

Visualising climate information



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Southern African Adaptation Colloquium

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Acknowledgments: Ross Blamey, Chris Jack, Lisa Coop, Kate Sutherland
and Susanne Lorenz (University of Leeds)



**Climate System
Analysis Group**



You will be shown 30 years of monthly rainfall data (1981 to 2010). Based only on the following graph, answer this question:

How likely will it be for the rainfall in **April 2014** to be more than **500mm**?

1	2	3	4	5	6	7	8	9
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Exceptionally
unlikely

Virtually
certain





**Climate System
Analysis Group**



How likely will it be for the rainfall in April 2014 to be more than 500mm?

1

2

3

4

5

6

7

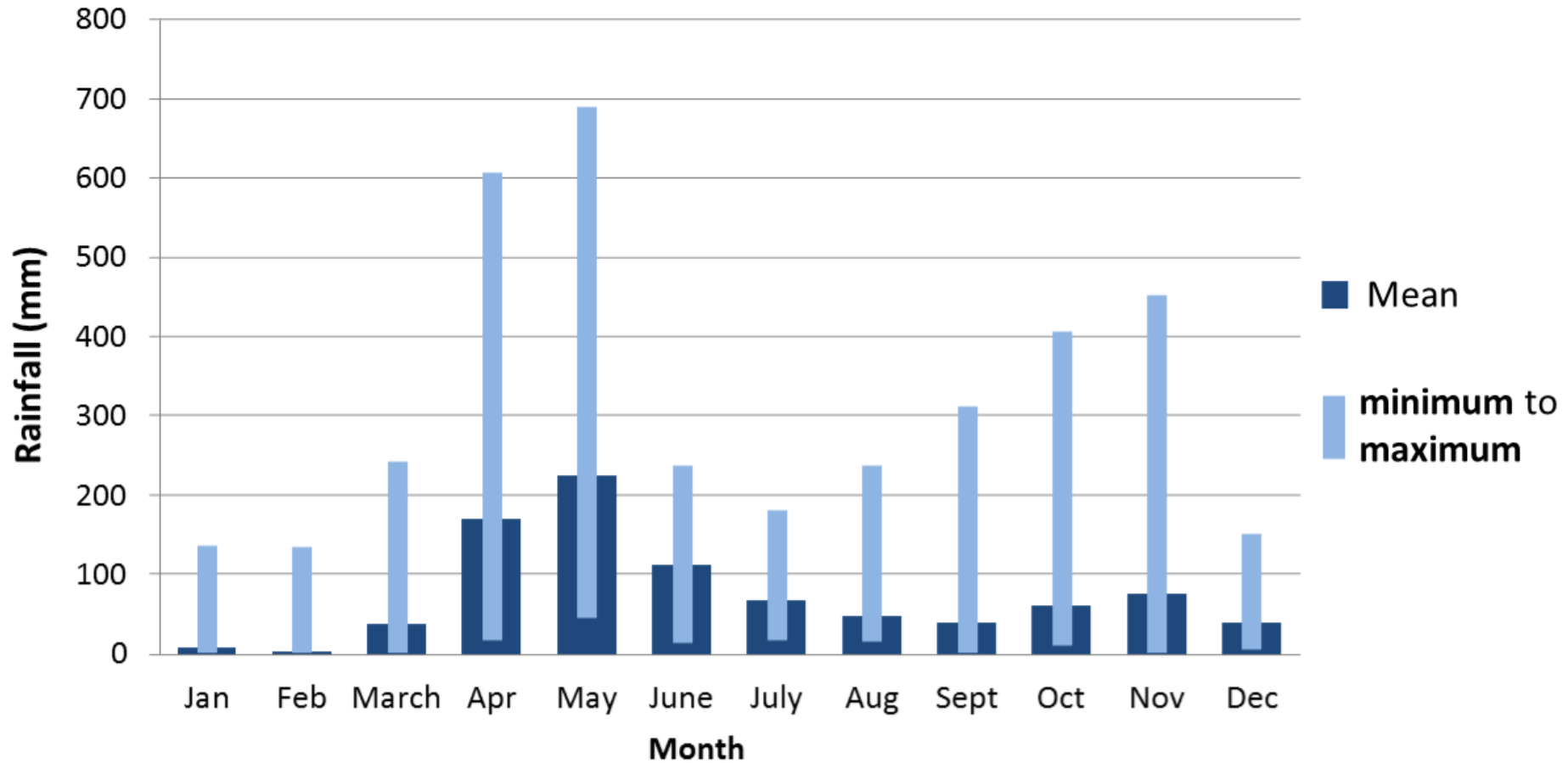
8

9

Exceptionally unlikely

Virtually certain

Observed Monthly Rainfall: 1981 to 2010





**Climate System
Analysis Group**



How likely will it be for the rainfall in April 2014 to be more than 500mm?

