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Symposium on 'The challenge of translating nutrition research into public health nutrition'

Session 5: Nutrition communication
The role of trust in health communication and the effect of conflicts of interest among scientists

Katherine A. McComas
Cornell University, Department of Communication, 313 Kennedy Hall, Ithaca, New York 14853, USA

One of the key challenges facing efforts to translate nutrition research into public health recommendations is understanding how the public will respond to these efforts, including whether they will trust the information. Among factors that influence trust in health communication is the extent to which the sources of the information are considered accurate, balanced, fair and unbiased. In relation to bias, few issues rise to as high a level of concern as the suspicion of conflicts of interest among scientists. Sometimes, even the perception of conflict of interest is enough to cast doubt on the integrity of the research and credibility of the results. The present paper provides an overview of research on conflicts of interest in science, including ways in which it has touched the field of nutrition. It then offers data on public views about conflicts of interest in science, including the extent to which funding sources influence trustworthiness of the research. The conclusions suggest implications for translational research in nutrition.

Health communication: Trust: Conflicts of interest

When considering the challenges of translating nutrition research into public health recommendations, the question of whether the public will trust the information looms large. In this context, few issues rise to as high a level of concern as the spectre of conflicts of interest among scientists[1–5]. A conflict of interest is generally understood to exist when an individual has a potential stake in the outcome of a decision and also the means to influence the outcome. These stakes can be many and varied, including financial, personal, professional and intellectual[6]. Perhaps the most visible conflicts of interest in science arise as a result of financial arrangements, such as when scientists accept funding or other gifts from an organization. Problems arise when this arrangement may somehow influence the behaviour of that scientist; i.e. would he or she behave differently if they were independent of such a relationship[5].

In recent years there has been rising concern and increasing awareness of the potential for conflicts of interest to damage the credibility of scientific results, including those in nutrition[7]. Some of this attention has prompted research exposing efforts by funding organizations to influence scientific results. For example, studies have examined how the tobacco industry has sought to promote its agenda through funding relationships[8] and how pharmaceutical corporations have used financial ties to influence drug trial outcomes[9]. Other research and commentary have focused on the financial relationships that could or might give rise to real or potential bias in food policy decisions[10–13]. Finally, studies have uncovered the real or apparent consequences of financial conflicts on the outcomes of science and scientists' behaviours[5,14,15].

Despite the concerns about how conflicts of interest in science may affect the public's trust, less attention has been paid to examining public attitudes about conflicts of interest in science. Although there is good reason to believe that real or perceived conflicts of interest would have a strong relationship with trust, there appears to have

Corresponding author: Dr Katherine McComas, fax +1 607 254 1322, email kam19@cornell.edu

been no systematic scientific inquiry that has explored this proposition. Using data collected from 1306 individuals, the present paper will seek to augment the knowledge of public views on conflicts of interest in science. In order to put the discussion within a broader context of translational research in nutrition, an overview of research examining trust in health communication will be given. Next, the literature examining conflicts of interest in science, including studies in nutrition research, will be briefly summarized. Subsequent discussion will include public opinion data that provide some evidence about the extent to which funding sources influence the perceived trustworthiness of scientists. The conclusions will suggest implications for translational research in nutrition.

Background

Trust in health communication

Scholars and practitioners alike have long known that effective health communication entails more than the simple transmission of information from a source to a receiver. The many factors that can influence message reception include the context of the communication, attitudes of the receiver, the complexity of the message and the characteristics of the source[16]. Among these factors, one of the most influential is the extent to which the intended audience perceives the message source as trustworthy[17].

Most of the research in communication, stemming from early psychological research at Yale University in the 1950s, has examined trustworthiness as a component of credibility[18]. In addition to trustworthiness, researchers have sought to uncover other factors or components of credibility, such as expertise[17], competence and dynamism[19] and objectivity[20]. In the 1970s and 1980s, amidst growing distrust of mass media, communication researchers turned to examining media credibility[21,22], producing additional scales that included an effort to develop a cross-validated measure[23]. In particular, compelling evidence has been provided[23] for the use of Meyer's five-item 'believability' scale[22], which has proved useful in recent health-risk communication work[24–26]. This scale measures credibility as a factor of openness, accuracy, fairness, bias and trustworthiness.

