

Uncertainty Classification in Nuclear Emergency Situations: Systematic Literature Review

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Image taken from Chernobyl miniseries, C. Mazin and J. Renck (2019).

Introduction

Communicating uncertainty for informed decision-making



Method:

Systematic literature review

Research question:

1. What are the existing definitions and types of uncertainties in radiological risk literature?
 - 1.2. *Are there different types of uncertainties across different actors present/mentioned in the literature?*

Focus:

Radiological Risk Situations

Communication of uncertainty and decision-making in uncertain situations

Actors:

Scientific community (experts)

Decision-makers

Laypeople and other actors

Search Method

52 articles chosen for final analysis

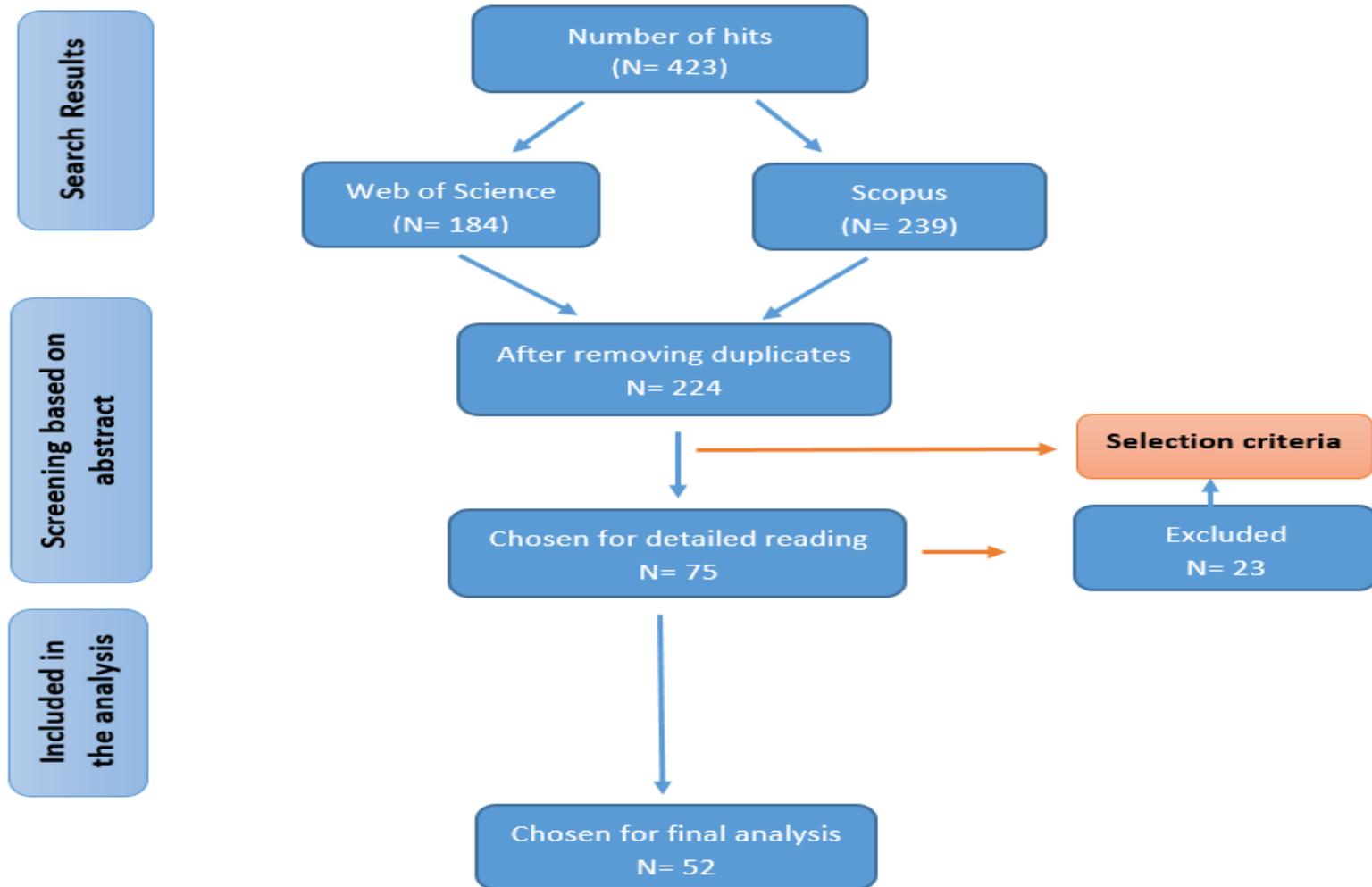
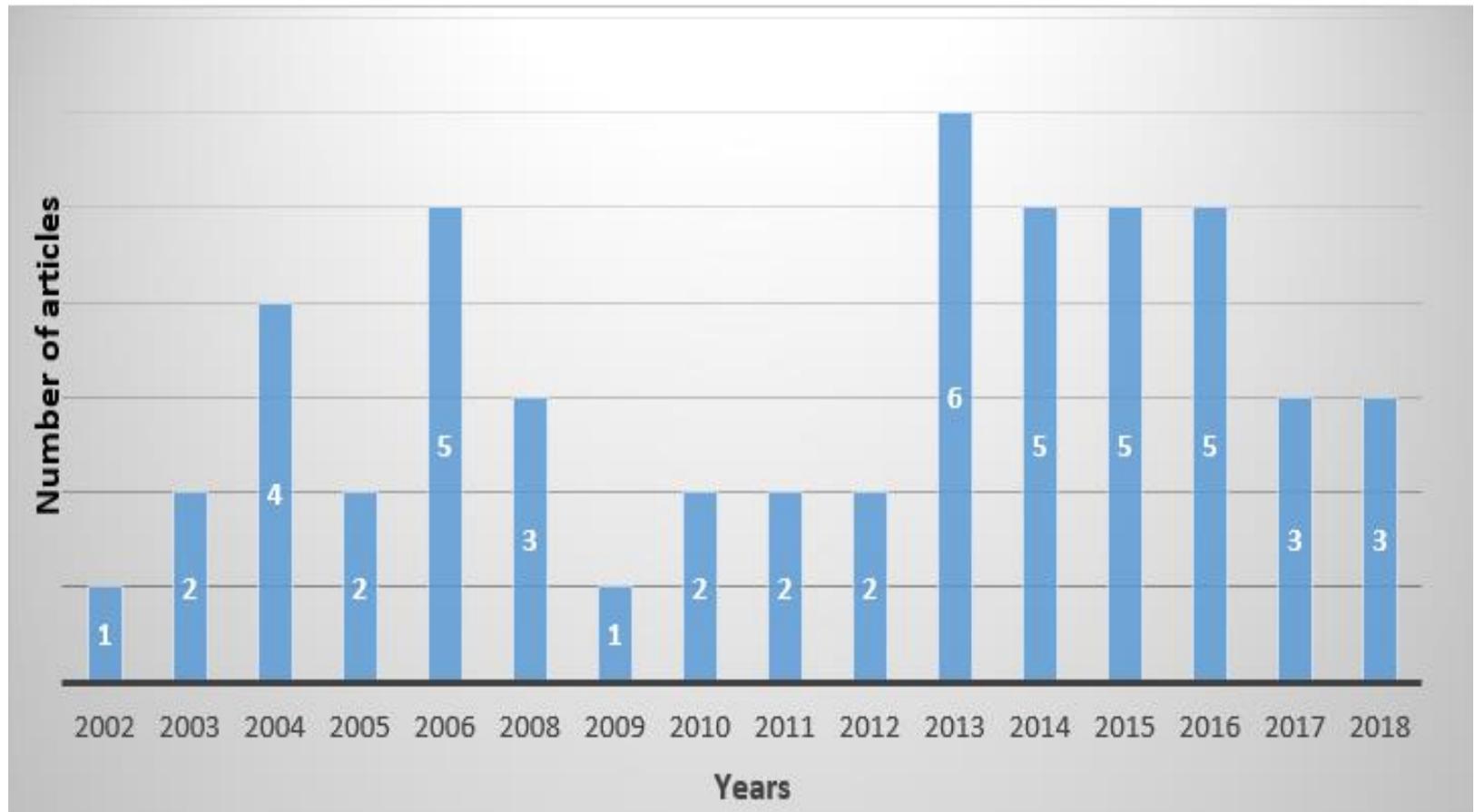


