

# Coping with uncertainty for individual decision-making in nuclear emergency situations

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# Research objectives

- To investigate what are people's concerns in case of an emergency
- To gain insights into expected behaviour with regards to recommended actions
  
- Data collected through surveys
  - Belgium, Spain, Norway
    - **People living close** to nuclear power plants (20 km radius Belgium, 30 km radius Spain)
    - **Other populations:** general public in Belgium and Norway, and living at 30-100km from nuclear installations in Spain



# Why are we interested in expected behaviour?

- Emergency decisions generally based on:
  - Model calculations
  - Measurements
  - Operational considerations



However, they also rely on assumptions about peoples' behaviour

- Largely unaddressed and leading to important uncertainties regarding the effectiveness of emergency measures
- Affects societal vulnerability to disasters

# Insights from theory

- Behavioral expectation is a good proxy for actual behaviour  
(*compliance with recommended actions*) (cf. Theory of Planned Behaviour)

## Potentially influencing factors

- Hazard related attributes  
(*perceived effectiveness of action*) (cf. Protective Action Decision Model)
- Resource related attributes  
(*perceived difficulty*) (cf. Protective Action Decision Model & Theory of Planned Behaviour)
- Descriptive norms  
(*expectation of specific reference groups performing the action*) (cf. extensions of Theory of Planned Behaviour)
- ... others (severity, susceptibility, distance, ...)

# Findings

*Imagine we have just heard the news that a nuclear accident has taken place at a nuclear installation or close to its borders and radioactivity has been released in the air. What would be your first concern?*

Risk (for oneself, family, general)  
People



Spain: <30 km NPP's

People,  
Take/find iodine tablets



Belgium <20 km  
Doel NPP

Risk (for oneself, family, general)  
People



Belgium <20 km  
Tihange NPP

# Findings

*Imagine we have just heard the news that a nuclear accident has taken place at a nuclear installation or close to its borders and radioactivity has been released in the air. What would be your first concern?*

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People

People,  
Take/find iodine

Risk (for oneself, family, general)

Main concerns /first reactions may differ between local populations in different countries, and between different areas in the same country

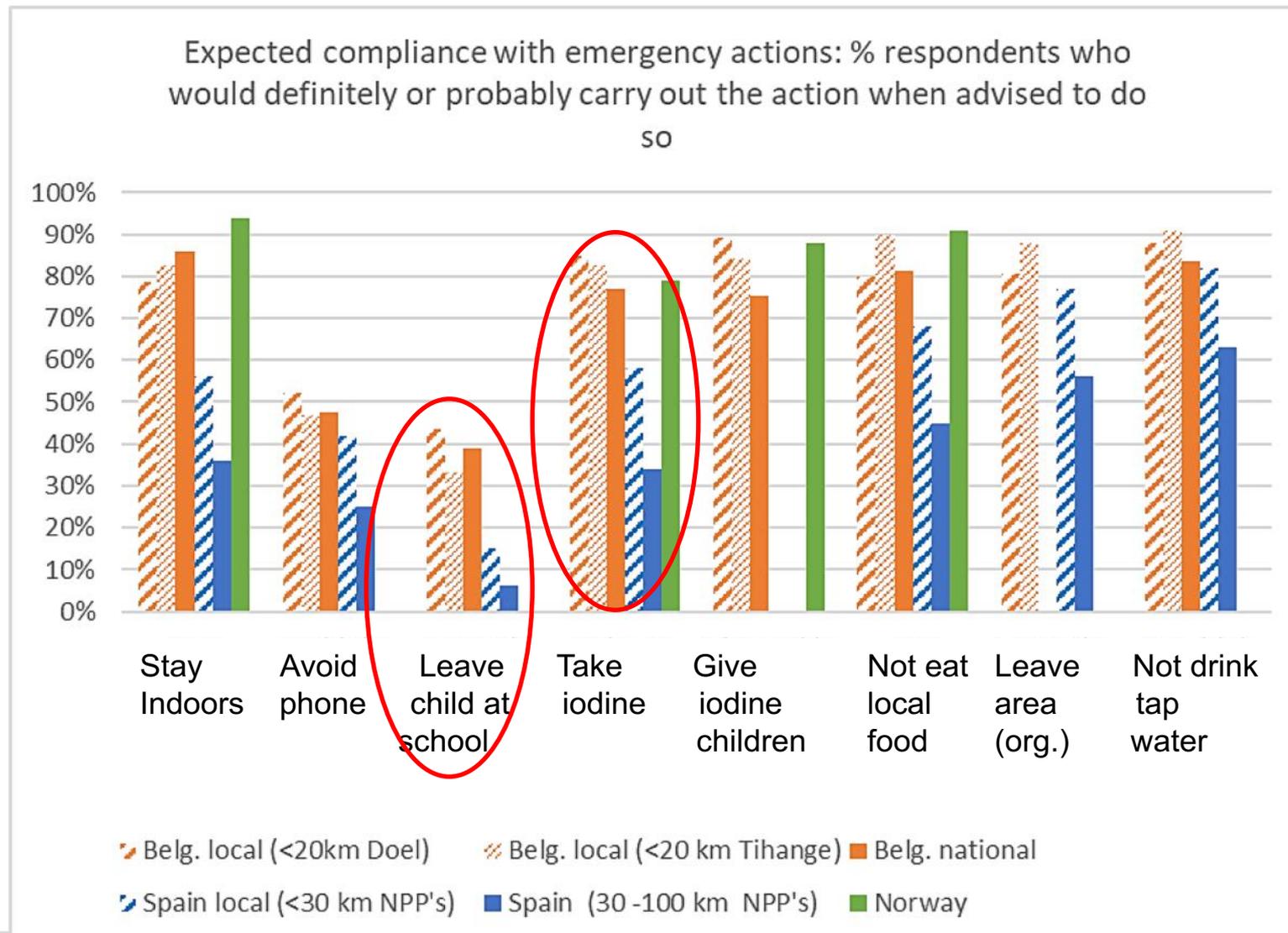
➔ Emergency response must be adapted to national and local context



