Factors influencing red light running – a Christchurch investigation

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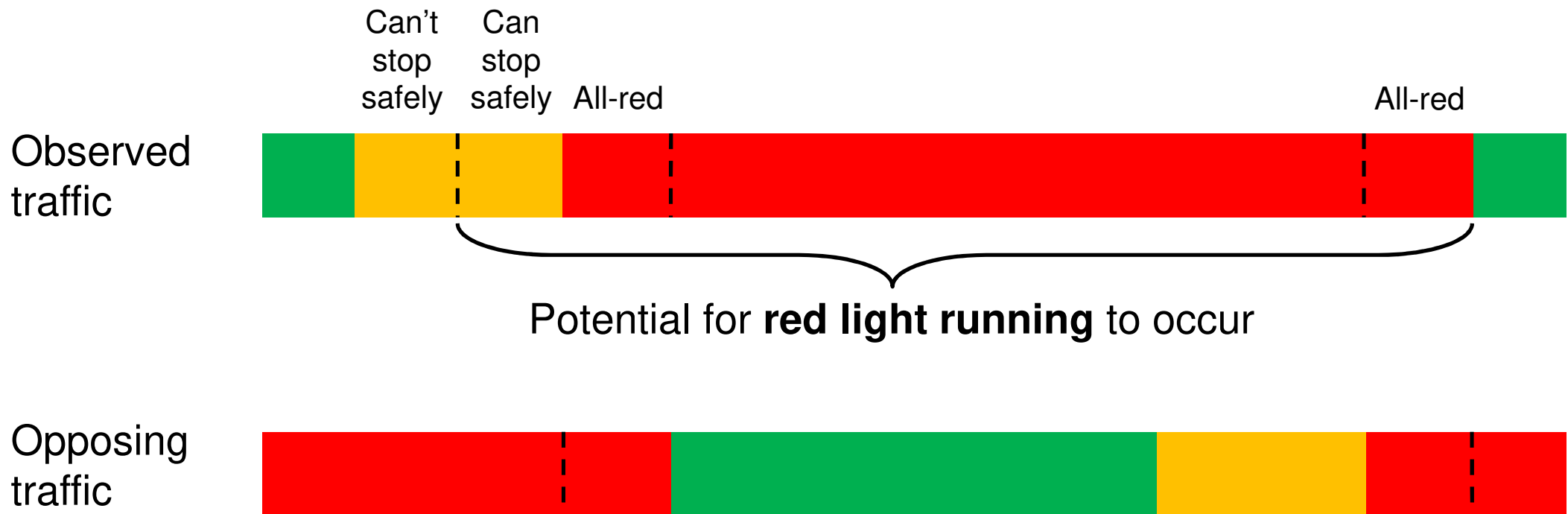**Dr Hamish Mackie, Mackie Research Ltd**

