INJURY PREVENTION IN THE AUSTRALIAN LED OUTDOOR ACTIVITY DOMAIN - OVERVIEW OF PROJECT

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THE UPLOADS PROJECT

- ARC Linkage grant

- Development, validation and trial of an injury surveillance system for the led outdoor activity industry in Australia

- Development and validation of an accident causation model linked to the surveillance system
THE UPLOADS PROJECT TEAM

- Industry partners
- Academics (MIRI)
  - human factors/safety systems
  - injury surveillance/data systems
  - sport/active recreation prevention
BACKGROUND
WHAT IF......?

• We all collected detailed data on accidents and near miss incidents....

• Analysed this data using a valid, universal accident analysis framework....

• Shared these analyses with one another....

• Talked openly about accident causation and near misses....

• Reported often on countermeasures and their success....
## TRANSLATING RESEARCH INTO INJURY PREVENTION PRACTICE (TRIPP)

<table>
<thead>
<tr>
<th>TRIPP Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Count and describe injuries</td>
<td>Injury surveillance</td>
</tr>
<tr>
<td>2 Understand why injuries occur</td>
<td>Prospective studies to establish aetiology and mechanisms of injury</td>
</tr>
<tr>
<td>3 Develop ‘potential’ preventive measures</td>
<td>Basic mechanistic and clinical studies to identify what could be done</td>
</tr>
<tr>
<td>4 Understand what works under ‘ideal’ conditions</td>
<td>Efficacy studies to determine what works in a controlled setting (e.g. RCTs)</td>
</tr>
<tr>
<td>5 Understand the intervention implementation context</td>
<td>Identifying personal, environmental, societal and sports delivery factors that may enhance or be barriers to implementation</td>
</tr>
<tr>
<td>6 Understand what works in the ‘real-world’</td>
<td>Effectiveness studies in context of real-world sports delivery</td>
</tr>
</tbody>
</table>

Source: Finch, 2006
ACKNOWLEDGED RISK OF SEVERE AND FREQUENT INJURY IN ACTIVE PURSUITS (FINCH ET AL, 2007)

ACCIDENTS AND INJURY OCCUR IN THE LED OUTDOOR INDUSTRY DOMAIN (SALMON ET AL, 2010)
- exact injury rates are unknown
- high media profile of fatal incidents

INDUSTRY’S UNDERSTANDING OF THESE ACCIDENTS AND INJURY IS LIMITED

THE SURVEILLANCE SYSTEMS REQUIRED TO ENHANCE IT DO NOT EXIST CURRENTLY (SALMON ET AL, 2009)
WHAT DO WE KNOW ABOUT ACCIDENTS?

- Complex, systems phenomenon
- Contributing factors reside at different levels of the system
- Factors interact with one another within and across levels of a system
- Will continue to occur within safety critical systems
INJURY OCCURS WITHIN AN ECOLOGICAL SYSTEM

Source: The Injury Iceberg. Hanson, Hanson, Varden, et al. Health Promot J Aust. 2005
WHAT DO WE KNOW ABOUT ACCIDENTS IN THE LED OUTDOOR ACTIVITY DOMAIN?

- Not a lot (Salmon et al., 2009; 2010)
- A little about the ‘broken component’ (e.g. instructor failures)
- Limited evidence on system-wide failures
- Poor spin-in from other domains
- No systems model
- Poor data systems
- Incident reporting limited
- Databases limited/fragmented
ADDRESSING THIS KNOWLEDGE GAP

UPLOADS will:

- Develop, trial, and validate a theoretically underpinned injury surveillance system
  - incident reporting
  - classification and coding
  - data storage
  - privacy and confidentiality
  - analysis and reporting

- Develop a systems model of incident causation that will be used to drive future injury prevention efforts
SYSTEMS THINKING
THEORY DRIVEN SYSTEMS APPROACH

• Systems approach adopted from other domains (e.g. Rasmussen, 1997; Reason, 1990)
• Human factors approach = accidents are caused by a range of interacting human and wider systemic failures (e.g. Reason, 1990).
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- Systems approach adopted from other domains (e.g. Rasmussen, 1997; Reason, 1990)
- Human factors approach = accidents are caused by a range of interacting human and wider systemic failures (e.g. Reason, 1990).
- Systems-based incident reporting and analysis considers
  - human errors made by those on the front line
  AND
  - decisions and actions taken at the higher organisational levels
THEORY DRIVEN SYSTEMS APPROACH