In the 1990s scholars in risk communication added more components to the growing list, including competency, caring, consistency, predictability, knowledge, commitment to a goal and faith in the source's good will[27–30]. The wealth of research offers scholars many methods for measuring trust and credibility. Arguably, the drawback of this proliferation of measures is inconsistency among studies in the conceptualization and measurement of trust, which can hinder the transfer of knowledge from one field to the next. In addition, as scholars have pointed out, some factors may prove more important than others in different circumstances[31].

An important consideration is that audiences base their evaluations on the perception of credibility or trustworthiness. Although such perceptions may align with a 'true' score of credibility or trustworthiness (should something like that exist), they also may not, which is often a hard lesson to learn. Rather than carefully considering the content of the message or the qualities of the source, audiences will sometimes judge the trustworthiness of a source on previous experiences with the source or others having similar characteristics[18]. Seminal research on judgment and decision making has explored human tendencies to use so-called cognitive shortcuts, such as the availability and representative heuristics, to form opinions[32].

The context or topic of the communication can also affect its effectiveness. Of particular relevance to the present paper is research examining how vested interests can influence source credibility. In this context, studies have found that sources perceived as having 'hidden agendas' or vested interests in the outcome are less credible[33,34]. On the other hand, sources perceived as arguing against their interests or contradicting a negative stereotype can be especially persuasive or trustworthy[18,28].

Finally, in addition to examining individual trust in specific sources, recent research has examined the issue of social trust, or the extent to which individuals place their trust in institutions responsible for managing health risks[35]. A compelling line of inquiry emerging from this area has examined the role of perceived shared values in judgments of trust, showing that individuals tend to trust sources more when they believe they share similar values[36,37].

Defining 'conflict of interest'

At this point, it is helpful to establish a general definition of conflict of interest. In an overview of the topic, it has been explained that a conflict of interest arises when (1) an individual or party has a relationship with another individual or party that requires the former to make a judgment on behalf of the latter, and (2) the individual or party in the former position has a special interest that could result in a different judgment than if that interest did not exist[38]. One example of a conflict of interest in science would be if a scientist were to sit on a government panel to review a grant proposal for funding and had submitted their own proposal to the competition. Another example might be a dietitian who recommends that a patient purchase dietary supplements of which the dietitian is the distributor. The dietitian would be in a state of conflict. In the case of both the grant reviewer and the dietitian, their recommendation might be without bias; however, there exists a greater potential for bias as a result of the financial interest in receiving the grant or profiting from sales of the supplement[12].

Conflict of interest and bias are terms that are often used synonymously, although their meanings are different. Whereas bias implies an existence of prejudice, conflict of interest merely suggests the tendency toward prejudice[38]. There has been some question as to whether individuals understand that simply stating that someone has a conflict of interest does not mean that they have behaved unethically[3,39]. Certainly, even the presence of the conflict can increase uncertainty about the neutrality of a process and undermine the individual's confidence in the ability to receive a fair outcome. Still, the perception of conflict of interest may exist without any evidence of real or potential conflict of interest, which can be frustrating to scientists whose reputations may suffer or whose results may be tainted. Given the problems that can arise from perceptions of conflict of interest or false accusations of bias, some researchers have wondered whether it could portend a new McCarthyism in science[40].

