

Comparing road traffic mortality rates from police-reported data and death registration data in China

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Objective To compare death rates from road traffic injuries in China in 2002–2007 when derived from police-reported data versus death registration data.

Methods In China, police-recorded data are obtained from police records by means of a standardized, closed-ended data collection form; these data are published in the *China statistical yearbook of communication and transportation*. Official death registration data, on the other hand, are obtained from death certificates completed by physicians and are published in the *China health statistics yearbook*. We searched both sources for data on road traffic deaths in 2002–2007, used the χ^2 test to compare the mortality rates obtained, and performed linear regression to look for statistically significant trends in road traffic mortality over the period.

Findings For 2002–2007, the rate of death from road traffic injuries based on death registration data was about twice as high as the rate reported by the police. Linear regression showed a significant decrease of 27% (95% confidence interval, CI: 35–19) in the death rate over the period according to police sources but no significant change according to death registration data.

Conclusion The widely-cited recent drop in road traffic mortality in China, based on police-reported data, may not reflect a genuine decrease. The quality of the data obtained from police reports, which drives decision-making by the Government of China and international organizations, needs to be investigated, monitored and improved.

Abstracts in عربي, 中文, Français, Русский and Español at the end of each article.

Introduction

Mortality from road traffic collisions is a serious public health problem in China. According to a review by Wang et al., deaths from vehicle collisions increased 97-fold between 1951 and 1999, and road traffic injuries have become the leading cause of death among persons 45 years of age and younger.¹ To counteract the increasing threat to life from road traffic collisions, during the late 1990s and early 2000s China revised its road traffic laws and adopted many preventive measures that had proved effective in high-income countries. Notably, the road traffic death rate in China began to fall after 2002, as documented in the *Global status report on road safety*² issued by the World Health Organization (WHO) in 2009. However, whether this recent decrease represents a genuine decline is questionable because: (i) China's reported road traffic fatality rate in 2006 was extremely low compared with the rate observed in low- and middle-income countries (6.8 per 100 000 population in China versus 21.5 and 19.5, respectively);² and (ii) the number of motor vehicles in China has increased rapidly in recent years.³

China, which is the country with the largest population in the world, accounts for about 13.5% of all deaths due to road traffic collisions.² Thus, the quality of China's road traffic injury data is critically important not only in terms of China's ability to develop effective measures for preventing and controlling traffic injuries, but also in terms of priority-setting in health at the global level. Since the recent decrease in road traffic mortality rates in China is based on data from police reports, which are believed to underreport true rates of death from road traffic injuries in many countries,^{4–12} China must resort to other sources of data to determine whether death rates have indeed decreased. Such

verification would lead to a better understanding of the true magnitude of the problem of fatal road traffic injuries in China.

In addition to police-reported data, China has death registration data that are collected by the Ministry of Health and that can also be used to estimate the rate of deaths from road traffic injuries. The ministry uses death registration data to estimate cause-specific death rates from various causes and has published these estimates in the *China health statistics yearbook* since 2002. Unfortunately, the Chinese government has rarely used death registration data to estimate mortality from road traffic injuries. Instead, it has relied on police reports because road safety falls under the jurisdiction of the Road Traffic Bureau of the Ministry of Public Security, which is responsible for collecting the data reported by the police. Although police-reported data have allegedly underestimated the actual rates of death from road traffic injuries in China,¹³ no one has yet compared police-reported data with death registration data to check for consistency between them.

This study rests on two working hypotheses: (i) that there is a substantial gap between road traffic death rates obtained from police reports and those derived from death registration data for the same time period; and (ii) that recent trends in mortality from road traffic injuries in China will differ depending on whether they are derived from death registration data or from police-reported data. Thus, the primary objective of the present study was to test these two hypotheses by checking for consistency between police-reported data and death registration data with respect to death rates from road traffic injuries in 2002–2007.

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Methods

Data sources

Police-reported data are extracted from police records on a standardized, closed-ended data collection form. The national Road Traffic Bureau is responsible for the design of the forms and other means to collect and register such data in China, and for releasing it four times a year and annually. All individuals who die of injuries sustained in a road traffic collision within 7 days of the incident are recorded as road traffic fatalities.¹⁴ Police-reported data are published and accessible in the *China statistical yearbook of communication and transportation*.

