

Kaleidoscope

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The number of foodbanks in the UK has increased dramatically over the past few years. So, it's timely to read the work by Paquin et al¹ on the longer-term impact of childhood food insecurities. Over 2000 Canadian infants, part of a longitudinal cohort study, were followed up to the age of 15. This included determining whether anyone had experienced hunger because the family had run out of food, or money to buy food, in the previous year. The general prevalence of household food insecurity was 8%. Those at *high risk* – defined as having a stable, approximately 50% probability of experiencing this at every age evaluated – accounted for almost 4% of the total sample. These individuals were more likely to live in single-parent, low-education and low-income families, with more siblings and higher rates of parental depression. Even after adjusting for these confounders, these children had higher rates of cannabis use, peer bullying and school dropout. The authors propose that familial dynamics may be a contributor to this, for example, through higher rates of parental stress, intimate partner violence and child maltreatment that affect how children learn to deal with adversity. They conclude that food insecurity can be identified relatively easily, and interventions are eminently viable. In the UK, the cost of living increase last year was the highest rate in a decade, and energy cost projections for the coming years are well above those of previous years. This study warns of the consequences of financial insecurity on increasing adversity and poorer functioning in young people

'Long and wasted years' is a refrain from Bob Dylan on loneliness and loss; smoking can sometimes be seen as mitigating this through being 'pro-social', with monochrome images of people sharing a cigarette outside a bar or restaurant. This has now been tested more formally,² as part of the English Longitudinal Study of Aging. Almost 9000 individuals were followed up over 12 years. At baseline, smokers were more likely to be lonely, having fewer social interactions with family and friends, and less involvement with the wider community and cultural activities. Over time, this association *increased* in magnitude, with greater social disengagement and loneliness. Interestingly, this was independent of all confounders such as age, sex, social class, and any concomitant physical or mental illness, rebutting the infamous comments in 2004 by the then Health Secretary, John Reid: 'What enjoyment does a 21-year-old single mother of three living in a council sink estate get? The only enjoyment sometimes they have is to have a cigarette'. His pejorative stereotyping is inaccurate, but there was, perhaps, some truth in a broader concept of smoking isolation. Indeed, societal and legislative changes over the past decade mean that smoking is increasingly perceived as anti-social in nature, something the authors suggest might perpetuate and amplify the sense of isolation in those who persist.

'She walks in beauty, like the night' wrote Lord Byron; we're all susceptible to having our heads turned by an attractive figure in an academic paper. The graphical presentation of big data has become more accessible in an age of sophisticated software capable of generating multiple visualisations. In a contrary view, Edward Tufte wrote 'Cosmetic decoration, which frequently distorts the data, will never salvage an underlying lack of content'. What impact does aesthetic presentation have on people's trust in the underlying data? Lin and Thornton³ sampled over 400 graphical

presentations of data from social media and academic journals, which participants rated on six properties (including 'How visually appealing is the graph' and 'How much do you trust the graph'). They found strong correlations between 'beauty' and trust responses, suggesting that the more attractive the graph, the more people trust the result it conveys. In a sub-analysis of graphs, the most attractive also had higher numbers of citations – even after adjusting for ratings of understandability, interest and surprise. Finally, using a single data-set, Lin and Thornton produced a number of different visualisations, orthogonally controlling for aesthetics (beautiful, ugly) and misleading visualisations (e.g. truncating axes or scales, using inappropriate or misleading colour scales). More attractive graphs were positively associated with higher trust but, surprisingly, the misleading visualisations did not negatively affect trust. Interestingly, significant factors including education, topic area (health, science, politics or entertainment), political affiliation and personality traits of participants did not eliminate the effect of perceived beauty on reported trust in the graph. Just a warning that because it looks good, doesn't make it right.

