) also found being female to be a risk factor, confirming other studies by Helzer et al. (1987), and Green (1994).

The age of the individual has had some empirical support as a precursor of PTSD. Norris (1992) and Blanchard Hickling, Vollmer, Loos, Forneris and Jaccard (1996) found that age was a strong predictor of PTSD, with elderly people showing consistently lower rates of PTSD in regard to an accident. However, Malt et al., (1993) found that 'nervousness' was more common in elderly people.

The role of prior trauma and prior PTSD in predisposing PTSD after a motor vehicle accident has also received substantial empirical support. Having previously suffered from PTSD was identified as a risk factor for developing PTSD from an accident (Blanchard Hickling, Vollmer, Loos, Forneris & Jaccard, 1996; Breslau et al., 1991). Prior trauma or prior PTSD have been claimed to sensitise the individual, leaving them more vulnerable when a new trauma occurs (Blanchard, Hickling, Taylor & Loos, 1995; Breslau, Davis & Andreski, 1995).

Prior psychological disorders have received empirical support for their association with PTSD risk (e.g., Blanchard Hickling, Vollmer, Loos, Forneris & Jaccard, 1996; Blanchard, Hickling, Taylor & Loos, 1995; McNally & Saigh, 1993; Mayou, 1992;

McFarlane, 1989). According to Blanchard, Hickling, Taylor and Loos, (1995) this comorbidity has been mostly mood disorders (especially major depression) and anxiety disorders. This relationship appears to be positive in nature, the higher the prevalence of prior psychological disorders, the higher the risk of PTSD following a serious MVA.

Further expanding on the influence of prior diagnosable depression, it would seem that those who suffer from PTSD are extremely likely to meet the criteria for depression according to Blanchard, Hickling, Taylor, Loos and Gerardi (1994; also Blanchard, Hickling, Vollmer, Loos, Forneris & Jaccard, 1996). Blanchard, Hickling, Taylor and Loos (1995) found that those MVA victims who developed PTSD were more likely to have a history of major depression than were the MVA victims who had lesser responses to the trauma. They found that 59% of their sample of MVA victims with a history of major depression developed PTSD in an injury-causing MVA. They also found that 75% of the MVA victims who were in the midst of a major depression at the time of the accident developed PTSD. Similar results were found by Breslau et al. (1991).

There are also numerous characteristics of the accident that have been proposed by previous researchers, and these factors are discussed in the next section.

1.6.2 Characteristics of the accident

Intensity of the MVA has been found to be associated with the development of PTSD. High intensity refers to the eliciting of extreme fear and the perception of absolute helplessness. Low intensity would be an accident where neither of these factors were present. In a review by March (1993) of 19 articles looking at the effect of stressor intensity, 16 endorsed an intensity-response relationship with

PTSD across a variety of settings. In other words, he proposes that increasing intensity of exposure is proportional to PTSD risk.

Initial horrific and intrusive memories of the MVA are also factors that have been found to effect the onset of PTSD. Mayou et al. (1993) support such an association, which has widespread confirmation from other researchers. For example, those who were more seriously distressed initially showed a slower recovery than those who were less distressed initially in a study by Blanchard, Hickling, Vollmer, Loos, Buckley and Jaccard (1995). Feinstein and Dolan (1991) suggest that the way an individual initially assimilates and deals with a traumatic event ultimately has the greatest influence in determining outcome, and it has been claimed that perhaps this is the strongest first assessment predictor for the development of PTSD (Mayou, 1992). Brom et al. (1993) suggest that severe emotional reactions in the early phases of coping are an indication that psychological disorders will eventually develop. Also, the victim's fear of dying in the accident has been found to play a key role in the development of PTSD (Blanchard Hickling, Vollmer, Loos, Forneris & Jaccard, 1996; Bryant and Harvey, 1996; March, 1993).

The extent of injury sustained in the accident is another major factor identified in a profusion of research. Blanchard, Hickling, Vollmer, Loos, Forneris and Jaccard (1996) stated that one was more prone to developing PTSD if the accident was likely to have caused death or bodily harm. This concept was also supported by Blanchard, Hickling, Mitnick, Taylor, Loos and Buckley (1995), and Friedman and Schnurr (1995). McNally and Saigh (1993) also state that one of the major contributing factors of PTSD is the extent of injury to the victim. However, there have been many conflicting views on this topic, as many researchers have failed to support such a relationship between injury severity and risk of PTSD (e.g., Bryant & Harvey, 1996; Taylor & Koch, 1995; Green, 1994; Green, McFarlane, Hunter & Griggs, 1993; Feinstein & Dolan, 1991).

As the last two sections have alluded to, various researchers have identified many factors that could be associated with PTSD. Age, sex, prior psychological disorders, and prior traumas are some of the broader demographic and individual factors. An abundance of characteristics of the event which influence the likelihood of PTSD have been proposed, the most widely supported ones being stressor intensity, extent of injury sustained, and the initial wellbeing of the individual.

The findings of this past research play an important part in the present study, as it is these factors which become the basis for the assumptions of the relationship between motor vehicle accidents and PTSD.

1.7 Summary

To summarise previous findings, this section is a synopsis of what has been previously stated in the introduction, and makes some suppositions about those findings and the relationships that exist between PTSD, motor vehicle accidents and health care utilisation.

An individual does not exist in isolation, but is continually being subjected to many influencing factors. These include such things as experiences of other previous traumas, adverse life events, their mental and physical health and well-being, and their demographic details including such factors as gender and ethnicity. If this individual experiences a traumatic motor vehicle accident, it brings about a new and usually frightening and disturbing experience for all involved (Bryant & Harvey, 1996), and how these people deal with this experience depends on a

complex interaction of many factors. For example, how much control a person had over the situation, who was at fault, or the initial level of distress it caused, are all factors which may affect how a person deals with the situation and are important details in a persons attempt to some make sense and order of what has happened. Needless to say that how an individual deals with this event is highly idiosyncratic, with no two people dealing with a traumatic event in an identical manner.

The reactions of the individual is also a function of time since the accident. This implies that a person copes through a series of dynamic stages. Initially, there will be overwhelming anxiety and possibly grief, especially if they, or someone else was hurt or killed. This initial anxiety is often compounded if they believe that their own life was in danger.

These short-term reactions are quite likely to develop into phobias: fear of situations and stimuli similar to the accident, and trepidation about further driving. This is to be expected, however they are generally short-lived. For the majority of individuals, these debilitating symptoms and reactions to the accident begin to dispel over time. An individual's coping strategies take over, and the accident victim deals with the situation the best they can and carries on with life. Memories about the accident just make up one of the many learning experiences that the individual will have faced in their lifetime.

However, there is a sub-group of people whose coping strategies are not sufficient after a traumatic event to allow them to function properly for any of a number of reasons. If such debilitating after-effects continue for many months, maybe even years, the person is likely to be suffering Posttraumatic Stress Disorder. This group of individuals have characteristics in common that allow researchers to predict a likelihood of a given individual developing PTSD after a motor vehicle accident.

Should the debilitating effects of PTSD continue indefinitely, the drain on health care resources would be immense. Any long-term mental or physical problems sustained as a result of a serious MVA means more access is required to health care professionals, thus placing increased demands on the health care system. Perhaps the best way to prevent this from occurring is to identify any problems with the early phases of the coping process in an individual so that measures can be taken toward providing prompt assistance early in the piece, before any symptoms become manifest in such a way that treatment is complicated and difficult. As Brom et al. (1993) state, prompt psychological assistance after serious traumatic events will help to detect problems in the primary phases of coping so that serious disorders can be prevented. Severe emotional reactions in the early phases of coping are an indication that disorders will eventually develop (Brom et al., 1993). A small and timely investment of health care resources implemented early in an individual's coping process could save large spending of these precious resources if an individual becomes severely debilitated by PTSD.

1.8 The Thesis

Coping with traumatic events is an inherent human process. People respond to and deal with traumatic situations in an individual way, often rationalising or denying aspects of the event to maintain their psychological integrity. The initial shock, disbelief and bewilderment of an event is sometimes met with coping mechanisms such as intrusion, avoidance or denial. Victims often temporarily suffer from negative symptoms which disrupt their lives in varying ways. Most people will struggle with some psychological and/or physical ailments, but in general they will handle these problems and recover without professional help (Brom & Kleber, 1989). The occurrence and severity of these symptoms diminish

over time, and the event becomes integrated into the life and personal history of the individual. Some victims however, struggle with severe post-traumatic stress symptoms as a consequence of the event they endured, suffering from such debilitating symptoms as those outlined in section 1.4.

So what are the factors which lead certain individuals and not others to develop PTSD? The literature is mixed in terms of definitive causal factors, and researchers have not been very successful in separating and quantifying these factors and their effects on PTSD. As McGuire (1990) points out, the way that PTSD presents itself is both complex and ambiguous, making accurate diagnosis difficult.

However, despite many complicating factors that have been outlined in this introduction, the attempt to identify those factors which lead to PTSD is not a hopeless cause. Posttraumatic Stress Disorder is not randomly distributed in the population, as some individuals are at a higher risk of suffering from post-traumatic stress symptoms than others (Breslau et al., 1991). The topic of identifying those at risk and in need of specific help is a very important task. As Burnstein (1989) points out, because so many individuals are involved in motor vehicle accidents, the number of potential cases of PTSD is very large.

The present study attempts to identify some key factors, both of the accident and the individual, which lead to PTSD in individuals who have experienced a MVA. The study also considers the impact on health care utilisation of PTSD victims following such accidents. The distress following motor vehicle accidents clearly diminishes the quality of peoples lives, judging from the symptoms they report. In this context, research which throws light on the dynamics of PTSD following an MVA would appear both useful and warranted.

The following section looks at the research objectives of the present thesis. These were born from deficiencies identified in past research and points that needed to be clarified because of contradictory research findings. In short, the objectives in the present thesis look at the following areas, identified as areas in need of clarification stemming from deficiencies in previous research. There is general lack of population based studies, with samples often being those admitted to medical care with physical injuries. There is also a lack of New Zealand studies. There is a lack of information surrounding the relationship between MVAs and health care utilisation, and the potential drain on resources that can be drawn from this single factor. In general, there are many ambiguous and contradictory findings, often depending on the varying circumstances, samples used, method of collection, and measures used.

1.9 The Research Goals

In a previous section, a summary of the findings of other research, looking at both personality and psychological factors which possibly predisposes an individual to develop PTSD, was outlined. These findings formed the basis from which the current research objectives were derived. As research is sometimes contradictory, some issues have required further scrutiny, hence forming the research objectives. A brief outline follows each objective, attempting to explain the rationale behind each objective.

Objective 1.

To confirm the relationship between experience of trauma and PTSD in New Zealand motor vehicle accident victims.

In line with the findings of many overseas researchers (e.g., March, 1993; Feinstein & Dolan, 1991; Blanchard, Hickling, Vollmer, Loos, Forneris & Jaccard, 1996), it is suggested that PTSD symptoms will be more prevalent among those who had experienced motor vehicle accidents which involved serious threat to the victims integrity or where serious danger, damage, injury or distress occurred. A New Zealand sample had never come under scrutiny, especially a large-scale population-based investigation. These studies were also largely clinically based, with those who had recently been admitted to a medical establishment included in the sample. Population-based studies are the best method to ascertain the impact of motor vehicle accidents.

Objective 2.

> To assess whether PTSD symptoms will be more prevalent among those individuals who have had previous exposure to traumatic events.

The second objective involves traumatic events which the individual may have encountered previously in their lives, which may include exposure to any of a multitude of traumas, both motor vehicle accidents and other traumatic events, as well as the impact of life events such as adverse health, relationships or finances. This objective stems from the findings of many researchers (e.g., Blanchard Hickling, Vollmer, Loos, Forneris & Jaccard, 1996; Blanchard, Hickling, Taylor & Loos, 1995; Breslau et al., 1991; McFarlane, 1989), who reported that having had other traumatic events occur before the accident would predispose victims to an increased severity of subsequent PTSD symptoms. For example, someone who had recently had a spouse die, had lost their job, and had been the subject of a mugging only two months previously, would be more likely to have their everyday functioning affected more than someone who had not had to face a multitude of problems before the event. However, this is not a clear-cut result, with many

unclear and ambiguous findings. Other researchers have failed to even find support for such a relationship.

Objective 3.

To determine the relationship between perception of the degree of danger, damage, injury or distress as a result of the event, and mental health status.

