Long-term outcomes of individuals injured in motor vehicle crashes: A population-based study

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A B S T R A C T

Background: Despite decline in U.S. traffic fatalities, non-fatal injuries remain a main cause of reduced self-reported health. The authors used a nationally representative survey to examine the long-term (≥ 1 year) implications of traffic injuries on self-care, depression, mobility, pain and activity domains of a widely used measure assessing Health-Related Quality of Life (HRQOL).
Methods: 30,576 participants from panels (2000–2002) of the Medical Expenditure Panel Survey (MEPS) were followed for about two years. The associations between reporting a traffic injury in the first follow-up year and the five domains of the Euroqol Health index (EQ-5D) were assessed using mixed logistic models with outcome severe/moderate problem in each domain. Models adjustment variables included age, gender, education, income, diabetes, asthma, smoking and insurance status.
Results: 590 participants reported traffic injuries. In the first follow-up analysis, having an injury was associated with deficits in all domains of the EQ-5D. With the exception of self-care, similar findings were reported in the second follow-up (≥ 1 year) after injuries with strongest associations between traffic injuries and both mobility and activity (both OR = 2.9, $P < 0.01$).
Conclusions: Traffic injuries are significantly associated with long-term reduced HRQOL. Injured individuals may benefit from early intervention programs to prevent the development of secondary complications and reduced HRQOL.

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Introduction

Traffic related injures are a ubiquitous and growing threat to population heath worldwide. While the U.S. has experienced a decline in traffic fatalities in the past decade [1], non-fatal motor vehicle (MV) injuries continue to be one of the major threats to public health [2]. Over 4 million individuals experienced nonfatal-MV injuries that required an emergency department (ED) visit in 2012 [3]. Although not all those seeking medical care sustain severe injuries, MV injuries can result in lasting disabilities among those injured [4]. Previous literature has shown that survivors of MV injuries often experience deficits in self-reported health [5–8].

One method of capturing health deficits is by using the concept of Disability Adjusted Life Years (DALYS). DALYS are summary measures that incorporate both mortality and morbidity into the estimate of the burden on population health. Population level estimates suggest that MV injuries have a major impact on DALYS in the U.S. [9,10]. According to datasets assembled from the National Health Interview Survey (NHIS) and other sources, MV injuries ranked 9th among the leading causes of DALYs [11]. Another measure of the burden of disease, Health-Related Quality of Life (HRQOL), also document the negative impact of MV injuries on health status [2,12]. Although the two measures are fundamentally different measures and have their own strengths and weaknesses, HRQOL relies on self-reported health status by those affected and thus providing more of a patient perspective on the

impact of MV injuries on population health. Additionally, HRQOL is ideal for population-based surveys because, unlike DALYS, it allows generating estimates that are focused on the burden of non-fatal injuries.

HRQOL is recognised as an important outcome in population health and improving HRQOL is one of the fundamental objectives of the Healthy People 2020 initiative [13]. However, there is a scarcity of literature examining the long-term effects of MV injuries on HRQOL [14]. Most studies examined injuries in general, rather than those related to MV crashes, and were conducted using small sample sizes from local hospitals or followed patients only for a short period of time [15–18].

This study utilised a nationally representative survey to examine the long-term (≥ 1 year) implications of MV injuries on domains of the Euroqol Health index (EQ-5D), a widely used self-reported measure assessing HRQOL. We hypothesised that although the gap in HRQOL deficits between those injured in MV crashes and the general population may narrow as the time post-injury increases, a significant HRQOL deficit will still exist at one year follow-up for those who experience MV crash injuries.

Methods

Dataset

Data used in the current analysis come from the Medical Expenditure Panel Survey (MEPS). This dataset is a nationally representative survey of health care use, health status, sources of payment and insurance coverage of the U.S. civilian non-institutionalized population [19]. The MEPS is a publically available dataset and co-sponsored by the Agency of Healthcare Research and Quality (AHRQ) and the National Center for Health Statistics [20]. The MEPS has a combined response rate that ranges from 64.7% to 65.8% for the 2000–2002 years.

Each year the MEPS selects a new panel of individuals of about 15,000 households to follow for about two and a half years. The survey includes five rounds of interviews spaced about 4–5 months apart (Fig. 1). For example, panel 5 was enrolled in the year 2000 and the last follow-up interview occurred in 2002. In addition to the health care expenditures and health status data, the MEPS also surveys respondents' regarding their medical conditions. This analysis used two data files from MEPS: the medical conditions file and the individual characteristics file.

