

### **Flaws undermine results of UK biotech debate**

Sir - The GM Nation? report released in the United Kingdom last month (see Nature 425, 331; 2003)

concluded that the general public is overwhelmingly against genetic-modification (GM) technology, with feelings ranging from "suspicion and scepticism, to hostility and rejection".

The study cost £500,000 (US\$830,000). Unfortunately, this was not money well spent. The methodology was so badly flawed that the data not only failed to support the authors' conclusions, but undermined them.

The main fault with the study, as the authors concede, is the self-selected nature of the main sample. About 36,000 people took part in an "open debate": half of these responses came by mail and half from the GM Nation? website (<<http://www.gmnation.org.uk>>). This sample is certainly large, but it is not random. It is in fact most likely to attract those who have strong opinions about GM. One might think that the sheer size of the sample swamps any problems with its self-selected nature, but for that to be the case you would need millions of participants.

Although the authors of the report were aware of this criticism, they offered only two countermeasures. First, they checked a random sample of responses to see if there were any standardized ones being sent in by activist groups, which there weren't. But people with strong views on GM are capable of expressing their own opinions, and this measure does nothing to prevent the sample being biased in favour of them.

Second, they commissioned a 'narrow-but-deep' study from another company, "as a control on the self-selecting participants in the open debate", to see if there was a "silent majority" with different views. This meant asking 78 people 13 questions from the open debate. This sample was randomly chosen - although the report is short on specific details - and stratified so that it roughly matched the general population. (This group was also re-tested after 2 weeks of group discussion and personal research to see if their attitudes to GM changed.)

The authors of the narrow-but-deep section conceded that their results were not statistically robust, because of the small numbers involved.

Nevertheless, they said: "We believe it is an accurate reflection of the general public." The initial responses of the random group were, however, noticeably different from the results of the open debate. (Even after 2 weeks, the differences, although not as large, remained significant.) Yet the GM Nation? report claimed that, apart from some minor differences, the two groups agreed. The general public, said the authors, is not "a completely different audience with different values and attitudes from an unrepresentative activist minority".

The actual results from the two groups were buried within the supporting documents, far apart from each other. Once these results are compared side-by-side, startling differences emerge for more than half of the questions used

(visit <<http://www.nottingham.ac.uk/philosophy/staff/Campbell/Table1.htm>>

for a full comparison).

For example, to the question "I would be happy to eat GM food", only 8% of the open-debate respondents agreed, compared with 35% for the random group. On the topic of whether GM was unnatural, 84% thought so in the open debate, but only 37% did in the random group.

We find it astonishing that the obvious mismatch between the random group and the open-debate group was not discussed anywhere in the report, and that it did not prevent this report being released and becoming headline news.

With £500,000, a larger version of the narrow-but-deep study could have been conducted, avoiding the problem of self-selection. As well as using a 'topic blind' recruitment strategy, questions about GM food would ideally be embedded among questions about other current concerns, so that the participants would be unaware that GM food was the focus of the research. Also, the sort of vague and leading questions used by GM Nation? should be avoided. Only then could we be confident that the findings are reliable and realistic.

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**Some analysis of *the GM Nation?* report  
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**Table 1**

***GM Nation?* data comparison of Open Debate group  
(N=36,557) vs (initial testing of) Narrow-But-Deep  
group (N=78) (% agreeing and disagreeing with  
questions)**

Note: "Dont Know/Unsure" answers have been left out. The large differences shown here are reason enough to discard the Open Debate data.

Note that for question 7, the *GM Nation?* report messes up the results. What we use is what we think are what they meant.

Also, the detailed breakdown of results from question 10 onwards are missing from the report, but overall agreement/disagreement figures were still available.

Note that many of the questions are leading questions. Consider question 2, "I am concerned about the potential negative impact of GM crops on the environment". This should have been "I think the impact of GM crops on the environment will be..." with a seven point scale from good-to-bad to be filled in. Also, the vagueness of some questions makes them leading. Consider question 8, "I don't think we know enough about the long term effects of GM food on our health". We'd all like to know more about the effects of GM on our health, no matter how much we already know. Because this question doesn't set any specific limits, it's hard to say "No" to it - who wants to ever declare that they know everything that there is to know about a topic? Also, what's the context? Is what is being asked whether we know enough about the effects in order to justify eating GM food? If so, that should have been specified.

	<b>Agree</b>			<b>Disagree</b>		
<b>Question</b>	<b>Open Debate group</b>	<b>Narrow-But-Deep group (initial test)</b>	<b>Difference</b>	<b>Open Debate group</b>	<b>Narrow-but-Deep group (initial test)</b>	<b>Difference</b>
1) <b>Cheaper food</b> (I believe GM crops could help provide cheaper food for consumers in the UK)	14%	43%	29%	70%	14%	56%
2) <b>Negative environment</b> (I am concerned about the potential negative impact of GM crops on the environment)	91%	57%	34%	7%	14%	7%
3) <b>Help British Farmers</b> (I believe that GM crops could improve	9%	40%	31%	79%	23%	56%