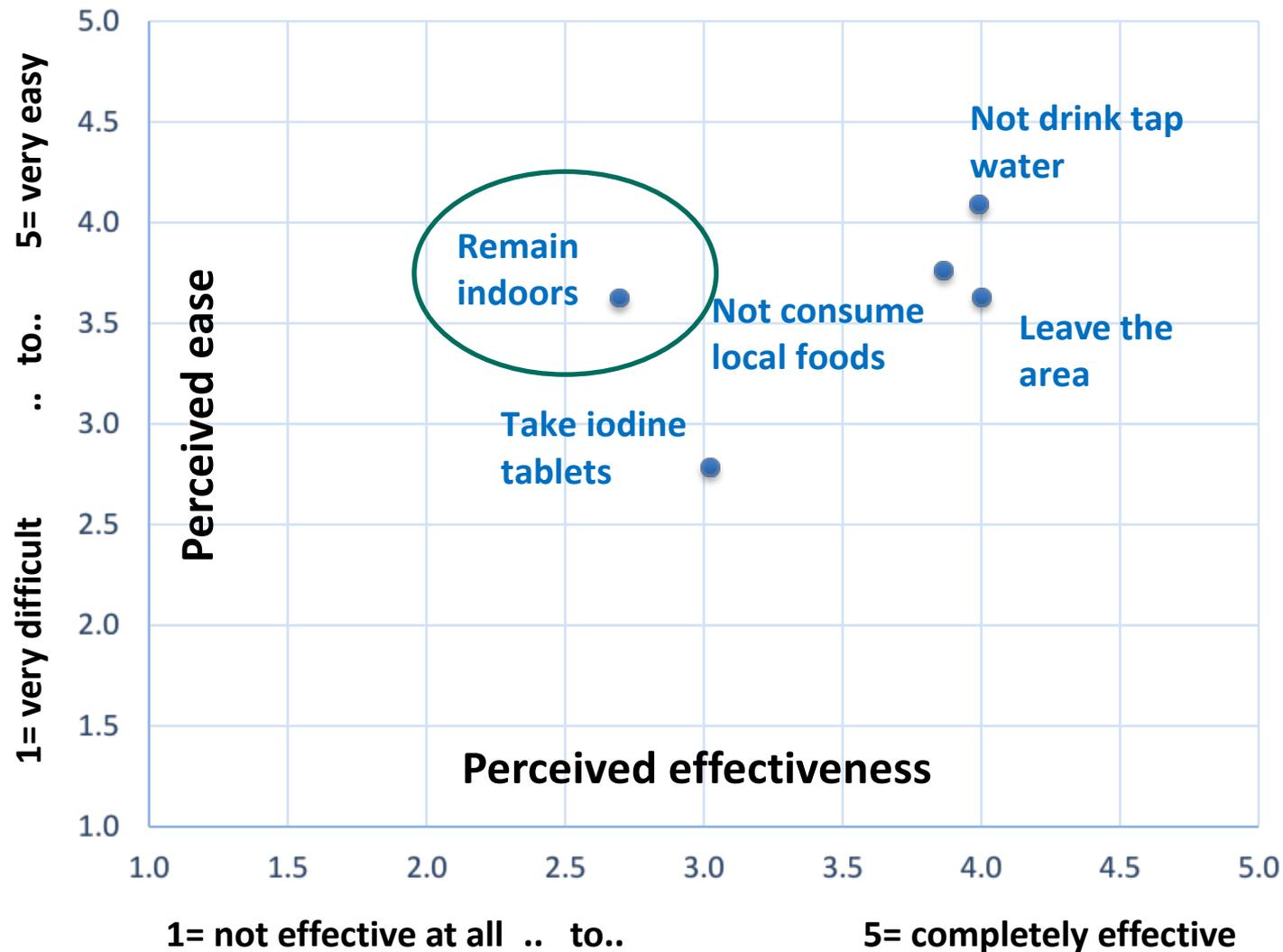
Spain: <30 km



# Findings



# Findings



Spain  
0-100 km  
(N=808)

# Findings



Across countries:

Avoiding local products or tap water, and leaving the area during few days are perceived as rather easy and effective.

Staying indoors is perceived as rather easy, but ineffective.

# Findings

- *Research hypothesis 1: Perceived effectiveness is correlated with expected compliance.*
- *Research hypothesis 2: Perceived ease of protective actions is correlated with expected compliance.*



Spearman corr. coef.	Descr. norm	Ease of action	Effectiveness action	
Staying indoors	0.27**	0.18**	0.27**	Belg. national
	0.26**	0.22**	0.18*	Belg. local (<20km Doel)
	0.19*	0.21**	0.28**	Belg. local (<20 km Tihange)
	0.49**	0.51**	0.50**	Spain local (<30 km NPP's)
	0.40**	0.24**	0.36**	Spain (30 -100 km NPP's)

- *Research hypothesis 3: Perception of other residents' behaviour is correlated with expected compliance*



# Findings

- *Research hypothesis 4: Perceived effectiveness is a stronger correlate of expected behaviour than perceived ease. **Partially verified***

Spearman corr. coef.	Descr. norm	Ease of action	Effectiveness action	
Staying indoors	0.27**	0.18**	0.27**	Belg. national
	0.26**	0.22**	0.18*	Belg. local (<20km Doel)
	0.19*	0.21**	0.28**	Belg. local (<20 km Tihange)
	0.49**	0.51**	0.50**	Spain local (<30 km NPP's)
	0.40**	0.24**	0.36**	Spain (30 -100 km NPP's)
Leave area few days	0.24**	0.26**	0.19*	Belg. local (<20km Doel)
	0.34**	0.36**	0.29*	Belg. local (<20 km Tihange)
	0.33**	0.34**	0.37**	Spain local (<30 km NPP's)
	0.45**	0.41**	0.34**	Spain (30 -100 km NPP's)

# Conclusions

- Perceived effectiveness of protective actions positively correlated with compliance with protective actions
  - To be accounted for in communication about protective actions
  
- Perception of other residents' behaviour is significantly correlated with behavioural intentions
  - Stakeholder engagement in emergency preparedness at local level
  
- Main concerns and compliance with protective actions differs between local populations in different countries, and between different areas in the same country
  - More research is needed to explain why such differences occur