As noted earlier, being in a state of conflict does not mean that someone has behaved unethically; however, depending on how the conflict is managed, it can lead to obvious or latent problems at a later stage. In particular, three scenarios have been outlined in which conflicts of interest become cause for concern[38]. In the first scenario the individual or party with the conflict is ignorant or unaware of the conflict and consequently takes inadequate measures to reduce the conflict's real or potential influence. In the second scenario the individual or party is aware of the conflict but does not disclose it. In addition to behaving unethically by most standards, the individual or party also does nothing to manage or neutralize the conflict. In the third scenario the individual or party discloses the conflict but still participates in the decision-making process. Although greatly preferable to non-disclosure, full disclosure of conflicts of interest and transparency of the process still does not remove the potential for bias to occur[14,41]. Moreover, it can still harm the perceived integrity of the process if individuals disagree with the decision to allow the conflicted individual to participate and perceive any resulting decision as tainted.

Managing conflicts of interest: increasing vigilance or increasing conflicts, or both?

In an era of decreasing government funding for research and increasing industrial funding, most researchers recognize the need to find appropriate and defensible processes for managing real or potential conflicts of interests among scientists[42]. One remedy that has achieved wide support is increased disclosure of conflicts of interest. For example, the peer-reviewed literature, following on the heels of the International Committee of Medical Journal Editors[6], has witnessed increasing requirements that contributing authors disclose financial interests in the results of their research. Recently, this discussion has been taken up in the nutrition literature[43,44].

Transparency may not however be enough to reduce bias. Research has found that results may be biased by funding sources even when financial interests are fully disclosed. In a study of authors' relationships with the food and beverage industry and their positions on the fat substitute olestra the journal articles on olestra over a 3-year period were coded as supportive, neutral or critical of the product[41]. Questionnaires were then sent to the authors of the articles to ask about any financial relationship with Proctor & Gamble, the manufacturer of olestra. The results show that 80% of the supportive authors had at least one financial relationship with Proctor & Gamble compared with 21% of neutral authors and 11% of critical authors. Further, 96% of supportive authors reported at least one financial relationship with the food and beverage industry. Another study has examined the influence of sponsorship and the conclusions of articles about soft drinks, juice and milk[14]. This study has also found that articles with industry funding are more likely to report favourable conclusions about the sponsor's product.

Research such as the two previously-mentioned studies, among others[8,9,45], poses the question of whether scientists can take industrial funding and still remain unbiased. These articles suggest that a lack of disclosure of financial interests is not the issue but rather how bias can result even with full disclosure. As for possible remedies, some suggest the possibility of researchers taking less commercial funding with a corollary need for non-commercial sources to increase their support for nutrition research[14,41].

Public perceptions of conflicts of interest in science

Despite the attention paid to the existence and consequences of conflicts of interest in the scholarly literature, less is known about how the public feels about conflicts of interest in science. Arguably, they are less exposed to the issue given that most members of the public are not as avid readers of the scientific literature as they are consumers of the popular press. Indeed, research consistently shows that individuals tend to receive their information about science from television, followed closely by the internet[46]. In comparison with the attention that the scientific literature has given to conflicts of interest in science the popular press has provided relatively less coverage. One study has examined >1000 scientific stories published in newspapers in 2004 and 2005 and has found that journalists typically do not report financial conflicts of interest information that are disclosed in scholarly journals[47]. Other research has raised similar concerns about the under-reporting of financial ties in media reports of scientific studies[48].

Mass media do, however, serve an important watchdog function in relation to conflicts of interest in science. A casual internet search of articles containing the search terms 'conflicts of interest' and 'science' reveals a steady stream of articles highlighting or uncovering real or apparent conflicts of interest. One study has found that when conflicts of interest are discussed in the mass media they are typically cast in a negative light[49].

The effect of this coverage on public views about conflicts of interest in science is however less known. Some research has examined the extent to which individuals are willing to tolerate real or potential conflicts of interest among US Food and Drug Administration advisory committee members. This research has found that individuals are more willing to accept real or potential conflicts of interest when they believe that there are fair procedures in place to ensure that conflicts are appropriately managed[50].

