

## Value of Health Care Delivery

**To the Editor:** In his Commentary, Dr Brook advocated for enhanced collaboration between clinicians and health sciences researchers to maximize health care value and reduce cost.<sup>1</sup> Thoughtful consideration of how health sciences data can be used to improve the delivery of care requires a framework that includes categories that are mutually exclusive and comprehensively exhaustive. Brook's identification of reliability, appropriateness, frequency, labor, and transparency provides a step in the right direction. However, we suggest that efficiency and safety should serve as additional foci for assessment with the goal to identify and reduce waste and errors in health care delivery.

In addition, Brook<sup>1</sup> noted the focus to date of health sciences research on patient-specific factors. However, health information resources now exist at a level of granularity to assess clinician-specific factors that influence care delivery. Data are now robust enough to permit the development of procedure-specific performance curves that provide an understanding of the evolution of outcomes over time.<sup>2</sup>

Collaborations to optimize health care value should include not only clinical practitioners and health sciences researchers but also participants from industry who may provide validated approaches to process improvement. For example, the statistical process control methodology<sup>3</sup> provides an approach to optimizing value that has been validated by more than 50 years of experience in the manufacturing industry. Statistical process control is a method to augment quality and efficiency through the use of advanced mathematical techniques to describe a process, identify its influencing factors, define normal outcome variance ranges, and trigger process modifications in an iterative fashion. This methodology has only recently been adapted to the health care realm; however, the richness of data now makes such approaches more accessible than ever before. Such techniques offer a potential foundation for the establishment of prospective approaches to performance improvement and optimization of health care value, as well as the opportunity to provide practitioners with real time feedback that can motivate them to rethink how they are routinely practicing medicine.<sup>4,5</sup>

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**Conflict of Interest Disclosures:** Both authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

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**In Reply:** Implementing Drs Duclos and Carty's suggestions will increase the likelihood that waste can be eliminated and the costs of health care can be moderated. However, it expands the agenda for action and, although an expanded agenda is certainly warranted, getting started is also important.

I hope that in a short time, researchers and clinicians will form meaningful partnerships so that researchers answer questions relevant to clinicians regarding how they can increase the value of care, and clinicians can more quickly implement research findings so that the value of care will increase in our lifetime.

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**Conflict of Interest Disclosures:** The author has completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

## RESEARCH LETTER

### Implementation of a Motorcycle Helmet Law in Taiwan and Traffic Deaths Over 18 Years

**To the Editor:** In 1994, a trial law was passed in Taipei City requiring motorcycle riders to wear helmets. A pilot study showed an increase in helmet use from 21% to 79% and a 56% reduction in motor vehicle-related deaths.<sup>1</sup> The law was terminated after 4 months, associated with an increase in deaths. In June 1997, a national helmet law was passed by the Taiwanese legislature. A public information campaign was conducted in the year before passage and strict enforcement followed with fines for noncompliance among riders and passengers. We studied motor vehicle-related deaths from 1991 through 2008 in Taiwan.

**Methods.** A population-based study was conducted of motorcycles registered, motor vehicle crashes, and motor vehicle-related deaths. Persons who died at the scene, on arrival at the hospital, or during hospitalization from a crash involving a bus, car, or motorcycle were obtained from the Death Certificate Registry of the Department of Health.<sup>2</sup> Pedestrian deaths were excluded. Death certificates are issued by both prosecutor and coroner and audited monthly. Registries of motorcycles were obtained from the Ministry of Transportation, including all new and used motorcycles.<sup>3</sup> Motor vehicle crash data were collected between 2000 and 2008 from the National Police Agency.<sup>4</sup> These data were complete for all years of this study. The linear trend model (SPSS version 12.0; SPSS Inc, Chicago, Illinois) was used to determine whether changes of each trend over time were significant, with  $P < .05$  indicating significance. This study was approved by the Taipei Medical University institutional review board.

**Results.** A reduction in the total number of motor vehicle-related deaths occurred in 1994, followed by an increase in 1995, coincident with the implementation and

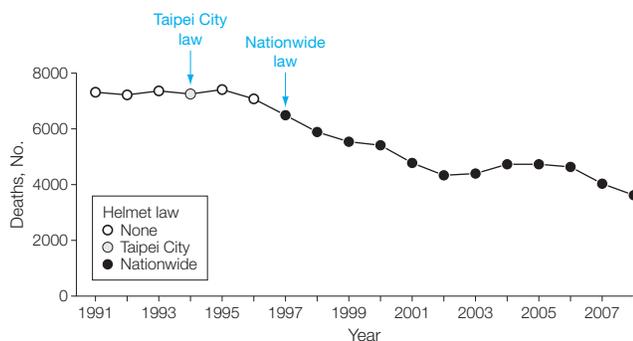
subsequent termination of the trial law in Taipei City; a sustained reduction started in 1996 with the publicity campaign for the national helmet law. The number of motor vehicle–related deaths decreased from 7322 in 1991 to 3646 in 2008 (mean annual decrease, 238.6; 95% confidence interval [CI], 198.8–278.5;  $P < .001$ ), in spite of a marked increase in motor vehicle crashes from 52 952 in 2000 to 165 982 in 2008 (mean annual increase, 15 601.8; 95% CI, 11 361.6–19 842.0;  $P < .001$ ) (FIGURE 1). The overall number of motorcycles registered increased from 7 409 175 in 1991 to 14 324 437 in 2008 (mean annual increase, 427 774.0; 95% CI, 404 675.2–450 872.9,  $P < .001$ ) (FIGURE 2).