Based on the findings of Brom et al. (1993), it is expected that a person's mental health status will be inversely correlated with the perceived impact of the event, such that if a person deems that the event had a extreme effect on their life, or it posed serious danger, damage, injury or distress, then this will contribute to poorer mental health. Although this relationship has widespread support, there are still contentious findings. For example, Green et al. (1993) found that injuries in MVA victims with PTSD were no more severe than those of MVA victims without PTSD, reflecting the findings of many studies who have failed to find a relationship between injury severity and risk of PTSD (Taylor & Koch, 1995).

Objective 4.

To ascertain if those with more PTSD symptoms access more health care services.

This objective looks at the effect on the longer-term health of accident victims, in particular the amount of health care utilisation. The work of Friedman and Schnurr (1995) is fundamental to this objective, as they state that PTSD is a major mediator of the relationship between trauma and health. The findings of Long et al. (1992) suggest that those with more PTSD symptoms will access more health care services such as visits to General Practitioners, and the requirement of prescription items. Further it is expected that these same people will also have

spent more days at home confined to bed because of their ill-health. Very few studies looking at MVAs have investigated the important aspect of health care utilisation of victims.

2. METHOD

The data presented in this thesis was part of a larger national study on the frequency and impact of traumatic events in New Zealand, titled "A community survey of trauma" (Flett, Millar, Long & MacDonald, in press). The details of this larger study are reported elsewhere.

This larger study by Flett et al. (in press) investigated the frequency and impact of various traumatic events in the community including the prevalence and duration of trauma-induced psychological disorders, and the subsequent health care utilisation of these trauma victims.

2.1 Procedure

The data collection utilised structured face-to-face interviews that typically lasted 45 minutes. These interviews were conducted in the respondents homes by trained National Research Bureau (NRB) interviewers, and the data was collected over a three month period. Participants were informed that their responses were anonymous and confidential, and that they could skip or omit any question, or withdraw from the study at any time. Information detailing how respondents could receive feedback of the results of the study was also detailed.

Households were randomly selected from pre-allocated mesh blocks taken from the procedure utilised in census taking. One adult of at least 18 years of age was randomly selected from each household. In total, 150 nation-wide mesh blocks were sampled and ten interviews conducted in each. This sample of 1500 people

was ethnically and geographically stratified to yield 750 urban interviews and 750 rural interviews, and to yield approximately one-third Maori respondents. 2590 people were contacted in an effort to get the desired number of 1500 respondents, achieving a 58% response rate.

2.2 The Sample Under Review

The primary questions that concerned the present study were those that specifically and indirectly related to motor vehicle accidents and their subsequent effects, their past histories of health and exposure to previous traumas, and health care services accessed.

A total of 167 people out of the available 1500 replied "yes" when asked if they had been in a serious motor vehicle accident in which one or more people had been seriously injured or killed. It is these 167 people who are the focus of the present research.

Table 2-1 summarises and compares the socio-demographic information for both the general sample used by Flett et al. (in press), and the sample used in the current study who had been involved in a serious motor vehicle accident. This subgroup was fairly representative of the total sample in terms of demographics, with age, marital status, paid employment, urban/rural area, and income, having a similar breakdown across the two groups.

The exceptions to this balanced representation were gender and ethnicity. Maori made up 43% of motor vehicle accident victims, despite only representing 34% of the total group sample, and the numbers of male and female were evenly divided (N=83, N=84 respectively), despite a far greater proportion of females in the

overall sample. Therefore, in general terms, the group of people who are statistically most at risk of suffering motor vehicle accidents are male maoris.

Table 2-1

Summary and comparison of socio-demographic information for both the general sample and the sample who had been involved in a serious motor vehicle accident.

	Overall sample (N=1500)	MVA victims (N=167)
Ethnicity		
New Zealand European	59 %	51 %
New Zealand Maori	34 %	43 %
Pacific Island	3 %	4 %
Other	4 %	3 %
Gender		
Male	36 %	50 %
Female	64 %	50 %
Age		
18-29	18 %	19 %
30-39	27 %	31 %
40-49	18 %	21 %
50-59	13 %	13 %
60-69	13 %	10 %
70+	11 %	7 %
Mean; SD	45; 17	43; 15
Marital Status		
Married	61 %	57 %
Never married	18 %	17 %
Separated/Divorced	12 %	18 %
Widowed	9 %	7 %
In Paid Employment		
Yes	47 %	48 %
No	54 %	52 %
Area		
Urban	50 %	49 %
Rural	50 %	51 %
Median Income	$13,700	$13,800

2.3 The Measures

The measures employed in the present study included a number of demographic, personal, medical and specific trauma incident questions. The following sections detail these measures.

2.3.1 Physical health

Respondents were asked to provide information on current symptoms, chronic illness, and self-ratings of their current health.

General physical health was assessed by a revised version of the Pennebaker Inventory of Limbic Languidness (PILL; Pennebaker, 1982). This scale measures the frequency of occurrence of common physical symptoms and sensations of ill health (e.g., headaches, nausea or vomiting, chest pains). High scores on this inventory indicate that the subject has more bothering ill-health symptoms, more physician and health care centre visits, and has more health-related work absences. Respondents indicated the experience of 28 physical symptoms and complaints over the last month, using a 5-point Likert scale of 'bother' (not at all, a little, moderately, quite a bit, extremely). Therefore, scores provided on this index should provide information on the number and severity of physical symptoms experienced by the respondent.

A list of common chronic health problems was included which assessed longer term health problems. Respondents indicated which complaints they had experienced for six months or longer. Flett et al. (in press) developed the scale used in the present study, by amending Belloc, Breslow and Hochstim's (1971) existing checklist of serious medical conditions.

2.3.2 Life events

The impact of life events on respondents was measured by the use of a 20-item life events scale looking at positive and negative life stressors in the last 12 months. This scale was adapted specifically for use in the current study by Flett et al. (in press) from the work of Hughes, George and Blazer (1988). The items included details on personal and family health, death, parenthood, legal problems, marital status, employment, residence, and finances. High scores on this scale indicate many stressful activities and major upheavals in the last 12 months. This measure provides important information on previous traumatic or stressful events which Davidson and Fairbank (1993) have claimed to predispose an individual to develop PTSD. The existence of life events such as these have also been identified as factors that increase use of mental health services (Rubio & Lubin, 1986; cited in Norris, Kaniasty & Scheer, 1990).

2.3.3 Traumatic experiences

A traumatic events scale was devised specifically for the present study by Flett et al. (in press) based on the work of Norris (1990). This scale was used to collect lifetime incidence data on traumatic events, including motor vehicle accidents. Other events included military combat, unwanted sexual activity, domestic assault, physical assault, muggings, accidents, disruption and damage from disaster, violent or unexpected death of loved one, and extreme violence toward a loved one. There was also an 'other' category, to which a respondent could indicate if they had other experiences which they felt were terrifying or traumatic.

This traumatic events scale had three sections. In the first section, respondents indicated whether or not they had ever experienced any of the traumatic events listed. The second section contained questions uncovering descriptive details of the traumatic event, including when the event occurred and briefly what happened.

The third section included a number of items which assessed the respondent's perceptions of various dimensions of this event. Using 5-point scales (see Table 3-2 for question anchors), respondents indicated the degree to which they felt that they were in control of the situation, how distressing the event was at the time, and the degree to which they felt that their lives were in danger during the event. Other questions tapped the degree to which the event was unexpected, their beliefs about why the event happened, the degree of physical injury and property loss or damage incurred. Questions on whether or not they had confided in others about the trauma, and the degree to which they felt that the event had affected their lives were other measures used.

2.4 The Dependent Variables

2.4.1 Posttraumatic stress disorder

Posttraumatic Stress Disorder symptoms were assessed with a short version of the Civilian Mississippi Scale (Keane, Caddell & Taylor, 1988). The original scale was for combat related PTSD, and was a 35-item, self report questionnaire which became one of the most widely used measures of PTSD in war zone veterans, renowned for its reliability and validity (Fontana & Rosenheck, 1994). Fontana and Rosenheck (1994) devised an 11-item version of the scale, claiming it had high sensitivity, high internal consistency, and had good correspondence with the

larger scale. Civilian versions of the scale, using less combat orientated item wording have also been utilised (e.g., Vevren, Gudanowski, King, & King, 1995).

The scale used in the present study included the 11 items from the short form of the combat-related Mississippi Scale (Fontana & Rosenheck, 1994), with wording more appropriate to a general survey, as used in civilian versions of the Mississippi scale (Flett et al., in press).

The coefficient alpha for the PTSD scale used in present study was .73, and the individual item-total correlations ranged from 0.32 to 0.64 with a mean of 0.52.

2.4.2 Mental health

In the present study, mental health was assessed by the Mental Health Inventory (Veit & Ware, 1983). Using a 7-point response scale, respondents indicated how frequently they had experienced 38 conditions over the last month (e.g., do you feel relaxed, nervous, lonely, restless). This measure provided an overall mental health score and incorporated two sub-scales of wellbeing and psychological distress, and these variables were considered as separate variables within this study. Both of these dimensions have been shown to have high internal consistency and high one-year stability (Veit & Ware, 1983). Internal consistency was high in the present study, with an alpha reliability score of .95.

There have been a number of studies linking mental health with the demand for medical care. The two dimensions of mental health status, distress and wellbeing, have been found to be strong predictors of health care use (e.g., Manning & Wells, 1992). Individuals with a poorer mental health status has been found to access health care services more frequently (Manning & Wells, 1992; Berkanovic,

Hurwicz & Landsverk, 1988). Also, individuals who have measured highly on the psychological distress subscale have also reported more illnesses (Berkanovic et al., 1988). Koss, Woodruff and Koss (1990) found that victims of violence were linked with increased risk for mental disorders among their community sample.

2.4.3 Health care utilisation

Three key aspects of health care utilisation were also examined. These areas dealt with the number of visits to a doctor in the preceding 12 months, the number of days spent in bed due to ill-health in the preceding 12 months, and the number of prescription items required from the chemist in the preceding 12 months. These were relatively informal measures of health care utilisation, exploring three important yet diverse aspects of health care utilisation.

2.5 Analysis

Where relevant, differences between groups were analysed using the *t* test. In all instances where *t* tests were performed, an *F* test of sample variances was carried out for each comparison, and if the probability of *F* was >.05, then it was assumed that the sample variances were equal and *t* statistics based on pooled variance estimates was used. If the probability of *F* was <.05, then it was assumed that the sample variances were unequal and *t* statistics based on separate variance estimates were used (Snedecor & Cochran, 1980).

Before undertaking hierarchical multiple regression to determine the nature of the relationship between motor vehicle accidents, PTSD, and health care utilisation, screening of the data was necessary to check for assumptions of normality, linearity, and to identify outliers (Tabachnik & Fidell, 1980). Log transformations

were applied to the dependant variables measuring visits to the doctor and the number of days confined to bed, because of their extreme skewness. However, even after this transformation, the skewness of the variable dealing with the number of days confined to bed, although greatly reduced, was still significant using conventional but conservative alpha levels as recommended by Tabachnik and Fidell (1980).

Bivariate correlation analysis was employed to provide insight into the relationship of the variables (Pearson r) before the regressions were performed. Hierarchical multiple regressions were then used to examine the model fit for each of the six dependant variables; PTSD, distress, wellbeing, days confined to bed, doctor visits, and prescription items.

Socio-demographic variables were entered on step one in the regression, and characteristics of the accident are entered on the second step. In this way, the question of whether characteristics of the accident itself significantly contribute to the prediction of mental health and health care utilisation, once socio-demographic characteristics are controlled for, can be answered.

3. RESULTS

This section is divided into five parts. The first part outlines the descriptive statistics of the independent variables utilised in the study, such as contextual and demographic variables, the characteristics of the accident, and the health of the sample. The second part details the descriptive statistics of all six dependent variables, with an emphasis on PTSD.

The third part of the results section looks at mental health, including the results and commentary of the regression models of PTSD, distress, and wellbeing. The fourth part explores the regressions relating to the health care utilisation of the sample, and the fifth and final section looks at whether the research goals were confirmed. Unless otherwise stated, the results section details just the subset of people who have experienced at least one motor vehicle accident. These people are now referred to as "the sample".

3.1 Descriptive Statistics - The Independent Variables

3.1.1 Contextual and demographic factors

Table 3-1 (below) provides descriptive statistics for the eleven variables that detail some of the contextual and demographic factors identifies by past literature as possible predisposing factors of PTSD. Question anchors and coding algorithms are specified.

The table shows that approximately half of the sample was male, half was Maori, and half were currently in paid employment. The majority of respondents had not

had more than one MVA, but most had experienced more than one other trauma in their lives. The mean number of adverse life events in the last 12 months exceeded three.