Research questions

To summarize, the present review suggests a growing attention to the consequences and management of conflicts of interest in science in efforts to maintain the integrity of science and the public's trust. What is less understood is how the public understands conflicts of interest in science. Arguably, the success of translational research hinges on effective communication; therefore, understanding how conflicts of interest may influence trust in science is paramount to efforts to improve the process of communication. To this end, the present study poses a basic research question that explores public opinion about conflicts of interest in science and how these conflicts of interest relate to the perceived trustworthiness of scientists.

The study goes one step further to examine how scientists' management of conflicts of interest relates to the public's satisfaction with science. Satisfaction is one of several outcome measures associated with effective communication, but it provides an important gauge of support for science. It also has a logical connection to trust and, by extension, conflicts of interest. Briefly, communication research tends to conceptualize satisfaction as related to needs gratification, expectation fulfilment, equivocality reduction or constraint reinforcement[51]. One concept of equivocality reduction in particular argues that satisfaction increases as uncertainty or equivocality decrease[52]. In this line of reasoning, it can be imagined that individuals' opinions about conflicts of interest, which are said to increase uncertainty, could influence their satisfaction with science. Thus, the second research question explores the relationship between attitudes toward conflicts of interest in science and satisfaction with science.

Methods

Postal survey

To examine the research questions, a postal survey was used to collect data from randomly-selected adult residents in two neighbouring counties in New York, USA. These counties were chosen because they host a major research university and its agricultural experiment station, thereby increasing the likelihood that questions about scientists and their research would be salient. The questions related to conflict of interest and trust in scientists were part of a larger study designed to examine public views about science, risk and research in local communities; thus, the questions asked about 'local' research or 'local' scientists to make it easier for respondents to form their responses about scientists with whom they may be familiar.

The survey method followed recommended techniques[53]. In the summer of 2006 introductory letters were sent with the eight-page questionnaire. This mailing was followed 1 week later by a reminder postcard. At 3 weeks after the initial mailing a letter and replacement questionnaire were sent to individuals who had not responded. In total, questionnaires were sent to 5000 potential respondents (2500 per county), and 1306 usable responses were received (722 in the university county and 584 in the research station county). After adjusting for bad addresses and ineligible respondents (e.g. deceased, ill, moved from the area), a 29% response rate was achieved. Although such response rates are not uncommon in general population mail surveys in the USA, higher response rates are usually considered valuable because of the ability to generalize to the wider population or sometimes to achieve more balanced results. The present response rate may reflect a lower interest in, or familiarity with, the topic of the questionnaire (science and technology) and perhaps some difficulty with the questionnaire wording (see later). Thus, it is important to consider that the respondents may be more interested in science and technology than the average community resident. Data were entered into SPSS 16.0 (SPSS Inc. Chicago, IL, USA) for analysis. Table 1 shows data for the key variables.

In terms of the demographic characteristics, the respondents were 64% male, 93% white, had an average age of 56 years and an average household income of between US $50 000 and US $74 999. They were generally well-educated; >80% had attended at least some college or received some post-high school education, with 30% having a bachelor's degree and 34% graduate work. There were some differences between the two counties, with respondents from the university-based community more likely to be older, female, non-white and better educated and to have a higher income than respondents from the neighbouring county. Comparing the demographic results with the US Census Bureau's 2006 American Community Survey of the two counties, the survey over-represents males, the educated and the wealthy in both counties. It also slightly over-represents white respondents in the county that plays host to the university. Data from both counties were combined for analysis.

Measurement

Conflict of interest was measured with four questions using a 1–5 scale in which 1 is 'strongly disagree' and 5 is 'strongly agree'. The questions were: 'Local scientists would keep secret the results of research that might embarrass an organization that sponsored their work', 'Local scientists don't care what the average person thinks about the ethics or morality of their work', 'Local scientists who receive corporate funding cannot be relied on to provide independent advice to decision makers' and 'Most scientists try hard to ensure that their reports are as truthful as possible, even if the results conflict with their financial interests' (reverse coded for analysis). These questions were examined to determine their suitability as a scale and received a Cronbach's α of 0·70. They were subsequently combined to form a single measure of conflict of interest with values from 4 to 19; the resulting mean score was 11·02 (SD 2·63).

