Research needs for reducing pedestrian RTI

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Introduction

- Unfortunately, there is a large information gap between research and practice. Because so much research is published all the time, policy-makers understandably are unaware of most of it, or do not have the 'tools' to assess its quality.

- Researchers, on the other hand, do not understand the information needs of policy-makers and continue to present their work in a way that is not easily accessible to implementers.

- Evidence based practice is one useful approach to improving the impact of practice in medicine, psychology, social work, nursing and allied fields.

Steps of Evidence-Based Practice

- **Step 1.** *Develop a clear and answerable question* derived from the client's problem or need.

- **Step 2.** *Search the literature for relevant research* that could help answer this question.

- **Step 3.** *Conduct a critical appraisal of this information and rank the evidence for its validity and applicability to the client's need and situation*.

- **Step 4.** *Formulate and apply an intervention based on the most relevant and applicable findings* which we can call the "best available evidence."

- **Step 5.** The professional should audit the intervention (to verify it was done appropriately) and evaluate its yield.

Do you have adequate evidence to make appropriate decision on pedestrian injuries in your community?

Published works on "Pedestrian" in title (PubMed):

- Total: 594
  - On children=314 (53%)
  - On ages 65+=141 (24%)
  - On others=139 (22%)
- Published in the last 5 years= 205 (35%)
- Published in the last year= 16
- Review=20
- Clinical trials= 15
- Metaanalysis=2

These articles are mainly from high income countries

Research approach

Scope of the problem/ Severity → Identify risk factors → Intervene → Implement → Evaluate
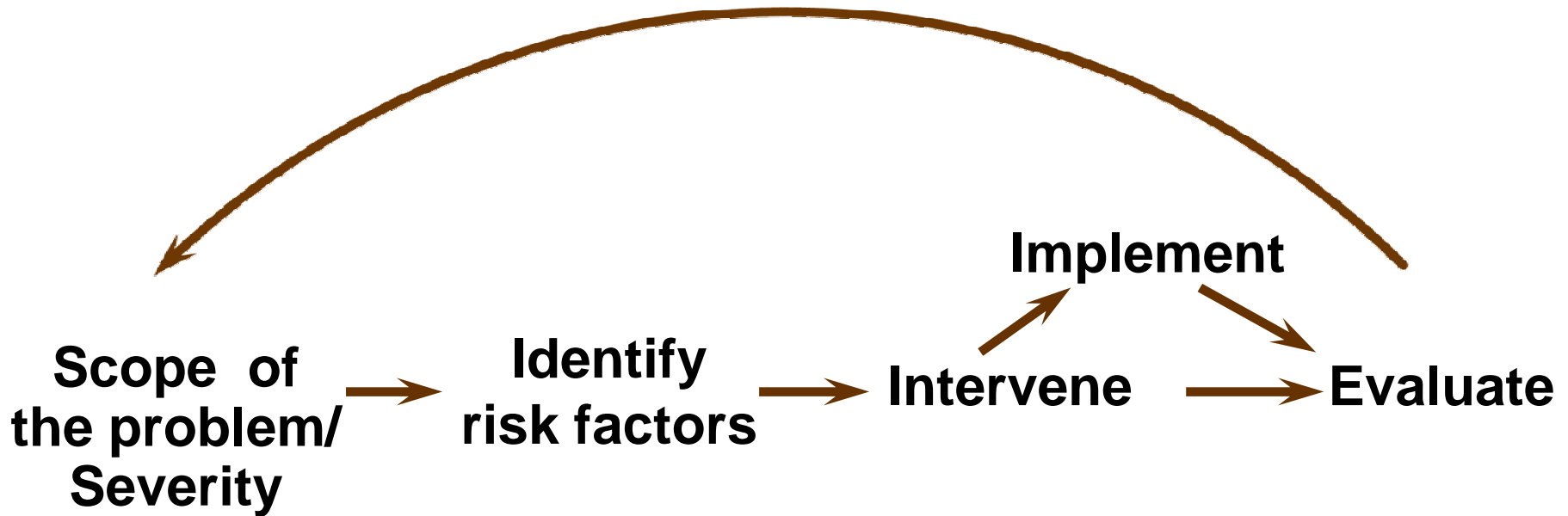
Determine the scope of the problem/Severity

- *Morbidity*
  - *Incidence*
  - *Prevalence*
- *Mortality*

- *Cost*
- *Burden*

What are some of the ways we can measure severity of pedestrian injuries in a population?