Continuing the theme of the superficial, we're reminded that it's not size that counts, but what you do with it that matters. The so-called 'big data paradox' arises from large-sample asymptotics: the mathematical principle that a statistical method can be justified by understanding its behaviour as the number of observations approaches infinity. For example, in a fair-coin flipping experiment, we would expect the probability of heads and tails to be equal at 1/2. Taking only three samples, we might find that the probability of heads is 2/3 whereas that of tails is 1/3. However, the law of large numbers tells us that the observed average probability of heads/tails asymptotically approaches the expected probability of 1/2 as N increases. Does this principle generalise, so that the bigger the data, the more we can trust the statistical inference? No: 'big' does not equate to 'quality'; a large, unrepresentative sample will provide poorer inferences about a population than a small, highly representative sample. An attempt to test this has been made by Bradley et al⁴ through defining a formal measure that links data quantity, quality and problem difficulty, applied to Covid vaccine uptake in US adults. They compared a well-designed household survey of around 1000 people per week, to two much larger opportunistic surveys from Delphi-Facebook (250 000 people per week) and Census Household Pulse (75 000 people every 2 weeks). The latter two had consistently small uncertainty estimates but, compared with actual CDC data on vaccine uptake, overestimated uptake by 17 and 14 percentage points, respectively. By contrast, the well-designed but much smaller household survey tracked the CDC data reliably. Bradley et al show that for estimating average population vaccine uptake, the Delphi-Facebook sample (comprising 250 000 respondents) performed no better than 10 random, well-sampled respondents. They conclude with a useful rubric: 'large sample sizes magnify the effect of seemingly small defects in data collection, which leads to overconfidence in incorrect inferences'.

Finally, we explore placebo – specifically, DAT's the power of expectation. As with most pharmacological trials across all medical specialties, the placebo effect is a recognised contributor to the clinical improvements seen with antidepressant medications such as selective serotonin reuptake inhibitors (SSRIs), although the magnitude and mechanism remains unclear. Inherent in the name, serotonin transporter (SERT) blockade is credited as the critical therapeutic target of SSRIs, but neuroimaging studies suggest a key role for the dopamine transporter (DAT), in line with their reciprocal influence on one another. Hjorth et al⁵ investigated the

effects of placebo on SERT and DAT following treatment with an SSRI, escitalopram, for individuals with social anxiety disorder (SAD). A 9 week treatment regimen of escitalopram was initiated for all participants, with half believing they were receiving an active treatment effective for SAD and the other half believing they were given an active placebo that would induce the side-effects of the SSRI without any therapeutic effects. Overt expectation of effectiveness led to a fourfold increase in response over those told to expect the active placebo, despite similar serum concentrations. This was not explained by SERT binding, which showed no difference between the groups before or after treatment, when all averaged 78% occupancy. However, there were significant DAT differences between the groups, with lower DAT binding in the striatum and thalamus corresponding to the symptom improvement seen in the overt group. These results indicate that DAT mediates the impact of psychological expectancy on treatment success. In line with the molecular data showing a delay between SERT binding and clinical effects, SERT blockade alone may be insufficient for response, although it may be a prerequisite. The importance of interactions between serotonin and dopamine, and the

psychological effects of expectation on dopaminergic neurotransmission, are intriguing enough to warrant further investigation.

References

- 1 Paquin V, Muckle G, Bolanis D, Courtemanche Y, Castellanos-Ryan N, Boivin M, et al. Longitudinal trajectories of food insecurity in childhood and their associations with mental health and functioning in adolescence. *JAMA Netw Open* 2021; **4**(12): e2140085.
- 2 Philip KEJ, Bu F, Polkey MI, Brown J, Steptoe A, Hopkinson NS, et al. Relationship of smoking with current and future social isolation and loneliness: 12-year follow-up of older adults in England. *Lancet Reg Health Eur* 2022; **14**: 100302.
- 3 Lin C, Thornton MA. Fooled by beautiful data: visualization aesthetics bias trust in science, news, and social media. *PsyArXiv* [Preprint] 2021. Available from: <https://psyarxiv.com/dnr9s/>.
- 4 Bradley VC, Kuriwaki S, Isakov M, Sejdinovic D, Meng X-L, Flaxman S. Unrepresentative big surveys significantly overestimated US vaccine uptake. *Nature* 2021; **600**(7890): 695–700. doi: 10.1038/s41586-021-04198-4
- 5 Hjorth OR, Frick A, Gingnell M, Hoppe JM, Faria V, Hultberg S, et al. Expectancy effects on serotonin and dopamine transporters during SSRI treatment of social anxiety disorder: a randomized clinical trial. *Transl Psychiatry* 2021; **11**(1): 559.