Trust in scientists was measured in two ways. First, trustworthiness as comprized of caring and competence was examined; i.e. how much the scientist is perceived to care about the situation and whether the scientist is perceived to have the skills or expertise to address the situation[28,29,54]. Using the same five-point scale, the four questions were: 'Most local scientists cannot be bothered to keep up to date on the skills needed to ensure their research is safe for communities like mine', 'If local scientists really cared about the community, they would do more to protect the public health and the environment', 'Quite a few local scientists don't seem to know how to protect public health and the environment' and 'Scientists in my community understand how to protect public health and the environment from potential risks of their research'. These items were examined for their reliability as a scale (α 0·73) and then combined into one scale with values from 4 to 20; the resulting mean score was 13·80 (SD 2·47).

Table 1. Response for conflict-of-interest, trust and satisfaction variables from a postal survey of randomly-selected adult residents in two neighbouring counties in New York, USA that host a major research university and its agricultural experiment station*

		Score†		Percentage of responders				
Variable	*n*	Mean	SD	Strongly disagree	Disagree	Do not know	Agree	Strongly agree
Conflict of interest								
Local scientists would keep secret the results of research that might embarrass an organization that sponsored their work	1259	2·9	1·0	6·8	24·4	42·3	22·6	3·9
Local scientists don't care what the average person thinks about the ethics or morality of their research	1256	2·5	0·9	10·1	48·5	27·5	12·2	1·8
Local scientists who receive corporate funding cannot be relied upon to provide independent advice to decision-makers	1248	3·0	0·9	3·8	27·2	37·3	27·0	4·7
Most scientists try hard to ensure that their reports are as truthful as possible, even if the results conflict with their financial interests	1252	3·4	0·9	2·3	12·8	33·5	46·9	4·5
Trust 1: caring and competence								
Most local scientists cannot be bothered to keep up to date on the skills needed to ensure their research is safe for communities like mine	1260	2·3	0·9	15·6	42·8	34·8	5·7	1·2
If local scientists really cared about the community, they would do more to protect the public health and the environment	1244	2·9	0·9	5·5	33·6	33·8	24·6	2·4
Quite a few local scientists don't seem to know how to protect public health and the environment	1258	2·5	0·9	10·4	41·3	37·8	9·1	1·4
Scientists in my community understand how to protect public health and the environment from potential risks of their research	1246	3·5	0·7	0·6	6·1	38·7	50·2	4·5
Trust 2: overall trustworthiness								
Local government scientists are trustworthy	1253	3·3	0·8	2·3	10·3	46·0	37·2	4·2
Local university-based scientists are trustworthy	1249	3·6	0·8	1·0	5·4	34·1	50·4	9·1
Local environmental-group scientists are trustworthy	1242	3·4	0·8	2·3	10·4	37·4	44·0	5·9
Locally-based corporate scientists are trustworthy	1251	3·0	0·9	4·4	19·3	49·1	24·9	2·4
Satisfaction with science								
I am satisfied with the scientific research that is going on in my community	1251	3·5	0·7	1·0	6·1	42·9	42·3	7·7
I am satisfied with the procedures in place to manage potential risk to public health and the environment from scientific research in my community	1253	3·3	0·7	1·6	1·01	46·1	38·6	3·6
I would support plans to bring more scientific research to my community	1253	3·8	0·8	1·0	4·9	21·5	55·3	17·2
The scientific research going on in my community is appropriate for the area	1248	3·5	0·8	0·6	3·9	49·4	36·5	9·6

*For details of procedures, see text.
†Scale of 1–5 in which 1 is 'strongly disagree' and 5 is 'strongly agree'.