the prospects of British farmers by helping them to compete with farmers around the world)						
4) <b>Profit driven</b> (I am worried that this new technology is being driven more by profit than by the public interest)	93%	69%	24%	6%	9%	3%
5) <b>Happy eaters</b> (I would be happy to eat GM food)	8%	36%	28%	86%	35%	51%
6) <b>Lowers pesticides</b> (I think that some GM crops could benefit the environment by using less pesticides and chemical fertilisers than traditional crops)	14%	54%	40%	71%	12%	59%
7) <b>Producers benefit</b> (I think that GM crops would mainly benefit the producers, and not ordinary people)	85%	56%	29%	8%	24%	16%
8) <b>Not know enough about health</b> (I don't	93%	80%	13%	5%	7%	2%

think we know enough about the long term effects of GM food on our health)						
9) <b>Medical benefits</b> (I believe that some non-food GM crops could have useful medical benefits)	23%	32%	9%	41%	12%	29%
10) <b>Regulated carefully</b> (I am confident that the development of GM crops is being carefully regulated)	7%	21%	14%	87%	44%	43%
11) <b>Contamination risk</b> (I am worried that if GM crops are introduced it will be difficult to ensure that other crops are GM free)	93%	64%	29%	5%	17%	12%
12) <b>Unacceptable interfere nature</b> (I feel that GM interferes with nature in an unacceptable way)	84%	37%	47%	10%	29%	19%
13) <b>Help developing countries</b> (I	13%	50%	37%	75%	18%	57%

believe that GM crops could benefit people in developing countries)						
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**Table 2**

**GM Nation? data comparison of Open Debate group (N=36,557) vs (re-tested) Narrow-But-Deep group (N=78) (% agreeing and disagreeing with questions)**

We think the results of the re-testing of the Narrow-but-Deep group after two weeks have no scientific credibility - the internal dynamics of a group is notoriously difficult to handle, and it really requires at the very least its own control group. In addition, such results cannot be said to be in any way a control on the Open Debate, as the circumstances are completely different. For that reason, only the initial testing of the Narrow-but-Deep group is an adequate control on the Open Debate group. But in case there is someone who still insists that the results from re-testing - and only these results, not the initial results - should be regarded as an adequate control for the Open Debate group, we present these results to show that large enough differences exist even here to warrant discarding of the Open Debate group.

Note that the detailed breakdown of results from question 9 and 10 onwards for the re-testing are missing from the report, but overall agreement/disagreement figures were still available

	Agree			Disagree		
Question	Open Debate group	Narrow-But-Deep group (re-test)	Difference	Open Debate group	Narrow-but-Deep group (re-test)	Difference
1) Cheaper food (I believe GM crops could help	14%	60%	46%	70%	24%	46%

provide cheaper food for consumers in the UK)						
2) <b>Negative environment</b> (I am concerned about the potential negative impact of GM crops on the environment)	91%	85%	6%	7%	12%	5%
3) <b>Help British Farmers</b> (I believe that GM crops could improve the prospects of British farmers by helping them to compete with farmers around the world)	9%	47%	38%	79%	39%	40%
4) <b>Profit driven</b> (I am worried that this new technology is being driven more by profit than by the public interest)	93%	88%	5%	6%	9%	3%
5) <b>Happy eaters</b> (I would be happy to eat GM food)	8%	26%	18%	86%	59%	27%
6) <b>Lowers pesticides</b> (I think that some GM crops could benefit the	14%	53%	39%	71%	29%	42%

environment by using less pesticides and chemical fertilisers than traditional crops)						
7) <b>Producers benefit</b> (I think that GM crops would mainly benefit the producers, and not ordinary people)	85%	77%	8%	8%	11%	3%
8) <b>Not know enough about health</b> (I don't think we know enough about the long term effects of GM food on our health)	93%	96%	3%	5%	1%	4%
9) <b>Medical benefits</b> (I believe that some non-food GM crops could have useful medical benefits)	23%	60%	37%	41%	16%	25%
10) <b>Regulated carefully</b> (I am confident that the development of GM crops is being carefully regulated)	7%	18%	11%	87%	61%	26%
11) <b>Contamination risk</b> (I am worried that if	93%	79%	14%	5%	15%	10%

GM crops are introduced it will be difficult to ensure that other crops are GM free)						
12) <b>Unacceptable interfere nature</b> (I feel that GM interferes with nature in an unacceptable way)	84%	66%	18%	10%	20%	10%
13) <b>Help developing countries</b> (I believe that GM crops could benefit people in developing countries)	13%	63%	50%	75%	28%	47%

**Some further comments:**

The authors of the Narrow-but-Deep survey said that the data from their survey were to be taken qualitatively rather than quantitatively (p. 19). However, this makes no sense. Unless the data can be taken quantitatively, there is no reason to pay any attention to the results of the 13 questions, of which much is made in both reports. (Anyway, in no way can the results be said to support the Open Debate group results, as was claimed in the report.)

What they mean, we presume, is that one cannot just automatically extrapolate to the general population from such a small sample. This is true, but it does not mean that the results have no quantitative significance. Besides, these random results have far more statistical significance than the self-selecting Open Debate results.