The cause-of-death surveillance system, which covers approximately 10% of the total population of China, is the source from which the Ministry of Health obtains death registration data. The diagnosed causes of death come from physicians' death certificates, which are submitted to the local police department by family members of the deceased and forwarded to the municipal, provincial and national health departments.¹⁵ Physicians classify deaths resulting from road traffic injuries in accordance with the *International Classification of Diseases* (ICD, 9th revision before 2002 and 10th revision thereafter). In death certificates, deaths from road traffic injuries are not limited to those that occur within a specified period after injury. Road traffic injury mortality rates based on death registration data are published and accessible in the *China health statistics yearbook*.

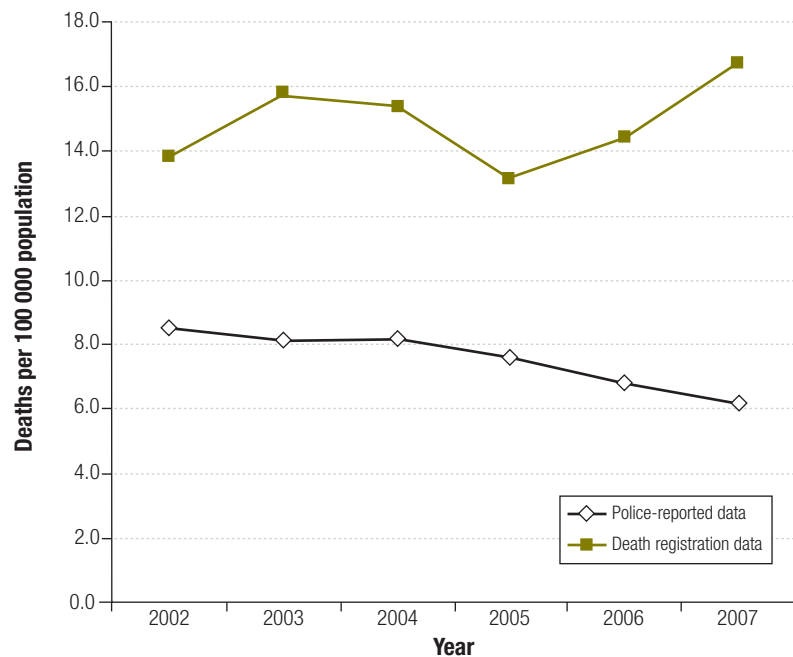
Statistical methods

Using the χ^2 test, we compared death rates from road traffic injuries based on police-reported data with those based on death registration data for the period from 2002 to 2007. We used linear regression to check for statistically significant trends in mortality rates over the study period, and we used the percent change in the death rate between 2002 and 2007 to measure the linear trend. To calculate this trend we used b (the regression coefficient) divided by the death rate for 2002.¹⁶ The level of statistical significance was set at $P < 0.05$.

Results

Fig. 1 shows that between 2002 and 2007, the road traffic death rate based on death registration data was almost twice as high as the rate reported by the

Fig. 1. Comparison of road-traffic death rates based on police reports and on death registration data, China 2002–2007



police ($P < 0.05$) and almost as high as the rates found in low- and middle-income countries. We found no decline in road traffic mortality after 2005. In 2007, road traffic deaths numbered 81 649 according to police data and 221 135 according to death registration data. When we compared the death rates obtained from the two sources, we found that for every year from 2002 to 2006 the police-reported rate of death from road traffic injuries was consistently no more than 62% of the rate obtained from death registration data and, in fact, in 2007 the death rate based on police reports was only 37% of the rate based on death registration data.

Police-reported data and death registration data showed different trends in road traffic death rates. Linear regression showed a significant decline of 27% according to police-reported data during 2002–2007, as opposed to a non-significant increase of 8% according to death registration data.