The sample of MVA victims revealed an evenly split urban/rural distribution, and the majority were currently married. The ages of respondents ranged from 20 to 85 years of age, with the average age being 43 years (SD=15 yrs). The mean annual income was 18,400, with a standard deviation of $14,500.

Table 3-1

Means, standard deviations, and question anchors used for the contextual and demographic variables in the multiple regression models (N=167).

Variable	M	SD	Question Anchors
Age	43.1	15.2	Actual age in years
Gender	1.5	0.5	1= male, 2= female
Ethnic group	1.5	0.5	1= NZ European, 2= Maori (N=156)
Paid employment	1.5	0.5	1= yes, 2= no
Annual income	18,400	14,500	Actual annual income ($NZD)
Adverse life events	3.5	2.4	No. of adverse life events from list of 20 events
Chronic health symptoms	1.4	1.6	No. of chronic health problems from list of 17 common symptoms
Multiple car accidents	1.8	0.4	1= yes (29), 2= no (137)
Number of traumas	2.1	1.8	No. of other traumas experienced from a list of 12 common traumatic experiences
Time since accident	16.3	12.8	Time in years (Range <1yr to 69yrs)
Physical health symptoms	40.2	11.4	Composite score of number and severity (min possible=28, max possible=140).

Of the 167 people in the study, 29 had been victim of more than one motor vehicle accident, and 135 had suffered from just one MVA. The average time since the accident (or most recent accident) was 16.3 years (SD=12.8 yrs).

3.1.2 Characteristics of the event

Table 3-2 (below) displays the descriptive statistics for the ten variables dealing with the characteristics of the most recent car crash. To put the figures in context, the question anchors are provided. Respondents revealed that generally the accident was very much both unexpected and out of their control. How distressing the accident was deemed to be, and the extent of sustained injuries were also judged to be quite substantial, with scores rating near the top end of the scale.

Table 3-2

Means, standard deviations, and question anchors used for characteristics of the motor vehicle accident variables used in the multiple regression models (N=167).

Variable	M	SD	Question Anchors
Control of situation	4.3	1.1	1= complete control; 5= no control
Unexpectedness	4.7	0.9	1= completely expected; 5= completely unexpected
Danger of situation	2.4	1.5	1= thought would not die; 5= believed they would die
Damage sustained	2.5	1.5	1= no destruction; 5= complete destruction
Extent of injury	2.6	1.1	1= severe injury; 4= no injury
Extent of distress	3.8	1.1	1= not at all distressing; 5= extremely distressing
Effect on life	6.1	1.5	2= no negative effects; 10= extreme negative effects
Discussed feelings	5.9	2.1	2= no feelings discussed; 10= lots of feelings discussed

The danger of the situation and the damage sustained were both judged to be moderate in intensity, with scores centring about the middle of the scale. Also in the mid-range of the scale were the variables tapping the negative effects of the MVA on their life, and the extent to which they were willing to discuss their feelings.

Nineteen percent judged that their own actions directly caused the accident, and fifty percent deemed that the actions of someone else lead to the accident occurring. A technical or mechanical problem was at fault according to just nine percent, and natural forces such as the weather was the attributed cause in 19% of accidents. Two percent of respondents did not know the probable cause of the accident.

The following sections expand on the descriptive statistics of prominent variables important in the understanding of the relationship between PTSD, mental health and health care utilisation following an MVA.

3.1.3 Adverse life events

Figure 3-1 below shows the percentages of people who have experienced any of the listed stressful events during the past 12 months. The most common event was a family member having an illness, injury, or a medical operation in the last 12 months, with 43% of respondents indicating that this was a source of stress in the last 12 months. The least common event was having a spouse or partner die in the last year, with only two percent confirming this occurrence.

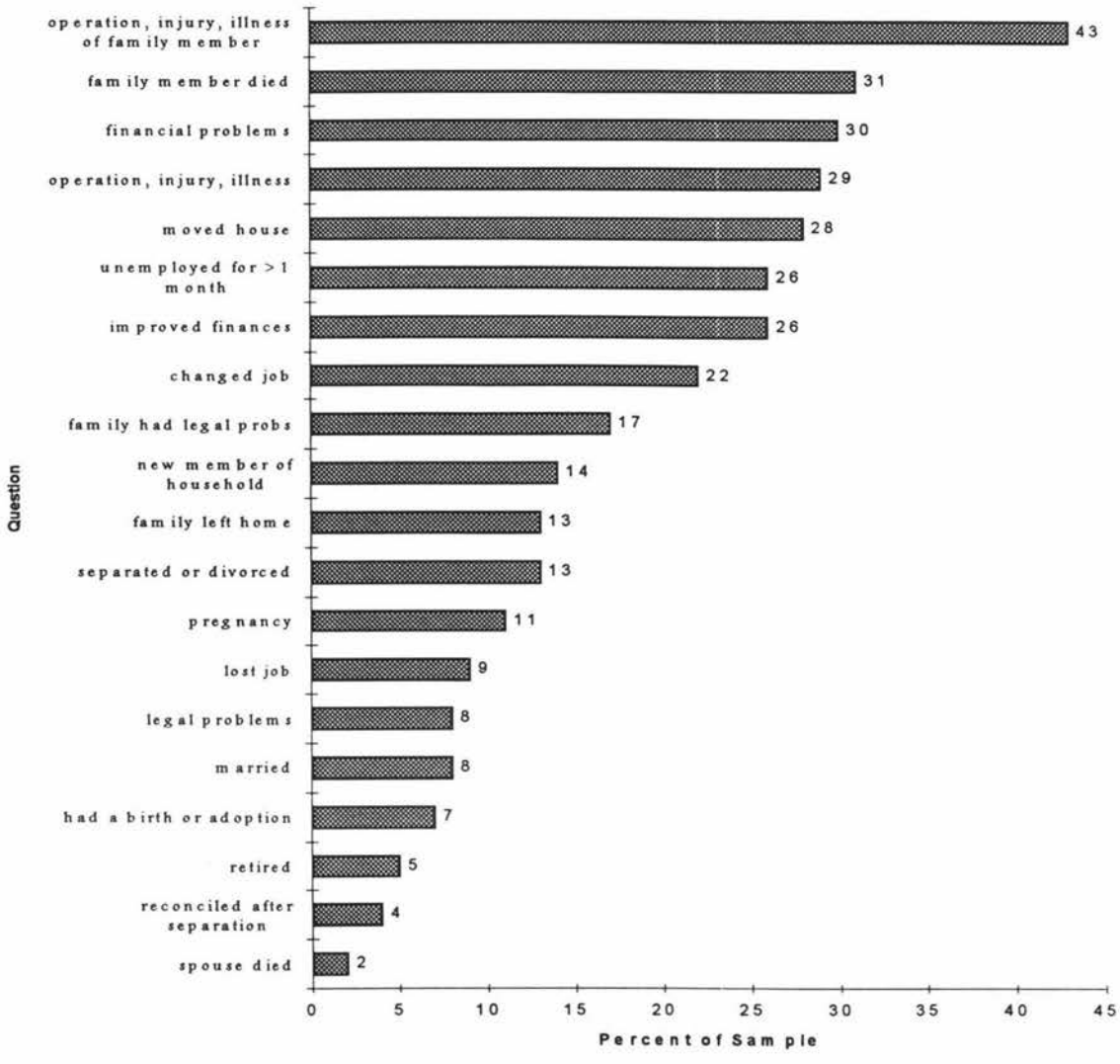

Figure 3-1 Percentage of people who reported experiencing each stressful life event.

The scores of the total number of adverse life events that had been experienced by individuals in the sample ranged from zero to eleven events, with the mean being 3.5 items (SD =2.4). Seventy five percent of the sample experienced four or less of the items, and nine percent experienced eight or more traumas (see Table 3-3).

Table 3-3

Prevalence of adverse life events that had been experienced by the sample (N=167).

Number of Adverse Life Events	Percent
0	7
1	14
2	18
3	22
4	14
5	5
6	6
7	5
8	4
9	4
10	1
11	1

M = 3.5 SD = 2.4

3.1.4 Previously experienced traumas

What other traumas had the sample experienced? Table 3-4 below shows the prevalence of traumatic experiences experienced by the sample, other than motor vehicle accidents. Respondents could choose from eleven specific traumas from a given list, as well as any other trauma not covered by the list. The 'N' column shows the number of people out of the 167 who had experienced that particular event. The percent column next to it presents the same outcome, but in percentage form. It is possible for people to have experienced more than one trauma, hence the percentage column adding up to more than 100% (see Table 3-5 for a break-down of numbers).

The most common experience was the violent or unexpected death of a loved one, with 56 people experiencing that event. The least prevalent was combat exposure, with only ten people indicating that they have experienced this traumatic situation.

Table 3-4

Prevalence of other traumas that have been experienced (other than motor vehicle accidents) from the list of 12 commonly experienced traumatic events (N=167)

Traumatic Experience	N	Percent
1. Military combat?	10	6
2. Unwanted sexual activity as a child?	20	12
3. Unwanted sexual activity as an adult?	15	9
4. Attacked or beaten by a family member?	42	25
5. Attacked or beaten (by other than a family member)?	38	23
6. Mugged, robbed or held-up?	21	13
7. Serious accident (not a vehicle accident)?	33	20
8. Serious injury or damage due to a major disaster?	13	8
9. Forced to leave home due to impending disaster?	15	9
10. Violent or unexpected death of a loved one?	56	34
11. A loved one experienced serious injury?	47	28
12. Another traumatic experience not covered?	42	25

Table 3-5 below shows the quantity of traumatic experiences that had been experienced. The mean number of traumas that the sample had experienced was 2.1 (SD = 1.8) out of the 12 traumatic experiences that were listed. Less than 20% of the sample had experienced no traumas other than a MVA, and almost half had experienced either one or two other traumas. Six people indicated that they had experienced six or more of the 12 traumatic events.

Table 3-5

Prevalence of traumas that had been experienced (other than motor vehicle accidents) from the list of 12 common traumatic experiences (N=167).

Number of other traumas	Number (167)	Percent
0	31	19
1	40	24
2	40	24
3	24	14
4	12	7
5	14	8
6	2	1
7	2	1
8	2	1

M = 2.1 SD = 1.8

3.1.5 Health

The health of the sample was ascertained by looking at both short-term general physical health, and long-term severe chronic health. The results of the total scores are presented in Table 3-6. To put these figures in context, Table 3-6 also shows the scores for people who have reported having had no traumatic events happen to them in their lives. This group of people was derived from the previously mentioned Flett et al. (in press) study.

An independent-samples *t* test revealed that there were significant differences between these two groups on the general physical symptoms measure $t(218.8) = 3.47$, $p<.001$, with the victims of motor vehicle accidents being significantly more bothered by the state of their general physical health in the last 12 months. However, there were no significant differences between these two groups for chronic health symptoms.

Table 3-6

Descriptive statistics of physical and chronic health of the sample (N=167).

	The Sample (N=167)				No Trauma (N=539)			
Variable	M	SD	Min	Max	M	SD	Min	Max
General physical symptoms	40.2	11.4	28	84	36.6	8.7	28	104
Chronic health symptoms	1.4	1.6	0	9	1.3	1.7	0	17

3.2 Descriptive Statistics - The Dependent Variables

This section explores the descriptive statistics for the dependent variables utilised in the present study. Where relevant, these basic statistics are compared with a

group of people who have reported having had no major trauma in their lives. Finally, the most important dependent variable in this research, PTSD, is expanded upon more fully.

Table 3-7 below details the questions used to tap the dependent variables used to measure mental health and health care utilisation, giving the ranges of possible scores and the coding algorithms where applicable. Table 3-8 details the means, standard deviations, and ranges for these variables.

Table 3-7

Explanations of the coding used for each of the six dependant variables (three for mental health, three for health care utilisation).

Dependant Variable	Coding Algorithms and Question Anchors
Mental Health	
PTSD	Total score from the PTSD questions
Distress	Psychological distress score from the Mental Health Inventory
Wellbeing	Psychological wellbeing score from the Mental Health Inventory Questionnaire
Health Care Utilisation	
Days confined to bed	Actual days spent in bed in last 12 months due to ill-health
Doctor visits	Total number of times seen a doctor in last 12 months
Prescription items	Number of prescription items from the chemist in last 12 months: 1= no items, 2= 1-4 items, 3= 5-9 items, 4= 10-14 items, 5= >15 items

Table 3-8 below details the basic descriptive statistics for the dependent variables. The scores for the sample are contrasted with the scores from the no trauma group.

