THE IDEA

Cumulative cultural evolution creates excellent solutions to many of life's problems. Hunting tools, stitched clothing, protective shelters and agricultural techniques show a gradual ratcheting up in complexity, efficiency and utility (Richerson and Boyd 2005). But in another domains of life the process of cultural evolution rarely leads to adaptive behavior. Most notably, traditional, alternative and historical medical treatments are typically ineffective and often harmful (Wootton 2006).

So why do harmful or neutral treatments achieve cultural success? The outcome of a disease is determined by many factors, and so when a treatment is applied there will be a distribution of outcomes: some people will get better and some people will get worse. If the people with better outcomes are more inclined to share their experience with others, then a treatment may retain a positive reputation despite a negative effect. If this is the case, the reputation of medical treatments will be more positive than the clinical evidence warrants.

THE DATA

We tested this idea using diet books. 1,360 people had reviewed the Atkins diet book on amazon.com, and 540 of these state both an exact weight change and a time period over which this change happened (e.g. "OMG I lost 20lb in 3 months - this diet is fantastic"). These reviews allow an estimation of the diets real-world reputation. Four clinical trials have examined weight change on the Atkins diet or similar and recorded weight change at multiple time points. Despite somewhat different interventions and samples, these studies show a consistent pattern of moderate loss. Fig 2 plots weight loss at each time period and shows that the average weight loss reported in amazon.com reviews of the Atkins diet are consistently larger than seen in clinical trials.

Gardner et al. 2007 shared individual level data from their clinical trial of 311 women, including 77 on the Atkins diet. The intervention entailed getting the Atkins Diet Book plus 8 weekly meetings with a dietician to discuss the book and progress. Weight change was significantly larger in the amazon.com reviews than in the clinical trial (ps << .01). At 6 months, 27% of clinical trial participants and 88% of amazon.com reviewers experienced weight loss of 10kg or more. Larger variance in clinical outcome was associated with a larger bias.

Biased reporting will influence cultural evolution to the extent that the reputation influences subsequent decisions. We performed an online experiment where each participant saw a picture of The Atkins Diet book plus three reviews, and The 17-day Diet plus three reviews. In one condition the Atkins book reviews were “debiased” by (a) drawing reviews from a sample of reviews with an average of 3.5 stars (this is the average satisfaction rating given to diets in a longitudinal study by Baldwin et al. 2009) and (b) changing the weight change to the mean weight change at that time point as measured in clinical trials. In the other other condition, the 17-day Diet was debiased using the same procedure. Order of diet presentation was counterbalanced. Fig 4 shows that participants were significantly less likely to pick the debiased diet.

THE IMPLICATIONS

The online reputed benefit of weight-loss diets is larger than its real effect, most likely because people with typical or poorer outcomes are less likely to tell others about their experiences. Thus the real-world reputation of medical treatments may be subject to a publication bias akin to that seen in science (Easterbrook et al. 1991). This kind of bias is more likely to operate when: (a) treatment depends on word-of-mouth reputation (b) treated individuals with poor distribution can remain "invisible", and (c) outcomes are a function of many factors, i.e. there is a broad distribution of outcomes. When this is the case, ineffective or even harmful treatments may maintain a positive reputation. This may partly explain the persistence and prevalence of bad medicine.