

Posttraumatic Stress Disorder: Epidemiology and Health-Related Considerations

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Epidemiologic studies show that prevalence of trauma and posttraumatic stress disorder (PTSD) is substantial in modern society. Most people will experience a traumatic event at some point in their life, and up to 25% of them will develop the disorder. Demographic and socioeconomic factors also play a role in the risk for exposure to traumatic experiences and subsequent PTSD. Psychiatric history, both personal or in family members, increases the likelihood of being exposed to trauma and of developing PTSD once exposed. Traumatic exposure and PTSD have an impact on the individual's health, health care service utilization, and general functioning. Such effects provoke a considerable economic burden not only for those persons experiencing trauma and PTSD, but also for the health care system and society as a whole. (J Clin Psychiatry 2000;61[suppl 7]:5-13)

Posttraumatic stress disorder (PTSD) has gained increasing recognition since its first formulation as a diagnosis in the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III)*. This anxiety disorder provokes significant occupational, psychiatric, medical, and psychosocial disability. Likewise, its consequences are enormously costly not only to the survivors and their families, but also to the health care system and society as a whole.²

Historically, PTSD has been the focus of study across small samples often regarding one particular traumatic experience at a time (e.g., combat, rape, burns). Those studies have been very useful to understand the characteristics of the syndrome and its prevalence among those at risk. However, such an approach lacks the possibility of being generalized to the population. Moreover, studies have often focused on PTSD patients in the clinical setting. These investigations only represent a small proportion of people experiencing this disorder, since few PTSD patients seek help from mental health professionals.³ Thus, these studies cannot adequately inform us about the frequency of traumatic events and their consequences as they occur in the community.

Epidemiologic studies allow us to estimate the rates of specific disorders and their impact on the community and the health care system. Population-based studies also pro-

vide the possibility of assessing the magnitude of a problem and its characteristics. The results of such studies can guide the planning of public policy, treatment, and prevention of given disorders.

The diagnosis of PTSD requires the necessary occurrence of a traumatic event and the individual's emotional reaction to it. For that reason, it is important to study not only the prevalence of different traumatic events in the community, but also the risk of the exposed individuals for developing PTSD. In other words, epidemiologic studies can inform us about (1) prevalence of different traumata and PTSD in the community, (2) characteristics of people within the general population at high risk of acquiring PTSD after traumatic situations, and (3) risk factors in the community for those who are at high risk of exposure to trauma.

Our objective in this article is to present an updated review of the epidemiology of PTSD and patterns of health utilization and costs to better illustrate the current importance of this anxiety disorder. We will review recent studies on the prevalence and risk factors of exposure to trauma and PTSD in the community, and describe some investigations about the impact of trauma and PTSD on an individual's health and the health care system.

PREVALENCE OF TRAUMA

The measurement of cases of a given disease or other condition in a given population at a designated time is called prevalence.⁴ The prevalence of exposure to traumatic events itself is an important part of the study of PTSD. There have been several studies⁵⁻¹¹ looking at the prevalence of trauma exposure (Table 1^{6,7,9,10,12-15}).

Green⁵ described a report by the International Federation of Red Cross and Red Crescent Societies in which the

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Table 1. Lifetime Prevalence of Traumatic Exposure and PTSD in the General Population^a

Study	Population		Exposure (%)		PTSD (%)	
	Sex	N	Men	Women	Men	Women
Helzer et al (1987) ¹²	Both	2493	–	–	0.5	1.3
Davidson et al (1991) ¹³	Both	2985	–	–	0.9	1.7
Breslau et al (1991) ⁷	Both	1200	43.0	36.7	6.0	11.3
Norris (1992) ⁶	Both	1007	73.6	64.8	6.1 ^b	8.5 ^b
Resnick et al (1993) ⁹	Women	4008	–	69.0	–	12.3
Kessler et al (1995) ¹⁰	Both	8098	60.6	51.2	5.0	10.4
Breslau et al (1997) ¹⁴	Women	801	–	40.0	–	13.8
Breslau et al (1998) ¹⁵	Both	2181	92.2	87.1	10.8	18.3

^aAbbreviation: PTSD = posttraumatic stress disorder.

^bThese values correspond to current (within the past year) conditional prevalence.

frequency, mortality, and morbidity from natural and technological disasters worldwide between the years 1967 and 1991 were assessed. A total of 7766 disasters were reported, killing more than 7 million people and showing even more comorbid conditions.