Table 3-8

Descriptive statistics of the sample and no trauma group for the six dependent variables.

	MVA (N=167)				No Trauma (N=539)			
Dependant Variable	M	SD	Min	Max	M	SD	Min	Max
Mental Health								
PTSD	23.4	6.3	12	39	20.2	4.6	11	40
Distress	62.5	25.1	30	143	50.5	20.1	24	137
Wellbeing	74.9	16.1	17	98	78.1	13.3	29	98
Health Care Utilisation								
Days confined to bed	3.5	7.2	0	48	2.1	5.7	0	60
Doctor visits	4.4	6.9	0	50	4.1	5.6	0	52
Prescription items	2.3	1.3	1	5	2.3	1.2	1	5

Independent *t* tests were performed on these two groups to see if there were any significant differences between them. The two groups differed significantly on all three mental health variables. PTSD was significantly more prevalent in the victims of motor vehicle accidents $t(211.2)= 5.72$, $p<.001$. The level of psychological distress in the sample was also significantly greater than that in the no trauma group $t(208)= 3.41$, $p<.001$. The last mental health measure, psychological wellbeing, was also shown to have differences between the two groups with victims of MVAs having smaller scores $t(220.8)= -2.46$, $p<.05$, indicating that the wellbeing of individual is likely to be negatively affected if they have been subjected to a traumatic motor vehicle accidents.

However, *t* tests revealed that there were only significant differences between the two groups on one of the three health care utilisation variables. The number of days confined to bed was greater in victims of MVAs $t(224.8)= 2.09$, $p<.005$. There were no differences in the number of visits to the doctor, or the quantity of prescription items required from the chemist.

3.2.1 PTSD in more detail

The PTSD responses are detailed in Figure 3-2 and Figure 3-3. The questions are broken-down to reveal the percentage of responses for each of the eleven PTSD questions. Feeling emotionally close to others is the most common of the PTSD symptoms, and feeling emotionally numb is the least common. Nightmares of the past experience, and guilt over past actions were also common symptoms.

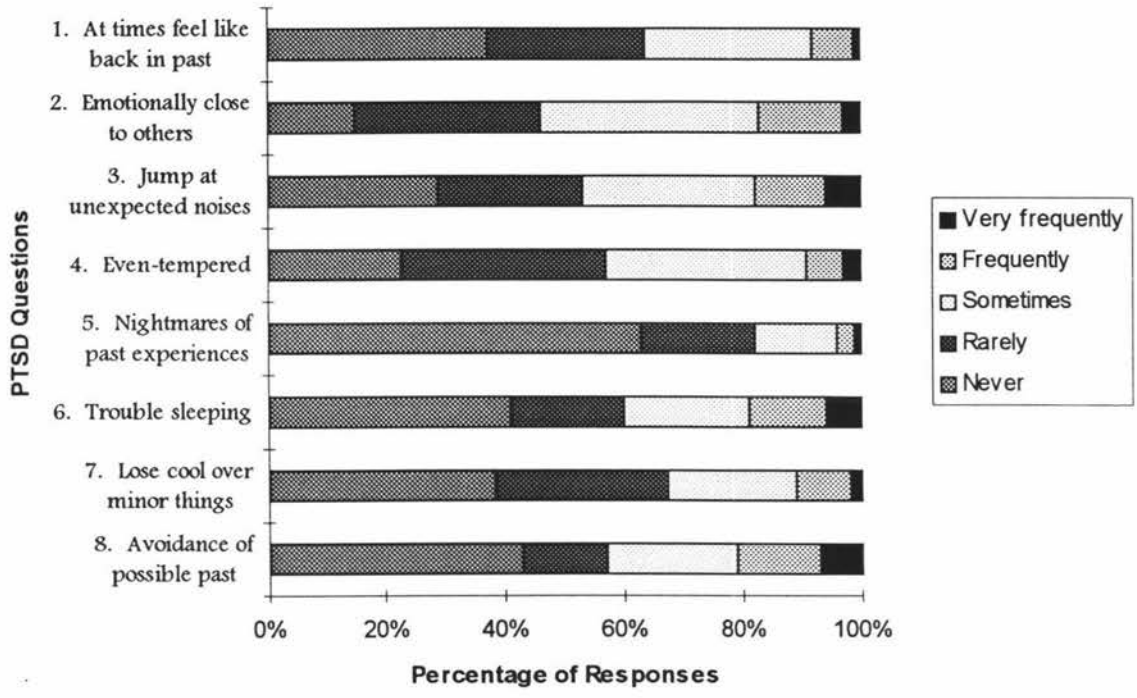

Figure 3-2 Percentage of responses by category for PTSD questions one to eight.

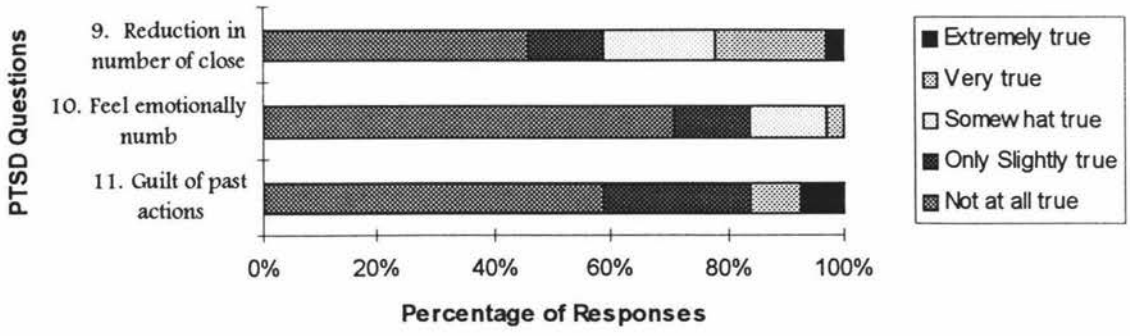

Figure 3-3 Percentage of responses by category for PTSD questions nine to eleven.

Figure 3-4 below shows the distribution of the total PTSD scores, the higher the score, the more PTSD-related symptoms. The mean score was 23.4 with a standard deviation of 6.3. The minimum possible score was 11 and the maximum possible score was 55. As Figure 3-4 shows, the sample's total PTSD scores ranged from 12 to 39. The distribution is slightly positively skewed, with 52% of the scores being between 17 and 26.

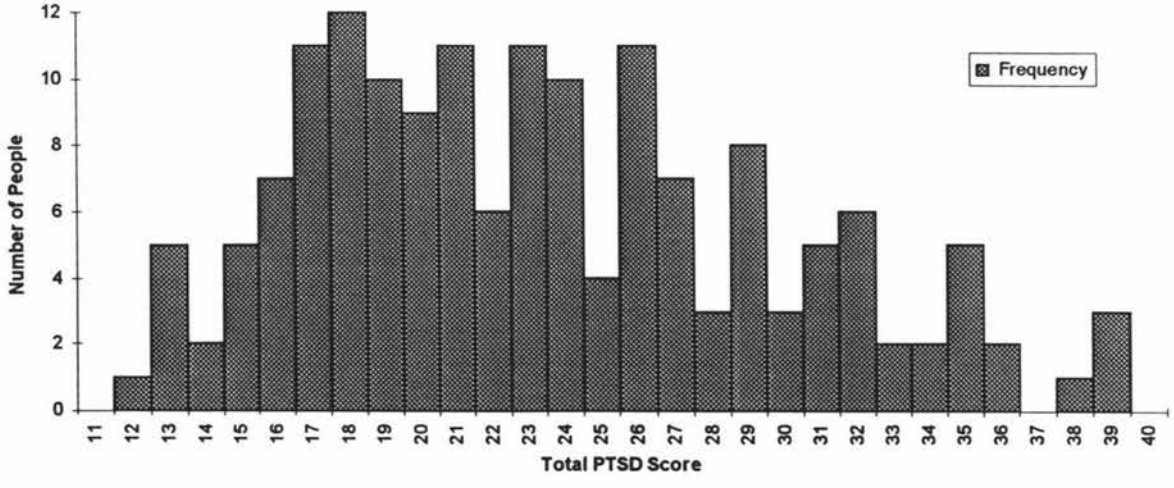

Figure 3-4 Frequency of PTSD scores.

Figure 3-5 below puts these figures in perspective as distributions are compared of the sample and the group who had suffered no trauma. The mean for the no trauma group was 20.2 (SD= 4.6) as compared with mean for the victims of MVAs of 23.4 (SD= 6.3). As previously mentioned, an independent-samples *t* test revealed that this difference was indeed significant, $t(211.2) = 5.72$, $p<.001$, indicating that those who have been subjected to a traumatic motor vehicle accident are more likely to develop PTSD symptoms.

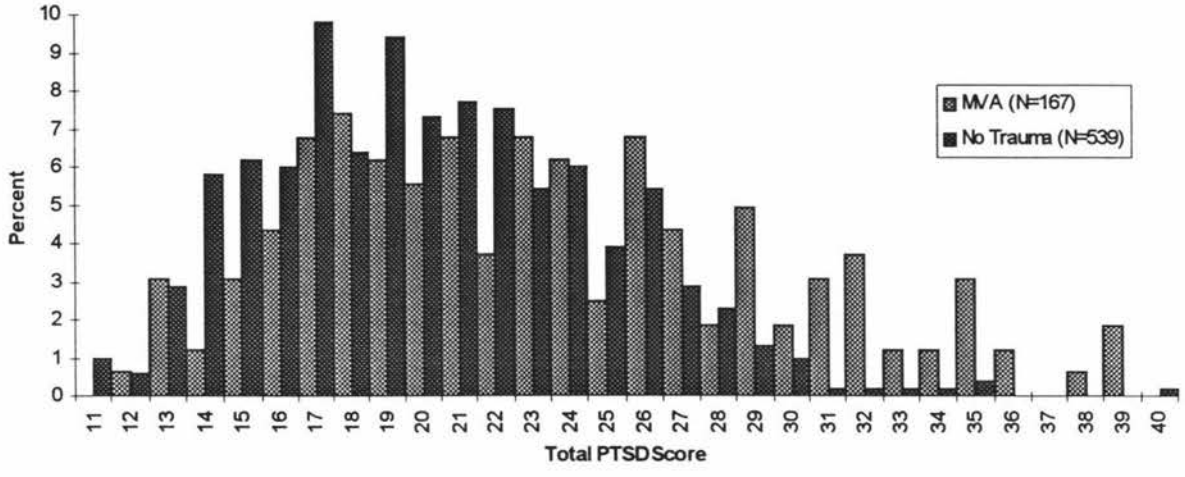

Figure 3-5 Comparison of PTSD scores for victims of MVA and those who reported having had no trauma.

The following sections look at the dependant variables used in the present study used to assess the relationship between motor vehicle accidents, PTSD, and health care utilisation. This is split up into two major sections, titled mental health and health care utilisation.

3.3 Mental Health

Hierarchical regression analysis was used to evaluate the contribution of personal characteristics and event characteristics in explaining three mental health variables: PTSD, distress, and wellbeing. The effects of the characteristics of the event itself were estimated after controlling for personal characteristics including demographics and past history of trauma. The results are presented in Table 3-10, Table 3-11, and Table 3-12. The standardised beta coefficients for each variable within the blocks are reported. Total variance explained by each step of the equation is provided (R^2 and adjusted R^2) along with the added variance explained by each block of variables while controlling for previous blocks (R^2 change).

Table 3-9

Bivariate correlations (Pearsons r) between the independent variables (predictors) and the dependant mental health variables.

	Correlation Coefficient		
Predictors	PTSD	Distress	Wellbeing
Age	-0.27***	-0.24	0.13*
Gender	-0.03	-0.05	0.13
Ethnic group	0.14*	0.06	0.08
Paid employment	-0.03	0.01	0.00
Annual income	-0.01	-0.02	-0.01
Adverse life events	0.40***	0.31***	-0.21**
Chronic Health	0.09	0.20**	-0.15*
Multiple car accidents	0.09	0.04	-0.06
Number of traumas	0.28***	0.11	-0.18**
Time since accident	-0.15*	-0.08	0.06
Physical symptoms	0.40***	0.50***	-0.30***
Control of situation	-0.07	0.01	-0.02
Unexpectedness	0.00	0.02	-0.11
Who caused the accident	-0.06	-0.03	0.09
Danger of the situation	0.18**	0.19**	-0.12
Damage sustained	-0.02	-0.05	0.03
Extent of injury	-0.21***	-0.11	0.13
How distressing was it	0.16*	0.08	-0.20**
Effect on life	-0.01	-0.02	-0.06
Discussed feelings	-0.10	-0.17	0.12

*p<.05, **p<.01, ***p<.001

Table 3-9 above shows the correlation coefficients for the relationships between the mental health variables and personal characteristics and characteristics of the event. This table is referred to recurrently when describing the regression models.