Discussion

Our findings support the hypotheses that rates of death from road traffic collisions based on police reports and on death registration data are different, and that unlike police-reported data, death registration data fail to show any recent decline. These inconsistencies strongly suggest that the decreasing trend in road traffic mortality shown by police-reported

data may not be genuine. Such a decline was expected to occur as a result of the many interventions implemented by the Chinese Government in the prior decade to prevent road traffic collisions. China has revised road traffic safety laws, set lower speed limits, standardized road signs and signals, imposed stricter training and testing for driver licensing and instituted other preventive measures that have proved successful in developed countries.¹⁷

The inconsistencies described in this paper may reflect to some extent the use of different definitions of what constitutes a road traffic death. To date China's Road Traffic Bureau has not specified whether or not it uses the same definition provided in the ICD, although their data, based on police reports, are more frequently cited than any other by researchers and international organizations such as WHO. On the other hand, the inconsistencies we have found suggest an underreporting of road traffic-related deaths in police records. In many countries, fewer traffic-related deaths and injuries are reported by the police than by other sources. In addition to differences in definitions, this may reflect differences in data collection methods. For example, in western Scotland, 45% of hospital admissions due to road traffic injuries were not recorded by the police.⁵ Loo et al. have reported that in the Hong Kong Special Administrative

Region, China, the police-reported road collision rate was only 58–60% of the actual rate, and that underreporting was particularly high for children (reporting rate of 34%) and cyclists (reporting rate of 33%).⁷ In another study, some road traffic injuries were not reported to the police mainly because, according to respondents, it was “not necessary” or the incident was a “hit and run case”.⁶ Others have suggested that road traffic officials may be purposely underreporting casualty statistics to avoid criticism from superiors who expect to see rates go down.⁴ These and other possible reasons for the underreporting of road traffic deaths in China have been discussed elsewhere.³

Knowing the actual number of road traffic fatalities is essential for planning realistic policies aimed at reducing these deaths. The inconsistency between police-reported data and death registration data strongly suggests that: (i) the

Government of China and international organizations should exercise caution in any decision-making stemming from the purported recent decrease in the road traffic death rate based on police reports; and (ii) the Government of China needs to improve the quality of the data. First, it should adopt the definition of “road traffic death” in the ICD. Second, it should integrate multiple data sources when estimating the burden of road traffic injuries and deaths because multiple data sources provide a more complete picture than a single source.¹⁸ Third, China could use the capture–recapture method to monitor the quality of existing data sources and estimate deaths from road traffic injuries. The capture–recapture approach has proved useful for evaluating the completeness of data sources and identifying biases within data sets.^{19,20} These strategies should also be considered by other countries, especially low- and

middle-income countries where the lack of reliable data poses a serious problem.²¹

In conclusion, the inconsistencies between the rate of death from road traffic injuries based on police-reported data and on death registration data strongly suggest that the actual rate has not decreased in recent years. China needs to investigate the quality of police-reported data and of death registration data and to adopt measures for improving it. Active efforts to audit and monitor data quality, even if only in periodic or sample surveys, are clearly necessary. ■

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ملخص

مقارنة معدلات وفيات الطرق المرورية من معطيات بلاغات الشرطة ومعطيات تسجيل الوفيات في الصين

النتائج في الأعوام 2002-2007، بلغت معدلات الوفيات الناجمة عن إصابات الطرق المرورية المستندة إلى معطيات تسجيل الوفيات حوالي ضعف المعدلات التي أبلغت عنها الشرطة. وأظهر التحوف الخطي انخفاضاً يعتد به إحصائياً بنسبة 27% (فاصلة الثقة 95%: 19-35) في معدل الوفيات خلال تلك الفترة وفقاً لمصادر الشرطة ولكنه لم يظهر تغيراً يعتد به إحصائياً وفقاً لمعطيات تسجيل الوفيات.

الاستنتاج إن الانخفاض الحديث الذي يُستشهد به على نطاق واسع في وفيات الطرق المرورية في الصين، استناداً إلى معطيات بلاغات الشرطة، قد لا يعكس انخفاضاً حقيقياً. أما جودة المعطيات المتحصل عليها من بلاغات الشرطة، والتي تؤثر في عملية اتخاذ القرار للحكومة الصينية والمنظمات الدولية، فتحتاج إلى استقصاء، ورصد، وتحسين.