Overview

- Red light running (RLR) definition

- RLR in Christchurch

- Projects underway in Christchurch to address RLR

- RLR factor framework
  - Driver-related factors
  - External factors

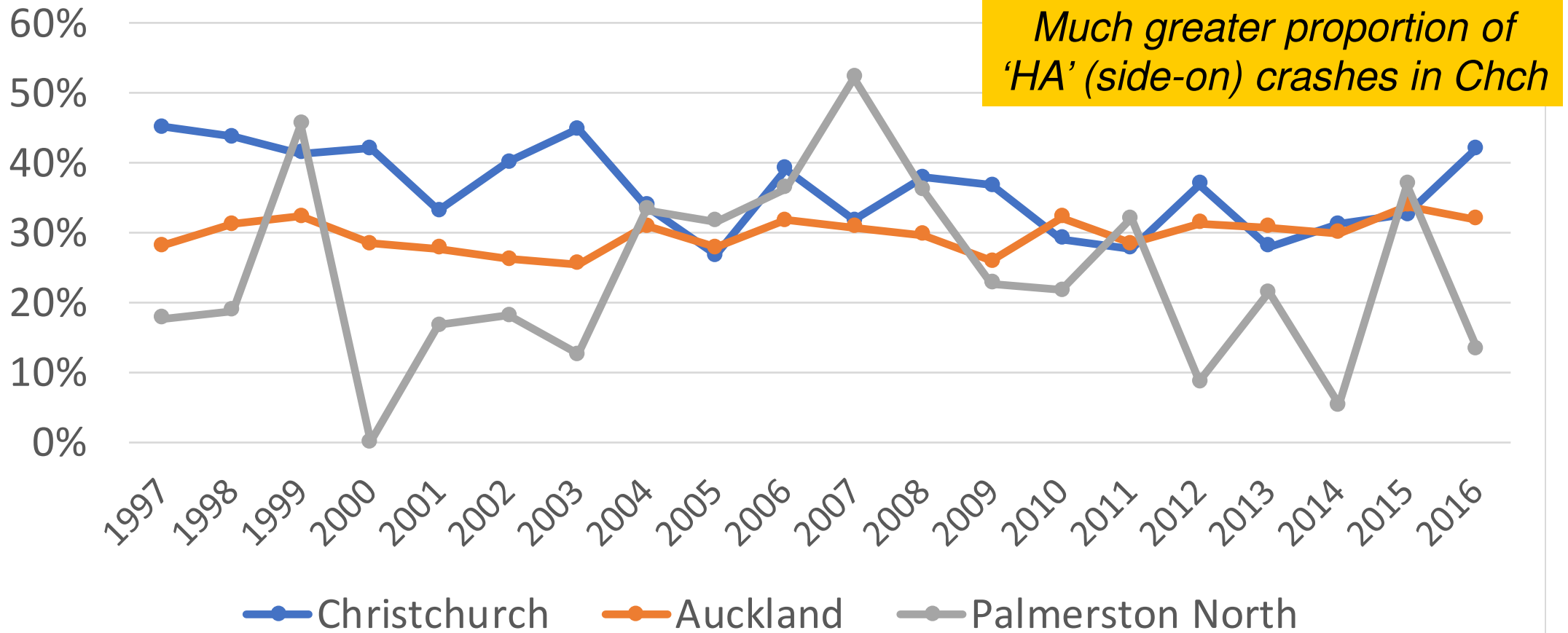# Red light running – definition

- *Whenever a driver transgresses a traffic signal that they **should** have stopped for*

Can't stop safely Can stop safely All-red All-red

Observed traffic

Potential for **red light running** to occur

Opposing traffic

RLR in Christchurch

Red light running crashes as proportion of all injury crashes

Much greater proportion of 'HA' (side-on) crashes in Chch

Legend: Christchurch — Auckland — Palmerston North

RLR crashes per population

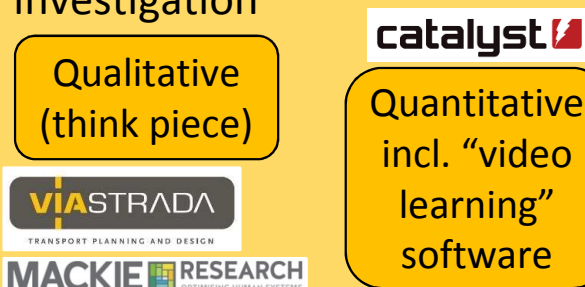| Region	RLR injury crashes (Abley, 2013)	Population	Crashes / 1,000 people	Rank
Christchurch City	**310**	**376,300**	**0.82**	1
Dunedin City	69	122,400	0.56	2
Invercargill City	24	52,600	0.46	3
Auckland	602	1,439,600	0.42	4
Wellington City	74	193,700	0.38	5
Hamilton City	50	143,300	0.35	6
Whangarei District	13	43,700	0.30	7
Palmerston North City	21	82,200	0.26	8
Tauranga City	26	115,400	0.23	9
Napier City	13	58,600	0.22	10
New Plymouth District	16	74,400	0.22	11
Hastings District			0.19	12
Lower Hutt City			0.18	13
Wanganui District			0.14	14

Partly due to more signalised intersections in Chch (314)

Projects in Christchurch to address RLR

(A) Red light running investigation

Qualitative (think piece)