3.3.1 PTSD

As shown in Table 3-10 below, personal characteristic variables alone explained 28% of variance (adjusted R^2) in PTSD at step one, $F(11,155) = 6.77$, $p<.001$. After step two, with the addition of the 9 characteristics of the event variables, total variance explained in PTSD was 36%, $F(20,146) = 5.70$, $p<.001$. The characteristics of the event variables accounted for 11% unique variance in PTSD when controlling for personal characteristic variables. The R^2 change when entering the characteristics of the event variables was significant, $F(20, 146) = 3.29$, $p<.01$. The overall model was significant.

By examining the beta coefficients at each step it is possible to observe the effects of individual variables on the dependent variable within each block, and the extent to which the addition of the second step alters these effects. With all variables in the equation (step two), only ethnicity, adverse life events and physical symptoms were significantly related to PTSD from the first block of variables. Having had multiple car crashes or lots of other traumas were not significant variables at any stage, and neither was the time since the accident. Gender, age, employment and income also did not significantly contribute to PTSD at any step in the equation.

As expected from bivariate correlation analysis (see Table 3-9), the greater the physical symptoms the greater the extent of the presenting PTSD symptoms. As too for adverse life events, indicating that stressful activities and major upheavals in the past 12 months also affect PTSD. Thus, those with physical symptoms, and

those who have had adverse life events had higher levels of PTSD than others who did not have similar symptoms, when controlling for other variables related to PTSD. Also, the regression would indicate that being Maori also tends to increase the chances of being afflicted by PTSD symptoms, although correlation analysis did not imply such a relationship. However, this significant ethnicity variable appears to be as a result of a suppression effect. This results when a variable becomes significant at the second step, when it is not significant in the first step. The conclusions that can be drawn from such a variable are questionable as there is much disagreement among statisticians over the meaningfulness of suppression effects or how to deal with them (Smith, Ager & Williams, 1992).

From the second block of nine characteristic of event variables, three were significantly related to PTSD in bivariate analyses, however only two were significant contributors of PTSD after controlling for personal characteristic variables in the regression analysis. Danger, injury, and distress were the three correlated variables, but only one of these, being the extent of injury sustained was a relevant contributor in the regression model. This negative correlation indicates that severe injury sustained in the accident leads to the occurrence of PTSD-like symptoms in accident victims. The degree to which thoughts and feelings were discussed was a significant predictor of PTSD, even though this relationship did not show up in bivariate analysis.

Many factors, including the person responsible for the accident, the amount of control in the situation, the unexpectedness, and the distress and effect on life were not significant contributors of PTSD levels. The variables assessing the danger of the situation or the damage sustained were also nonsignificant contributors of PTSD.

Table 3-10

Hierarchical multiple regression of personal characteristics and characteristics of the event on PTSD showing standardised regression coefficients, R, R^2, adjusted R^2 and R^2 change for all subjects (N=167).

PTSD		
Predictors	Step 1	Step 2
Controlling Variables		
Age	-0.062	-0.117
Gender	-0.035	0.010
Ethnic group	0.100	0.147*
Paid employment	-0.018	-0.072
Annual income	0.030	0.057
Adverse life events	0.269**	0.245**
Chronic Health	-0.019	0.011
Multiple car accidents	0.135	0.111
Number of traumas	0.098	0.142
Time since accident	-0.050	-0.035
Physical symptoms	0.349***	0.303***
Characteristics of Event		
Control of situation		-0.112
Unexpectedness		-0.011
Who caused the accident		-0.058
Danger of the situation		0.026
Damage sustained		-0.050
Extent of injury		-0.312***
How distressing was it		-0.040
Effect on life		0.076
Discussed feelings		-0.152*
Multiple R	0.57***	0.66***
Total R^2	0.32	0.44
Adjusted R^2	0.28	0.36
R^2 change	0.32***	0.11**

*p<.05, **p<.01, ***p<.001

3.3.2 Distress

Personal characteristic variables alone explained 30% of variance in Distress in step one, $F(11,155) = 7.54$, $p<.001$. With the addition of the 9 characteristics of the event variables in step two, total variance explained in distress was 32%, $F(20,146) = 4.97$, $p<.001$. The characteristics of the event variables accounted for 6% unique variance in distress when controlling for personal characteristic

variables, however this R^2 change from entering the characteristics of the event variables was not significant, $F(20, 146) = 1.54$, $p>.05$. However, the overall model was significant.

With all variables in the equation, once again adverse life events and physical symptoms were significantly related to distress from the first block of variables. Age was not a significant predictor, although it was significant at step one, suggesting a partial mediation by the characteristics of the event variables. As with PTSD, multiple car crashes and other traumas and the time since the accident were not significant variables at any stage. Gender, employment and income also did not significantly contribute to distress at any step in the equation.

Bivariate analysis revealed little information over and above the regression model. Adverse life events, age and physical symptoms were the only three variables significantly correlated with distress. There was a positive correlation between the number of adverse life events encountered by a person and their level of distress. A positive correlation also existed between the number of physical health symptoms and levels of distress. Distress was found to be negatively correlated with age, indicating that feelings of distress are reduced as an individual gets older.

Two of the nine characteristic of event variables were significantly related to distress in bivariate analysis. These were the danger of the situation, which was positively correlated, and the willingness to discuss the event was negatively correlated with distress. However, neither of these two variables were found to be significant in the regression model. The only variable which was found to be a significant predictor of distress was the extent of the injury sustained from the accident. The model suggests that the two are negatively correlated, indicating that distress levels increase as the injuries become more severe.

As with PTSD, the majority of factors were not significant contributors of distress levels. Other than those already mentioned, the amount of control in the situation, the person responsible for the accident, the damage sustained, the unexpectedness, and the distress and effect on life were not significant predictors of distress.

The introduction of the variables dealing with the characteristics of the event did not significantly improve the predictability of distress, over and above the controlling variables.

Table 3-11

Hierarchical multiple regression of personal characteristics and characteristics of the event on Distress showing standardised regression coefficients, R, R^2, adjusted R^2 and R^2 change for all subjects (N=167).

DISTRESS		
Predictors	Step 1	Step 2
Controlling Variables		
Age	-0.192*	-0.195
Gender	-0.058	-0.021
Ethnic group	-0.002	0.009
Paid employment	0.044	0.020
Annual income	-0.002	0.012
Adverse life events	0.262**	0.263**
Chronic Health	0.086	0.129
Multiple car accidents	0.015	0.024
Number of traumas	-0.136	-0.120
Time since accident	-0.044	0.016
Physical symptoms	0.436***	0.398***
Characteristics of Event		
Control of situation		-0.001
Unexpectedness		-0.006
Who caused the accident		-0.038
Danger of the situation		0.118
Damage sustained		-0.068
Extent of injury		-0.164*
How distressing was it		-0.121
Effect on life		0.039
Discussed feelings		-0.121
Multiple R	0.59***	0.64***
Total R^2	0.35	0.41
Adjusted R^2	0.30	0.32
R^2 change	0.35***	0.06

*p<.05, **p<.01, ***p<.001

3.3.3 Wellbeing

Only 10% of the variance in wellbeing was explained by the personal characteristic variables in step one, $F(11,155) = 2.77$, $p<.005$. After step two, with the addition of the 9 characteristics of the event variables, total variance explained in wellbeing was 12%, $F(20,146) = 2.18$, $p<.005$. The characteristics of the event variables accounted for 7% unique variance in wellbeing when controlling for personal characteristic variables. The R^2 change when entering the characteristics of the event variables was not significant, $F(20, 146) = 1.38$, $p>.05$.

At the end of step two, only one variable out of the eleven personal characteristic variables was significantly related to wellbeing. This sole significant variable was the presence of physical symptoms. This was to be expected as bivariate analysis also revealed this negative correlation between wellbeing and physical symptoms, indicating that an individuals wellbeing is impaired as the number of physical symptoms increase.

However, correlation analyses disclosed four other variables from the first block alone which were significantly correlated with wellbeing. Adverse life events, number of past traumas, and the chronic health variables were all negatively correlated with wellbeing. Age was positively correlated with wellbeing, denoting that younger people are more likely to have their mental wellbeing adversely affected. Gender, employment and income also did not significantly contribute to wellbeing distress at any stage.

From the second block of nine characteristic of event variables, there were no significant predictors of wellbeing after controlling for the personal characteristic variables. Correlation analysis indicated a significant negative correlation with the variable dealing with the effect that the accident had on their life, but the regression model did not confirm this relationship. Therefore, not surprisingly, the characteristics of the event variables did not significantly improve the regression model. Nonetheless, the overall model was significant.

Table 3-12

Hierarchical multiple regression of personal characteristics and characteristics of the event Wellbeing showing standardised regression coefficients, R, R^2, adjusted R^2 and R^2 change for all subjects (N=167).

WELLBEING		
Predictors	Step 1	Step 2
Controlling Variables		
Age	0.078	0.062
Gender	0.123	0.099
Ethnic group	0.125	0.115
Paid employment	-0.060	-0.016
Annual income	0.005	-0.023
Adverse life events	-0.153	-0.164
Chronic Health	-0.081	-0.074
Multiple car accidents	-0.072	-0.061
Number of traumas	-0.067	-0.089
Time since accident	-0.020	0.005
Physical symptoms	-0.222*	-0.184*
Characteristics of Event		
Control of situation		0.062
Unexpectedness		-0.113
Who caused the accident		0.058
Danger of the situation		-0.061
Damage sustained		0.032
Extent of injury		-0.114
How distressing was it		0.120
Effect on life		-0.129
Discussed feelings		0.121
Multiple R	0.41**	0.48**
Total R^2	0.16	0.23
Adjusted R^2	0.10	0.12
R^2 change	0.16**	0.07

*p<.05, **p<.01, ***p<.001

3.3.4 Summary

The three mental health variables, PTSD, distress, and wellbeing were all significantly correlated ($p<.001$), indicating very high convergent validity among these variables.

Of the three mental health regression models, the PTSD model was the most successful, with the variables explaining 36% of the variance of PTSD. Also, it was the only model in which the characteristics of the event variables explained additional variance over and above that explained by the controlling variables.

The distress regression model explained 32% of the variance, but the characteristics of the event variables did not significantly add to its predicting power. This was the same for the wellbeing regression model, except only 12% of the variance was explained by the variables. However, both models were significant at $p<.01$.

Physical symptoms was the only variable which was consistently a significant predictor of the mental health variables. This would indicate that the general physical health of an individual is the single best predictor of the state of their subsequent mental health following a traumatic motor vehicle accident. In support of a concept of the importance of physical health determining mental health, the extent of injury was also a significant predictor of mental health, especially PTSD.

The presence of many adverse life events was also a key predictor of mental health, especially distress and PTSD. This suggests that MVAs are more inclined to affect the mental health of those who have been subjected to various stressors in the past.

Many variables contributed little to the predicting power of the models, and at no time were they significant contributors to the regression. Such variables included gender, employment, income, the damage sustained, the danger involved, or the number MVAs.

3.4 Health Care Utilisation

Hierarchical regression analysis was used to evaluate the contribution of personal characteristic variables in explaining three variables, designed to assess the health care utilisation of the motor vehicle accident victims in the sample. The following sections detail three multiple regressions looking at three aspects of health care requirements: Days spent in bed, visits to the doctor, and number of prescription items.

To better understand the relationship between PTSD and the health care utilisation of accident victims, PTSD was employed as the step 2 predicting variable in the regression models. This is due to past research identifying PTSD as a major mediator of the relationship between trauma and health (e.g., Freidman & Schnurr, 1995).

Two of these variables, days spent in bed and visits to the doctor, were transformed to reduce unacceptable skewness. Log_{10} transformations reduced this skewness.

Table 3-13

Bivariate correlations between the independent variables and the dependant health care utilisation variables.