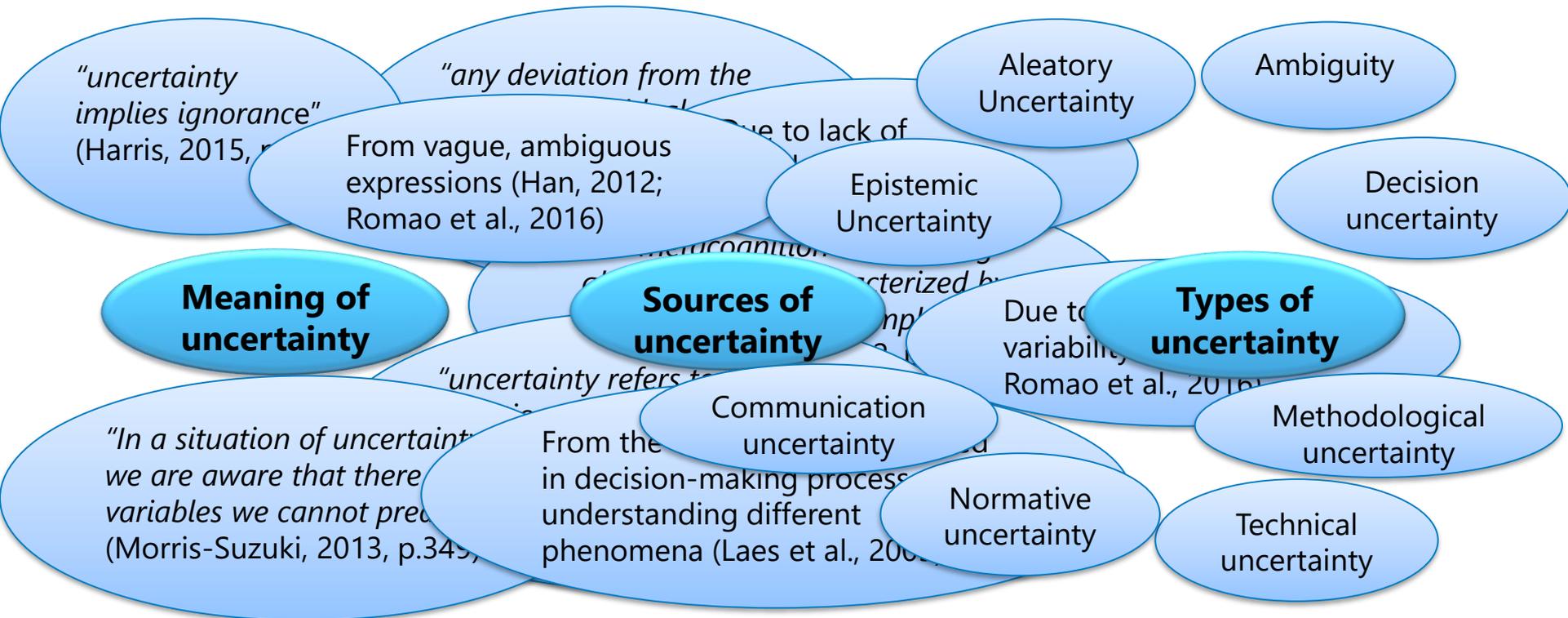
Figure 1. Literature search and selection flow

Scientific attention regarding uncertainties



Publication years of the articles analyzed and the number of articles published per year.

Results: Definitions of uncertainty in literature (n=19/52)



Ignoring the change of uncertainty information when it is communicated from the **producer** (e.g. the scientist/modeler) to the information **receiver** (e.g. the decision-maker or laypeople) (Maxim and van der Sluijs, 2011).

Results: Examples of uncertainties across different actors

Scientific Community:

Decision-makers:

Laypeople and other actors:

Results: Examples of uncertainties across different actors

Scientific Community:

- Epistemic:
 - *Average risk of the population at a particular power plant*
- Aleatory:
 - *The likelihood of events*
- Methodological:
 - *Quality, relevance and interpretation of methods and results*
- Communication:
 - *Issuing information that is useful, but which is subject to deep uncertainty.*
 - *Multiple publics*
- Decision:
 - *When to issue information?*
 - *Applying results to policy making*