Quantitative incl. "video learning" software

(B) Red light camera implementation

Detailed and enforceable events for a few locations

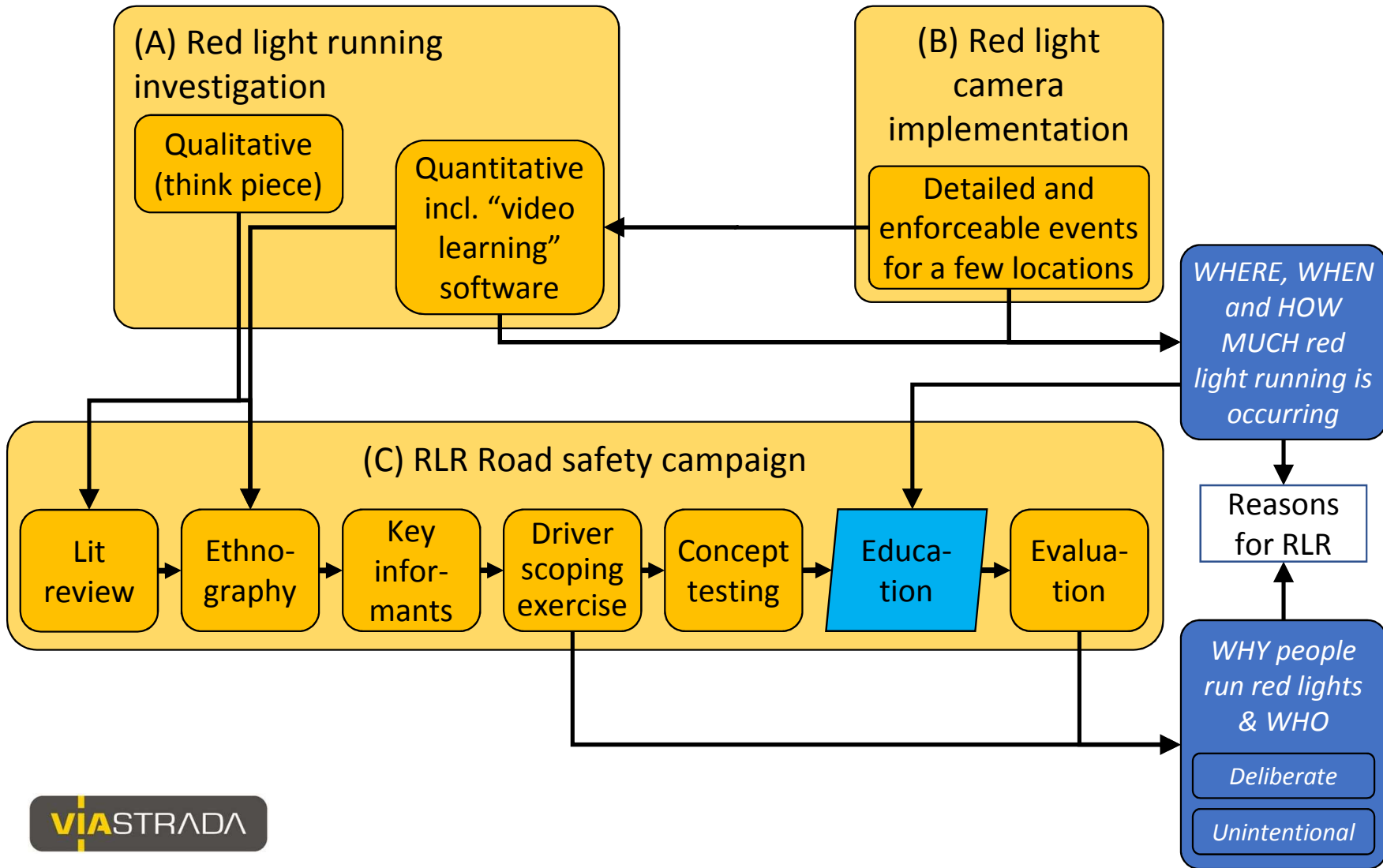**(C) RLR Road safety campaign**

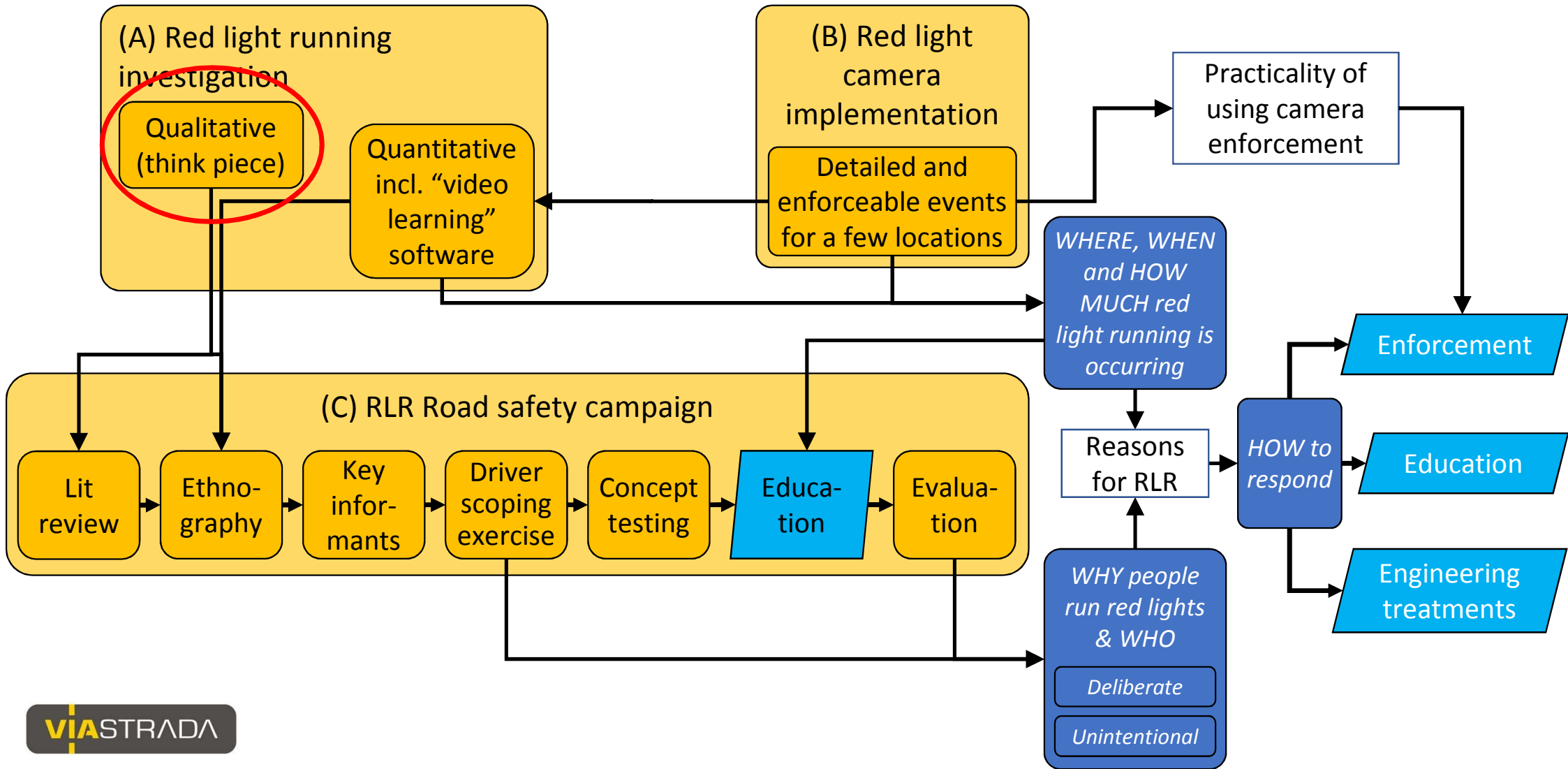Lit review → Ethno-graphy → Key infor-mants → Driver scoping exercise → Concept testing → Educa-tion → Evalua-tion

Projects in Christchurch to address RLR

(A) Red light running investigation
- Qualitative (think piece)
- Quantitative incl. "video learning" software