MV-related injuries in the MEPS

Medical conditions are collected in the MEPS interview as the reason for a particular incident of medical care (hospital stay, outpatient visit, emergency room visit, home health episode, prescribed medication purchase, or medical provider visit), the reason for one or more episodes of disability days or as a condition "bothering" the person during the reference period.

Medical conditions are ascertained in every survey round (1–5) by asking respondents if they experienced any condition since the previous interview [21]. When reporting a medical condition, the respondents are asked if the condition was due to an injury. The MEPS defines an injury as a "physical problem that arose from some sort of external trauma to the body such as a fall." If affirmed, a follow-up question asks if that injury was MV-related. Though the MEPS does not specifically define the term "MV-related", we assumed it includes all road users, including pedestrians. Only injuries that occurred in either round 1 or round 2 are included in this study.

Outcome measures

The main outcomes were the five dimensions of the EQ-5D: mobility, pain/discomfort, self-care, usual activity and depression/anxiety [22]. Each dimension is measured using a three level response: no problem, some problems and severe problems.

EQ-5D was collected twice for each individual using self-administered questionnaires during rounds 2 and 4. In this study, outcome measurement that occurred at round 2 is the first outcome measure and the one at round 4 is the second outcome measure. According the MEPS manual, time lag of HRQOL measurement between round 2 and 4 is about one year [23]. The MEPS only collected the EQ-5D for panels starting between 2000 and 2002 (panels 5–7). All available years were used in this study.

Additionally, we examined the effects of MV injuries on the EQ-5D index. This score uses a multi-attribute utility function that covers the five dimensions: mobility, pain/discomfort, self-care, usual activity and depression/anxiety. The five dimensions are scored to provide a summary preference score between −0.11 and 1 based on U.S. community preferences [12,24]. The EQ-5D index has been validated in previous studies [22,25]. Differences greater than 0.03 are considered clinically significant on the EQ-5D index [26–28].

Participant selection

As the HRQOL measure was only collected from those ≥ 18 years of age, the study population was limited to this group. Injured respondents were selected into the study if they reported a MV-related injury in either round 1 or round 2 (Fig. 1), but did not sustain another MV injury in future rounds. MEPS participants who did not report any MV injury at any follow-up were selected as the unexposed group.

Statistical analysis

The MEPS survey has a complex survey design, which takes into account survey weights, strata and clustering of individuals in order to provide nationally representative results of U.S. non-institutionalized populations [20,29]. Therefore, all descriptive analyses were adjusted for the design using STATA 12 (STATA Corp LP, College Station, TX, USA) and its survey procedures.

Descriptive statistics of characteristics for those in the MV injury and those in the unexposed group were obtained using chi-square tests [29]. To examine differences in comorbidities between the two groups, we assessed the frequencies of diabetes, asthma, emphysema, stroke, hypertension and coronary heart disease (CHD). Those conditions are referred to in the dataset as "priority conditions". Such classification was designated because they are relatively prevalent, affect health status, and generally accepted standards for appropriate care have been developed [30]. Participants were asked if they had ever been diagnosed with
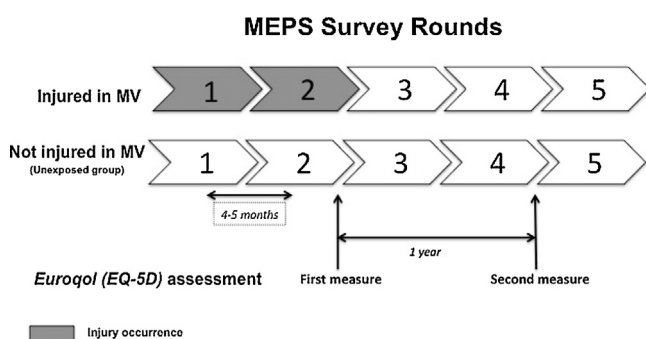
MEPS Survey Rounds

Injured in MV: 1 > 2 > 3 > 4 > 5

Not injured in MV (Unexposed group): 1 > 2 > 3 > 4 > 5

4-5 months

1 year

Euroqol (EQ-5D) assessment — First measure — Second measure

Injury occurrence

Fig. 1. Classification of the comparison groups: Motor vehicle (MV) injured and the unexposed group in the Medical Expenditure Panel Survey (MEPS).