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The socioeconomic inequality in traffic-related disability among Chinese adults: The application of concentration index

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ABSTRACT

Traffic crashes have become the fifth leading cause of burden of diseases and injuries in China. More importantly, it may further aggravate the degree of health inequality among Chinese population, which is still under-investigated. Based on a nationally representative data, we calculated the concentration index (CI) to measure the socioeconomic inequality in traffic-related disability (TRD), and decomposed CI into potential sources of the inequality. Results show that more than 1.5 million Chinese adults were disabled by traffic crashes and the adults with financial disadvantage bear disproportionately heavier burden of TRD. Besides, strategies of reducing income inequality and protecting the safety of poor road users, are of great importance. Residence appears to counteract the socioeconomic inequality in TRD, however, it does not necessarily come to an optimistic conclusion. In addition to the worrying income gap between rural and urban areas, other possible mechanisms, e.g. the low level of post-crash medical resources in rural area, need further studies. China is one of the developing countries undergoing fast motorization and our findings could provide other countries in similar context with some insights about how to maintain socioeconomic equality in road safety.

1. Introduction

Traffic crashes have become a major public health problem worldwide, especially for developing countries (Ameratunga et al., 2006; World Health Organization, 2009). During last decades, traffic-related injuries and fatalities have increased dramatically in China (Wang et al., 2003), which makes traffic crashes the fifth leading cause of burden of disease and injury in terms of DALY (disability-adjusted life year) (World Health Organization, 2008). Effective countermeasures to reduce the negative influence of road crashes would require understanding of various contributing factors, including the socioeconomic disparities, which is missing in the Chinese literatures.

The socioeconomic inequalities in traffic injuries and fatalities have been demonstrated by previous studies (Hyder and Peden, 2003; Nantulya and Reich, 2003; Sethi et al., 2006; Laflamme et al., 2009; Chen et al., 2010). Risks for road traffic injuries and fatalities are higher among disadvantaged groups with less education (Murray, 1998; Ferrando et al., 2005; Park et al., 2010), unskilled occupation (Hasselberg and Laflamme, 2003, 2004, 2008), lower income (Hasselberg and Laflamme, 2004; Chakravarthy et al., 2010), or lower SES in general (Chen et al., 2010; Hanna et al., 2010). However, these studies were mainly conducted in developed countries, and the situation in developing countries, including China, is still under-investigated (Ameratunga et al., 2006). In addition, few studies have employed concentration index (CI) to analyze the socioeconomic inequality in traffic injuries and fatalities, although CI has demonstrated its advantages in many health issues, e.g. child-mortality (Wagstaff, 2000) and obesity (Zhang and Wang, 2004, 2007).

CI is one of the best summary measures of socioeconomic inequalities in health by meeting the following three key requirements: (1) reflecting the socioeconomic dimension to inequalities in health; (2) reflecting the experiences of the entire population; and (3) being sensitive to changes in the socioeconomic distribution of the population (Wagstaff et al., 1991). Also, the application of CI has additional advantages over traditional regression models. For example, regression models usually indicate the existence of SES inequality through the comparison between SES categories in the model and the reference category, which means we still do not know the overall inequality degree of the whole study population. However, CI can easily solve this problem by producing a single CI value (Zhang and Wang, 2004). Moreover, the newly developed decomposition technique further makes CI a valuable tool to analyze the potential sources of health inequality (Wagstaff et al., 2003; Van Doorslaer et al., 2004).

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Therefore, this study used a nationally representative survey to calculate and decompose concentration index of traffic-related disability among Chinese adults. By doing this, we aim to depict a whole picture of the socioeconomic inequality in traffic-related disability and find out the potential ways to reduce the inequality.

2. Methods

2.1. Data source

The 2006 China Disability Survey was conducted in all province-level administrative regions of mainland China. The survey was approved by the State Council and all respondents provided consent to participate to the Chinese government (Zheng et al., 2011). Within each provincial stratum, a four-stage sampling strategy using four-level natural administrative units (i.e., county, town, village and community) and a probability proportional to size cluster sampling method were employed to derive nationally representative sample. The survey excluded the institutionalized population and comprised a total of 734 counties (5964 communities) with a sample size of 2,526,145, representing 1.9‰ of the total non-institutionalized population in China (Zheng et al., 2011). The measure unit of general household information was household, including household size, the number of disabled household members, housing area, house ownership, total household income, appliance, and the consumption amount of electricity per month; the measure unit of other information is person. For the current study, we focused on adults aged 18 years and above (n = 1,909,205) and the unit of analysis is person.