(B) Red light camera implementation
- Detailed and enforceable events for a few locations

WHERE, WHEN and HOW MUCH red light running is occurring

Reasons for RLR

(C) RLR Road safety campaign
- Lit review
- Ethno-graphy
- Key infor-mants
- Driver scoping exercise
- Concept testing
- Educa-tion
- Evalua-tion

WHY people run red lights & WHO
- Deliberate
- Unintentional

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Projects in Christchurch to address RLR

(A) Red light running investigation

- Qualitative (think piece)
- Quantitative incl. "video learning" software

(B) Red light camera implementation

- Detailed and enforceable events for a few locations

Practicality of using camera enforcement

WHERE, WHEN and HOW MUCH red light running is occurring

(C) RLR Road safety campaign

- Lit review
- Ethno-graphy
- Key infor-mants
- Driver scoping exercise
- Concept testing
- Educa-tion
- Evalua-tion

Reasons for RLR

WHY people run red lights & WHO
- Deliberate
- Unintentional

HOW to respond

Enforcement

Education

Engineering treatments

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RLR factor framework – driver-related factors

System influencing red light running occurrences

Driver-related factors

External factors

Deliberate RLR

Unintentional RLR

RLR factor framework – deliberate driver choice

Driver-related factors

Deliberate RLR

Personal predisposition

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RLR factor framework – deliberate driver choice
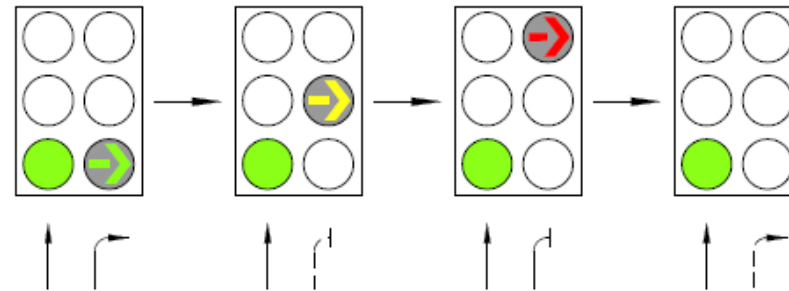
Deliberate RLR

Driver-related factors

Personal predisposition

Specific motivation

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RLR factor framework – deliberate driver choice

Driver-related factors

Deliberate RLR

Personal predisposition

Specific motivation

Familiarity with site operation

RLR factor framework – unintentional driver error

Driver-related factors

Unintentional RLR

Ill-equipped driver

Oblivious driver

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RLR factor framework – ill-equipped drivers

Driver-related factors

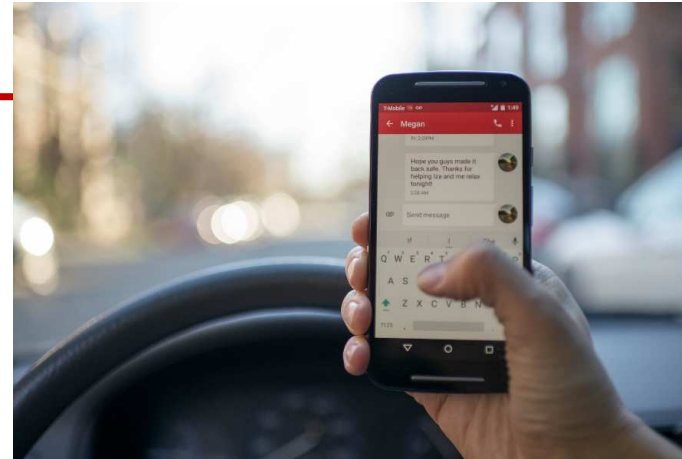**Unintentional RLR**

Ill-equipped driver

Physical limitations

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RLR factor framework – ill-equipped drivers

Driver-related factors

Unintentional RLR

Ill-equipped driver

Physical limitations

Cognitive limitations

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RLR factor framework – ill-equipped drivers

Driver-related factors

Unintentional RLR

Ill-equipped driver

Physical limitations

Cognitive limitations

Temporary impairment

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RLR factor framework – ill-equipped drivers