1

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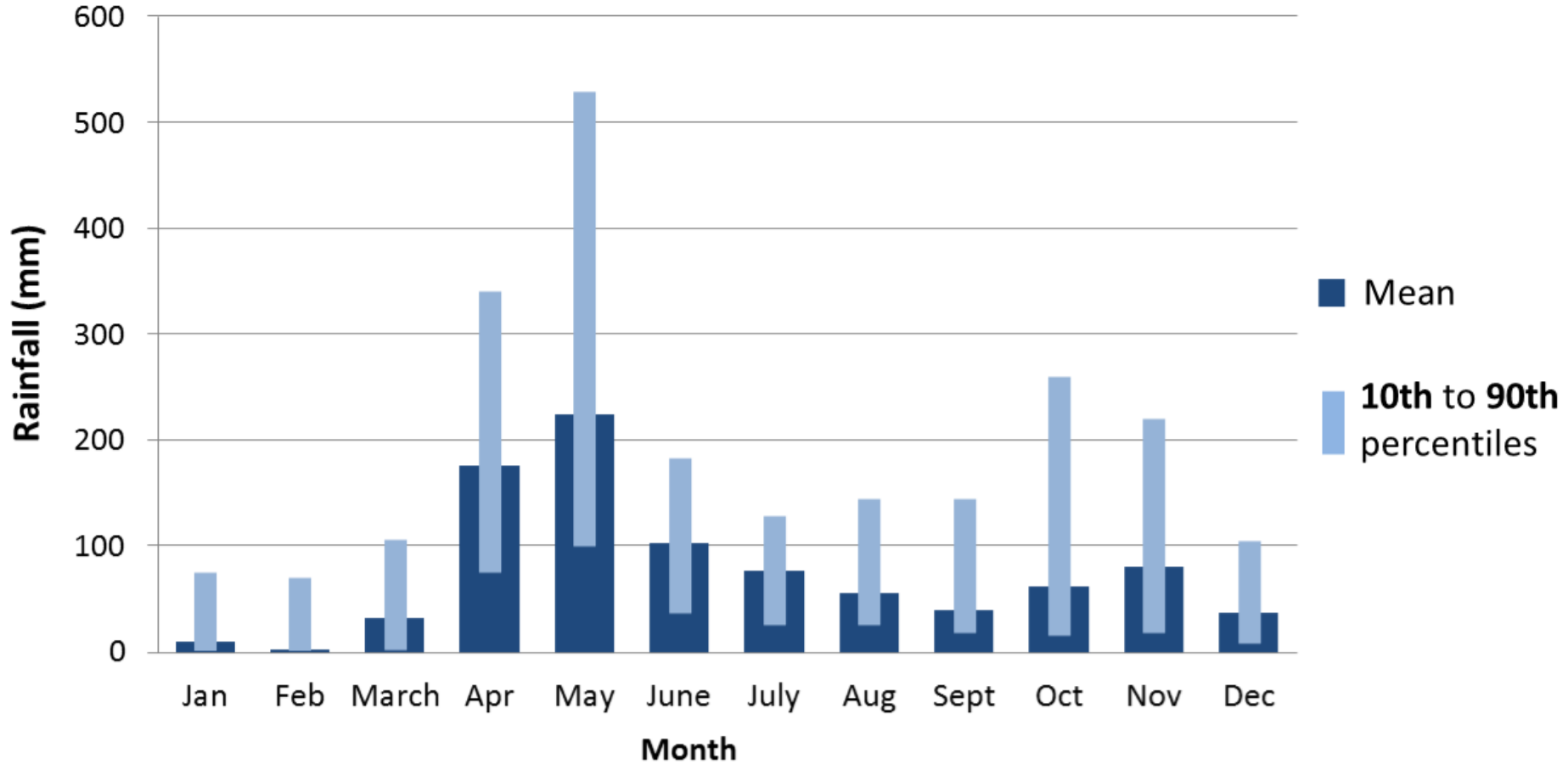
8

