Uncertainty Visualization in Data Journalism:
A Pilot Study on Election Polls in a DER SPIEGEL Online Article

Carmen Garro*
Hamburg University of Applied Sciences

Christoph Kinkeldey†
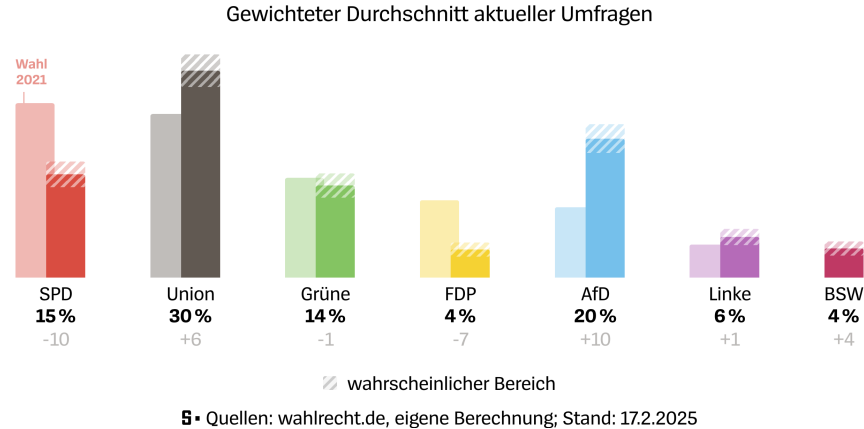Hamburg University of Applied Sciences

Figure 1: Weighted average estimates of political party support by DER SPIEGEL based on results from nine opinion polls conducted by different German research institutes. The marked area in the column charts denotes the 95 percent confidence interval.

ABSTRACT

Uncertainty visualization, such as in political polling, plays a key role in shaping public understanding and interpretation of data. While most research on uncertainty visualization has focused on controlled laboratory settings, we investigate how readers perceive and interpret these visuals in a real-world context. We included a short survey in a DER SPIEGEL pre-election article, gathering 98 voluntary responses. Results indicate that two-thirds of respondents found the visualization useful, but interpretations varied across levels of engagement—from basic recognition to inaccurate interpretations. These findings highlight both the potential and the pitfalls of uncertainty visualizations in journalistic contexts and will inform a follow-up study aimed at reducing misinterpretation and mistrust in probabilistic reporting.

Index Terms: Uncertainty visualization, Uncertainty Perception, Data Interpretation, Election Polls, Confidence Intervals

1 INTRODUCTION

Uncertainty is inherent in estimates due to sampling error and model assumptions [9]. In political polling, visualizing uncertainty can support transparency and informed interpretation, but remains rare in data journalism [6]. When present, it is often shown as margins of error — yet how readers interpret these visuals in real news contexts is under explored.

Past research has examined uncertainty perception mainly in research settings with controlled variables [11, 7, 5], finding that error bars and intervals can be misinterpreted or overlooked. Real-world reactions in journalistic settings has not been keenly studied. This gap is especially relevant in political coverage, where public under-

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*e-mail: Carmen.GarroCarranza@haw-hamburg.de
†e-mail: christoph.kinkeldey@haw-hamburg.de

standing of uncertainty may shape trust in polls and perceptions of electoral competitiveness.

This pilot study explores how readers of DER SPIEGEL, a major German news outlet, perceive and interpret such uncertainty visualizations. We analyze comments on visualized uncertainty from recent polling articles; whether and how readers notice the error bands, what kinds of misunderstandings arise, and if the visualization influences their discussion of the poll results. Our findings help bridge the gap between laboratory research on uncertainty perception and its real-world application by informing and engaging diverse news audiences.

2 SURVEY ABOUT PERCEIVED USABILITY OF POLLING UNCERTAINTY

Between 17–23 February, we embedded a short voluntary survey in an online DER SPIEGEL article with aggregated poll results and confidence intervals shown as error bands (Figure 1) [4]. The survey asked readers to rate the usefulness of the visualization and respond to three statements on different levels of engagement:

"The representation of the probable range helps me to better. . .

Q1: *". . . assess the significance of the survey results"* for Significance [S].

Q2: *. . . compare the predicted vote shares of the parties"* for Analysis [A].

Q3: *. . . assess possible election outcomes"* for Interpretation [I].

These three statements correspond to increasing levels of engagement: from general comprehension [S] to comparative analysis [A] and, to broader interpretation and electoral implications [I].