**Comments.** Implementation of a motorcycle helmet law was associated with a 50.2% reduction in motor vehicle–related deaths in Taiwan over 18 years, despite a 93.3% increase in the number of motorcycles. About 65% to 70% of all motor vehicles in Taiwan are motorcycles,<sup>3,5</sup> which suggests why the helmet law was associated with such a reduction in motor vehicle–related deaths. The pattern of

motor vehicle–related deaths reported previously<sup>1,5,6</sup> continues to show a decrease without any plateau, as might be expected, during the latest 8-year period, despite the 213.5% increase in the number of crashes. We do not have data specifically on the motorcycle-related deaths or information on the type of crash, such as motorcycle to car or motorcycle to motorcycle. Another limitation is the study's ecological nature. Social, environmental, and regulatory factors, as well as emergency care improvements, may have accounted for some of the reduction in motor vehicle–related deaths,<sup>1</sup> but we could not identify any specific changes in legislation, weather conditions, highway speeds, motorcycle design, or treatment practices that would have altered exposure to a crash or risk of death.<sup>1</sup> The generalizability to other countries may be limited. Because of cultural and other differences, implementation of helmet laws in other countries may not be associated with similar reductions in mortality.

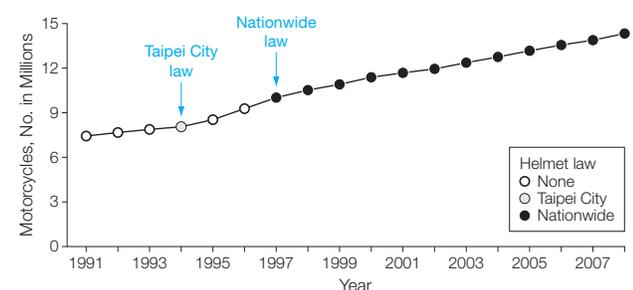
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**Figure 1.** Motor Vehicle–Related Deaths in Taiwan, 1991–2008



Taipei City trial law and enforcement occurred from February through June in 1994. The nationwide law and enforcement began in 1997. With data from 1991 representing 100%, there was a 50.2% decrease in motor vehicle–related deaths by 2008. Data are from Department of Health, Executive Yuan, Taiwan.

**Figure 2.** Registered Motorcycles in Taiwan, 1991–2008



Taipei City trial law and enforcement occurred from February through June in 1994. The nationwide law and enforcement began in 1997. With data from 1991 representing 100%, there was a 93.3% increase in the number of motorcycles registered. Data are from the Institute of Transportation, Ministry of Transportation and Communications, Taiwan.

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**Author Contributions:** Dr Chiu had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Study concept and design:** Chiu, Chiang.

**Acquisition of data:** Chu, Chang, Lui,

**Analysis and interpretation of data:** Chiu, Chiang.

**Drafting of the manuscript:** Chiu,

**Critical revision of the manuscript for important intellectual content:** Chu, Chang, Lui, Chiang.

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**Obtained funding:** Chiu, Chu, Chang, Lui, Chiang.

**Administrative, technical, or material support:** Chu, Chang, Chiang.

**Study supervision:** Chiang.

**Conflict of Interest Disclosures:** All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

**Funding/Support:** The study was supported by the Injury Prevention and Disaster Medicine Research Foundation, the Taiwan Department of Health (DOH100-TD-B-111-003), the National Health Research Institute (NHRI-EX100-9707PI), and the National Science Council (NSC98-2321-B-038-003-MY3, NSC98-2314-B-038-012-MY3, NSC 98-2911-I-038 -003).

**Role of the Sponsors:** The Injury Prevention and Disaster Medicine Research Foundation was involved in the preparation, review, and approval of the manuscript; the Taiwan Department of Health assisted with the collection, management, analysis, and interpretation of the data; and the National Health Research Institute and National Science Council supported the design and conduct of the study.

**Additional Contributions:** We thank Ching-Chang Hung, MD, Department of Neurosurgery, National Taiwan University Hospital, for assistance in manuscript preparation without receiving any compensation, and the directors and staff of all major hospitals who gave full support and provided complete and invaluable data.

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