9

Exceptionally unlikely

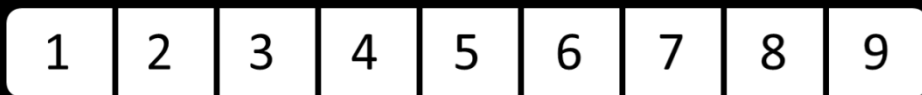
Virtually certain

Observed Monthly Rainfall: 1981 to 2010



Your results

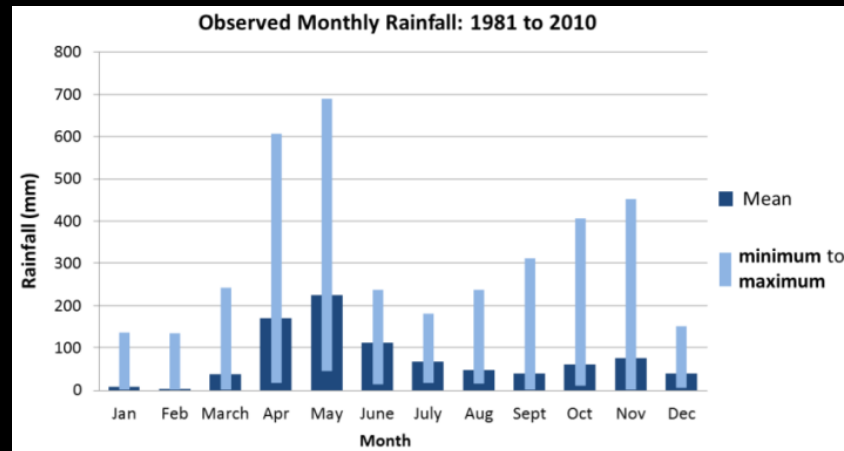
3 12 12 6 1 0 1 0 0



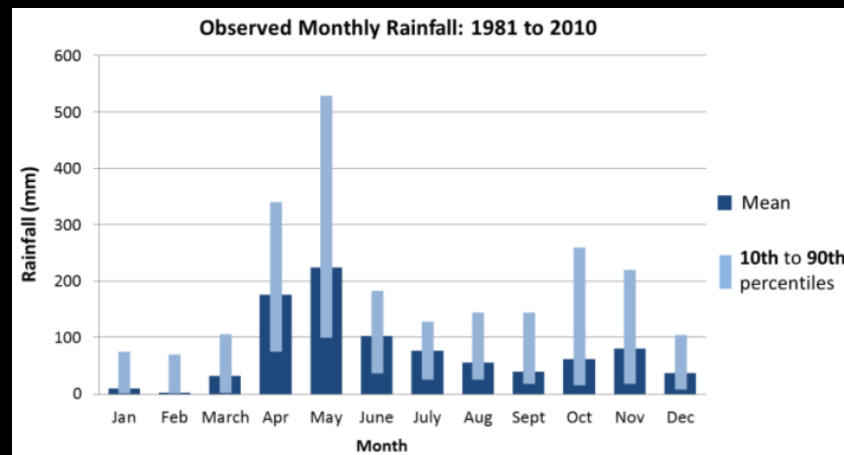
Exceptionally unlikely

Virtually certain

Plot 1: min & max



Plot 2: 10th & 90th



8 15 14 4 2 1 1 0 0

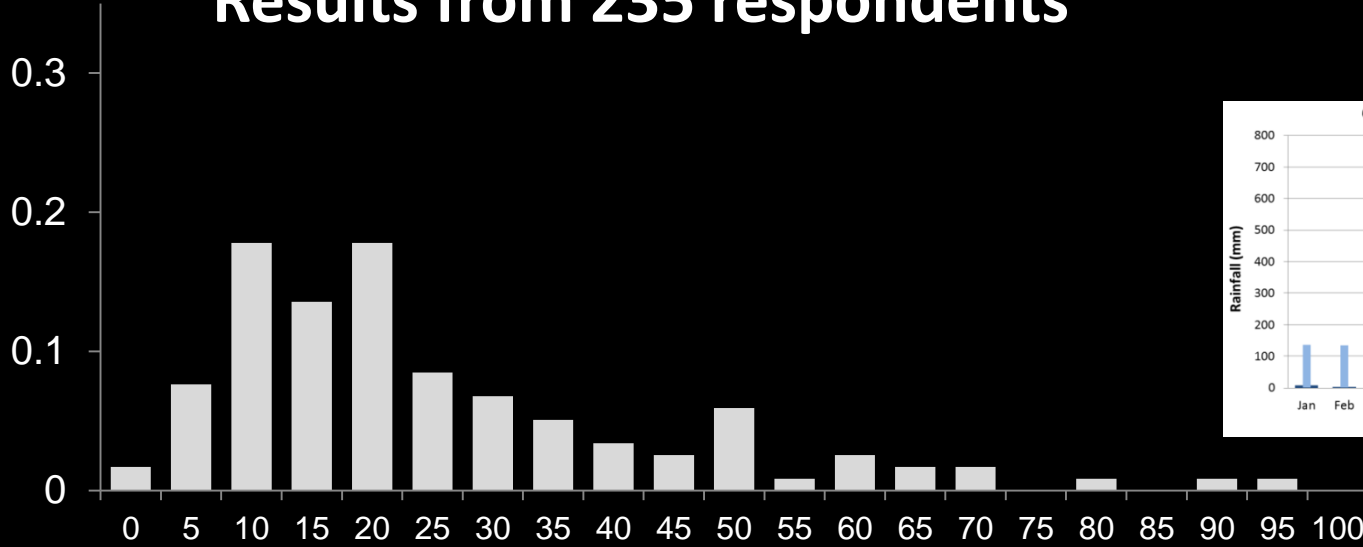


Exceptionally unlikely

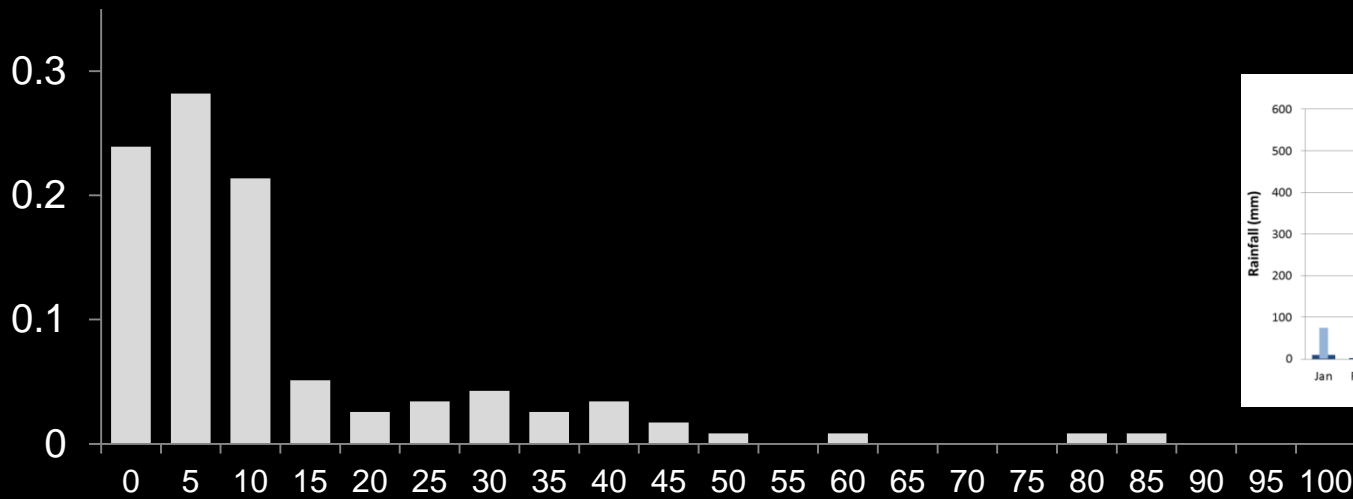
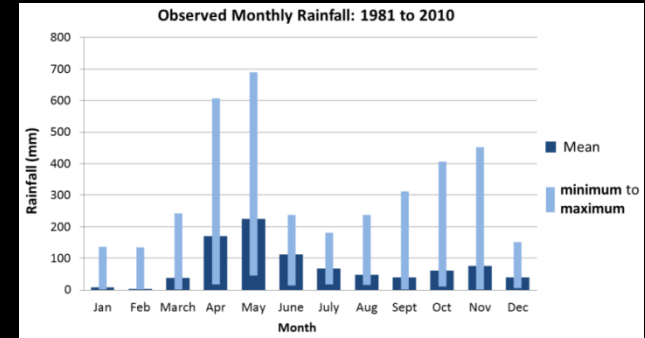
Virtually certain



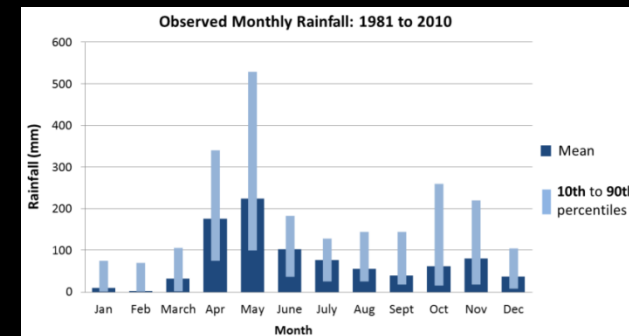
Results from 235 respondents



Plot 1: min & max



Plot 2: 10th & 90th



Research questions

- How do **alternative visualisations** of climate change projections affect a user's ability to understand and interpret the information?
- How does the **choice of information content**, from historical observations and future climate projection data, affect a user's ability to understand uncertainty and assess climate risk?



The survey

Based on feedback from a trial survey with the Winter School 2013 participants, and with the help of Susi Lorenz from the University of Leeds, we developed the survey targeted at the African user community.