- Prevalence — **What proportion has it?**

- Incidence — **How many new cases are there?**

- Economic Cost — **Cost to whom?**

- DALYs — **How many good years is it costing?**

- Mortality rate — **How many are killed?**
  - ☐ Years of life lost

- Political priority — **Strong lobby groups**

- Media coverage — **Is Pedestrian injury really a big deal?**

Degrees of Injury Severity/ Accident pyramids

Injury Deaths

Hospitalization

Emergency Dept.

Physician Visit

Households
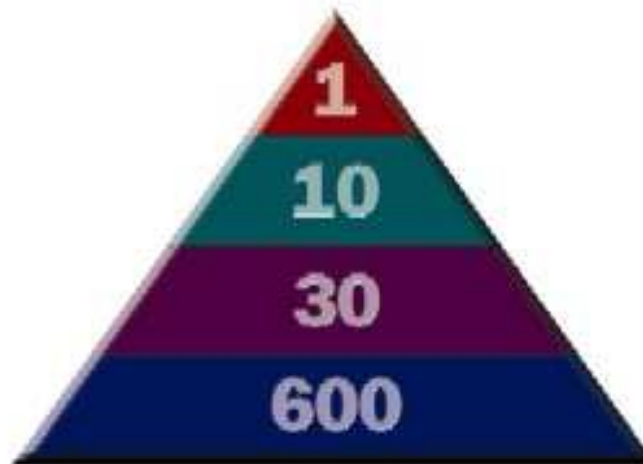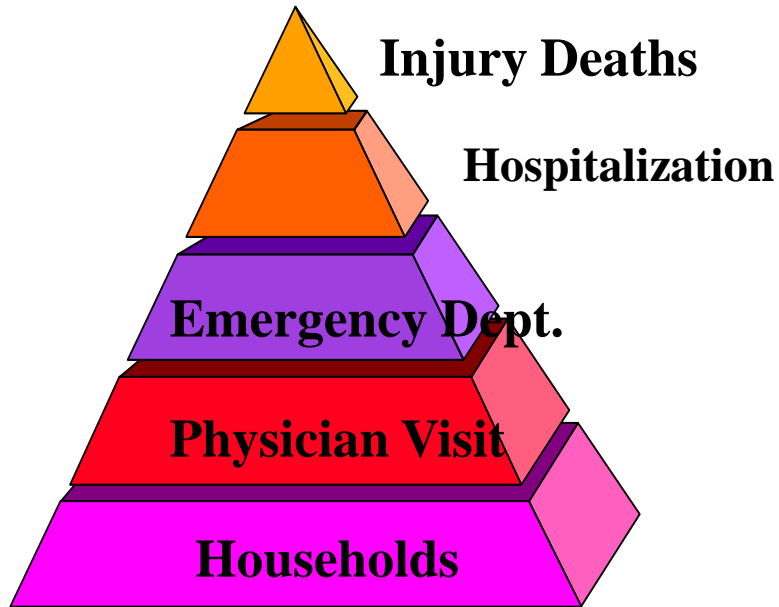
1 – serious injury

10 – minor injuries

30 – Property damage

600 – incidents

Incidence rate

- An incidence rate is the number of new cases of a disease divided by the number of persons at risk for the disease.

Prevalence rate

- A prevalence rate is the total number of cases of a disease existing in a population divided by the total population.

- Prevalence is a measure often used to determine the level of morbidity in a population.