Norris⁶ studied the frequency and impact of various potentially traumatic events in a community-based sample of 1000 adults from the southeastern United States. The author used a restricted definition of trauma as “an event involving violent encounters with nature, technology, or humankind.”^{6(p409)} Norris found that 69% of the sample had experienced at least one traumatic event in their lifetime and 21% in the past year alone (Hurricane Hugo was excluded as traumatic experience). Lifetime exposure was higher among males and whites than among women and African Americans (73.6% and 76.8% vs. 64.8% and 61.2%, respectively).

Breslau et al.⁷ found a lower lifetime prevalence of traumatic exposure in a sample of 1007 young adults (aged 21–30 years) from a health maintenance organization (HMO) in Detroit, Michigan. A total of 39.1% of the sample had one or more traumatic experiences, of which 67.3% reported 1 event, 23.3% reported 2 events, and 9.4% reported 3 events. The most common traumatic experiences were sudden injury or serious accident, physical assault, seeing someone seriously hurt or killed, and news of sudden death of a close relative or friend. The trauma distribution was similar across gender except for rape, which was reported only by women. This sample was followed up 3 years later,⁸ and at that time 19% of the population had experienced exposures to new trauma. African Americans had a higher incidence of exposure than whites during follow up. The types of trauma most commonly reported at follow up remained the same as at baseline. However, this study had several limitations related to its design, especially the fact that the population was a young sample (aged 21–30 years) from an HMO and, as a result, does not represent all socioeconomic strata.

In a sample of 4008 adult women (mean age = 44.9 years), Resnick et al.⁹ studied the prevalence of civilian

trauma and PTSD, making a distinction between crime and noncrime traumas. They found that the overall lifetime exposure to any type of trauma was 69%. The breakdown of exposure to any type of trauma (69% of the total sample) by event category was as follows: 12.6% were traumatized by rape, 14.3% by molestation or attempted sexual assaults, 10.3% by physical assault, 13.4% by the death of a close friend or relative by homicide, 35.6% by crime victimization, and 33.3% by noncrime trauma. In addition, they reported that 51.8% of crime victims had experienced more than one type of crime or multiple incidents of a single crime type.

In a younger population of women (mean age = 31.7 years) who participated in a study in which the psychiatric and cognitive outcome of their children related to birth weight was investigated, Breslau et al.¹⁴ (see Table 1) found a lifetime prevalence for trauma exposure of 40%.

Kessler et al.¹⁰ conducted the National Comorbidity Survey (NCS), a nationally representative face-to-face survey of persons aged 15 to 54 years carried out in 48 states. In that study, they found a rate of exposure to one or more traumatic events of 51.2% in women and 60.6% in men. Among those who had been exposed, 12.5% of women and 17% of men had a history of more than 3 exposures to traumatic situations in their lifetime.

Data from the 1996 Detroit Area Survey of Trauma,¹¹ a representative sample of 2181 persons aged 18 to 45 years, showed a wide range of prevalence for trauma exposure, depending on trauma type. The lifetime prevalence to any traumatic exposure was 89.6%, and the mean number of distinct traumatic situations was 4.8. Sudden unexpected death of a close relative or friend was the most prevalent traumatic event (60%). The lifetime prevalence of exposure to traumatic experiences found by Breslau et al.¹¹ in their study was higher than in previous community surveys, probably because they used a broader range of trauma and included traumatic bereavement among the list of potential stressors.

Regardless of methodological differences, these investigations point out that exposure to traumatic experiences is common in the population with a range from 39%⁷ to almost 90%.¹¹ Moreover, many persons are exposed to more than one traumatic event or to a trauma that occurs repeatedly.

PREVALENCE OF PTSD

As mentioned earlier, PTSD rates have frequently been studied in persons exposed to different specific traumas like combat, sexual assault, rape, natural disasters, and other extreme events. More recently, the prevalence of PTSD has been assessed in the general population using nationally representative samples^{9–11} as well as in samples from specific geographic areas.^{6,12,13} Some of these surveys also studied the conditional risk for PTSD, i.e., the preva-

lence of the disorder among those who had been exposed to traumatic situations.^{6,9,10,11,14}

Lifetime prevalence of PTSD rates from surveys of the general adult population range from 1.0%¹² to 9.2%.⁷ If we include studies limited to representative samples of women, the ranges increase to 12.3%⁹ and 13.8%,¹⁴ respectively. This difference is consistent with the finding of several other general population surveys where women appear to be more likely than men to develop PTSD (see Table 1). The 2 earliest community prevalence studies of PTSD were done as part of Epidemiologic Catchment Area (ECA) programs.^{12,13} Data from the ECA presented by Helzer et al.¹² showed a PTSD lifetime prevalence of 1.0% among adults in the St. Louis metropolitan area. Davidson et al.,¹³ from the same ECA program in the Piedmont region of North Carolina, reported a lifetime prevalence rate of 1.3% adults meeting diagnostic criteria for PTSD.