	Correlation		
Predictors	Bed Days	Visits to GP	Prescription items
Age	-0.22**	-0.01	0.03
Gender	-0.08	0.13*	0.11
Paid employment	0.00	0.09	0.15
Annual income	-0.04	0.04	0.08
Adverse life events	0.25***	0.15*	0.08
Chronic Health	0.13*	0.23**	0.26***
Multiple car accidents	0.18*	0.07	0.16*
Number of traumas	0.15*	0.11	0.04
Time since accident	-0.17	-0.13*	-0.04
Physical symptoms	0.34***	0.19**	0.33***
PTSD	0.30***	0.07	0.15

*p<.05, **p<.01, ***p<.001

3.4.1 Days spent in bed due to ill-health

At step one, personal characteristic variables alone explained 17% of variance (adjusted R^2) in PTSD, $F(10,156) = 4.42$, $p<.001$. After step two, with the addition of PTSD, total variance explained in Bed Days was still only 17%, $F(11,155) = 4.08$, $p<.001$. The R^2 change when entering PTSD was not significant, $F(11,155) = 0.77$, $p>.05$.

With all variables in the equation, multiple car accidents and physical symptoms were significantly related to the number of days spent at home in bed due to ill-health in the last 12 months. However, these were at least partially mediated by the PTSD variable added at step two. So too was the adverse life events variable, as it was significant in step one, but it as no longer significant by the end of step two.

The physical health symptoms and multiple car accident variables were positively correlated with the number of days needing to be spent in bed. Not surprisingly, this indicates that those people who suffer from physical ill-heath symptoms and those who have had in excess of one MVA, are more likely to require longer recuperation periods requiring bed rest. This would imply that then experience of having had a MVA may indeed have a chronic effect on health care utilisation.

Bivariate analysis revealed six of the ten variables in block one to be significantly correlated with the number of days spent in bed. Not surprisingly, the multiple car accidents and physical symptoms variables were correlated, as too was adverse life events. The chronic long-term health of the accident victim, and the total number of traumas experienced other than motor vehicle accidents, were also significantly positively correlated with days in bed. The age of the individual was negatively correlated, indicating that older people who suffer MVAs spend less time in bed than younger people.

As with the previous mental health regressions, gender, income, and employment status were not significant contributors to the model. Once again, the time since the accident also had no bearing as a predictor of the dependant variable.

Correlation analysis revealed that PTSD, the sole variable of block two, was significantly correlated with days spent in bed at the $p<.001$ level. Despite this, PTSD was not found to be a significant predictor of bed days in the regression model. The overall model was significant, but the introduction of PTSD did not enhance its predictability.

Table 3-14

Hierarchical multiple regression of personal characteristics and PTSD on days confined to bed, showing standardised regression coefficients, R, R^2, adjusted R^2 and R^2 change for all subjects (N=167).

Days Confined to Bed		
Predictors	Step 1	Step 2
Controlling Variables		
Age	-0.133	-0.127
Gender	-0.082	-0.080
Paid employment	0.023	0.022
Annual income	-0.028	-0.030
Adverse life events	0.175*	0.153
Chronic Health	0.085	0.086
Multiple car accidents	0.201**	0.192*
Number of traumas	0.012	0.006
Time since accident	-0.067	-0.063
Physical symptoms	0.249**	0.223*
PTSD		0.075
Multiple R	0.47***	0.47***
Total R^2	0.22	0.22
Adjusted R^2	0.17	0.17
R^2 change	0.22***	0.00

*p<.05, **p<.01, ***p<.001

3.4.2 Visits to the doctor

At step one, personal characteristic variables alone explained 11% of variance (adjusted R^2) in doctor visits, $F(10,156) = 3.00$, $p<.01$. After step two, with the addition of PTSD, total variance explained in doctor visits was still only 11%, $F(11,155) = 2.83$, $p>.05$. The R^2 change when entering PTSD was not significant, $F(11, 155) = 1.07$, $p>.05$, yet the overall model was significant.

According to the regression model when all variables were entered into the equation, four variables were significantly related to the number of doctor visits in the last 12 months. Gender, adverse life events, and number of chronic health symptoms were all significantly positively correlated with doctor visits. This

indicates that females, those who had experienced higher levels of stressful events, and those with greater numbers of long-term health problems are more likely to frequent the doctor. Time since the accident was significantly negatively correlated with the number of doctor visits, denoting that doctor visits decrease as more time passes from when the accident occurred.

Bivariate correlation analysis confirmed the significant correlation between these four variables, and also suggest a significant positive correlation between the number of presenting physical symptoms and the number of required visits to the doctor.

Table 3-15

Hierarchical multiple regression of personal characteristics and PTSD on visits to the doctor showing standardised regression coefficients, R, R^2, adjusted R^2 and R^2 change for all subjects (N=167).

Visits to Doctor		
Predictors	Step 1	Step 2
Controlling Variables		
Age	0.089	0.082
Gender	0.164*	0.162*
Paid employment	0.121	0.122
Annual income	0.155	0.157
Adverse life events	0.194*	0.220*
Chronic Health	0.207*	0.206*
Multiple car accidents	0.132	0.144
Number of traumas	0.012	0.021
Time since accident	-0.198*	-0.203*
Physical symptoms	0.061	0.092
PTSD		-0.092
Multiple R	0.40**	0.41**
Total R^2	0.16	0.17
Adjusted R^2	0.11	0.11
R^2 change	0.16**	0.01

*p<.05, **p<.01, ***p<.001

Several variables made no significant contribution individually to the model, such as income, employment status, age, and exposure to multiple traumas.

Once again, PTSD was not a significant predictor of the dependent variable, and correlation analysis found no significant relationship between PTSD and the number of doctor visits.

3.4.3 Prescription items

At step one, personal characteristic variables alone explained 17% of variance (adjusted R^2) in Prescription items, $F(10,156) = 4.49$, $p<.001$. After step two, with the addition of PTSD, total variance explained in Bed Days was still only 17%, $F(11,155) = 4.05$, $p<.001$. PTSD accounted for no unique variance in prescription items when controlling for personal characteristic variables. The R^2 change when entering PTSD was not significant, $F(11, 155) = 0.01$, $p>.05$.

With all variables in the equation, four of the ten variables were significantly related to the number of prescription items required from the chemist in the last 12 months. Once again, the number of physical ill-health symptoms was a significant predictor of prescription items, and its positive correlation indicating that, as intuitively expected, the required number of prescription items required increases as the number of physical symptoms increase. Other significant variables were paid employment, income, and having had multiple motor vehicle accidents.

Bivariate correlation analyses verified the positive relationship between prescription items and physical symptoms, employment and multiple vehicle accidents. This significant relationship with employment indicates that those who do not have paid employment are more likely to access prescription medicines.

Those who have been subjected to multiple MVAs are also more inclined to require prescription items.

Correlation analysis also indicated a relationship between prescription items and chronic health, however the regression model did not confirm a significant relationship.

Despite its significant correlation ($p<.001$) with prescription items in bivariate analysis, PTSD was not a significant predictor of the amount to prescription items required. The overall model was significant, but the introduction of PTSD did not enhance the predictability of prescription items.

Table 3-16

Hierarchical multiple regression of personal characteristics and PTSD on the quantity of required prescription items, showing standardised regression coefficients, R, R^2, adjusted R^2 and R^2 change for all subjects (N=167).

Prescription items		
Predictors	Step 1	Step 2
Controlling Variables		
Age	0.065	0.065
Gender	0.142	0.142
Paid employment	0.219**	0.219**
Annual income	0.233**	0.233**
Adverse life events	0.140	0.142
Chronic Health	0.137	0.137
Multiple car accidents	0.178*	0.179*
Number of traumas	-0.034	-0.033
Time since accident	-0.114	-0.114
Physical symptoms	0.239**	0.241**
PTSD		-0.007
Multiple R	0.47***	0.47***
Total R^2	0.22	0.22
Adjusted R^2	0.17	0.17
R^2 change	0.22***	0.00

*p<.05, **p<.01, ***p<.001

3.4.4 Summary

The three health care utilisation variables were all significantly correlated with each other ($p<.05$), demonstrating convergent validity amongst the variables prescription items, days confined to bed, and visits to the doctor.

Despite PTSD being significantly correlated with the dependant variable in bivariate analyses in two of the models, the addition of PTSD in the second step of each regression failed to significantly enhance the predictability of health care utilisation. These results indicate that sufferers of PTSD symptoms do not access health care services more than non-sufferers.

No model could account for more than 17% of the variance in the dependent variables used to assess health care utilisation. However all models were able to significantly predict health care utilisation to some degree (at least $p<.01$).

There were few conclusive predicting variables of health care utilisation as a whole. Eight of the ten variables were significant predictors at some point, however they lacked consistency across the three regressions. The number of physical symptoms and the occurrence of more than one MVA were significant in two of the three models. Gender, adverse life events, chronic health, time since the accident, employment, and income were all significant in just one model. Only two variables, age and number of traumas other than MVAs, were at no time significant variables.

4. DISCUSSION

The findings of this research are discussed within the framework of the four main objectives outlined previously in the introduction. From this, the implications of this study are considered, and limitations of the research design identified. Suggestions for future research are then proposed.

4.1 Research Findings In Relation To The Study Objectives

4.1.1 Objective one:

> *To confirm the relationship between experience of trauma and PTSD in New Zealand motor vehicle accident victims.*

Victims of motor vehicle accidents do indeed suffer from more PTSD-related symptoms. As Table 3-8 shows, the mean PTSD score for the MVA victims was 23.4, compared with 20.2 for the comparison group who had suffered no trauma. This significant difference between these two groups was highlighted by Figure 3-5, showing the distribution of the no trauma group skewed toward the lower end of the PTSD scale, as compared with the accident victims.

Therefore, the objective to confirm the relationship between MVA trauma and PTSD was indeed substantiated. While previous studies of clinical populations (e.g. Bryant & Harvey, 1996; Blanchard, Hickling Taylor & Loos, 1995) have demonstrated a linkage between MVA and PTSD, the findings reported here show similar effects with a community based study of trauma. This is a relationship of some importance, pivotal to the present research. The implications of this finding

is that even with a simple, eleven item scale, it is possible to detect a group of people who vary significantly from the norm with respect to PTSD-like symptoms. This suggests that motor vehicle accidents may indeed impact upon people's functioning, in aspects such as a shortened temper, emotional detachment, or the occurrence of nightmares. What is interesting is that the scale does not make any mention or reference to any trauma, let alone MVAs, yet it appears to be sensitive enough to be able to detect this affected group of people.

The direction of this relationship was not investigated further as it was well beyond the scope of the study. While it may seem more intuitively logical to assume that trauma impacts upon people's lives causing PTSD-like symptoms, the reverse may also be true: people who have PTSD-like symptoms are more likely to subsequently have an accident. There is some evidence that prior experience of PTSD may exacerbate the symptomatic consequences of a more recent incident (Norris et al., 1990). As was noted in the introduction to this thesis, prior trauma or prior PTSD may sensitise the individual leaving them more vulnerable when a new trauma occurs (e.g. Breslau et al., 1995). In attempting to understand the links between trauma and PTSD, linear notions of causality are clearly inappropriate, and there are likely to be reciprocal feedback loops between the person and the experience of trauma which may be modelled more effectively with the utilisation of longitudinal research.

The regression (Table 3-10) showed that it is possible to explain PTSD by examining characteristics of the event variables, when controlling for personal characteristics and history of the individual. Despite only a few variables being significant within themselves, the overall model was significant. Indeed, the inclusion of the characteristics of the event variables significantly increased the predictive power of the model.

Adverse life events, physical symptoms, extent of injury, and discussed feelings were all significant predictors of PTSD. The adverse life events variable is an important component in objective two, so it shall be discussed in further detail later. The linkage between generalised adverse life events and PTSD shown in this study is mirrored in previous research which shows that a prior history of exposure to adverse or traumatic events increases the vulnerability to both future exposure to such events (e.g., Breslau et al., 1995), and the development of subsequent health problems conceptualised and measured in a variety of ways (e.g., Friedman & Schnurr, 1995). As noted in the introduction, such events have also been identified as factors that increase the use of mental health services (e.g. Rubio & Lubin, 1986: cited in Norris et al., 1990).

Further confirmation of the relationship between experience of trauma and PTSD transpired when it was revealed that physical ill-health symptoms of a short-term general nature were far more prevalent among the sample of accident victims than those who had not experienced any trauma. This provides further evidence that trauma leads to injury and ill-health in victims.

General ill-health (physical symptoms) predicting PTSD indicates an important link between physical health status and PTSD. Since PTSD is a mental health disorder, the positive relationship between mental and physical health confirms the findings of a multitude of researchers (e.g., Flett, 1986; Vaillant, 1979).

In keeping with this relationship, another of the significant variables was role of injury sustained in the accident. There is much debate in the literature about the nature of the relationship between injury and PTSD symptoms. Some previous studies have shown a relationship between extent of injury following MVA and PTSD (e.g., Blanchard, Hickling, Taylor & Loos, 1995; Blanchard, Hickling, Vollmer, Loos, Forneris & Jaccard, 1996), while other research has failed to

demonstrate this relationship (e.g., Bryant & Harvey, 1996; Taylor & Koch 1995). This shall be discussed further in objective three, but to summarise, it would appear that the single most consistent predictor of PTSD is the physical condition of the individual following MVA.