Table 2. Pearson correlations among conflict-of-interest, trust and satisfaction variables from a postal survey of randomly-selected adult residents in two neighbouring counties in New York, USA that host a major research university and its agricultural experiment station†

	Trust 1: caring and competence		Trust 2: overall scientist trustworthiness		Satisfaction with science	
Variable	Correlation	*n*‡	Correlation	*n*‡	Correlation	*n*‡
Conflict of interest	−0·63*	1185	−0·62*	1182	−0·56*	1198
Trust 1: caring and competence			0·55*	1175	0·62*	1184
Trust 2: overall scientist trustworthiness					0·55*	1180

**P*<0·01 (two-tailed).
†Pair-wise deletion of missing values. For details of procedures, see text.
‡No. of respondents.

Items were recoded so that higher scores indicated a greater belief in scientists' competence and care, i.e. greater trust.

The second measure of scientists' trustworthiness was more direct. A single-item was used that asked '............... are trustworthy' for four different types of scientists (local government scientists, local university-based scientists, local environmental-group scientists and locally-based corporate scientists). These items were combined into a scale representing overall trust in scientists (α 0·79) with the range from 4 to 20; the mean score was 13·38 (SD 2·57).

Finally, the respondents were asked about their satisfaction with science in their community using four questions: 'I am satisfied with the scientific research that is going on in my community', 'I am satisfied with the procedures in place to manage potential risk to public health and the environment from scientific research in my community', 'I would support plans to bring more scientific research to my community' and 'The scientific research going on in my community is appropriate for the area'. These items were combined into a satisfaction with science scale (α 0·79), ranging again from 4 to 20, with a mean score of 13·38 (SD 2·57).

Results

Opinions about conflicts of interest

The results in Table 1 show that approximately 27% of respondents agreed or strongly agreed that scientists would conceal results that would embarrass their funding organization; in comparison, 31% disagreed or strongly disagreed, while 42% were unsure how scientists would behave. Respondents were about evenly divided on whether they could rely on scientists who receive corporate funding to provide independent advice, with 32% believing they could not and 31% believing they could; 37% were unsure. In comparison, over half (51%) agreed or strongly agreed that, even in the face of financial conflicts, scientists would try to ensure that their reports were truthful, in comparison with 15% who shared the opposing view. Finally, 59% of respondents believed that local scientists did care about what the average individual felt about the morality or ethics of their research, whereas 14% believed otherwise.

Trust in scientists

Generally, the results in Table 1 suggest that most respondents trust local scientists. The mean scores for the items on both trust measures show that, on average, respondents were more favourable than unfavourable about the trustworthiness of scientists, although many were unsure. For the first trust measure, which examined competence and caring, 58% of respondents indicated that they believed scientists had the skills to ensure that their research was safe in comparison with 7% who did not; even so, 35% were unsure. More than half (52%) the respondents indicated that they believed scientists knew how to protect public health and the environment in comparison with 11% who did not; again, a large percentage were unsure (38%). Another 55% agreed or strongly agreed that scientists knew how to protect the public and the environment from risks from their research; 39% were unsure. Finally, 27% agreed or strongly agreed that scientists who cared about the community would do more to protect public health and the environment, whereas 39% disagreed or strongly disagreed, indicating that they believed scientists were doing enough; 34% were unsure. In terms of overall trustworthiness, university-based scientists were considered the most trustworthy, followed by local environmental-group scientists, government scientists and corporate scientists.

Satisfaction with science

Respondents also tended to be satisfied with the science being conducted in their community (50%), although many expressed uncertainty on the different items. There were 42% who were satisfied with the procedures used to manage potential health or environmental risks; however, 46% were unsure. Another 46% believed that the research being conducted in their community was appropriate for the area, while another 49% were unsure. Nonetheless, 73% would support more scientific research in their community compared with 6% who would not.

Relationship between conflicts of interest, trust in scientists and satisfaction with science

The results of the correlation analysis (Table 2) indicate significant relationships among conflicts of interest, trust and satisfaction with science (*P*<0·01). Specifically, conflict of interest was negatively related to both trust

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measures and satisfaction with science. Trust and satisfaction with science were positively correlated.