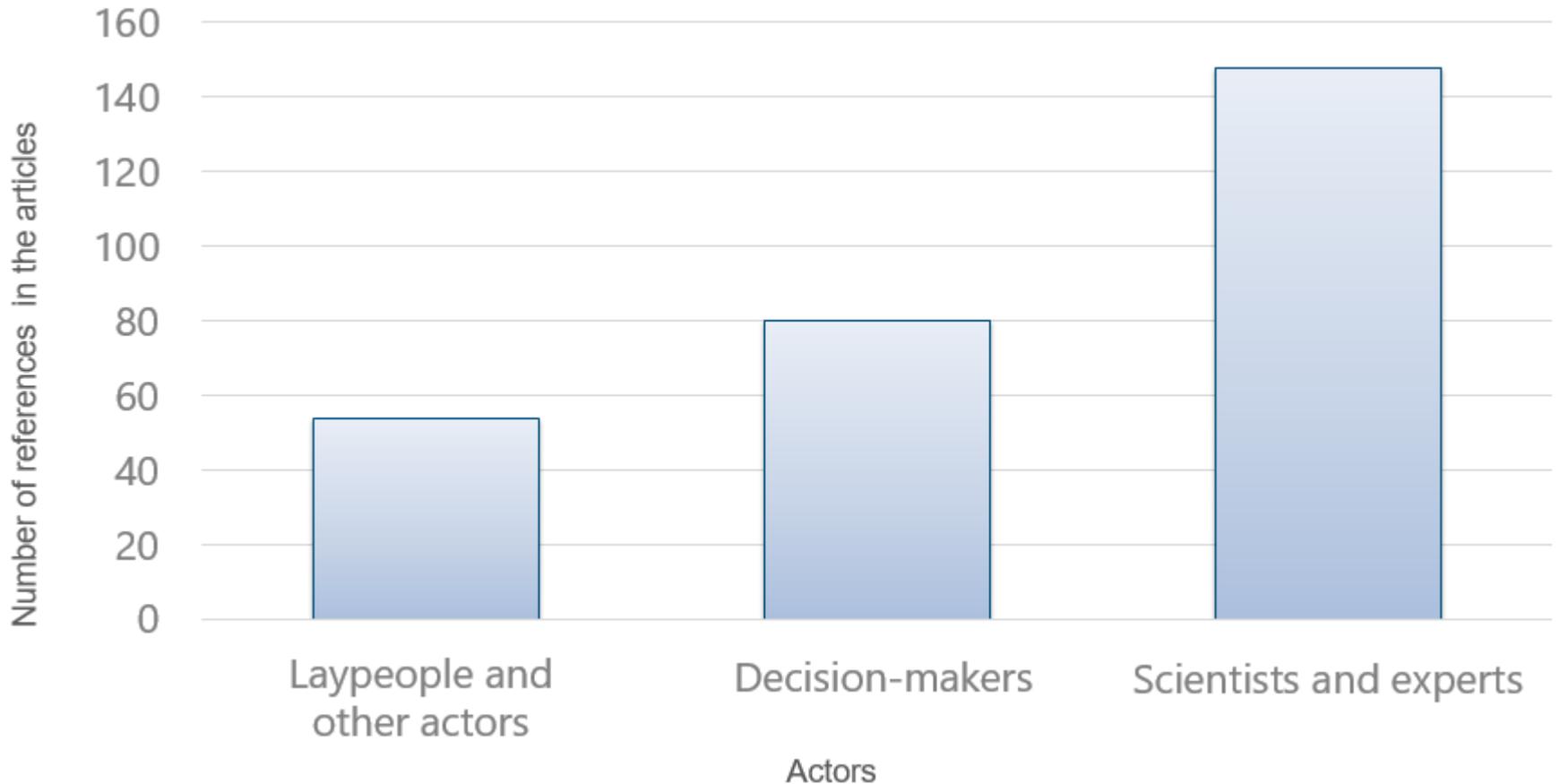
Decision-makers:

- Practical and ethical:
 - *Should people be arrested for failure to evacuate?*
- Decision:
 - *Difficulties to implement policy decisions in uncertain situations*
 - *What level of certainty is demanded to curtail or even ban an activity that might be harmful?*
- Political and Economic:
 - *Reactions of social actors and the possible interactions with other policy fields*
 - *Economic and financial issues*
 - *Public acceptance*

Laypeople and other actors:

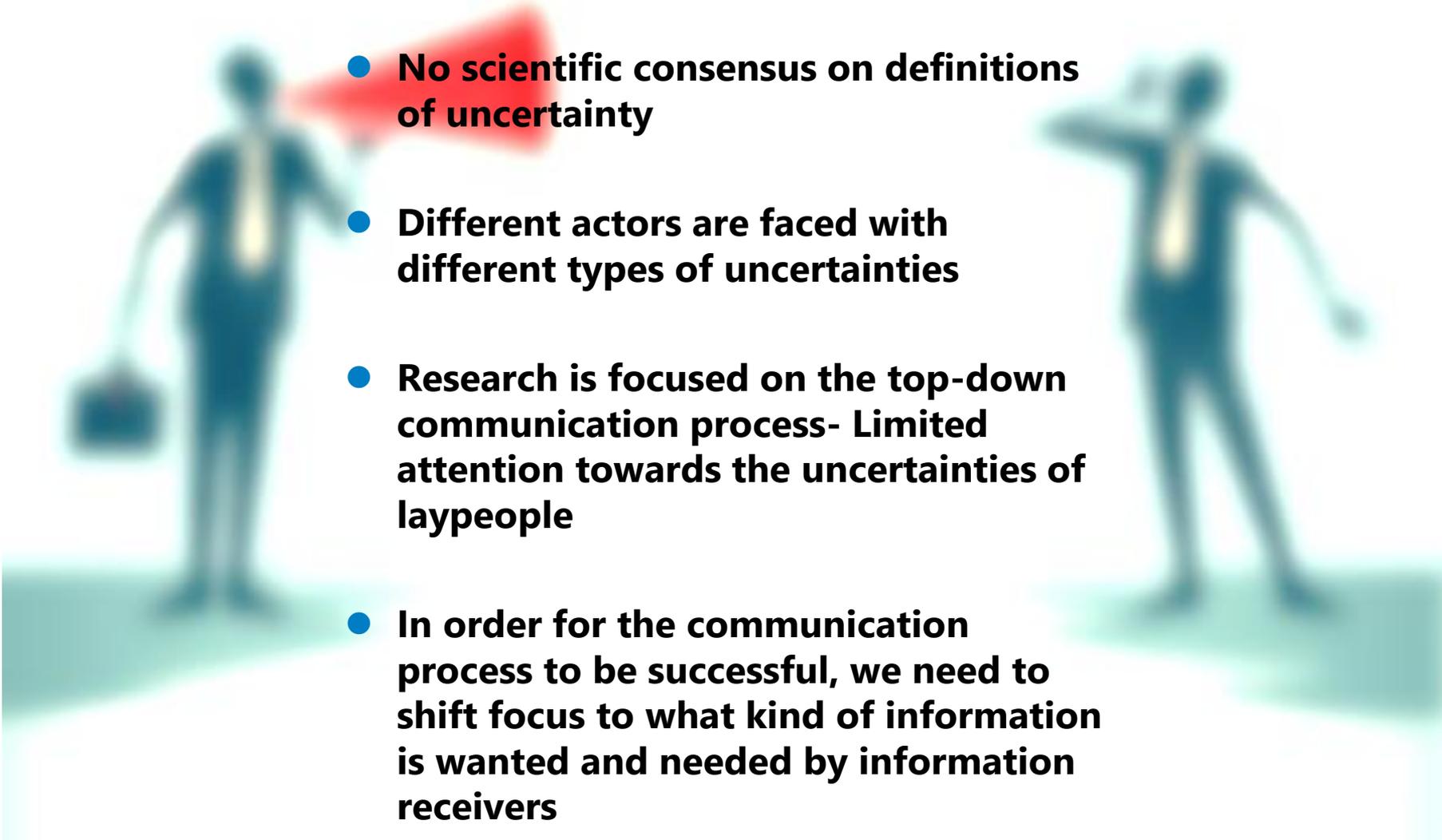
- Epistemic:
 - *Where, when, and how may the incident occur?*
 - *What actions (not) to take?*
- Lack of trust:
 - *Conflicts of interest*
 - *Contradictory information*
- Ambiguity:
 - *Scientists' hyperspecificity*
 - *Rumours and fear vs. expert information*
- Concerns:
 - *Health and safety*
 - *Anxiety*

Laypeople's uncertainties are analyzed the least



The number of times articles refer to different actors.

Conclusion and implications for uncertainty communication

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- **No scientific consensus on definitions of uncertainty**
 - **Different actors are faced with different types of uncertainties**
 - **Research is focused on the top-down communication process- Limited attention towards the uncertainties of laypeople**
 - **In order for the communication process to be successful, we need to shift focus to what kind of information is wanted and needed by information receivers**

Thank you for your attention!

Gràcies per la vostra atenció!

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