- Systems approach adopted from other domains (e.g. Rasmussen, 1997; Reason, 1990)
- Human factors approach = accidents are caused by a range of interacting human and wider systemic failures (e.g. Reason, 1990).
- Systems-based incident reporting and analysis considers:
  - human errors made by those on the front line
  AND
  - decisions and actions taken at the higher organisational levels
- Person centric approaches commonly lead to the development of inappropriate countermeasures
  - focus on reducing variability in human behaviour
  - do not treat the incident -causing conditions present in the wider organisational system
Effectiveness studies

Death
Hospitalization
Emergency department visits
Other injury treatment
Non-medically-treated injuries
Events without injuries
Sustained and observed behaviour
Self-reported behaviour
Behavioural intentions/plans
Knowledge and attitudes

Specific focus of ecologically-driven intervention implementation studies

THE PROJECT
PROJECT PHASES

1. Methodological development of prototype incident reporting, storage and analysis methods. Will form a prototype accident & injury surveillance system.

2. Methodological validation, trialling and refinement of surveillance system methods using led outdoor activity injury incident data.

3. In-depth incident study using injury surveillance system to explore injury causing incidents in the led outdoor activity domain in Australia.

4. Accident causation model development based on the above.
SURVEILLANCE ASPECTS
WHAT IS SURVEILLANCE?

Public health definition

• the ongoing and systematic collection, analysis, interpretation and dissemination of health information
STEPS IN A SURVEILLANCE SYSTEM

1. Defining the problem
2. Collecting the data
3. Entering the data
4. Processing the data
5. Interpreting the data
6. Reporting the results
7. Using the results to plan prevention/treatment
8. Evaluating the surveillance system

Other stakeholders:
- Health departments
- International agencies
- Private sector & NGOs
- Other public sector agencies
OUTPUTS FROM SURVEILLANCE

• Surveillance produces data that describe
  – the size and characteristics of the problem
  – the population at risk
  – the potential risk factors
  – the trends

• Surveillance data is used for prevention, advocacy, research and evaluation purposes
### INJURY vs INCIDENT FOCUS

The availability of data items relevant to injury prevention in the main sources of data on injury

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Hospital separations</th>
<th>Emergency department presentations</th>
<th>Death records</th>
<th>Incident records</th>
<th>Insurance claims</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury event characteristics</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>Y</td>
<td>?</td>
</tr>
<tr>
<td>Type/circumstance</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Date/time of injury</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>Y</td>
<td>?</td>
</tr>
<tr>
<td>Type of place of occurrence</td>
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<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Geographic location</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Context of activity while injured</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Environmental factors at time of injury</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Personal and demographic data</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Age/gender</td>
<td>Y</td>
<td>?</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Area of residence</td>
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<td>?</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Ethnicity</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>N</td>
<td>N</td>
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<tr>
<td>Socioeconomic status</td>
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<td>N</td>
<td>I</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Outcomes of injury</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Nature of injury</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Injury body region</td>
<td>I</td>
<td>I</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Severity of injury</td>
<td>I</td>
<td>I</td>
<td>N</td>
<td>N</td>
<td>?</td>
</tr>
<tr>
<td>Costs of injury</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>N</td>
<td>I</td>
</tr>
</tbody>
</table>

*Recorded on the database (Y), can be indirectly generated (I), Limited information/quality (?), not available (N), not relevant (-)*

Adapted from Boufous & Finch, 2006
EXAMPLES OF INJURY-BASED DATA (VEMD)
THE NATIONAL MINIMUM DATASET

Demographic and administrative items (de-identified)

- Age, sex, postcode and suburb, COB and preferred language spoken at home
- Time and date of ED presentation, departure status and destination

Injury surveillance items (minimum dataset – limited coding)

- Human intent (unintentional (accidental); intentional - self harm, assault)
- Major cause (falls, transport, hit/struck/crush, burn/scald etc.)
- Nature of injury (e.g. fracture, sprain, cut/pierce etc.)
- Body region injured (e.g. head/face/neck, upper extremity, trunk etc.)
- Place where injury occurred (home, school …, athletics and sports area, ‘other specified place’– forest, beach, campsite,…mountain…river etc.)
- Activity when injured (leisure, working for income etc)

Narrative (short): What happened?
VEMD CASE NARRATIVES: EXAMPLES

Patient with teacher on school camp - coming down hill **abseiling** fallen and rolled left ankle

**Inversion injury of ankle while walking in mountains.** Wearing proper hiking boots

**Outdoors, hiking, slip**

At school camp was **white water rafting** when it hit a rock and she fell on rock now has sore foot

**Pushed off raft** and rope caught round ankle

**Inversion injury to right ankle while climbing a mountain**

Fell whilst **rock climbing** – was wearing helmet

**Rock climbing tonight with harness, fell down onto back**
DEVELOPING THE SURVEILLANCE ASPECTS
DESIGNING AND BUILDING A SURVEILLANCE SYSTEM

