Do periodic vehicle inspections improve vehicle safety? –
A literature review

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With the odour of petrol
both excessive and alarming
we hurtle hell-for-leather
between crimson bougainvillea blossom
and scarlet poinsettia....... 
this day is our last!

Jamaican Bus Ride
A.S.J. Tessimond 1902-1962
Content

• Road Traffic Crashes
• Possible solutions
• Aim of this work
• Method
• Results
• Themes & considerations
• Discussion
• Summary
Road Traffic Crashes (RTCs)

The current situation

• 3,500 deaths/ day worldwide$^1$
• 91% in lower & middle income countries (LIC & MIC)$^2$
• 50 million injured/year$^2$
• Britain: 29000 seriously injured/ year$^3$
• Mwanza, Tanzania: 1600 surgical patients/ year$^4$

2. WHO fact sheet 358 March 2013
   http://www.who.int/mediacentre/factsheet/fs358/en/
   http://www.traumamanagement.org/content/6/1/1
## Possible solutions

<table>
<thead>
<tr>
<th></th>
<th>Human Factors</th>
<th>Vehicle factors</th>
<th>Environmental factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-crash; crash prevention</strong></td>
<td>Information</td>
<td>Roadworthiness</td>
<td></td>
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<tr>
<td></td>
<td>Attitude</td>
<td>Vehicle visibility</td>
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<td>Behaviour</td>
<td>Handling</td>
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<td>Impairment</td>
<td>Speed management</td>
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<td>Enforcement</td>
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<td></td>
<td>Visibility</td>
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<tr>
<td><strong>During crash; injury prevention</strong></td>
<td>Using restraints?</td>
<td>Crashworthiness</td>
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<tr>
<td></td>
<td>Crashworthiness devices e.g. airbags,</td>
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<tr>
<td></td>
<td>restraints</td>
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<td></td>
<td></td>
<td>road side furniture compatibility</td>
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<td><strong>Post-crash; life-sustaining</strong></td>
<td>First-aid skills</td>
<td>Ease of extrication</td>
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<td>Access to medics</td>
<td>Fire risk</td>
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<td>Rescue facilities</td>
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<td></td>
<td>Congestion</td>
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</table>

## Possible solutions

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<th>Human Factors</th>
<th>Vehicle factors</th>
<th>Environmental factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information, Attitude, Behaviour</td>
<td>Roadworthiness (vehicle visibility, handling, speed management)</td>
<td>Crashworthiness/safety devices e.g. airbags, restraints</td>
<td>Road design, Speed limits, Pedestrian facilities, Weather</td>
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<td></td>
<td>Crash-protective roadside furniture</td>
<td>Rescue facilities, Congestion</td>
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<tr>
<td></td>
<td></td>
<td>Ease of extrication, Fire risk</td>
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</tr>
</tbody>
</table>

### Aim:

The role of vehicle inspection programmes (VIPs) in preventing crashes, injuries and deaths.
Method

• Conceptual framework
ROAD TRAFFIC CRASHES

Human Factors
- behaviour
- number of passengers
- socioeconomic status

Vehicle Factors

Environmental factors
- visibility
- weather
- road surface quality
- road design

Types of motorised road using vehicles
- Buses, cars, powered two-wheeler vehicles, trucks, trailers, rickshaws, tuktuks, motorised golf carts, wheelchairs

Standards

Design and Manufacture
- & crashworthiness
- & collision compatibility
- visibility if stationary or broken down

Components
- Brakes
- Steering
- Tyres
- Windscreens
- Airbags
- Lights
- Seatbelts

Maintenance

Inspection & Programmes
- Voluntary
- Mandatory
- Random
- Frequency
- Names in different jurisdictions

Unique issues in LMIC
- Age of vehicles
- Unconventional vehicles and unconventional use of vehicles

Political & Economic issues
- Culture (what is the norm?)
- Legislation
- Enforcement