Breslau et al.,¹⁴ in a sample of randomly selected young adults from an HMO in Detroit, found a lifetime prevalence of 9.2% in the total sample and 23.6% among those exposed to trauma (conditional risk). The authors performed a 3-year follow-up¹⁵ of that population in which they found that, among subjects who reported new traumatic exposure during those 3 years, the prevalence of PTSD was 11%. However, it is not clear whether these were new cases of PTSD. Some of the limitations of this sample have already been mentioned.

Norris⁶ investigated the frequency and impact of different traumatic events in a southeastern U.S. population. In that study, the author found a prevalence of 7.3% for current (within the past year) PTSD among individuals who had experienced traumas. Looking at prevalence rates of current PTSD in different traumata, the lowest rate was associated with combat (2%) and the highest with sexual assault (14%). The data also showed that a current PTSD diagnosis was more frequent after violent crimes, death, or accidents than after various environmental hazards (7%–11% vs. 5%–8%, respectively).

Kessler et al.¹⁰ presented data from the NCS showing a lifetime prevalence of PTSD of 7.8% and a current (within 30 days) prevalence of 2.3%. They also found a wide variety of prevalence rates of PTSD across different trauma types. Rape showed the highest conditional probability of leading to PTSD in men and women alike. Sixty-five percent of men and 46% of women reported rape as the trauma most likely to produce PTSD. Given the fact that rape is more frequent among women, this might be one of the reasons for their higher vulnerability for PTSD.

Two studies have been conducted in adult female populations.^{9,14} Resnick et al.⁹ found an overall prevalence of PTSD was 12.3% lifetime and 4.6% within the past 6 months. The conditional risk for PTSD in women exposed to any type of traumatic event was 17.9% lifetime and 6.7% current. As described above, the authors made a distinction between crime and noncrime traumas; the rate of

PTSD was significantly higher among crime versus non-crime subjects (25.8% vs. 9.4%). Interestingly, the highest rates of both lifetime (38.5%) and current (17.8%) PTSD occurred among women with physical assault history, and rape was the second most common cause of this disorder (32% and 12.4%, respectively). In a sample of 801 mothers who participated in a study of cognitive and psychiatric outcome in their children by level of birth weight, Breslau et al.¹⁴ found a lifetime prevalence of PTSD in the total sample of 13.8%: 16.8% in urban women and 11% in suburban women ($p = .02$). Posttraumatic stress disorder was only slightly more likely to be present in urban than in suburban women after exposure (37% vs. 32%).¹⁴ However, the applicability of these results to the general population is not clear given the characteristics of the sample.

In the 1996 Detroit Area Survey of Trauma, Breslau et al.¹¹ evaluated the conditional risk of PTSD on randomly selected trauma. The authors randomly selected the trauma to be assessed with the objective of avoiding bias that can exist when the “worst” traumatic event is to be assessed. Interestingly, the overall probability of PTSD after traumatic exposure was 9.2% (13% in women and 6.2% in men), rates that resemble previous results in general population surveys including exposed and non-exposed individuals. In this sample, the probability of PTSD associated with the worst event was 13.6%.

In summary, PTSD appears to be common. Lifetime prevalence for PTSD in the general population seems to be around 8% to 9%, with women having a higher risk for PTSD than men. PTSD also is more frequent after certain types of trauma (e.g., rape) regardless of the survivor's gender.

AT-RISK POPULATIONS

Several studies have investigated risk factors for exposure to trauma and for PTSD in the general population, and the findings according to gender are summarized in Table 2.

Risk Factors for Exposure to Trauma

Gender. One of the most consistent findings in the different studies related to risk factors is that men are at higher risk for traumatic exposure than women. Norris⁶ reported that this difference was significant for lifetime ($p = .05$) but not past-year frequencies of exposure (73.6% in men vs. 64.8% in women and 19.5% in men vs. 22.4% in women, respectively). In a young HMO population, Breslau et al.⁷ found that, controlling for all other risk factors, men were 1.46 times more likely to be exposed to traumatic events than women. This finding could be more prominent depending on the type of trauma reported by the respondent. The 1996 Detroit Area Survey of Trauma¹¹ showed that men had twice the possibility of women of being exposed to events in which they were personally at risk