The extent to which MVA victims discuss their feelings was another predictor of PTSD symptoms. This significant result raises some interesting points in an attempt to explain this negative relationship, indicating that those individuals who never confided in others about the experience are more susceptible to suffering PTSD symptoms. This is a very important facet of these findings, especially as it is an area mostly neglected by past research. People who are given the appropriate opportunity to vent their feelings and thoughts after the event are generally better off. There may well be a large 'personality' aspect in this finding, in as much as there are individuals who are far more likely to discuss their feelings in general, yet if something is to be taken from this, it must be that everyone be encouraged to discuss their feelings at various stages. Research in other contexts has also illustrated the importance of disclosure of feelings associated with trauma (e.g., Raphael & Wilson, 1993). In a study of traumatic experiences in the New Zealand police, Stephens (1995, 1996) found that talking about feelings associated with trauma with peers, having emotional support from peers, and operating in an environment which was supportive of disclosure of feelings, were all negatively associated with PTSD symptoms. Earlier research has similarly noted the stress buffering effects of having a close confidante relationship when undergoing stressful life events (e.g. Brown & Harris, 1978; Flett, 1986). Obviously, more focused research on facilitation of disclosure and relevant contextual variables which promote disclosure is needed.

4.1.2 Objective two:

To assess whether PTSD symptoms will be more prevalent among those individuals who have had previous exposure to traumatic events.

This objective was derived from a multitude of researchers, who have found previous exposure to prior trauma influences how a person may cope when another traumatic situation occurs (e.g., Blanchard Hickling, Vollmer, Loos, Forneris & Jaccard, 1996; Blanchard, Hickling, Taylor & Loos, 1995; McNally & Saigh, 1993; Mayou, 1992; McFarlane, 1989).

Table 3-9 showed the bivariate correlations between PTSD and the predicting variables employed in the PTSD regression analysis (Table 3-10). Among this list, were three variables of particular interest to the present objective: adverse life events; multiple car accidents; and number of other traumas.

The results verified the relationship between stressful life events and PTSD, as alluded to by previous research. The occurrence of adverse life events in a person's life is positively correlated with PTSD-like symptoms. In interpreting this result, it is important to note that the average time since the MVA was in excess of 16 years, and the life events scale explores stressful events in the previous 12 months. This result lends strong support to the notion that PTSD symptoms are indeed more prevalent among those individuals who have had previous exposure to traumatic events. The occurrence of major upheavals and stressful events could well be a manifest representation of the general impaired function in the trauma victim.

The occurrence of multiple car accidents constituted the second part of this objective. Those who had experienced multiple motor vehicle accidents were

expected to be more susceptible to PTSD-like symptoms, as these past experiences have been found to sensitise the victim (Blanchard Hickling, Vollmer, Loos, Forneris & Jaccard, 1996). The results in the present study failed to add support to the notion that previous motor vehicle accidents make PTSD-like symptoms more likely, as having had multiple MVAs were not significantly associated with higher levels of PTSD symptoms. However, in the present sample only 17% (N=29) had experienced multiple accidents which meant that the likelihood of showing a statistically significant relationship between multiple accidents and PTSD with the available data was much reduced.

The final constituent of this objective examined the lifetime incidence data of traumatic events, other than motor vehicle accidents experienced by the individual. Some analyses indicated that a history of previous trauma is indeed correlated with PTSD-like symptoms (e.g. Blanchard, Hickling, Taylor & Loos, 1995; Breslau et al., 1995). In the present study, a history of previous trauma was not significantly associated with PTSD. One possible reason for this difference is the level of measurement precision associated with documenting the history of previous trauma. The present study employed a simple count of the number of previous traumas and, as Norris (1992) noted, "...some precision is lost in creating aggregate event measures..." (p.413) of this type. Also, there was much variability in elapsed time since the reported trauma and as Green (1993) indicates, there is likely to be error associated with memory decay and confounding associated with the respondent's adjustment to the event. Clearly future research will need to address these sorts of measurement issues in order to document more clearly the relationships between multiple trauma and outcome.

In summary, this objective looking at the influence of previous exposure to traumatic events cannot be supported. Despite the significant relationship between the adverse life events scale and PTSD, more research is needed on the

factors which were used to assess previous trauma. Indeed, the measures of previous trauma are such that it is possible that the other traumatic events occurred since the vehicle accident, rather than before the event, leading to inconclusive results regarding the nature of the relationship between PTSD symptoms and previous exposure to traumatic events.

4.1.3 Objective three:

> *To determine the relationship between perception of the degree of danger, damage, injury or distress as a result of the event, and mental health status.*

The mental health status of the accident victim is perhaps the most important aspect of an individual's wellbeing. Physical injuries heal with time, but mental injuries often persist well after the physical injuries have healed. This objective looked at the impact of the event, and the subsequent influence on mental health status.

Bivariate analyses showed some interesting figures with the comparison of the MVA victims and no trauma victims on the three mental health variables; PTSD, distress, and wellbeing (Table 3-8). Victims scored more highly on the number of PTSD symptoms, scored higher on the level of distress, and scored lower on the wellbeing scale. These results indicate that victims of motor vehicle accident are more likely to experience mental health difficulties.

The mental health regressions provided further insight into the mental health status of accident victims. Four variables that directly explored this objective were introduced into each of the regression models: extent of injury sustained; danger of

The regressions looking at each of the three health care utilisation measures were employed in an attempt to uncover further insight into this health care utilisation-PTSD relationship. However, contrary to the findings of Friedman and Schnurr (1995), PTSD failed to explain significant amounts of variance in any of the health care regressions, making definitive conclusions difficult without further research.

Health care utilisation was able to be predicted by numerous variables in the regressions, such as physical symptoms and having been previously involved in a MVA. These predicting variables tended to lack consistency across the three dependent variables, however this is not entirely unexpected, as health care utilisation is a multi-faceted variable, and the three dependant variables used in this study (days in bed, doctor visits and prescription items) measure diverse and perhaps independent aspects of health care utilisation.

These results make interpretation of this objective difficult. It is important to stress that health care services are not fully represented, as only three aspects are measured, and to say that there is no relationship between PTSD and health care utilisation may well be misleading. Unfortunately, the results of this study fail to lend definitive support to ascertaining that those with more PTSD symptoms access more health care services.

Future research in this area may benefit from a more elaborate modelling of the relationships between trauma, PTSD and health care utilisation. Recent research by Wolinsky and colleagues (e.g., Wolinsky & Johnson, 1991) has examined health care use in terms of predisposing, enabling and need characteristics. This may well be a useful framework in which to model the effects of trauma on health care use. More recent research suggests that PTSD may mediate the relationship between trauma and health/health care use (Friedman & Schnurr, 1995; Wolfe, Schnurr, Brown & Furey, 1994).

4.2 Limitations of the design

This was a cross-sectional retrospective study, subject to biases and limitations inherent of such a design. This means that the person is recalling symptoms that he or she has had in a prior time-frame. Green (1994) proposes that perhaps individuals who currently suffer from PTSD are more likely to recall earlier examples of predisposing symptoms. For example, the characteristics of the event variables could either be heightened or down played depending on an individual's current condition. Also, as the information about the accident was not obtained straight after incident, the accuracy of recall can be called into question. Unfortunately there is no easy way of quantifying the information provided, and the results they give are subjected to all sorts of biases, intentional or otherwise. Indeed, these biases may well be an integral part of an individual's coping strategy (e.g., denial; see Horowitz, 1976).

Another limitation was that the sample was not studied before the traumatic MVA occurred. Information about pre-trauma distress or wellbeing levels is non-existent, and we have to rely on population norms for comparisons. This makes drawing direct causal inferences impossible.

And what of those who had problems and are now over them? Time since the accident was a significant predictor of visits to the doctor, however this could well be a function of the long length of time since the accident. On average, the mean length of time between the last motor vehicle accident and responding to the questionnaire was greater than 16 years. If an individual was indeed afflicted with PTSD symptoms after a traumatic accident, it is possible that many or all of the debilitating symptoms would have since diminished.

The measurement of PTSD used in the present study (The shortened form of the Mississippi scale for PTSD with civilian wording) may not be particularly sensitive for this type of longer-term, population-based research. The eleven items could well be too restricting, and more research may be needed to ensure that such a scale has acceptable reliability and validity for community based samples.

4.3 Implications of the study

This section briefly summarises the main points previously raised, and some of the major implications of the findings of the present research, especially for health care utilisation.

Despite the methodological limitations noted above, a number of tentative speculations are nevertheless possible. Victims of MVAs report having more bothering ill-health symptoms than those who have not suffered any trauma. They also have more PTSD symptoms, more psychological distress, and lower levels of psychological wellbeing. Therefore the occurrence of a traumatic motor vehicle accident does have a severe negative effect on victims. This is perhaps the most important finding of this study, confirming overseas research, and the establishment of this relationship is fundamental to future action required to address this problem in New Zealand. The importance of motor vehicle accidents is reflected in the findings of Norris (1992) who noted that "If one event stood out from the pack it was motor vehicle crash... when both the frequency and severity data were considered together, it emerged as perhaps the single most significant event among those studied here... this event alone would yield 28 seriously distressed persons for every 1000 adults in the United States" (p.416).

One of the most important points that has arisen out of this study is the relationship between physical health and mental health status. On numerous occasions, physical ill-health symptoms (e.g., injury, physical symptoms) predicted mental ill-health (e.g., PTSD, distress). Once again, this is not a new finding, yet is of extreme importance in this study as it demonstrates that in a New Zealand sample, physical ill-health predicts mental ill-health. The major implication of this finding is on health care utilisation. Not only do physical injuries utilise substantial quantities of scarce health care resources, but so do mental injuries. It is important to remember that mental injuries often tend to far outlast the physical presenting symptoms.

The pivotal PTSD finding in the present research comes from the PTSD regression. People who have had motor vehicle accidents where injury has been sustained, and they do not disclose their feelings have significantly more PTSD-like symptoms. This is even after controlling for other trauma and the potential time-lag since the accident. This has important implications for treatment and subsequent interventions. Early medical attention to physical injuries is paramount, but also very important is the need for individuals to express their feelings. This could well involve the establishment of counselling services to deal with such situations, or other opportunities to encourage people to reveal their feelings in order to reduce potential long-term negative consequences of PTSD.

4.4 Future research

The following section outlines some suggestions for how future research in this area of motor vehicle accident research could proceed.

Future research efforts could focus on attaining more robust measures of PTSD, especially for motor vehicle accident victims and relevance to New Zealand society. Tests of validity and reliability of these PTSD measures would be useful to allow the researcher to be confident of accurate reporting of the prevalence of the problem, and identification of the problem areas.

More work is also required looking at what variables are the predictors of PTSD. This, and other research, has demonstrated that some variables are indeed better predictors than others at predicting the occurrence of PTSD symptoms in MVA victims. This would imply that there are certain areas that future research should focus on, especially the physical aspects of an individual's health, but also other adverse life events that have occurred in an individual's lifetime.

One possible solution is the implementation of longitudinal studies which monitor the progress of MVA victims. This is the best way to determine what short-term factors later become predictors of PTSD. This would also serve to enhance our understanding of those individuals who are able to overcome the trauma without help, and further our knowledge as to what is 'normal' coping.

Future efforts would do well to further our comprehension of the relationship between PTSD and health care utilisation. This should be a major underlying theme of any such study, not only to reduce an afflicted individual's suffering, but also the extent to which those who are afflicted with PTSD symptoms drain New Zealand's scarce health care resources.

The role that victim support schemes could play in the recovery and therapy of accident victims could also provide important information. This is potentially the most effective way of overcoming the long term effects of serious accidents, and

this research has alluded to the role that discussing one's feelings has on ensuing PTSD symptoms.

4.5 To Conclude...

In summary, the research reported in this thesis has achieved its purpose to identify variables which predispose individuals to develop PTSD in the wake of a serious motor vehicle accident. General aspects of mental health and ensuing health care utilisation by New Zealand adults are also able to be predicted by predisposing characteristics and characteristics of the event itself. Perhaps more importantly, this study has served to highlight the need for attention to survivors of motor vehicle accidents at numerous stages after a traumatic accident, not just the immediate aftermath, and appreciate that mental injuries may far outlast any physical injuries.