Mortality Rate

- A mortality rate is the number of deaths due to a disease divided by the total population.

Cost

Road crash costs by region (US$ billion)

Region	Regional GNP USD$bn	Estimated annual crash costs	
	1997	GNP	Cost
Africa	370	1.00%	3.7
Asia	2,454	1.00%	24.5
Latin America/Caribbean	1,890	1.00%	18.9
Middle East	495	1.50%	7.4
Central & Eastern Europe	659	1.50%	9.9
Sub total	5,615		64.50
HMCs	22,665	2.00%	453.3
Total			**517.8**

what does an accident *really* cost?

For Accidents it is included:

- **Incident Costs** (e.g. Time to provide first aid, rehabilitations)

- **Investigation Costs** (e.g. Time spent to complete an accident investigation report)

- **Damage Costs** (e.g. Time to repair or replace equipment)

- **Replacement Costs** (Time to hire or relocate replacement worker)

- **Productivity Costs** (e.g. Reduced productivity of injured people after they return to work)

- **RECOVERY COSTS** (Average Margin)

The following major categories of costs are included in the calculation of comprehensive costs:

- Medically-related costs.
- Emergency services.
- Property damage.
- Lost productivity.
- Monetized Quality-Adjusted Life Years (QALYs).

Medically-Related Costs

Medically related costs include:

- ambulance,
- emergency medical,
- physician,
- hospital,
- rehabilitation,
- prescription, and
- related treatment costs, as well as the ancillary costs of crutches, physical therapy, etc.

Calculation of national costs

- Police data are the usual starting point for making estimates of the number of crashes and casualties.

- However, it should be acknowledged that police data often suffers from substantial under-reporting. Therefore, it is worthwhile pursuing data on the number of casualties from other sources that may be available.

- Often hospital surveys and mortality and injury surveillance systems in the medical sector are useful to assess the level of under-reporting in police statistics and to provide a basis for deriving factors to allow for under-reporting in the police records.

Notes

- Cost estimation is not exact - it can only be approximated.

- The estimates depend on many factors.

- It is different in different countries

Do you know how much is the cost of pedestrian injuries in your community?

Disability adjusted life years (DALY)

- DALY (Disability adjusted life years) is a summary measure that combines the impact of illness, disability and mortality on population health.

- DALY is a health gap measure that extends the concept of potential years of life lost due to premature death (PYLL) to include equivalent years of healthy life lost in state of less than full health, broadly termed disability.

Leading causes of DALYs, worldwide, 2004

	Disease or injury	DALYs (millions)	Per cent of total DALYs
1	Lower respiratory infections	94.5	6.2
2	Diarrhoeal diseases	72.8	4.8
3	Unipolar depressive disorders	65.5	4.3
4	Ischaemic heart disease	62.6	4.1
5	HIV/AIDS	58.5	3.8
6	Cerebrovascular disease	46.6	3.1
7	Prematurity and low birth weight	44.3	2.9
8	Birth asphyxia and birth trauma	41.7	2.7
9	Road traffic accidents	41.2	2.7
10	Neonatal infections and other[a]	40.4	2.7
11	Tuberculosis	34.2	2.2
12	Malaria	34.0	2.2
13	COPD	30.2	2.0
14	Refractive errors	27.7	1.8
15	Hearing loss, adult onset	27.4	1.8
16	Congenital anomalies	25.3	1.7
17	Alcohol use disorders	23.7	1.6
18	Violence	21.7	1.4
19	Diabetes mellitus	19.7	1.3
20	Self-inflicted injuries	19.6	1.3

Specification of data needed

- Duration of time lost due to a death at each age
- Disability weights
- Age-weights
- Time preferences (discounting)
- Total resident population
- Standard population

Data sources, viability and quality

- Data on disability could be provided by health surveys or hospital discharge data, or ad hoc registries on a local basis.