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Method

• Conceptual framework
• Advice
• Search strategy
<table>
<thead>
<tr>
<th>MeSH used in database searches</th>
<th>Vehicle Inspection Program/ Motor vehicle roadworthiness certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Road”; “traffic”;</td>
<td>MRC: motor vehicle certificate*, test*, assess*, inspect*, roadworth*;</td>
</tr>
<tr>
<td>“accident*”; incident*”;</td>
<td>warrant of fitness, certificate of fitness, periodic vehicle monitor*;</td>
</tr>
<tr>
<td>“crash*”;</td>
<td>maint* (for maintenance), minimum safety standard*, ministry of transport*;</td>
</tr>
<tr>
<td>“collision*”; “fatal*”;</td>
<td>department of transport*, vehicle test*, motor vehicle check*, certificate of approval, vehicle inspect*;</td>
</tr>
<tr>
<td>“death*”; “injur*”;</td>
<td>technical inspect*</td>
</tr>
<tr>
<td>“prevent*”; “reduc*”;</td>
<td></td>
</tr>
<tr>
<td>“declin*”; “safe*”;</td>
<td></td>
</tr>
<tr>
<td>Free-text terms</td>
<td></td>
</tr>
<tr>
<td>“car”; “vehicle*”; “bus*”;</td>
<td></td>
</tr>
<tr>
<td>“lorr*”; “truck*”; “van*”;</td>
<td></td>
</tr>
<tr>
<td>“motorbi”; “push bi*”; “motorcycle*”;</td>
<td></td>
</tr>
<tr>
<td>“cycl” “minibus*”; “rickshaw*”</td>
<td></td>
</tr>
<tr>
<td>“power*”; “motor*”; “disab*”;</td>
<td></td>
</tr>
<tr>
<td>“pedestrian*”; “speed*”</td>
<td></td>
</tr>
</tbody>
</table>

Medical Subject Headings [MeSH] below were used to perform the search and Boolean operators “AND” and “NOT” and “OR” and “*”) helped refine the literature search. The MeSH based search was complemented with a “free-text-search”. 
Method

• Conceptual framework
• Advice
• Search strategy
• Electronic databases & websites
• Ethics approval wavered
• Quality Assessment\(^1,2\)

2. *Quality Assessment Tool for Quantitative Studies.* McMaster University, School of Nursing, Effective Public Health Practice Project. McMaster University, Toronto: McMaster University School of Nursing, 2011.
Results

Articles found from database and website search
n=2874

Abstract not available in English
n=3

Duplicates removed
n=8

Articles in English with duplicates removed
n=2863

Excluded after full text reviewed
n=136

Excluded as not relevant after abstract reviewed
n=2708

Total number of articles included in the final literature review
n=32

Additional articles found after reviewing relevant references
n=13
Results

Number of articles each decade for high, middle and low income countries*

Decades


Number of articles

Low income countries (LIC)
Middle income countries (MIC)
High income countries (HIC)

Databases and websites

- CAB Global Health
- DH Data
- Medline
- Global Health
- Embase
- ProQuest
- AOJ
- Google

Database/website

Key
- Strong
- Moderate
- Weak
- Not relevant

Expert opinion quality not assessed
Articles found from databases and websites

Key
- Database/website
- Article year
- Not relevant
Articles found from databases and websites (reference search)
Articles found from databases and websites (reference search & quality assessment)
Important themes

- Mechanical defects contribute to crashes and injury severity\(^1,^2\)
- RTCs associated with lack of up-to-date vehicle inspection & lack of recent tyre pressure check\(^3,^4,^5\)
- VIPs provide a snapshot\(^6,^7\)
- VIPs and driver behaviour\(^8\)

1. **Hockey, R.** *Public Health.* 2003, Vol. 27(6); 656.
2. **Asander, S** *Sydney: Wheels '92 Conference and Workshop,* 1992
General considerations

• Not many articles in total
• Few from LIC and MIC
  – ?related to language
• VIPs often part of wider reforms

Discussion: High Income Countries

- Established infrastructure\(^1,^2\)
- Individual responsibility\(^3\)
- Different programmes with the same country\(^4\)
- Random roadside technical inspections\(^2\)


Discussion: Upper Middle Income & BRICS Countries

- Vehicle ownership $>$ Infrastructural developments

- VIPs in one area

Discussion:
Lower middle & lower income countries

- Average age of vehicles\textsuperscript{1, 2}
- Importation of vehicles\textsuperscript{3}
- Informal and unmotorised vehicles\textsuperscript{4, 5}


Summary

- Very few articles from LIC and MIC
- Difficult to make country specific recommendations
- After reviewing 36 databases and websites
- 32 relevant articles were found
- Global and specific considerations regarding VIPs to HIC, MIC and LIC and crash, injury and mortality rates
Thank you

Any Questions?