الغرض مقارنة معدلات الوفيات الناجمة عن إصابات الطرق المرورية في الصين في الأعوام 2002-2007 المستقاة من معطيات بلاغات الشرطة مقابل معطيات تسجيل الوفيات.

الطريقة تجمّع معطيات بلاغات الشرطة في الصين من سجلات الشرطة عن طريق نموذج جمع معطيات معياري يحتوي على أسئلة محددة الإجابات؛ وتُنشر هذه المعطيات في “الكتاب الإحصائي السنوي للنقل والاتصالات”. ومن جهة أخرى، تجمع معطيات التسجيل الرسمي للوفيات عن طريق شهادات الوفاة التي يستوفيهها الأطباء وتُنشر في “الكتاب الإحصائي الصحي السنوي للصين”. وقد تفقّد الباحثون المعطيات الموجودة عن وفيات الطرق المرورية في الأعوام 2002-2007، واستخدموا اختبار “خي مربع χ^2 ” للمقارنة بين معدلات الوفيات المتحصل عليها، وأجروا التحوف الخطي لاستكشاف الاتجاهات الإحصائية المُعتدّ بها إحصائياً في وفيات الطرق المرورية خلال تلك الفترة.

摘要

中国警方报告数据和死亡登记数据得出的道路交通死亡率比较

目的 旨在比较2002至2007年间警方报告数据和死亡登记数据得出的道路交通伤害死亡率。

方法 在中国，警方记录在案的资料是通过一种标准化、封闭式数据收集表格从警方记录中获得的；这些数据公布在《中国交通运输统计年鉴》上。另一方面，官方的死亡登记数据源于医师完成的死亡证明，公布在《中国卫生统计年鉴》上。我们搜集了2002至2007年间两个来源的关于道路交通死亡的数据，使用 χ^2 测试比较了从两种数据源得出的死亡率，并进行了线性回归分析，从而寻找此期间道路交通死亡率统计上显著的趋势。

发现 2002至2007年间，根据死亡登记数据得出的道路交通伤害死亡率几乎高达警方报告数据得出的死亡率的两倍。如就此期间警方的数据来看，线性回归显示出死亡率的显著下降，达27% (95%置信区间CI: 35-19)，然而，就此期间的死亡登记数据来看，死亡率并没有显著变化。

结论 在中国广泛引用的基于警方报告数据近期的道路交通死亡率下降的说法不能正确反映真实情况。来自于警方报告用于推动中国政府和国际组织决策的数据质量，需予以调查、监督和改进。

Résumé

Comparer les taux de mortalité routière selon les données déclarées par la police et selon les données d'enregistrement des décès en Chine

Objectif Comparer les taux de mortalité par accidents de la route en Chine entre 2002 et 2007 lorsque les données sont signalées par la police et lorsque les données proviennent de l'enregistrement des décès.

Méthodes En Chine, les données enregistrées par la police sont obtenues à partir des registres de police renseignés par des formulaires de collecte de données standard et fermés. Ces données sont publiées dans l'*Annuaire statistique chinois de la communication et du transport*. Les données officielles d'enregistrement des décès sont, quant à elles, obtenues à partir des certificats de décès délivrés par les médecins et elles sont publiées dans l'*Annuaire statistique chinois de la santé*. Nous avons effectué des recherches dans ces deux sources afin d'y prélever des données sur les décès dus à des accidents de la route de 2002 à 2007. Nous avons utilisé le test du khi carré pour comparer les taux de mortalité obtenus, puis réalisé une régression linéaire pour définir les

tendances statistiquement significatives de la mortalité routière au cours de cette période.

Résultats Pour la période 2002–2007, le taux des traumatismes mortels liés aux accidents de la route basé sur les données d'enregistrement des décès était deux fois supérieur au taux déclaré par la police. La progression linéaire a montré une diminution significative de 27% (95% intervalle de confiance, IC: 35–19) du taux de mortalité pendant cette période selon les sources de police, mais pas de changement important selon les données d'enregistrement des décès.