- Data on mortality could be collected from death registries

- Disability weights and age weights are those used in the World bank report established with the participation of a group of independent experts.

- Data on resident population standardized for age and sex should be available from national censuses and should be reliable. European population could be used as standard.

Years of life lost (YLD)

- **Remember:**

  DALY = years of life lost due to being DEAD

  + years of life lost due to being DISABLED

- **DALY combines death and disability**

  But we can tease them apart again:

    - YLL = years of life lost (due to death alone)
    - YLD = years of life lost (due to disability alone)
    - DALY = YLL + YLD

- The years of life lost (YLL) basically correspond to the number of deaths multiplied by the standard life expectancy at the age at which death occurs.

$$YLL = N * L$$

- L = standard life expectancy at age of death in years
- N = number of deaths

- Because YLL (years of life lost) measure the incident stream of lost years of life due to deaths, an incidence perspective is also taken for the calculation of YLD (years lost due to disability).

- To estimate YLD for a particular cause in a particular time period, the number of incident cases in that period is multiplied by average duration of the disease and a weight factor that reflects the severity of the disease on a scale from 0 (perfect health) to 1 (dead).

YLD = I * DW * L

- I = number of incident cases
- DW = disability weight
- L = average duration of the case until remission or death (years)

Table 5 Short-term disability weights by nature of injury, age and treatment category

| Injury category	Treated					Untreated				
	0-4	5-14	15-44	45-59	60+	0-4	5-14	15-44	45-59	60+
Fractured skull	0.431	0.431	0.431	0.431	0.431	0.431	0.431	0.431	0.431	0.431
Fractured face bones	0.223	0.223	0.223	0.223	0.223	0.223	0.223	0.223	0.223	0.223
Fractured vertebral column	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266
Injured spinal cord										
Fractured rib or sternum	0.199	0.199	0.199	0.199	0.199	0.199	0.199	0.199	0.199	0.199
Fractured pelvis	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.247
Fractured clavicle, scapula or humerous	0.153	0.153	0.136	0.136	0.136	0.153	0.153	0.136	0.136	0.136
Fractured radius or ulna	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
Fractured hand bones	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Fractured femur	0.372	0.372	0.372	0.372	0.372	0.372	0.372	0.372	0.372	0.372
Fractured patella, tibia or fibula	0.271	0.271	0.271	0.271	0.271	0.271	0.271	0.271	0.271	0.271
Fractured ankle	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
Fractured foot bones	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077
Other dislocation	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Dislocated shoulder, elbow or hip	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Sprains	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064
Intracranial injuries	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359
Internal injuries	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208
Open wound	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108
Injury to eyes	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108

Note

Do you know how much is the DALY of pedestrian injuries in your community?