Table 2: Main Characteristics of Exposure to Trauma and PTSD by Gender

Gender	Exposure to Trauma	PTSD
Men	At higher risk than women More physical assault and other life-threatening situations Risk factors: history of early conduct problems, neuroticism/extroversion, psychiatric disorders, parental substance abuse, parental divorce	More frequent if history of psychiatric disorder, parental psychiatric disorder At higher risk if married at the time of the trauma, lower education Leading traumas: combat, childhood neglect, physical abuse, sudden unexpected death of a loved one
Women	At lower risk than men More sexual assaults and childhood parental neglect Risk factors: history of affective, anxiety, or substance abuse; parental mental illness and substance abuse; parental aggression Lower education, younger age, being married at the time of the trauma, having been married previously, urban residence, and lower income are significant predictors	At higher risk than men More frequent if history of psychiatric disorder, parental psychiatric disorder, parental aggression Younger age and prior trauma exposure significant predictors Leading traumas: sexual assault, rape, sudden unexpected death of a loved one

(e.g., assaultive violence). On the other hand, there was not such a difference when stressful events like knowing about the unexpected death of a loved one or any traumatic situation that affects others was considered. Also, the mean number of traumatic events reported was significantly higher in men than in women (5.3 vs. 4.3, respectively; $t = 5.6, p < .001$).

Kessler et al.¹⁰ reported that 61% of men and 51% of women had at least one traumatic event ($p < .001$). They also found differences between men and women by the type of trauma experienced; women were at higher risk than men of being exposed to sexual trauma (rape, molestation, childhood sexual abuse) and childhood parental neglect. Conversely, a higher proportion of men reported witnessing someone being badly injured or killed, being involved in a natural disaster or a life-threatening accident, physical attacks, combat experience, being threatened with a weapon, being held captive, or being kidnapped. Similar results were presented by Norris who found that women were more exposed to sexual assault whereas men were more exposed to physical assault.⁶

Race. Regarding ethnic status, results are inconsistent. Norris⁶ found that whites were at higher risk than African Americans for lifetime traumatic exposure, especially robbery, physical assault, tragic death, or a natural disaster other than Hurricane Hugo ($p < .05$). Nevertheless, for past-year frequencies the difference was not significant, although African Americans were more likely than whites to experience motor vehicle accidents during that time period (3.6% vs. 1.6%, $p < .05$).

In their HMO sample, Breslau et al.^{7,8} found that there were no differences between groups at baseline. However, at 3-year follow-up African Americans had a higher incidence of exposure to traumatic events than whites. In the 1996 Detroit Area Survey of Trauma, Breslau et al.,¹¹ reported that nonwhites showed a 2-fold higher risk than whites for lifetime exposure to assaultive violence.

Other risk factors. Other risk factors associated with exposure to traumatic experiences include age, educational level, abnormal personality traits, psychiatric problems, family psychiatric history, and previous traumatic exposure.

Norris⁶ found a trend for exposure to trauma to decrease with age; this finding was stronger for past-year exposure, but was also present for certain lifetime frequencies (e.g., physical assault and sexual assault). Breslau et al.¹¹ reported that all classes of traumatic experiences peaked at age 16 to 20 years. Nevertheless, there were important differences across trauma types in the pattern of rates over the life span of the participants. Assaultive violence decreased abruptly after age 20 years and continued to decline in the subsequent decades. Other traumata did not show this pattern of continued reduction with age, e.g., sudden unexpected death of a loved one was the only trauma to remain at the high level it reached at ages 16 to 20 years until age 40 years; the level peaked between 41 and 45 years of age.

Breslau et al.⁷ found, in a sample of young adults, that along with male sex, a history of early conduct problems, a family history of any psychiatric disorder, and neuroticism/extroversion in the respondent increased the risk of exposure to traumatic events. The 3-year follow-up⁸ showed that previous exposure to traumatic events, as well as neuroticism and extroversion, all served as independent risk factors for subsequent exposure to trauma.

In a sample of young women (mean age = 31.7 years), Breslau et al.¹⁴ reported that exposure to trauma was more frequent in women who were single and had not completed high school. Higher proportions of urban than suburban women reported physical assault, rape, and witnessing violence toward others. Some similarities were found in the 1996 Detroit Area Survey of Trauma¹¹ where lifetime prevalence of assaultive violence was revealed to be higher in persons with low education than college graduates, in lower income, central-city residents, and in those subjects previously married. Nonetheless, the last 2 risk factors (place of residence and marital status) disappeared when race, education, and income were controlled.¹¹

In an analysis of the data from the NCS, Bromet et al.¹⁶ looked at the association of childhood risk factors with exposure to trauma and PTSD. They found the following risk factors for exposure to trauma: preexposure affective, anxiety, and substance abuse disorders; parental mental illness and substance abuse; parental aggression toward women respondents; and preexposure history of anxiety disorder,

parental substance abuse history, and parental divorce in men.