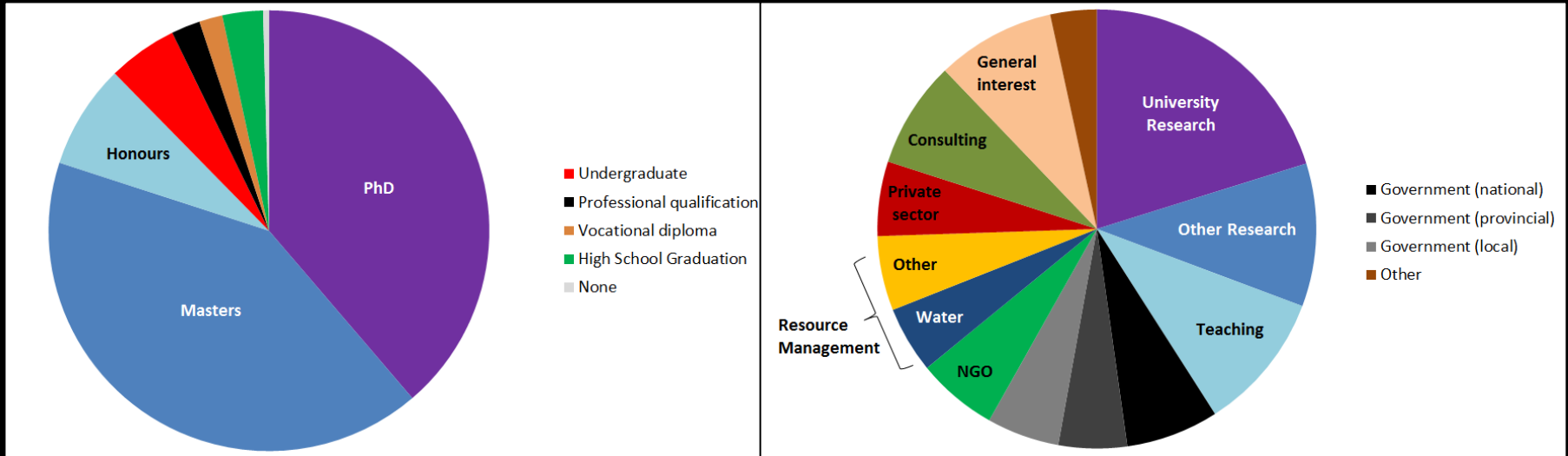
The survey URL was sent in an email in September 2013 with the hope that people would respond...

...and they did!

We currently have 272 complete responses and a further 245 incomplete responses.



The survey: demographics



- Highly educated respondents
- Spanned the research, public and private sectors
- 55% focus work on Africa (majority of those - southern Africa); 20% Europe; 10% North America; 15% other
- 90% of respondents said they use graphs “often” or “very often”

The survey: select results

How do you expect the average annual rainfall to change in the future?

The middle of the slider corresponds to no change in the future.

Very likely to decrease

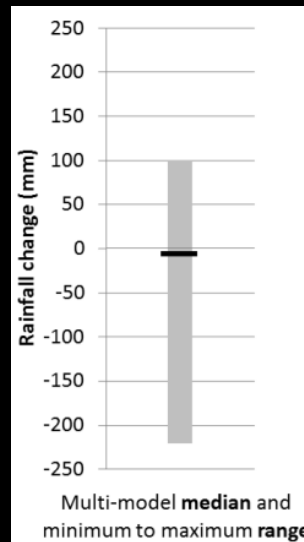


Very likely to increase

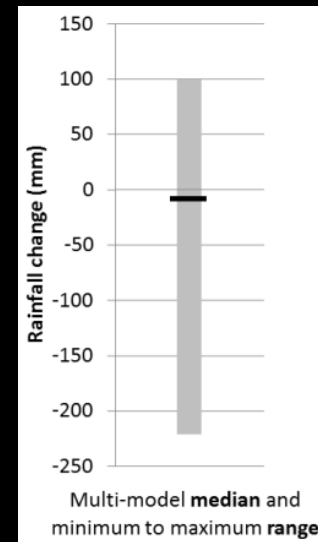


How do you expect the average annual rainfall to change in the future?