Risk factor identification

Research approach

Scope of the problem/ Severity → **Identify risk factors** → **Intervene** → **Implement** → **Evaluate**
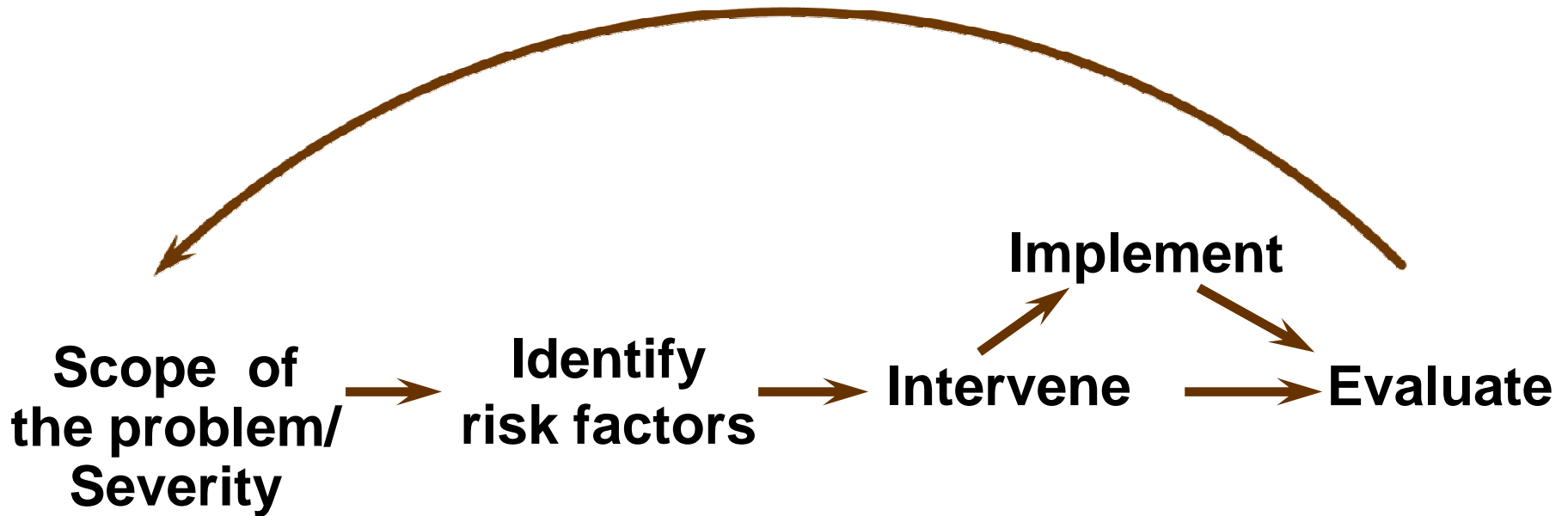
Risk factors for pedestrian injuries
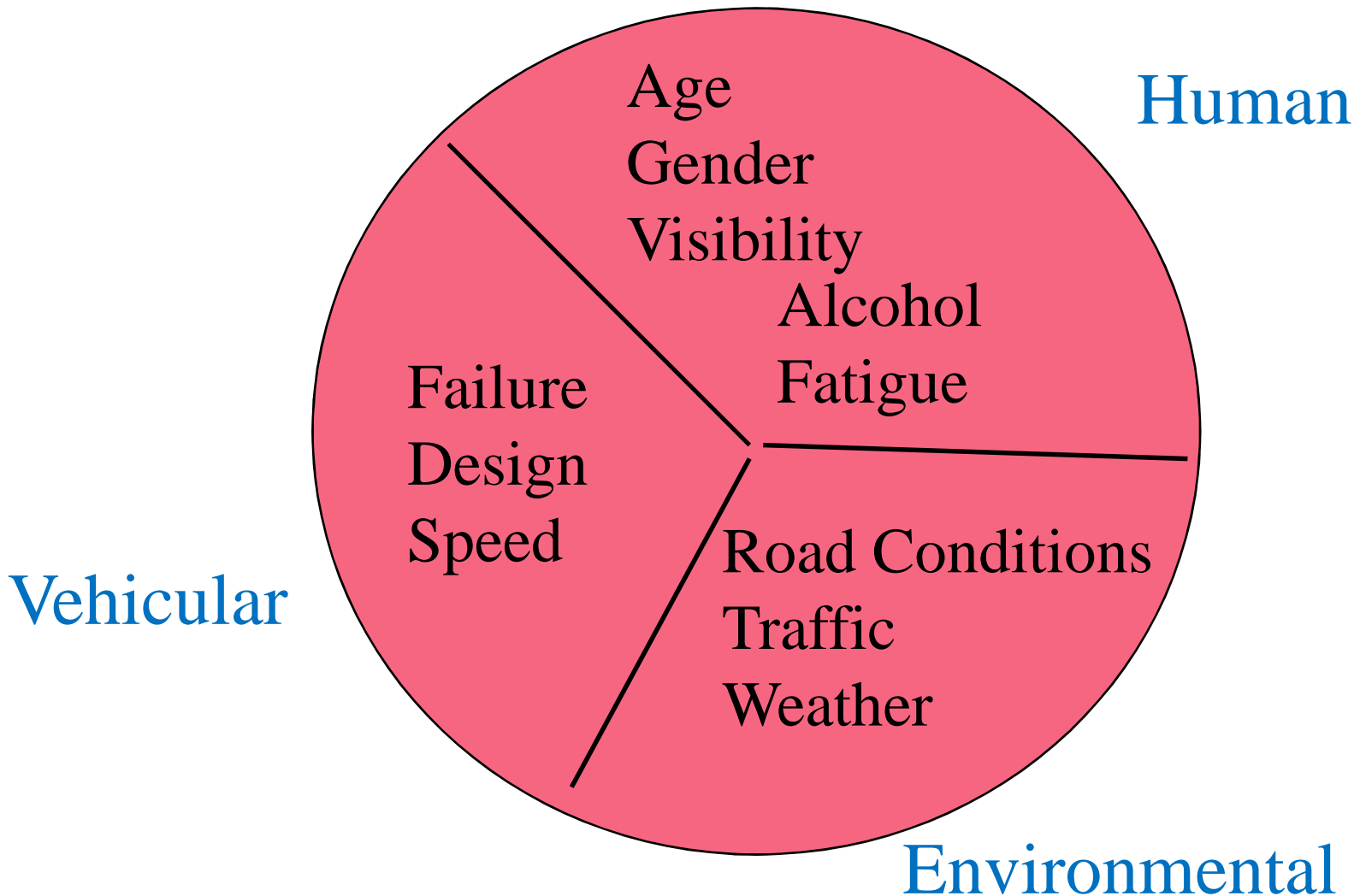
Risk factors influencing Exposure to Risk

