

Risk estimates from an online calculator are more believable and recalled better when expressed as integers.

Witteman, H. O., Zikmund-Fisher, B. J., Waters, E. A., Gavaruzzi, t. & Fagerlin, A. (2011).

Statistics Communication reading group | Lude Rozema



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Online risk calculators

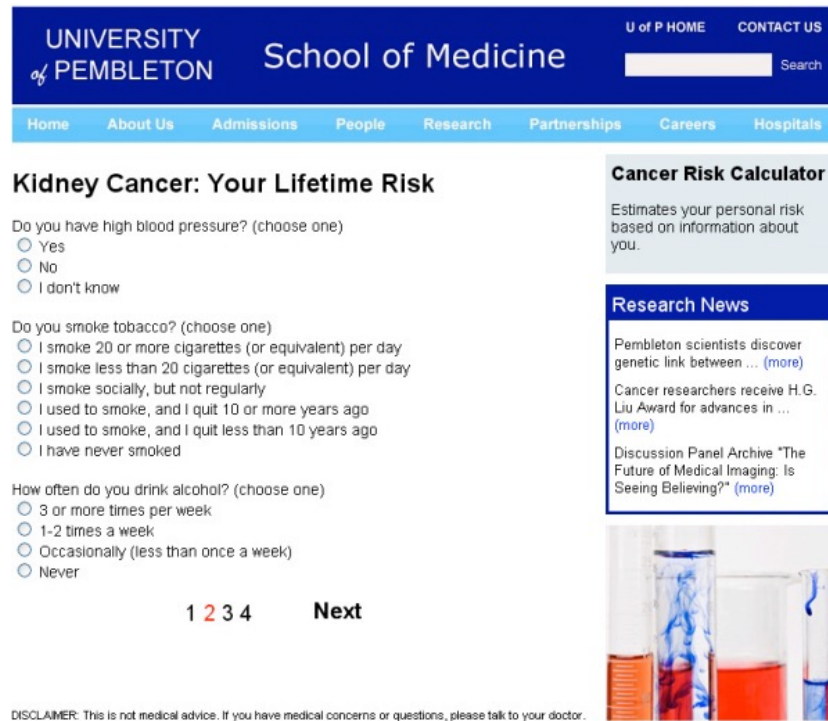
1. HIV, breast cancer, heart attack etc.
2. Plug in some info; sex, height, lifestyle.
3. Out comes a risk (numerical or in words).
4. Focus on numerical risks only.

Precision in numerical risks

1. Numerical risk estimates in calculators come with degree of precision.
2. Precision (e.g. 120 minutes vs. 2 hours) influences how people act on numerical information.
3. Seen in investing, house bidding and choice of consumer products.
4. So the research question put forward is:
What is the influence of precision in numerical risk estimates from online health calculators in terms of believability and perceived magnitude of the risk?

Methods - design

1. Participants were directed to a mock risk calculator on a mock website of a mock (?) university and answered real questions relating to health and lifestyle.
2. Length of survey differed: participants randomly assigned to longer (17 questions) or shorter (11 questions) survey.



The screenshot shows a mock website for the University of Pembleton, School of Medicine. The header includes the university name, a search bar, and navigation links: Home, About Us, Admissions, People, Research, Partnerships, Careers, and Hospitals. The main content area is divided into two columns. The left column features a section titled "Kidney Cancer: Your Lifetime Risk" with three sets of radio button questions: "Do you have high blood pressure?", "Do you smoke tobacco?", and "How often do you drink alcohol?". Below these questions are navigation buttons labeled "1 2 3 4" and "Next". The right column contains a "Cancer Risk Calculator" section with a brief description and a "Research News" section with two news items. At the bottom left, a disclaimer reads: "DISCLAIMER: This is not medical advice. If you have medical concerns or questions, please talk to your doctor."



Methods - design

1. Participants randomly assigned to **falling** or **rising** condition and random precision:
Integer of 2%
One decimal place of **1.9%** or **2.1%**
Two decimal places of **1.87%** or **2.13%**
Three decimal places of **1.867%** or **2.133%**
2. Shown random risk and rate its believability, magnitude and applicability (Not at all - Extremely) of 6 adjectives: accurate, precise, exact, likely to be wrong, scientific and uncertain.
3. Second mock website; do it all again and randomly receive a remaining, different risk from the respective **falling** or **rising** condition. Compare first and second risk on everything but perceived magnitude.
4. Demographic variables and a cross-randomised survey on colon cancer. Afterwards, recall both risk estimates. Exact or approximate (within 50% of actual risk). Both 0-1.

Methods - analyses

1. MANOVA on believability and perceived magnitude with precision, direction and length of questionnaire as independent variables.
2. MANOVA on secondary outcome variables with the same independent variables.
3. Repeated measures logistic regression of recall on number of decimals.
4. Binomial tests for differences in assessment of first and second risk estimate for each primary and secondary outcome measure.

Results (1)

1. $N = 3422$, approximately representative of US population.
2. Integer risk estimates yielded highest believability (4.35/6), although small effect (partial eta-squared of 0.003). Decreased slightly with additional precision.
3. Larger precision or smaller survey yields larger perceived risk magnitude (partial eta-squared of 0.004 and 0.002, resp.).
4. Direction of values (falling or rising) had no effect on magnitude or believability.
5. Unclear effect of secondary outcomes.
One decimal point was least uncertain, longer survey yielded higher accuracy ratings.

Results (2)

1. First and second risk largely perceived equal.
Exception: estimates with fewer decimals as more believable, less accurate, less precise, less exact, less scientific and more uncertain.
2. Recall decreased as precision increased, both for exact and approximate recall.

Conclusion

1. Differences in precision can result in different interpretation and recall.
2. Less precision, more believability. Integers just easier?
3. Less precision, smaller perceived risk. Less numbers, less risk?
4. Less precision, better recall, even approximately.

Limitations apply; other risks, no prior expectations, small effects, black box results due to little effect in secondary outcomes.

Conclusion - some thoughts for discussion

1. How could this experiment be improved?
2. How does it relate to things that we already know in this group?
3. How serious should we take these effects given the very small effect sizes?
4. Could the advise of rounding to the nearest integer be of use in clinical practice?

Thank you for your attention!



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