2.2. Measurement

2.2.1. Traffic-related disability (TRD)

During the survey, trained field interviewers used a structured questionnaire to ask questions about visual, hearing and speech, physical, intellectual, and mental functioning difficulties. Those who responded "yes" to any question were referred to doctors of various specialties for further disability screening and confirmation, as well as the severity and causes of disabilities according to medical examinations and diagnostic manuals. Two kinds of disabilities, i.e. physical disability and intellectual disability, include traffic crashes as disability causes. Physical disability refers to a loss of motor function of varying degrees or to limitations in movements or activities resulting from deformed limbs or body paralysis (palsy) or from deformity caused by damage to the structure or function of those body parts involved in mobility. Intellectual disability refers to lower than normal intellectual ability and is accompanied by adaptive behavior disorders. This kind of disability results from impairment of the structure and functions of the nervous system, limits individual activity and participation, and requires all-round, extensive, limited, or intermittent support (Zheng et al., 2011). TRD was defined as physical or intellectual disability caused by traffic crashes, which was binary as yes or no.

2.2.2. SES indicator for calculation of CI

The calculation of CI requires a single indicator to capture respondents' socioeconomic status characteristic (O'donnell et al., 2008). In this study, we used the variable of per capita household income (PHINC, in Chinese Yuan (CNY)), which was obtained through dividing total household income by household size. In the survey, interviewers asked respondents about their total household income in 2005, which included wage, net operating income, property income, and transfer income (e.g. insurance and pension). For rural households, the household income also included the income in kind from agricultural activities such as grain and poultry, which was converted into the monetary estimates by respondents. And, the interviewers filled the questionnaire according to the final answers of respondents. Furthermore, the survey took two measures to ensure the reliability of the data. (1) Before the interview, the respondents were notified that the survey kept strict confidentiality of respondents' information through the whole survey process, which increases the accuracy of answers to the household income question (Singer et al., 1995). (2) When all the household questionnaire items are finished, interviewers and respondents checked the answers together and then signed their names at the bottom of the questionnaires to confirm the results, which reduces errors in providing or recording information.

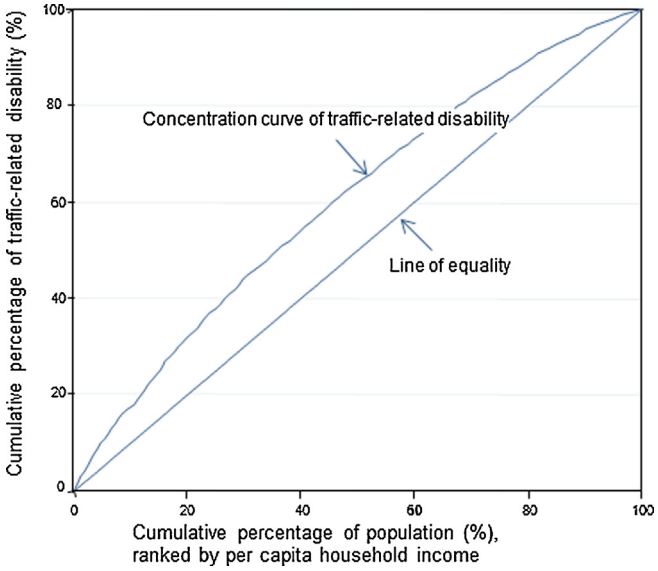

Fig. 1. Concentration curve of traffic-related disability among Chinese adults.

2.2.3. Determinants for decomposition of CI

In order to decompose CI, we included a series of determinants: (1) demographic variables, including sex (categorized as male or female), age (years), rurality of residence (categorized as urban or rural) and marital status (categorized as married or unmarried); (2) SES variables, including education background and PHINC. The education background was categorized as no higher than primary school, junior high school (i.e. any education at junior high school level), senior high school (i.e. any education at senior high school level), or higher than senior high school; (3) we also considered regional variability and assigned respondents to one of the following 8 regions of China: Northeast (NE), North Coast (NC), East Coast (EC), South Coast (SC), Middle Reaches of Yellow River (MRYeR), Middle Reaches of Yangtze River (MRYaR), South West (SW), and Northwest (NW) (Li and Hou, 2003).

2.3. Concentration index

2.3.1. Calculation of CI

The value of CI is calculated based on the concentration curve (Fig. 1), which plots the cumulative percentage of TRD (y-axis) against the cumulative percentage of the population, ranked by PHINC (x-axis) beginning with the poorest (left) and ending with the richest (right) (Wagstaff et al., 1991, 2011). Then, the CI is defined as twice the area between the concentration curve and diagonal (also referred as the line of equality) (Wagstaff et al., 2011). When the concentration curve coincides with the diagonal, the CI is equal to zero usually indicating no socioeconomic inequality in TRD; when the curve lies above (below) the diagonal, the CI is negative (positive) indicating the TRD is more concentrated