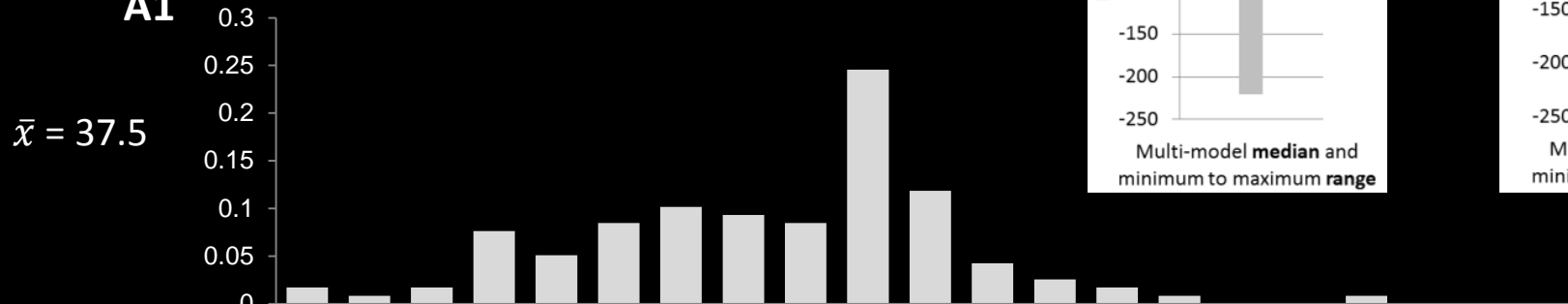
A1



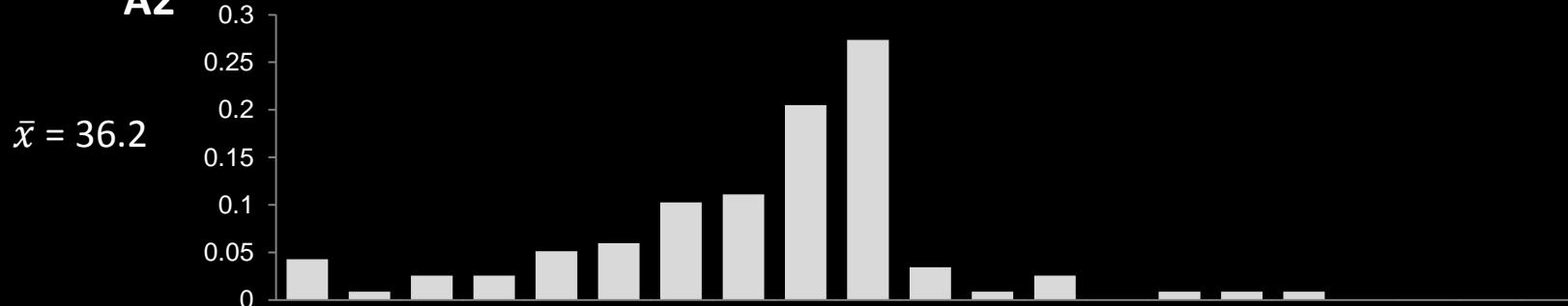
A2



A1

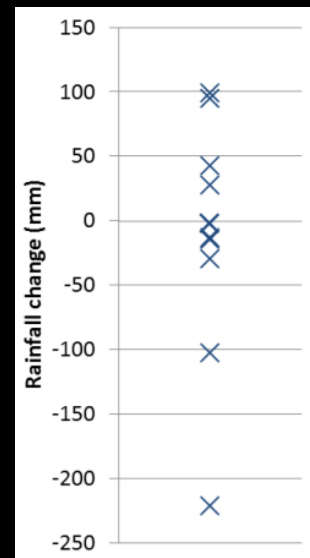


A2

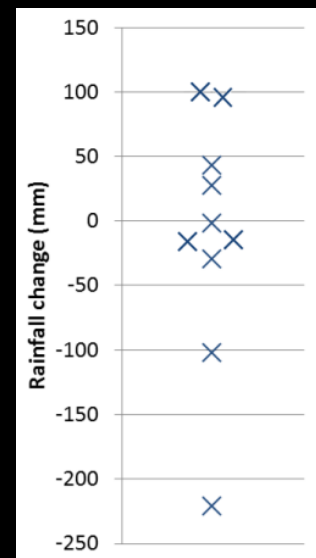


How do you expect the average annual rainfall to change in the future?