5. REFERENCES

American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC: American Psychiatric Association.

Barton, D. (1996). White crosses, dead farmers. (1996, September 10). *Evening Standard*, p. 11.

Belloc, N. B., Breslow, L., & Hochstim, J. R. (1971). Measurement of physical health in a general population survey. *American Journal of Epidmology, 93,* 328-336.

Berkanovic, E., Hurwicz, M., & Landsverk, J. (1988). Psychological distress and the decision to seek medical care. *Social Science Medicine, 27,* 1215-1221.

Blanchard, E. B., Hickling, E. J., Mitnick, N., Taylor. A. E., Loos, W. R, & Buckley, T. C. (1995). The impact of severity of physical injury and perception of life threat in the development of post-traumatic stress disorder in motor vehicle accident victims. *Behavior Research Therapy, 33,* 529-534.

Blanchard, E. B., Hickling, E. J., Taylor, A. E., & Loos, W. R. (1995). Psychiatric morbidity associated with motor vehicle accidents. *The Journal of Nervous and Mental Disease, 183,* 495-504.

Blanchard, E. B., Hickling, E. J., Taylor, A. E., Loos, W. R, & Gerardi, R. J. (1994). Psychological morbidity associated with motor vehicle accidents. *Behavior Research Therapy, 32,* 283-290.

Blanchard, E. B., Hickling, E. J., Vollmer, A. J., Loos, W. R, Buckley, T. C., & Jaccard, J. (1996). Short-term follow-up of post-traumatic stress symptoms in motor vehicle accident victims. *Behavior Research Therapy, 33,* 369-377.

Blanchard, E. B., Hickling, E. J., Vollmer, A. J., Loos, W. R, Forneris, C.A., & Jaccard, J. (1996). Who develops PTSD from motor vehicle accidents. *Behavior Research Therapy, 34,* 1-10.

Breslau, N., Davis, G. C., & Andreski, P. (1995). Risk factors for PTSD-related traumatic events: A prospective analysis. *American Journal of Psychiatry, 152,* 529-535.

Breslau, N., Davis, G. C., Andreski, P., & Peterson, E. (1991). Traumatic events and posttraumatic stress disorder in an urban population of young adults. *Archives of General Psychiatry, 48,* 216-222.

Brom, D., Kleber, R. J., & Hofmann, M. C. (1993). Victims of traffic accidents: Incidence and prevention of posttraumatic stress disorder. *Journal of Clinical Psychology, 49,* 131-140.

Brown, G. W. & Harris, T. (1978). *Social origins of depression.* London: Taverstock.

Bryant, R. A., & Harvey, A. G. (1996). Initial posttraumatic stress responses following motor vehicle accidents. *Journal of Traumatic Stress, 9,* 223-234.

Burnstein, A. (1989). Posttraumatic stress disorder in victims of motor vehicle accidents. *Hospital and Community Psychiatry, 40,* 295-297.

Burnstein, A., Ciccone, P. E., Greenstein, R. A., Daniels, N., Olsen, K., Mazarek, A., Decatur, R., & Johnson, N. (1988). Chronic Vietnam PTSD and acute civilian PTSD: A comparison of treatment experiences. *General Hospital Psychiatry, 10,* 245-249.

Davidson, J. R. T., & Fairbank, J. A. (1993). The epidemology of posttraumatic stress disorder. In J. R. T. Davidson, & E. B. Foa (Eds.), *Posttraumatic stress disorder: DSM-IV and beyond* (pp. 37-54). Washington, DC: American Psychiatric Press.

Davidson, J. R. T., Hughes, D., Blazer, D. G., & George, L. K. (1991). Post-traumatic stress disorder in the community: An epidemiological study. *Psychological Medicine, 21,* 713-721.

Ehlers, A., Hofmann, S. G., Herda, C. A., & Roth, W. T. (1994). Clinical characteristics of driving phobia. *Journal of Anxiety Disorders, 8,* 323-339.

Feinstein, A., & Dolan, R. (1991). Predictors of posttraumatic stress disorder following physical trauma: An examination of the stressor criterion. *Psychological Medicine, 21,* 85-91.

Flett, R. A. (1986). *Subjective wellbeing: Its measurement and correlates.* PhD Thesis, Department of Psychology, Otago University, Dunedin, New Zealand.

Flett, R., Millar, M., Long, N., & MacDonald, C. (in press). *A community study of trauma in the New Zealand population.* A report to the New Zealand Accident Compensation Corporation; Wellington, New Zealand.

Fontana, A., & Rosenheck, R. (1994). A short form of the Mississippi scale for measuring change in combat-related PTSD. *Journal of Traumatic Stress, 7,* 407-414.

Freidman, M. J., & Schnurr, P. P. (1995). The relationship between trauma, post-traumatic Stress Disorder, and physical health. In M. J., Freidman, D. S. Charney, & A. Y. Deutch (Eds.), *Neurobiological and clinical consequences of stress: From normal adaption to PTSD* (pp. 507-524). Philadelphia: Lippincott-Raven.

Gordon, K. (1995). *Psychiatric morbidity and posttraumatic stress disorder in motor vehicle accidents.* National Conference for Stress and Trauma. Hobart, Australia; March 1995.

Green, B. L. (1993). Identifying survivors at risk: Trauma and stressors across events. In J. P. Wilson, & B. Raphael (Eds.), *International Handbook of Traumatic Stress Syndromes* (pp. 135-145). New York: Plenum Press.

Green, B. L. (1994). Psychosocial research in traumatic stress: An update. *Journal of Traumatic Stress, 7,* 341-361.

Green, M. M., McFarlane, A. C., Hunter, C. E., & Griggs, W. M. (1993). Undiagnosed post-traumatic stress disorder following motor vehicle accidents. *The Medical Journal of Australia, 159,* 529-534.

Helzer, J. E., Robins, L. N., & McEvoy, L. (1987). Post-traumatic stress disorder in the general population. *The New England Journal of Medicine, 317,* 1630-1634.

Hickling, E. J., & Blanchard, E. B. (1992). Post-traumatic stress disorder and motor vehicle accidents. *Journal of Anxiety Disorders, 6,* 285-291.

Horowitz, M. J. (1976). *Stress Response Syndromes.* New York: Jason Aronson.

Hughes, D. C., George, L. K., & Blazer, D. G. (1988). Age differences in life event qualities: Multivariate controlled analyses. *Journal of Community Psychology, 16,* 161-174.

Jones, R. W., & Peterson, L. W. (1993). Post-traumatic stress disorder in a child following an automobile accident. *The Journal of Family Practice, 36,* 223-225.

Keane, T. M., Caddell, J. M., & Taylor, K. L. (1988). Mississippi scale for combat-related post-traumatic stress disorder: Three studies in reliability and validity. *Journal of Consulting and Clinical Psychology, 56,* 85-90.

Koss M. P., Woodruff, W. J., & Koss, P. G. (1990). Relation of criminal victimization to health perceptions among women medical patients. *Journal of Consulting and Clinical Psychology, 58,* 147-152.

Kuch, K., Cox, B. J., Evans, R., & Shulman, I. (1994). Phobias, panic, and pain in 55 survivors of road vehicle accidents. *Journal of Anxiety Disorders, 8,* 181-187.

Kuch, K., Swinson, R. P., & Kirby, M. (1985). Post-traumatic stress disorder after car accidents. *Canadian Journal of Psychiatry, 30,* 426-427.

Land Transport Safety Authority. (1994). Motor vehicle accidents in New Zealand: Statistical statement calendar year 1993. Land Transport Safety Authority.

Long, N., Chamberlain, K., & Vincent, C. (1992). The health and mental health of New Zealand Vietnam war veterans with posttraumatic stress disorder. *The New Zealand Medical Journal, 105,* 417-419.

Malt, U. F., Høivik, B., & Blikra, G. (1993). Psychosocial consequences of road accidents. *European Psychiatry, 8,* 227-228.

Manning, W. G., & Wells, K. B. (1992). The effects of psychological distress and psychological well-being on use of medical service. *Medical Care, 30,* 541-553.

March, J. S. (1993). What constitutes a stressor?: The 'Criterion A' issue. In J. R. T. Davidson, & E. B. Foa (Eds.), *Posttraumatic stress disorder: DSM-IV and beyond* (pp. 37-54). Washington: American Psychiatric Press.

Mayou, R. (1992). Psychiatric aspects of road traffic accidents. *International Review of Psychiatry, 4,* 45-54.

Mayou, R., Bryant, B., & Duthie, R. (1993). Psychiatric consequences of road traffic accidents. *British Medical Journal, 307,* 647-651.

McGuire, B. (1990). Post-traumatic stress disorder: A review. *The Irish Journal Of Psychology, 11,* 1-23.

McFarlane, A. C. (1989). The Aetiology of post-traumatic morbidity: Predisposing, precipitating and perpetuating factors. *British Journal of Psychiatry, 154,* 221-228.

Nguyen, T. (1995). *Primary prevention programme for acute stress reaction in motor vehicle accidents.* National Conference for Stress and Trauma. Hobart, Australia; March 1995.

Norris, F. H. (1992). Epidemology of trauma: Frequency and impact of different potentially traumatic events on different demographic groups. *Journal of Consulting and Clinical Psychology, 60,* 409-418.

Norris, F. H., Kaniasty, K. Z., & Scheer, D. A. (1990). Use of mental health services among victims of crime: Frequency, correlates, and subsequent recovery. *Journal of Consulting and Clinical Psychology, 58,* 538-547.

Raphael, B. & Wilson, J. P. (1993). Theoretical and intervention considerations in working with victims of disaster. In J. P. Wilson, & B. Raphael (Eds.), *International handbook of traumatic stress syndromes* (pp. 105-117). New York: Plenum Press.

Richards, J. (1996). Victims of crime and road accidents. In N. Long, & D. Paton (Eds.), *Psychological aspects of disasters: Impact, coping and intervention* (pp. 269-283). Palmerston North, New Zealand: Dunmore Press.

Roca, R. P., Spence, R. J., & Munster, A. M. (1992). Posttraumatic adaptation and distress among adult burn survivors. *American Journal of Psychiatry, 149,* 1234-1238.

Taylor, S., & Koch, W. J. (1995). Anxiety disorders due to motor vehicle accidents: Nature and treatment. *Clinical Psychology Review, 15,* 721-738.

Smith, R. L., Ager, J. W. & Williams, D. L. (1992). Suppressor variables in multiple regression/correlation. *Educational and Psychological Measurement, 52,* 17-29.

Snedecor, G. W., & Cochran, W. G. (1980). *Statistical methods* (7th ed.). Ames, Iowa: Iowa State University Press.

Statistics New Zealand. (1993). *A picture of health.* Wellington: Statistics New Zealand.

Statistics New Zealand. (1995). New Zealand Official Yearbook 95 (98th ed.). Wellington: Statistics New Zealand.

Stephens, C. (1995). *Talking about trauma: Social support and PTSD in the police.* Paper presented at the International Society for Traumatic Stress Studies Conference. Boston, U.S.A.

Stephens, C. (1996). T*he impact of trauma on health and the moderating effects of social support: A study with the New Zealand police.* PhD Thesis, Department of Psychology, Massey University, Palmerston North, New Zealand.

Tabachnik, B. G., & Fidell, L. S. (1980). *Using multivariate statistics* (2nd ed.). New York: Harper & Row.

Vaillant, G. E. (1979). Natural history of male psychological health: Effects of mental health on physical; health. *New England Journal of Medicine, 301,* 1249-1254.

Vasil, A. (1996). Road injuries rise - researcher. (1996, November 4). *The Dominion,* p.3.

Veit, C. T., & Ware, J. E. (1983). The structure of psychological distress and well-being in general populations. *Journal of Consulting and Clinical Psychology, 51,* 730-742.

Vevren, D. L., Gudanowski, D. M., King, L. A., & King, D. W. (1995). The civilian version of the Mississippi PTSD scale: A psychometric evaluation. *Journal of Traumatic Stress, 8,* 91-109.

Vincent, C., Long, N., & Chamberlain, K. (1991). *Health, mental health and well-being of New Zealand Vietnam veterans.* Palmerston North: Department of Psychology, Massey University, New Zealand.

Wolfe, J., Schnurr, P. P., Brown, P. J., & Furey, J. (1994). PTSD and war-zone exposure as correlates of perceived health in female Vietnam veterans. *Journal of Consulting and Clinical Psychology, 62,* 1235-1240.

Wolinsky, F. D., & Johnson, R. J. (1991). The use of health services by older adults. *Journal of Gerentology: Social Sciences, 46,* 345-357.