Risk Factors for PTSD

Not everyone exposed to a traumatic experience will develop PTSD. It is known that an average of 25% of people experiencing one or more traumas will develop the disorder.¹⁷ The determinants of whether PTSD develops after traumatic experiences are still not clear, but some factors confer a higher risk than others. Basically these risk factors can be classified according to the person involved and the trauma experienced.

Gender. There is general agreement across the studies that women are at higher risk than men for PTSD, despite being less frequently exposed to traumatic situations. Data from the ECA survey showed that women were more likely than men to have PTSD.^{12,13} Norris⁶ also found that women not only were more likely to satisfy diagnostic criteria for PTSD, given the occurrence of a violent crime, but women generally perceived their lives as more stressful than men. This greater vulnerability in women is consistent with the report by Breslau et al.⁷ Kessler et al.¹⁰ reported similar results with women being twice as likely overall as men to have lifetime PTSD (10.4% vs. 5%, $p < .05$). Breslau et al.¹¹ also found that gender emerged as a significant risk factor when other sociodemographic factors were controlled, with the rate in women being 2-fold higher than in men.

Race. There is no consistency about which ethnic group is at higher risk for PTSD. Davidson et al.¹³ reported that PTSD was higher among nonwhites although at a statistically nonsignificant level. An initially apparent difference in the PTSD rate in the 1996 Detroit Area Survey of Trauma¹¹ became nonsignificant when adjusted for other variables. Nonetheless, when inner city residence was dropped from the model, the adjusted odds ratio for PTSD in nonwhites versus whites was 1.8.

Personality and psychiatric history. Helzer et al.¹² described PTSD as associated with a variety of psychiatric disorders (e.g., obsessive-compulsive disorder, dysthymia, and manic-depressive disorder). They also found that PTSD could be predicted by a history of behavioral problems before the age of 15 years (e.g., stealing, lying, truancy, and vandalism) and that the rate of PTSD increased with the number of behavioral problems. From the Piedmont region of North Carolina, Davidson et al.¹³ found that being abused as a child increased the possibility of developing PTSD. Also, respondents who showed the disorder had a higher prevalence of other psychiatric diagnoses (e.g., somatization disorder, schizophrenia/schizophreniform disorder, panic disorder, and social phobia). However, in this study, age at PTSD onset was not ascertained, making it impossible to establish which disorder came first. Breslau et al.⁷ found that neuroticism and preexisting anxiety and depression increased the odds ratio of showing PTSD after trau-

matic exposure.⁷ Similarly, Bromet et al.¹⁶ reported that a history of previous affective and/or anxiety disorders was a significant predictor of PTSD in both genders.

Family psychiatric history. Davidson et al.¹³ reported that patients with PTSD were 2.8 times more likely to have a history of psychiatric illness in their relatives. Breslau et al.⁷ reported that a family history of anxiety and antisocial behavior increased the risk for PTSD (odds ratio [OR] = 2.9 and 2.05, respectively). In an analysis from the NCS, Bromet et al.¹⁶ reported similar findings. They found that parental mental disorder was a risk factor for PTSD in men and women alike (OR = 1.9).

Type of trauma. In the ECA from St. Louis, Helzer et al.¹² found that combat survivors had the highest risk for developing PTSD, especially among those combatants who were wounded.¹² Davidson et al.¹³ noted that the most frequent traumata reported by people who had PTSD were (1) threat or close call, (2) seeing someone hurt or killed, (3) physical attack, (4) accident, and (5) combat. Breslau et al.⁷ in their HMO sample found similar results except for rape, which had the highest rate of PTSD (80%) and was observed only in women. They performed a comparison across the 4 most frequent types of traumatic events experienced by both genders. This comparison showed that assault and sudden injury or accident affected women and men equally, but seeing someone killed or seriously hurt or news of the sudden death of a close friend or relative led to substantially higher rates of PTSD in exposed women than men. Norris reported survivors of sexual assault as having the highest rate of PTSD, and motor vehicle crashes as presenting the most adverse combination of frequency and impact.⁶

In women, Resnick et al.⁹ and Breslau et al.¹⁴ found consistent results with assault and rape as the most frequent trauma leading to PTSD. Resnick et al.⁹ reported that the highest rate of both lifetime PTSD (38.5%) and current PTSD (18%) occurred among women with a history of physical assault followed by those with a history of rape (32% and 12.4%, respectively). Breslau et al.¹⁴ reported that assault accounted for 12.4% and rape for 7.4% of traumatic experiences leading to PTSD. Kessler et al.¹⁰ found rape as the trauma most likely to be associated with PTSD in men and women alike. Sixty-five percent of men and 46% of women who reported rape as their most upsetting trauma developed PTSD. Other traumata associated with a high probability of PTSD included combat, childhood neglect, and childhood physical abuse among men and sexual molestation, physical attack, being threatened with a weapon, and childhood physical abuse in women.