B1

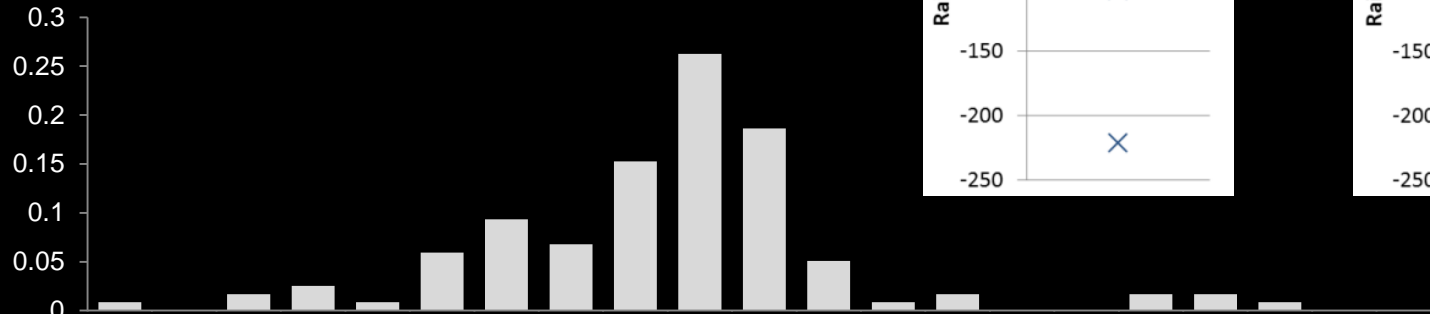


B2



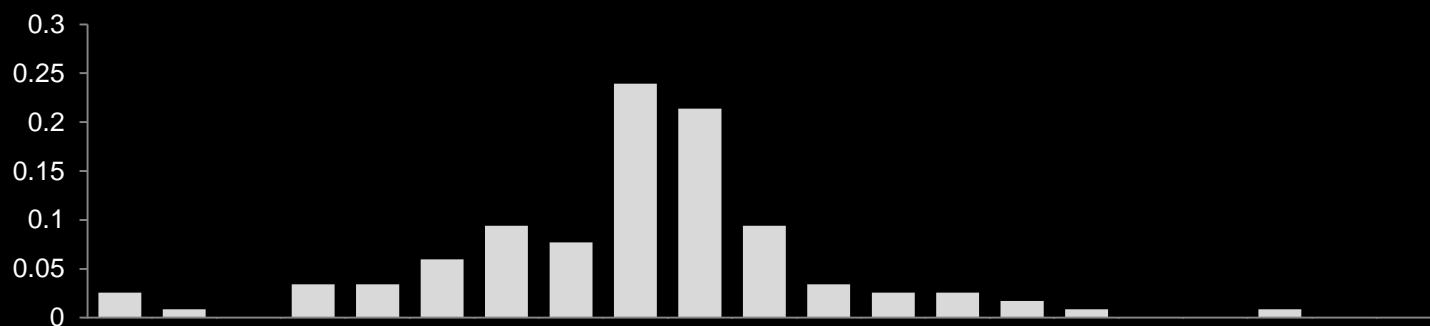
B1

$\bar{x} = 42.6$



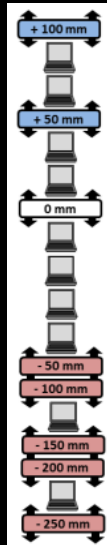
B2

$\bar{x} = 39.6$

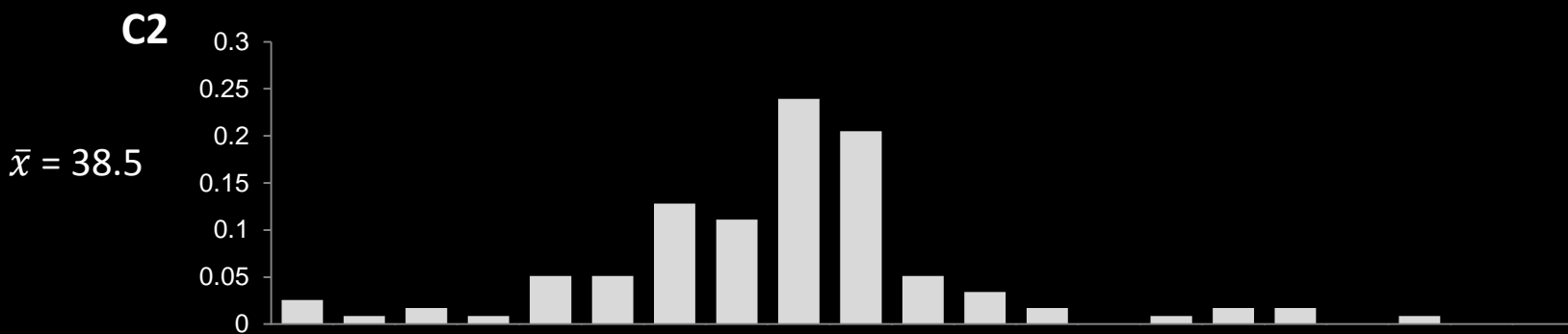
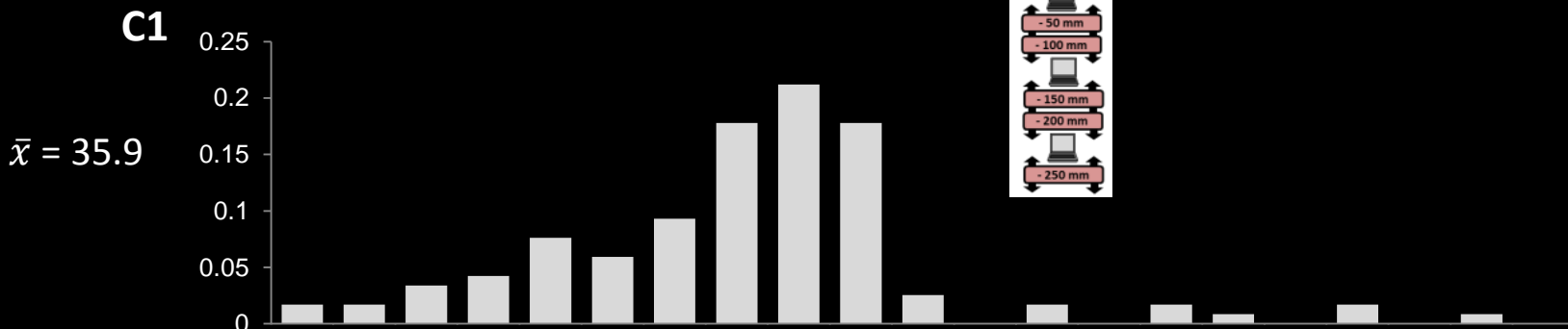
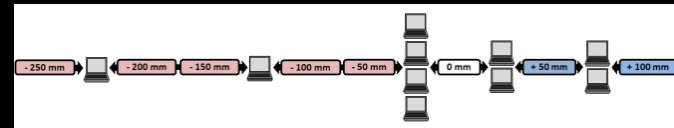


How do you expect the average annual rainfall to change in the future?

C1



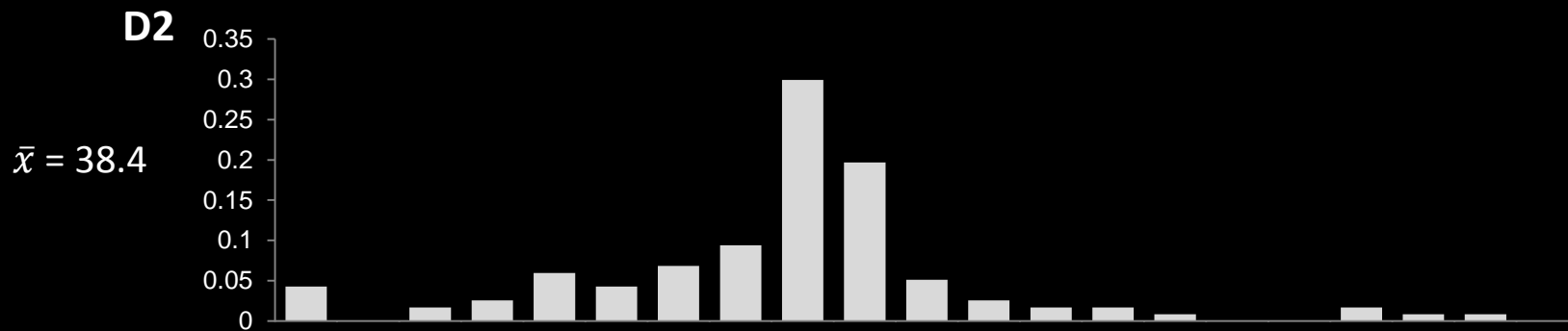
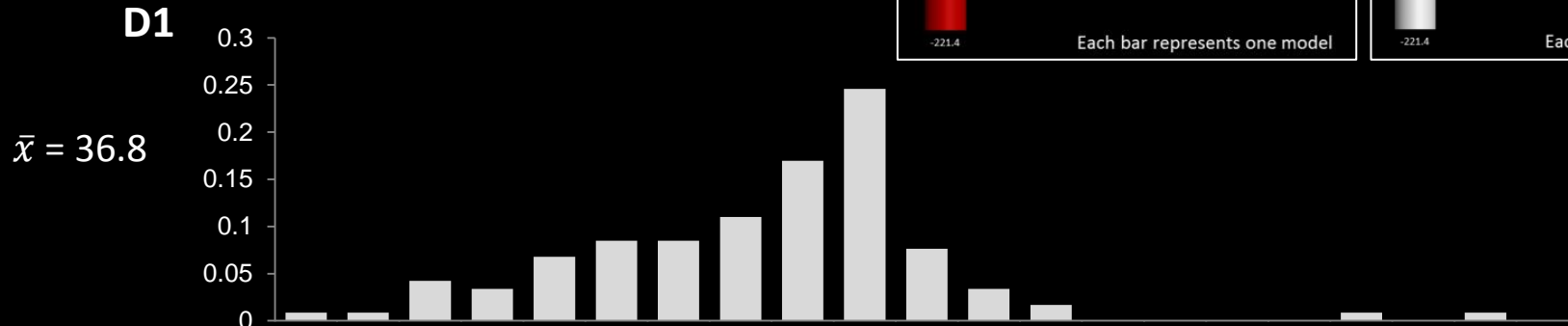
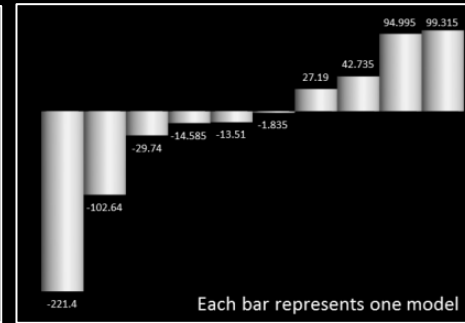
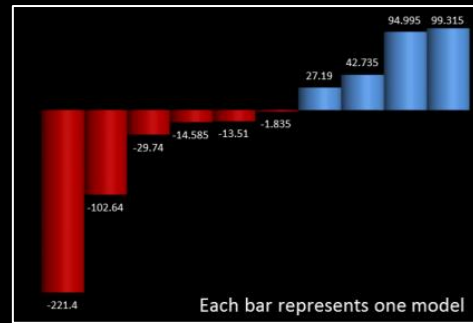
C2



How do you expect the average annual rainfall to change in the future?