Conclusion Il est possible que la baisse récente, largement rapportée, de la mortalité routière en Chine, basée sur les données déclarées par la police, ne traduise pas une véritable diminution. La qualité des données obtenues à partir des rapports de police, moteur de la prise de décision du gouvernement chinois et des organisations internationales, doit faire l'objet d'investigations, de contrôles et d'améliorations.

Резюме

Сравнение показателей смертности в ДТП по данным полицейской отчетности и официальной регистрации случаев смерти в Китае

Цель Сравнить показатели смертности от дорожно-транспортных травм в Китае в 2002–2007 гг. по данным полицейской отчетности и официальной регистрации случаев смерти.

Методы В Китае данные полицейской статистики заимствуются из полицейской отчетности посредством использования стандартной, закрытой статистической формы; они публикуются в «*Китайском статистическом ежегоднике по транспорту и связи*». В свою очередь, данные официальной регистрации случаев смерти заимствуются из свидетельств о смерти, заполняемых врачами, и публикуются в «*Китайском статистическом ежегоднике по здравоохранению*». Мы провели поиск данных о случаях смерти от дорожно-транспортных травм за период 2002–2007 гг. в обоих источниках, использовали тест χ^2 для сравнения полученных показателей смертности и рассчитали линейную регрессию, чтобы выявить статистически значимые тенденции смертности в ДТП за данный период.

Результаты За период 2002–2007 гг. показатель смертности от дорожно-транспортных травм, основанный на данных официальной регистрации случаев смерти, был почти в два раза выше показателя, сообщенного полицией. Линейная регрессия показала значительное, 27%-ное снижение (95%-ный доверительный интервал, ДИ: 35–19) смертности за данный период согласно полицейским источникам и отсутствие значительных изменений согласно данным официальной регистрации случаев смерти.

Вывод Широко цитируемые данные о недавнем резком снижении смертности в результате ДТП в Китае, основанные на полицейской статистике, могут не отражать фактического снижения. Качество данных, заимствованных из полицейских протоколов, на основе которых принимаются решения правительством Китая и международными организациями, необходимо изучать, отслеживать и улучшать.

Resumen

Comparación de las tasas de mortalidad por accidente de tráfico extraídas a partir de los datos aportados por la policía y los datos obtenidos del registro de defunciones en China

Objetivo Comparar los índices de mortalidad por accidente de tráfico en China, entre 2002 y 2007, procedentes de los datos notificados por la policía, en comparación con los datos del registro de defunciones.

Métodos En China, los datos registrados por la policía se obtienen a partir de los archivos policiales mediante un formulario cerrado y normalizado de recopilación de datos; dichos datos se publican en el *Anuario estadístico de transporte y comunicaciones de China*. Por otra parte, los datos oficiales del registro de defunciones se obtienen a partir de los certificados médicos de defunción (cumplimentados por los facultativos) y se publican en el *Anuario estadístico de salud de China*. Realizamos búsquedas de datos sobre las muertes por accidente de tráfico en el período comprendido entre 2002 y 2007 en ambas fuentes; para comparar las tasas de mortalidad

obtenidas se empleó la prueba de la χ^2 y se realizó una regresión lineal para buscar las tendencias estadísticamente significativas del índice de mortalidad por accidentes de tráfico durante dicho período.

Resultados Entre 2002 y 2007, la tasa de mortalidad por accidente de tráfico basada en los datos de los registros de defunciones fue, aproximadamente, dos veces superior a la notificada por la policía. La regresión lineal mostró una disminución significativa del 27% (intervalo de confianza del 95%, IC: 35–19) en el índice de mortalidad durante dicho período, de acuerdo con las fuentes policiales, pero ningún cambio significativo por lo que respecta a los datos del registro de defunciones.

Conclusión Basándonos en los datos policiales, el reciente y ampliamente citado descenso de la mortalidad por accidente de tráfico en China

podría no reflejar una disminución real. Es preciso investigar, supervisar y mejorar la calidad de los datos procedentes de los informes policiales,

que influyen en la toma de decisiones del Gobierno de China y de las organizaciones internacionales.

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