Breslau et al.,¹¹ in their analysis from the 1996 Detroit Area Survey of Trauma, also found assaultive violence as the traumatic experience with the highest risk for PTSD (21%). However, the trauma most often reported as the precipitating event among persons with PTSD was the sudden unexpected death of a loved one (31% of all PTSD

cases), an event experienced by 60% of the sample and with a PTSD risk of 14.3%.

HEALTH SERVICE UTILIZATION AND COST

A variety of studies have looked at the impact of traumatic exposure and PTSD on health and the pattern of medical and psychiatric services use and consequent cost. To date, much of the research has focused on combat and sexual assault survivors that has largely been limited to men and women, respectively, restricting its generalizability. Furthermore, no study to our knowledge has distinguished between exposure to trauma and PTSD in the effect on health and consequent service utilization—for example, the difference in medical service utilization between trauma exposed versus nonexposed subjects without differentiating who (among the exposed) had or had not developed PTSD. Regardless of the limitations, these studies underscore the impact of traumatic exposure and PTSD on an individual's health and on the health care system.

Health Consequences of Trauma and PTSD

Boscarino¹⁸ reviewed the medical histories of 1399 male Vietnam veterans approximately 20 years after combat exposure. The investigator identified those veterans who developed PTSD and compared this group ($N = 332$) with PTSD-negative combatants. He found that, controlling for selection bias, socioeconomic variables, behavioral risk factors, and hypochondriasis, PTSD-positive theater veterans disclosed a higher lifetime prevalence of circulatory, digestive, musculoskeletal, nervous system, respiratory, and nonsexually transmitted infectious diseases as many as 20 years (mean = 17 years) after exposure to trauma.

In a population of female veterans ($N = 109$), Wolfe et al.¹⁹ studied combat exposure and combat-related PTSD and their correlates of perceived health. They reported that both PTSD and exposure were associated with reports of negative health outcomes when each variable was not adjusted for the other. The effects associated with exposure decreased when PTSD was controlled for, whereas the effects associated with PTSD remained when exposure was controlled for. Veterans with PTSD were at much higher risk of having dermatologic ($OR = 3.88$, $p < .001$), pain ($OR = 3.32$, $p < .001$), gastrointestinal ($OR = 3.23$, $p < .01$), ophthalmologic ($OR = 3.09$, $p < .01$), endocrinologic ($OR = 3.09$, $p < .01$), gynecologic ($OR = 2.38$, $p < .01$), and cardiovascular problems ($OR = 2.02$, $p < .05$) than veterans without PTSD.

Koss et al.²⁰ assessed the relationship between crime victimization and physical health in a large population of female HMO patients ($N = 2291$). They reported that criminal victimization was an important predictor of health perceptions even after accounting for the contributions of demographics and other stressful life events with

known links to illness. Waigandt et al.²¹ investigated the long-term physical health implications of sexual assault in women who were rape victims. They compared a sample of 51 rape survivors with an age-matched control group of 51 nonrape subjects. The perceived health status questionnaire results revealed statistically significant differences between rape survivors and nonrape subjects. The results in the Cornell Medical Index Health Questionnaire showed statistically significant differences in (1) Present Illness Symptoms with a larger number of symptoms in rape survivors as opposed to nonrape subjects ($t = 5.51$, $p < .01$), (2) Negative Health Behavior with rape survivors having 50% more negative behavior than did nonrape subjects ($t = 5.05$, $p < .01$), and (3) Female Reproductive Physiology Illness Symptoms with rape survivors scoring twice as high than nonrape subjects ($t = 6.21$, $p < .01$).