1. Identify stakeholders
2. Define system objectives
3. Define a case
4. Identify data sources
5. Assess available resources
6. Inform and involve stakeholders
7. Define data needs
8. Collect data
9. Establish a data processing system
10. Design and distribute reports
11. Train staff and activate system
12. Monitor and evaluate
LINKS TO OTHER INITIATIVES/APPROACHES

• ICD coding and classifications systems
  – ICD-11 under review
  – activity codes

• ICECI (international classification of the external cause of injury)

• Database structure and management principles
  – Data linkage
  – Data mining
  – Statistical modelling
  – Identification of clusters in time and space
CONFIDENTIALITY AND PRIVACY

- Australia has strict laws
- System (and its trials) will undergo ethical review and approval
- Team has strong reputation for this with both routine health sector data and sports organisation/team level data
- Some information already in public domain (e.g. media)
- Confidential for both injured person and organisations
  - all data de-identified
  - data aggregated and reported in grouped form only
  - need to consider
    - lower limits of counts reportable
    - organisational-specific reports
    - access to database, custodians, etc
THE SYSTEMS APPROACH FOR INTERPRETATION AND PREVENTION
ACCIDENT ANALYSIS METHOD REQUIREMENTS

- Reliability
- Sound underpinning theory (e.g. Systems approach)
- Specific to led outdoor activities
- Quick and easy to learn and use
- Integration with surveillance system
- Multiple case analyses
- Outputs support identification of trends
- Outputs inform countermeasure design
METHODS COMPARISON CASE STUDY

• Existing systems-based methods applicable (Salmon et al, 2011)

• Comparison of Accimap, HFACS and STAMP

• Investigate potential for use in accident surveillance system

• Identify limitations of existing methods

• Mangatepopo gorge incident
Accimap
Mangatepopo Gorge incident

- 15th April 2008, Mangatepopo gorge, Tongariro National Park
- Gorge walking activity
- Six students and their teacher drowned
- Various contributory factors identified
Methodology

- Three Human Factors analysts
- Each investigated incident using either Accimap, HFACS or STAMP
- Same input data (Coroners report, Independent inquiry report)
- Analysis reviewed by industry partners
Monash Injury Research Institute

OPC company
- provide information to parents, teachers and students
- receive informed consent and medical information as well as competencies
- ensure risk management
- up to date and clear policy
- provide resources
- learn from previous incidents

Directed by
Feedback

Chief executive
- overall accountability for areas of the business with focus on finance, sponsorship, culture and strategy

Supervises

Centre manager
- overall accountability, staff, safety budget, culture

Field manager
- supervise field staff
- responsibility for safety
- provide weather update
- allocating instructors
- organizing safety checks
- training and observing instructors in field
- ensure quality of programs

Provides training
Provide training
instruct

Training manager
- manage recruitment and instruction and coordinate training
- back up field manager

Instructors
- educate young people in outdoors
- responsible for safety of students
- make decisions regarding activity
- adhere to policy
- discuss with FM/ get consent from FM
- adhere to competency assessment TM

Consent and instruct

Students
- adhere to instructions of instructor

Supervise and assist

Parents
- provide informed consent

Teachers
- assist students with disability
- inform parents
WHAT ACCIMAP TELLS US

• Accimap most suited to accident analysis in led outdoor activity domain; however....

• Taxonomic support required for use as part of surveillance system

• Further evidence that led outdoor activity accidents have multiple interacting contributory factors

• Incident highlights importance of accident & near miss surveillance system (Salmon et al. Safety Science, 2011)
WATCH THIS SPACE!

Over the next 3 years, **UPLOADS will**

- Provide a mature safety management system through better systems to track incidents
- Develop, trial and validate a theoretically underpinned, systems-based injury surveillance system that can be used to collect, classify, store and analyse incident data on a continual basis
- Generate new detailed and specific knowledge regarding injury and injury causing incidents in Australia, including their type, frequency, causes, and outcomes
- Develop a novel systems-based model of incident causation for led outdoor activity for wider applicability across Australia
Phd OPPORTUNITY

- MIRI PhD scholarships available
  - closing date 27th Jan

- Linked to UPLOADS (supervisor)
  - injury surveillance system development (Finch)
  - human factors in-depth investigations (Salmon)
  - safe systems development for led outdoor activity domain (Salmon)

- Also available
  - injury risk management in the Australian fitness industry
Chief Investigator
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(Details of the quoted references can be provided upon request)