Driver-related factors

Unintentional RLR

Ill-equipped driver

Physical limitations

Cognitive limitations

Temporary impairment

Poor understanding of NZ driving requirements

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RLR factor framework – oblivious drivers

Driver-related factors

Unintentional RLR

Oblivious driver

Distractions

RLR factor framework – oblivious drivers
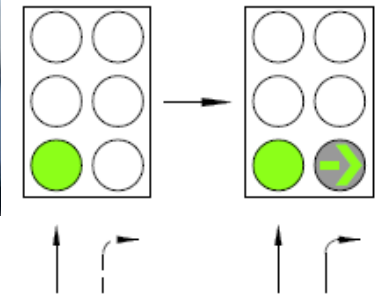
Driver-related factors
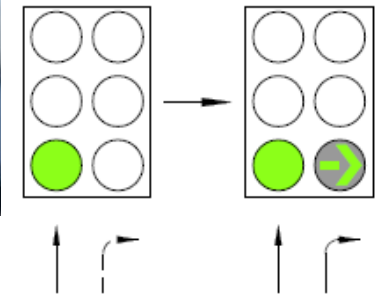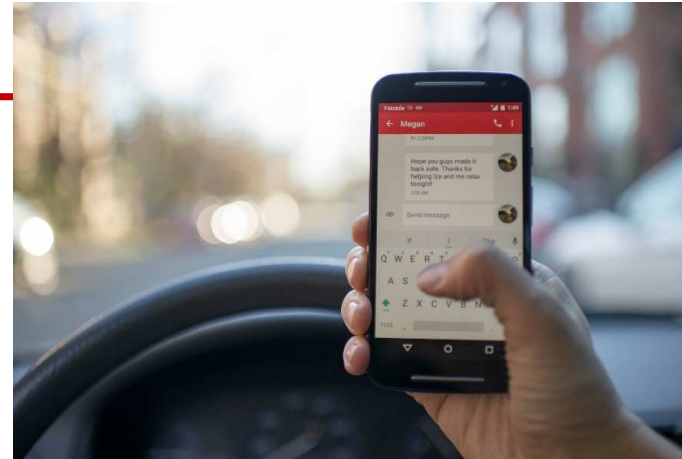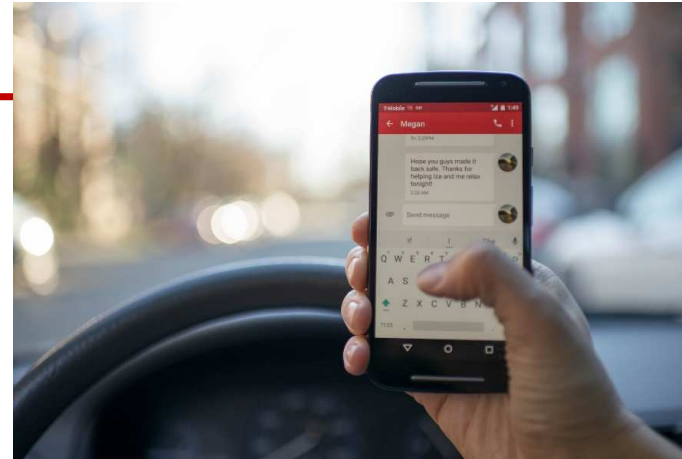
Unintentional RLR