D1

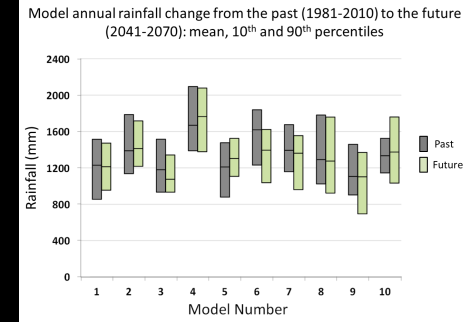
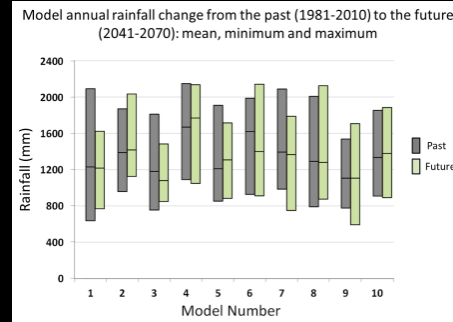
D2



How do you expect the average annual rainfall to change in the future?

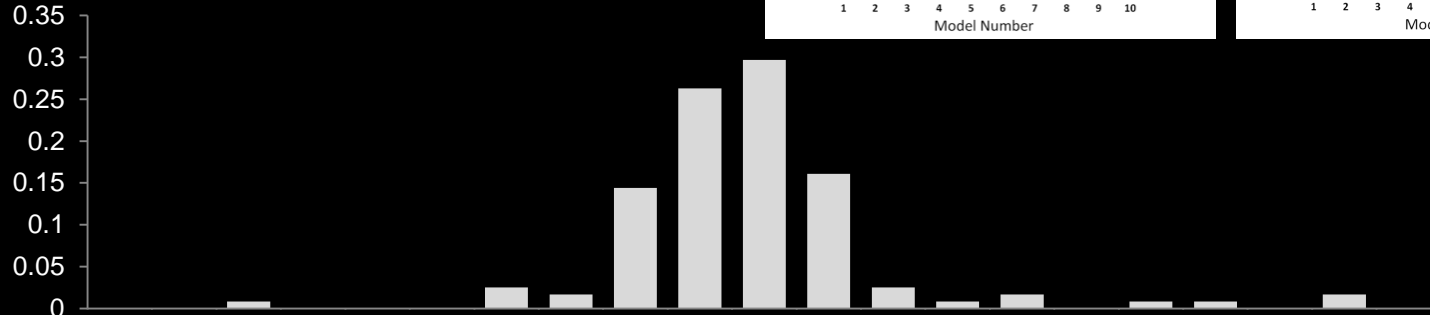
Mod 1

Mod 2



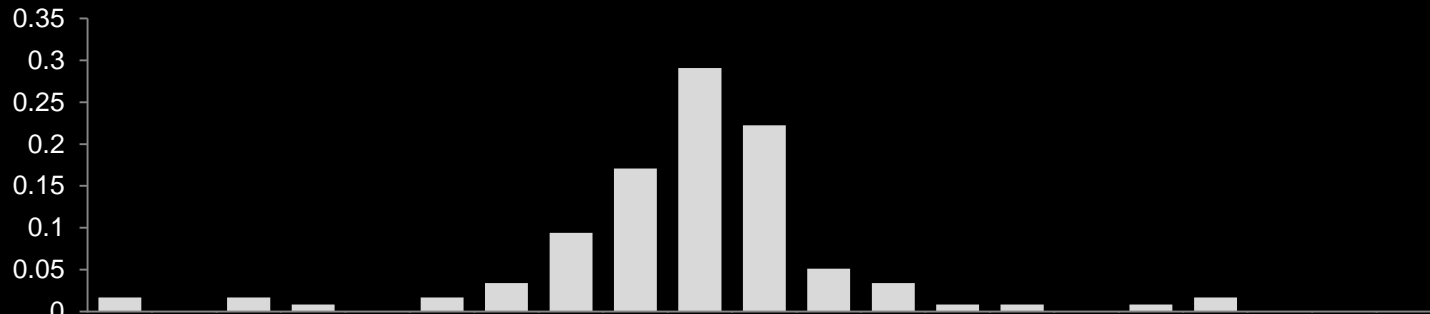
Mod 1

$$\bar{x} = 49.0$$



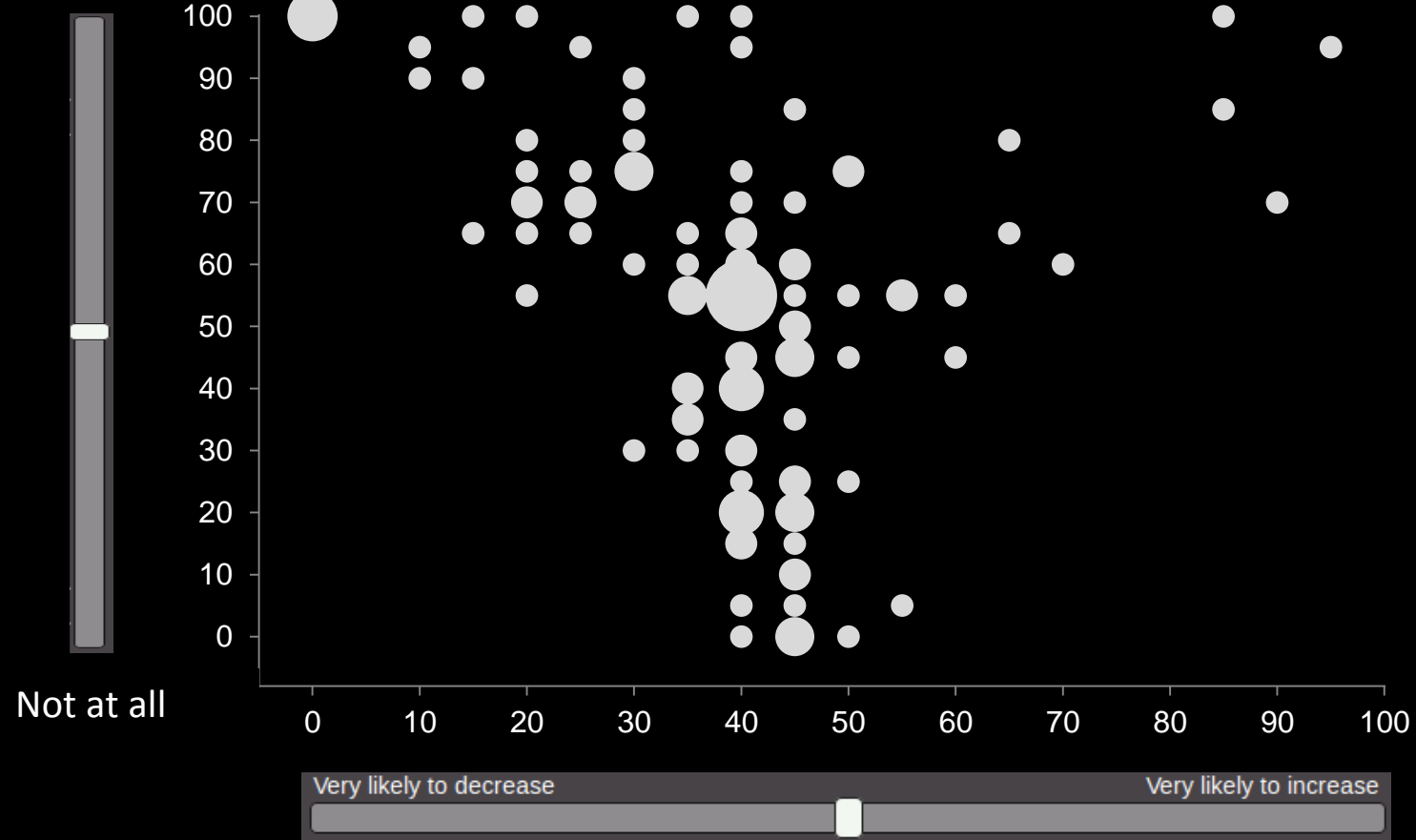
Mod 2

$$\bar{x} = 44.0$$

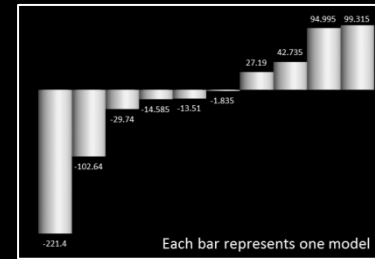


How confident are you in your answer?

Extremely



D2



Conclusions

1. Altering the information contained within a visualisation significantly alters the interpretation of climate risks.

Seemingly arbitrary choices can have profound impacts so it is important that we understand how our choices may affect users' abilities to understand the data.

2. Respondents were strongly influenced by the attributes of the visualisations.

For example, there is evidence that the use of colour can alter the interpretation of climate change messages.

3. The text and language used to describe the visualisation can affect the interpretation as much, if not more, than the type of visualisation used.

It is vital to provide sufficient explanatory text **with the figures**, irrespective of the user's level of numeracy or familiarity with the style of figure.



Spiegelhalter et al. (2011)
Visualizing uncertainty about the future
Science, **333**, 1393-1400

“Deeper uncertainties do not translate readily into visualizations. In fact, the more attractive a depiction is made, the more people may believe it represents the whole truth rather than being a construction of limited knowledge and judgment. **So perhaps the greatest challenge is to make a visualization that is attractive and informative, and yet conveys its own contingency and limitations.**”