Golding²² investigated the same relationship (sexual assault history and physical health) in a randomly selected sample of women from the Los Angeles ECA ($N = 1610$). She found that sexually assaulted women were more likely than nonassaulted women to report poor health perceptions, functional limitation, several chronic diseases, medically explained somatic symptoms, and medically unexplained somatic symptoms. Sexual assault was associated with an increased risk of symptoms in a variety of organ systems, not just the reproductive system. Medically explained symptoms were more common in sexually assaulted women than nonassaulted women (29.3% vs. 16%). The highest significant odds ratios were observed for burning sensation in sexual organs ($OR = 3.23$), paralysis ($OR = 3.10$), pain during urination ($OR = 2.76$), and diarrhea ($OR = 2.74$). Women with a history of sexual assault also showed a higher prevalence of diabetes and physical disability (adjusted odds ratio = 2.35 [$p < .01$] and 1.96 [$p < .05$], respectively).

These results are consistent with those previously obtained by Koss et al.,²³ who investigated the deleterious effects of criminal victimization on women's health and medical utilization in a sample from an HMO ($N = 413$; mean age = 36.4 years; range, 19–69 years). They found that severely victimized women, compared with non-victims, reported more distress and less well being ($p < .01$).

Felitti et al.²⁴ studied the relationship of traumatic exposure during childhood (e.g., childhood abuse and household dysfunction) to many of the leading causes of death in adults. Their sample of 9508 adults from an HMO were asked about traumatic childhood exposures (psychological, physical, or sexual abuse; violence against mother; or living with household members who were substance abusers, mentally ill or suicidal, or ever imprisoned). These 7 categories were compared with measures of adult risk behavior, health status, and diseases. Both prevalence and risk increased for factors such as smoking, severe obesity, physical inactivity, depressed mood, and suicide attempts

as the number of childhood exposures increased. For example, when a person who had 4 categories was compared with those with no categories, the odds ratio ranged from 1.3 for physical inactivity, 7.4 for alcoholism, 10.3 for injected drug use, to 12.2 for suicide attempts. They found in logistic regression models (which included age, gender, race, and education as covariates) a statistically significant relationship between the number of categories of childhood exposure and each of the adult health risk behaviors and diseases that were studied ($p < .001$). They also found a significant dose-response relationship ($p < .05$) between the number of childhood exposures and a history of the following disease conditions: ischemic heart disease, cancer, chronic bronchitis or emphysema, hepatitis or jaundice, skeletal fractures, and poor self-rated health. However, they did not find a statistically significant dose-response relationship for stroke or diabetes.

Health Utilization and Cost

To date, there is no official information in the United States regarding the costs of trauma exposure and PTSD. Nevertheless, there are some studies that have looked at health services utilization in sexually traumatized patients. Some investigators have also estimated the economic burden associated with traumatic experiences and PTSD.

Golding et al.,²⁵ using data from the Los Angeles ECA study, estimated the association between a history of sexual assault and the current utilization of mental health and medical services. They found that sexual assault was associated with seeking both forms of care. Respondents with a history of sexual assault were nearly twice as likely as the nonassaulted respondents to have used mental health services in the 6 months prior to the interview (17.8% vs. 9.0%, $p < .01$). Also, assaulted respondents were significantly more likely than nonassaulted respondents to report a physical health visit in the past 6 months (60% vs. 44%, $p < .01$). After a hierarchical logistic regression, an interaction of assault history with private health insurance status indicated that assault was associated with a larger increase in use of medical services among those respondents without private health insurance than those with private health insurance (30.2% non-assaulted and 54.4% assaulted without private insurance [$p < .01$] vs. 50.3% nonassaulted and 59.4% assaulted with private insurance [$p < .05$]). They also found an interaction between sexual assault and Medicaid utilization, indicating that assault was associated with increased utilization among those without Medicaid (42.4% nonassaulted vs. 58% assaulted; $p < .01$), but was unrelated to utilization in those with Medicaid (63.5% nonassaulted vs. 59% assaulted; not significant). The authors also looked at the prevalence of sexual assault among service users. When mental health services were studied, 22.4% of respondents seeking care had a history of sexual assault, compared with 11.4% of those not seeking care ($p < .01$). Users of

medical services were more than half as likely to have been sexually assaulted than nonusers (16.2% vs. 9.5%, not significant). Prevalence of sexual assault was significantly higher among female users than nonusers (21% vs. 12.1%, $p < .01$). Similarly, in a sample of 51 women who had experienced rape, Waigandt et al.²¹ found that women reporting sexual assaults made approximately 35% more visits to their physicians per year than those not reporting sexual assault ($p < .03$).²¹

Kimerling and Calhoun²⁶ also studied the relationship between sexual assault and physical health in a population of 115 rape survivors (aged 15–71 years) compared with a matched control group with no history of sexual assault ($N = 87$). They found a different pattern in medical service utilization; no differences were shown in number of visits initially, but by 4 months postassault, the survivor group reported a significant increase that persisted at the 1-year follow-up ($p < .05$). When comparing mental health service utilization, the result was not significant. However, frequency tabulations showed that rape survivors sought medical services more than psychological services in the year following the assault. The majority of the survivor sample sought medical treatment (72.6%), but only 19% sought mental health treatment of any kind. In an HMO setting, Koss et al.²³ reported that severely victimized women made physician visits twice as frequently ($p < .01$) and had outpatient costs 2.5 times greater compared with nonvictims ($p < .01$) during the time studied.