Oblivious driver

Distractions

Misinterpretation of site operation

RLR factor framework – oblivious drivers

Driver-related factors

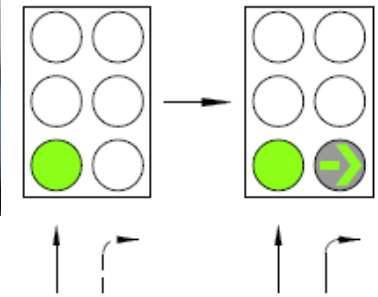**Unintentional RLR**
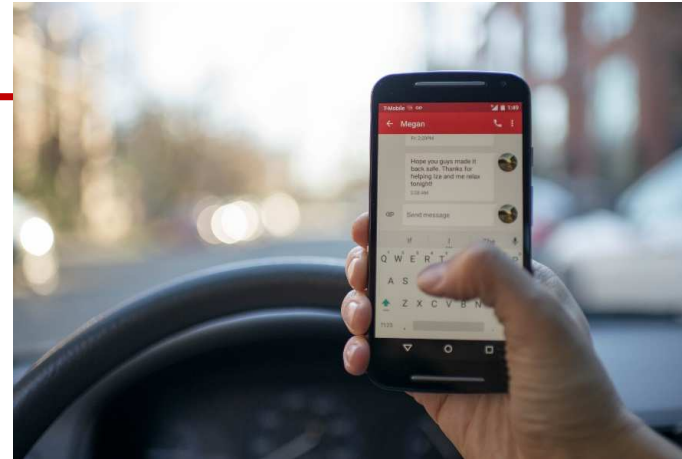
Oblivious driver

Distractions

Misinterpretation of site operation

Confusion / reaction to change in other signals

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RLR factor framework – oblivious drivers

Driver-related factors

Unintentional RLR

Oblivious driver

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Misinterpretation of site operation
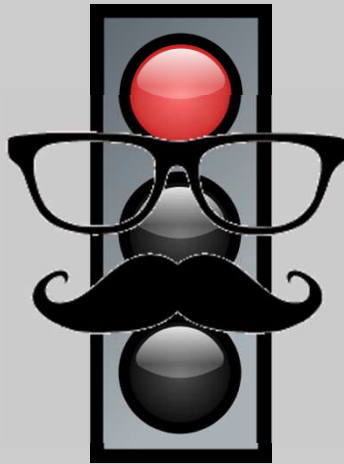
Confusion / reaction to change in other signals

Failed to perceive traffic signals

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RLR factor framework – driver-related factors

Driver-related factors

Deliberate RLR

Unintentional RLR

Violating another road rule / Influenced by other drivers

Ill-equipped driver

Oblivious driver

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RLR factor framework – external factors