We opened a free text space for opinions of people on the uncertainty visualization, asking "How would you justify your answer?"

3 RESULTS

We received 98 responses from readers who were mostly men (73%), with university studies or higher (62%), and between 20-79 years of age (87%). Two-thirds (67%) found the display of uncertainty useful, while 29 (29%) did not. Self-reported perception of

the three levels in the direct questions tend to polarize into either strongly agree or strongly disagree.

When asking readers about the reasons for their responses, we received a total of 45 comments. We classified them into three categories, those interpretations that are consistent with what can be derived from (Figure 1) are called **"Accurate interpretations"** (13 responses), then those that derail are **"Inaccurate interpretations"** (19 answers), descriptions, comments, suggestions and critiques are classified into **"Supplementary Remarks"** (13).

Accurate Interpretations: Some readers explained the visualization, stating that this is a result of aggregating poll results and that it contains uncertainty (11 responses) [S] with comments such as *"Gives me information on the robustness of the data, which I usually miss in the overall picture of forecasts/survey analyses"* and *"[...]It is clear anyway that there is an area of uncertainty"*. Analysis and Interpretation only had one comment for each. *"Helps to assess, for example, whether the 5% hurdle is likely to be exceeded and, if so, whether it is rather certain or rather shaky"*[A]; and *"I see the fuzziness of the forecasts more clearly. For example, the FDP may or may not be out..."* [I].

Inaccurate Interpretations: These interpretations also occur at the different levels of engagement, for the superficial level [S],10 readers commented on general aspects, mainly about the error allocation or methods, such as how *"[...]distributing deviations of 1% everywhere is clumsy[...]"*, or that *"it would be helpful to compare your own survey with the others"*. For comparisons or differences between estimates [A] (3 answers) readers commented mainly on periods, such as *"you do not know what the reference value is. Previous week, previous day, last election?"* or *"The correct order would be CDU AFD SPD Greens ... so that the conservative majority in the country (55%, and rising) would be honestly represented."*. For the third layer of thought [I], some readers say *"[...]this only creates manipulation and the voter is lazy and does not read the election programmes [...]"* or that the objective is *"To warn against voting for the FDP"*. Others say that parties like the *"AFD, underrepresented, BSW perceived as too low. It distorts voters' perceptions and can degenerate into undecided voters giving their vote to these parties[...]"*

Supplementary Remarks: Superficial comments (2), opinions (6 answers), suggestions (4 answers), and one critique are also included. Readers suggested *"The order of the parties seems arbitrary to me. They should be presented from left to right according to the predicted share of the vote."*, that *"it remains speculative"*, or even *"total rubbish"*.

4 LEARNINGS FROM THE PILOT STUDY

Variation in Interpretations and Reactions: Literature suggests that confidence interval interpretations are not intuitive [8] and even trained researchers can misinterpret confidence intervals and error bars [2]. Our results reflect these challenges: while some readers correctly understood the error bands, others overlooked or misinterpreted them. Beyond cognitive difficulties, there is evidence that opinion poll credibility is subjectively determined, and when results are not aligned with preferences, people are more critical of the results and source [3]. In line with prior work [11, 10], we also find that skepticism toward polls and mistrust of media presentation shape how uncertainty visualizations are received in real-world contexts.

Focus on headline numbers: Commenters engaged more with party percentages and ranking than uncertainty—which is consistent with prior findings that audiences often overlook uncertainty in news graphics [6, 7]. This suggests we should test designs or explanations that actively draw attention to uncertainty, rather than assuming readers will interpret it unaided.

Positive reception: Two-thirds of the respondents found the uncertainty visualization useful, with a subset explicitly valuing the transparent display of uncertainty. This is consistent with literature, indicating that the communication of uncertainty can preserve or even enhance trust [1, 9].

Convenience sample limitations: This pilot study relies on self-selected commenters, not a representative audience. For robust insights, the main study should include diverse readers and control for political orientation, statistical literacy, and pre-existing attitudes toward polling.

5 CONCLUSION

Our pilot study finds that the challenges documented by Witzenberger and Diakopoulos [10]—including audiences' focus on headline numbers, limited engagement with error bars, and interpretations shaped by pre-existing attitudes—also emerge in a real-world news setting. Even when uncertainty was noticed, reader responses clustered at different levels of thought, from basic recognition to comparative analysis to broader electoral interpretation, with frequent misinterpretations at each stage. These results point to the need for clearer, more engaging designs that guide audiences through all levels of understanding while building trust in political reporting.

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