Thanks for listening!



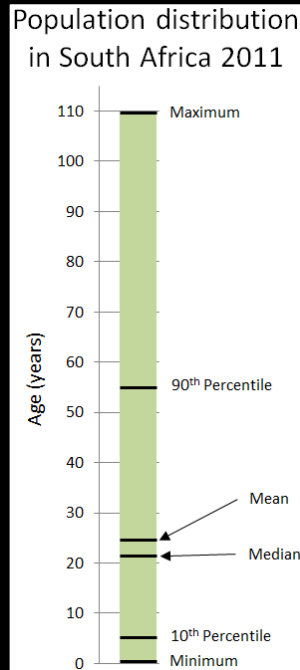
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The survey: structure



Stream 1 Min and max information with population example (61)

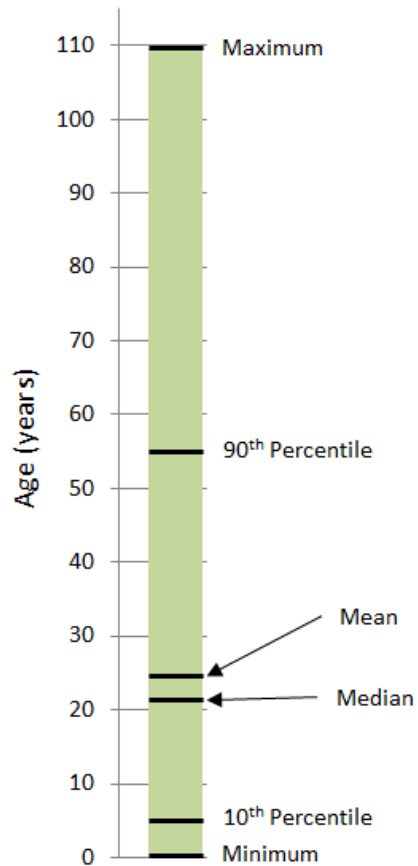
Stream 2 Min and max information without population example (57)

Stream 3 10th and 90th percentile information with population example (65)

Stream 4 10th and 90th percentile information without population example (52)



Population distribution in South Africa 2011



In order to be able answer some of the questions in this survey, it is important that you understand what is meant by the median and different "percentiles" of the climate distributions. The figure here provides an example of the population of South Africa from the 2011 census. The total population in 2011 was recorded as 51.8 million people. In this data, the oldest living person (maximum) was reported to be 110 years old. Ten percent of the total population (i.e. 5,180,000 people) were older than 55 (90th percentile). The mean age was 25 years old but the median was only 21 years old. This tells us that 50% of the population was under 21 and 50% was over 21. Ten percent of the population was younger than 5 years old (10th percentile) and, as you might guess, the youngest person was (nearly) zero years old.



Guiding science questions

1. What information can be reliably extracted from/across different sources of climate data?
2. What information should be displayed to communicate the underlying data?
3. How should that information be visualised?