External factors

External factors

Exposure / opportunity – specific intersection

External factors

Exposure / opportunity – specific intersection

Exposure / opportunity – network level

RLR factor framework – external factors

External factors

Exposure / opportunity – specific intersection

Exposure / opportunity – network level

Behaviour of other drivers

RLR factor framework – external factors

External factors

Sources of frustration

Exposure / opportunity – specific intersection

Exposure / opportunity – network level

Behaviour of other drivers

RLR factor framework – external factors

External factors

Sources of frustration

Exposure / opportunity – specific intersection

Exposure / opportunity – network level

Surface friction ⇒ **Dilemma zone**

Behaviour of other drivers

RLR factor framework – external factors

External factors

Sources of frustration

Exposure / opportunity – specific intersection

Exposure / opportunity – network level

Surface friction ⇒ **Dilemma zone**

Visibility of signals

Behaviour of other drivers

Complete RLR factor framework

System influencing red light running occurrences

Driver-related factors

External factors

Deliberate RLR

Personal predisposition	Specific motivation

Familiarity with site operation

Sources of frustration

Exposure / opportunity – specific intersection

Violating another road rule / Influenced by other drivers

Unintentional RLR

Ill-equipped driver

Physical limitations

Cognitive limitations

Temporary impairment

Poor understanding of NZ driving requirements

Oblivious driver

Distractions

Misinterpretation of site operation

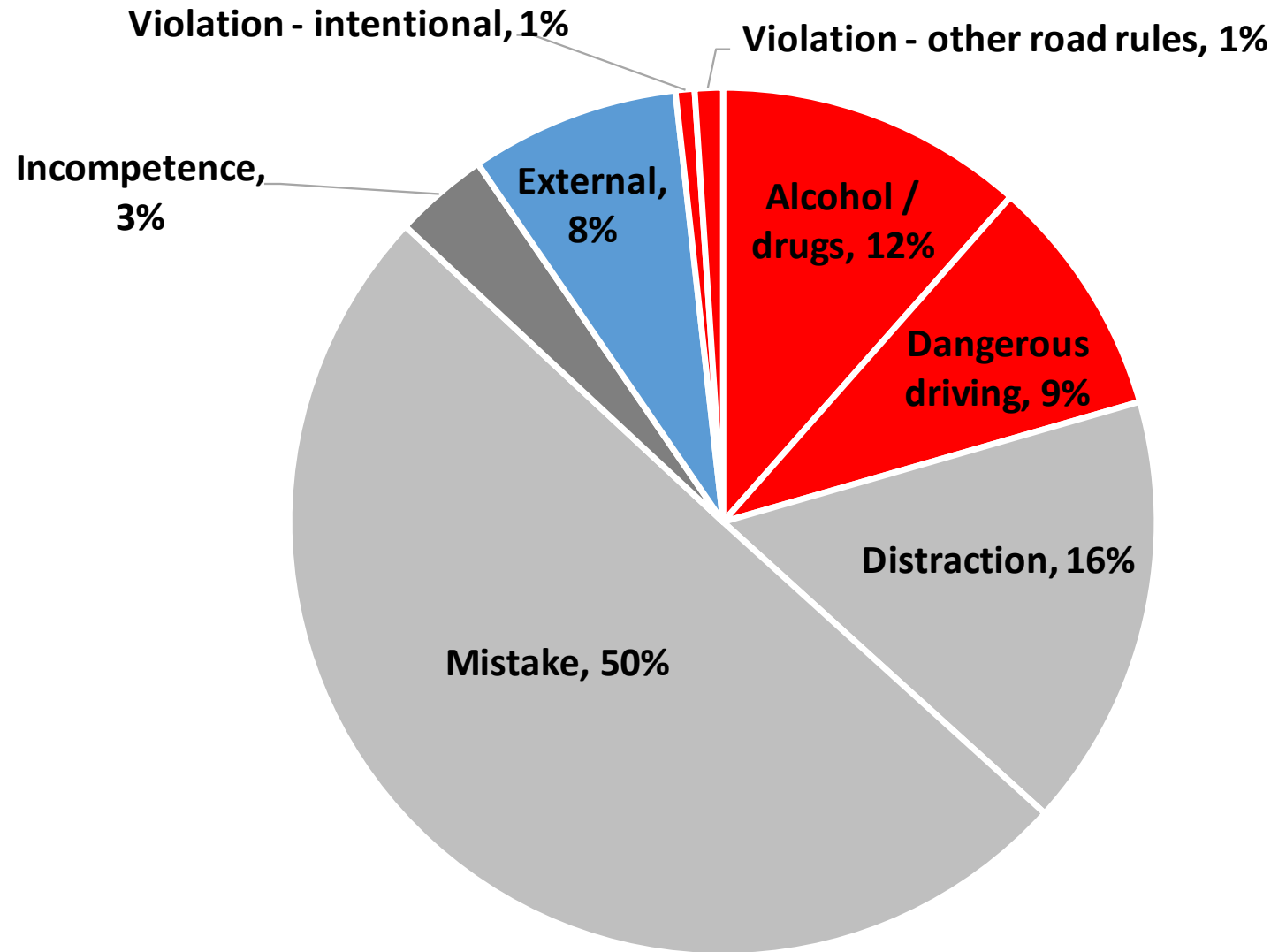Confusion / reaction to change in other signals

Failed to perceive traffic signals

Exposure / opportunity – network level

Surface friction ⇒ **Dilemma zone**

Visibility of signals

Behaviour of other drivers

Future – RLR detection using "video learning"

				0.75	1.75	3.5	175.5	290.5
479.75	536.75	540.5	637.5	783.5	783.75	871.75	969.25	993.75	1021.75	1021.75	1437.5	1474.5
1529.5								

Conclusions

- Red light running contributes **significantly** to injury crashes at signalised intersections

- RLR can be due to:
  - Deliberate (intentional) violation
  - Oblivious violation by normally competent drivers
  - Errors by ill-equipped drivers
  - External factors

- Engineering treatments can address external RLR factors
  - Can also help influence driver behaviour factors

- The proposed factor framework has potential to help understand and address the RLR problem