Greenberg et al.,²⁷ using data from the NCS, calculated the cost associated with anxiety disorders. They applied multivariate regression techniques and adjusted the results for demographic and comorbid psychiatric conditions. They estimated 2 types of costs: direct and indirect. Direct cost was defined by (1) psychiatric service costs (e.g., counseling, hospitalization), (2) nonpsychiatric medical costs (e.g., primary care visits, emergency room), and (3) prescription drug costs. Indirect cost included excess absenteeism as well as anxiety-related reductions in at-work productivity. They pointed out that the economic burden of anxiety disorders was estimated to be approximately \$42.3 billion in 1990 dollar terms, or \$63.1 billion in 1998 dollars. The 1990 results imply an average annual cost per sufferer of \$1542, and an average annual cost in the workplace of \$256 per suffering worker, of which 88% is attributable to lost productivity while at work as opposed to absenteeism.

Consistent with other authors referred to above, Greenberg et al.²⁷ reported that the largest component of the societal cost of anxiety disorder was direct nonpsychiatric medical treatment costs, accounting for 54% of the total, while direct psychiatric treatment cost accounted for an additional 31%. This particular cost distribution suggests that inappropriate treatment of undiagnosed and misdiagnosed subjects contributes meaningfully to the overall economic burden. Their results showed that PTSD and

panic disorder were found to have the highest rates of service use. PTSD had a statistically significant impact at the 5% level in both direct psychiatric medical service utilization (hospitalizations, visits to family doctors, psychiatrists, psychologists, social workers, counsellors, and other specialists) and indirect workplace outcomes (work cutback days). Kessler and Frank²⁸ using data from the same survey (NCS) also reported that PTSD had a greater effect on work cutback than on absenteeism (2.76 vs. 0.81, respectively).

CONCLUSION

Although the studies reviewed here suffer from considerable limitations and their methodological differences prevent us from making a straightforward comparison of their results, nonetheless they demonstrate the prevalence of traumatic experiences and PTSD.

Traumatic experiences and subsequent PTSD are more frequent than previously appreciated. The lifetime prevalence of exposure to any traumatic situation in general populations has been shown to be as high as 90%. This indicates a high likelihood for every human to become exposed to at least one traumatic event during his or her life span. Moreover, it is quite common to be exposed to more than one trauma and for traumatic situations to reoccur across time. However, only a percentage of those exposed will develop PTSD. This conditional risk has a broad range (from 9% to 65%) depending on factors related to the person (gender, socioeconomic status, personal and familial psychiatric history, etc.) and characteristics related to the trauma itself. For example, certain traumatic situations have a high conditional risk regardless of which personal risk factors are involved (i.e., rape). Furthermore, PTSD lifetime prevalence among the general population is substantial (1%¹²–9.2%⁷), with women having a higher risk for developing the disorder even though men show a higher occurrence of traumatic events.

People exposed to traumas like combat or sexual assault and persons exhibiting PTSD related to those traumatic experiences sustain a deleterious impact on their health and their health perceptions. Consequently, they have a tendency to use the health care system (direct cost) more frequently than people not exposed to traumas. Despite the fact that there are no established data as to how costly trauma is to the health care system and society, some investigators have estimated that it is quite expensive. In addition, these patients tend to seek care in general medical settings more often than in mental health settings. The likelihood of misdiagnosis, nonrecognition, and inappropriate treatment remain high for PTSD and leads to a high direct cost of PTSD. There is also an indirect cost that is related to the loss of productivity at work.

In summary, traumatic experiences and PTSD are highly prevalent in modern society and imply substantial

costs, not only economic but also in the quality of life. For these reasons, future epidemiologic studies are warranted to improve our understanding and better characterize the risk factors and also to determine which factors might be protective for exposure to trauma and PTSD. That approach may be of invaluable help in planning more informed public policies for better diagnosis and treatment of PTSD as well as reduction of traumatic stress.

Disclosure of off-label usage: The authors have determined that, to the best of their knowledge, no investigational information about pharmaceutical agents has been presented in this article that is outside U.S. Food and Drug Administration–approved labeling.

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