- Economic Factors and social deprivation

- Demographic factors e.g. Age, Sex

- Land use practice e.g. Mode of travel, length of trip

- High Speed travel/driving

- Vulnerable road users

- Road layout and road design

Note

Do you know what are the risk factors of pedestrian injuries in your community?

EVALUATION

Types of evaluation

- Process evaluation

- Impact assessment

- Outcome evaluation

Choosing the evaluation methods

- Both qualitative and quantitative methods can be used within the design of an evaluation.
- Qualitative methods may be employed for the formative, and process evaluations, e.g. focus groups, short-answer or open-ended questionnaires.

- Impact and outcome evaluations may be carried out using a variety of quantitative methods.
- Using an experimental or quasi-experimental design to demonstrate a change (or not) is the most powerful programme evaluation for detecting changes in outcome. The type of methods used will depend on the aim and the budget for the evaluation. e.g. focus groups, short-answer or open-ended questionnaires.

Study types for impact and outcome evaluations

- Randomised control trial (RCT)
- Quasi experimental designs
  - □ *Controlled before-after study*
  - □ *Interrupted time series design*

Randomised control trial (RCT)

- The gold standard of evaluation, the randomised control trial will provide the highest quality level of evidence that an intervention or programme is successful.

Study types and their advantages and disadvantages

	Formative and process evaluation	Impact and outcome evaluation	Pros and cons
QUALITATIVE			
Focus groups/in-depth interviews	✓ – formative – process	✓ – outcome	– Can provide information on why intervention may or may not have worked – Cheap – Sample (participants) are not random sample – Results are not generalisable
QUANTITATIVE			
Randomised controlled trials		✓ – impact ✓ – outcome	– Most rigorous evidence – Expensive – Randomisation not always feasible
Controlled before–after study		✓ – impact ✓ – outcome	– Most practical design – Must have comparable control group
Interrupted time series design		✓ – impact ✓ – outcome	– Practical design if sufficient numbers of events and accurate surveillance systems in place
Before–after study (no control group)		✓ – impact ✓ – outcome	– Cheap – Low level of evidence

Note

Have you ever evaluate the interventions of pedestrian injuries in your community?

Thank you for your attention

Road Traffic Injuries Research Network