Injury data collection and analysis in low-resource settings Using Web 2.0 and the geospatial Web

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Abstract

A pilot study was conducted in Cape Town, South Africa to assess the feasibility of using Web 2.0 tools for the collection, management and analysis of injury data, with a particular focus on the spatial context.

Background and Relevance

The 'invisible epidemic' of injury is one of the leading causes of death in almost every country in the world (Mock *et al.*, 2004), however, low and middle income countries (LMIC) suffer a disproportionate share of the global burden. Of the total worldwide deaths due to injury, more than 90% occur in LMIC (Hofman *et al.*, 2005; Peden *et al.*, 2002). Multiple studies have demonstrated the important role geography plays in the epidemiology of injury, including the relationship with socio-economic and environmental factors (e.g. LaScala *et al.*, 2000; Yiannakoulias *et al.*, 2003). The collection of injury data is rare in LMIC, thus, little is known about its causes and implications, the spatial context, or the populations at risk (Kobusingye & Lett, 2000). As a result, external funding for injury control is disproportionately low when compared with higher profile population health problems (Schultz *et al.*, 2007). Web 2.0, *the second wave of the World Wide Web*, heralds a new age of democracy and equality through its facilitation of information sharing, bottom up decision-making, decentralization, and self-organization (Barsky & Purdon, 2006; Greaves & Mika, 2008). Two traditional barriers to effective data collection and analysis are access to software and availability of trained personnel. With free and easy-to-use Web 2.0 technologies, there is the potential to develop injury surveillance systems and data analysis that can be managed by existing staff in even the lowest-resource settings.

Methods and Data

A pilot study was conducted in Cape Town, South Africa during the month of October 2008 to assess the feasibility of using Web 2.0 tools for the collection, management and analysis of injury data, with a particular focus on the spatial context. Data were collected at a major hospital on the nature of the incident, the type of injury, and the demographic characteristics of the injured person, including their area of residence, and the location where the injury was sustained. Free and simple Web 2.0 tools were used for the project, with the ultimate aim of developing an injury surveillance system which could potentially be translated to other low-resource environments. Google Spreadsheet

was used for input and management of the data, while several tools of the geospatial Web including Google Earth and OpenStreetMap were used for georeferencing and basic spatial analysis and visualization.

Results

Google Spreadsheet was useful for managing the extensive epidemiological dataset collected, particularly the capability for multiple people to refine, edit and access the dataset from any Web-enabled computer at anytime. Web-based city maps were used for establishing the incident location and home location when this information was unavailable elsewhere. Free online geocoding tools available proved to be easy-to-use and reasonably accurate. Google Earth and other free geospatial applications were utilized to develop a basic system for analyzing the spatial implications of injury in Cape Town, which may be useful for directing prevention efforts to high-risk areas of the city.

Conclusions

Advanced analysis and visualization available within proprietary GIS and data analysis software is likely unattainable for most low-resource settings. However, the findings of the study suggest that streamlined data collection and management, and simple, useful visualizations and analysis can be achieved using these free applications. This presents an opportunity for hospitals with constrained resources to engage in injury data collection and analysis, the prerequisite for subsequent prevention and control. A major advantage of a lightweight Web-based system is the potential for ongoing refinement and improvement using the built-in sharing and collaboration tools. Ensuring the sustainability of such a system in low-resource settings where funds and personnel are limited is an important area for future research. In addition to the findings, several important issues were illuminated regarding the collection of injury data and its analysis in low-resource settings, including issues of patient privacy and knowledge translation. Overall, this exploratory presents a step towards the development of injury surveillance systems that are appropriate for low-resource settings.

References

Barsky, E., & Purdon, M. (2006). Introducing Web 2.0: Social networking and social bookmarking for health librarians. *Journal of the Canadian Health Library Associations, 27*, 65-67.

Greaves, M., & Mika, P. (2008). Semantic Web and Web 2.0. *Web Semantics: Science, Services and Agents on the World Wide Web, 6*(1), 1-3.

Hofman, K., Primack, A., Keusch, G., & Hrynkow, S. (2005). Addressing the growing burden of trauma and injury in low- and middle-income countries. *Am J Public Health, 95*(1), 13-17.

Kobusingye, O. C., & Lett, R. R. (2000). Hospital-based trauma registries in Uganda. *Journal of Trauma, 48*(3), 498-502.

LaScala, E. A., Gerber, D., & Gruenewald, P. J. (2000). Demographic and environmental correlates of pedestrian injury collisions: a spatial analysis. *Accid Anal Prev, 32*(5), 651-658.

Mock, C., Quansah, R., Krishnan, R., Arreola-Risa, C., & Rivara, F. (2004). Strengthening the prevention and care of injuries worldwide. *The Lancet, 363*(9427), 2172-2179.

Peden, M., McGee, K., & Sharma, G. (2002). *The injury chart book: a graphical overview of the global burden of injuries*. Geneva: World Health Organization.

Schultz, C. R., Ford, H. R., Cassidy, L. D., Shultz, B. L., Blanc, C., King-Schultz, L. W., & Perry, H. B. (2007). Development of a hospital-based trauma registry in Haiti: An approach for improving injury surveillance in developing and resource-poor settings. *Journal of Trauma, 63*(5), 1143-1154.

Yiannakoulias, N., Rowe, B. H., Svenson, L. W., Schopflocher, D. P., Kelly, K., & Voaklander, D. C. (2003). Zones of prevention: the geography of fall injuries in the elderly. *Social Science & Medicine, 57*(11), 2065-2073.