Discussion

Recent years have witnessed growing attention to conflicts of interest in science and increasing concern about their impacts, both on scientists' behaviours and the public's trust in the integrity of science. Although studies have examined the potential bias that conflicts of interest can have on scientists' behaviour, fewer studies have examined public opinion about conflicts of interest in science. The results of the present exploratory study suggest that the public is cautious in its judgment about the potential impacts of conflicts of interest in science; i.e. respondents answered 'don't know' 28–42 % of the time to the questions about how local scientists would manage real or potential conflicts of interest. Possible explanations are that respondents simply have little experience with this issue. As research has shown, despite attention in the scholarly literature, the mass media carry little information about scientists' conflicts of interest[47,48].

Overall, it seems that respondents were willing to give scientists some credit for independence even in the face of financial conflicts of interest. They were also more positive that scientists would care about what the average citizen thought about the morality or ethics of their research. One possible explanation for this finding is that respondents were more familiar with local scientists and consequently more willing to give them the benefit of the doubt. Research has shown that familiarity with a source can influence trust[16]. However, not all respondents were willing to give scientists the benefit of the doubt, as 27–32 % thought that scientists' financial conflicts of interest would result in scientists giving biased advice or keeping their findings secret. It is possible that this negativity could reflect research showing that when media do cover conflicts of interest in science they tend to focus on negative rather than positive aspects[49]. Certainly, media coverage of conflicts of interest in other professions rarely casts them in a positive light, so respondents could be applying similar standards to science.

On average, respondents were generally trusting of the scientists in their local community. Both the measures of caring and competence (trust 1) and overall trustworthiness (trust 2) show positive scores. In particular, respondents were generally confident that scientists had the requisite skills to protect public health and the environment from potential risks from their research. They also tended to believe that scientists cared about protecting public and environmental health. However, respondents expressed some uncertainty about the caring and competence of scientists, with between 34 % and 39 % answering 'do not know' on each of the trust 1 measures. This uncertainty grew in the trust 2 measures, ranging from 34 % responding 'do not know' for university-based scientists to 49 % for corporate-based scientists. The high percentage of 'do not know' responses suggests that a reasonable number of respondents simply did not know whether they could or should trust local scientists.

In relation to the overall trustworthiness of scientists (trust 2), variance existed among the four types of scientists with university-based scientists accorded the highest trustworthiness and corporate scientists the lowest. Given concern about the independence of scientists who receive corporate funding, it is perhaps not surprising that respondents rated corporate scientists at the low end of the spectrum. However, it is important to point out that the low end of the spectrum was a mean score of 3·0 on a scale of 1–5, with higher scores indicating greater trust. Thus, even the lowest-rated scientists were on average considered trustworthy.

Overall, respondents were also satisfied with the science in their community. This issue included whether they believed that the research was appropriate for the area and whether they would support more scientific research in their community. This finding is perhaps not surprising, given that both counties host major research facilities, which provide economic benefits to the region. Even so, a reasonable number was unsure, with almost half the respondents indicating they simply did not know whether the research was appropriate for the area.

Finally, the results of the correlation analysis confirm a strong relationship between respondents' trust in scientists and how respondents perceived local scientists would manage real or potential conflicts of interest. Simply put, respondents who believed that scientists would remain independent in the face of financial conflicts of interest were significantly ($P<0·01$) more willing to trust them. Furthermore, the manner by which scientists would manage conflicts of interest was strongly correlated with respondents' satisfaction with research in their community; i.e., when respondents believed that scientists would behave ethically in the face of conflicts of interest, they were much more satisfied with the science in their community.

Conclusions

The ability to connect scientific discoveries to practical applications is one of the goals of translational research. Understanding the barriers to successful translation is thus a vital step in this process. One of the potential barriers is the extent to which the public trust the science. In this context, much discussion has focused on the damaging impact of conflicts of interest among scientists. There are many examples within the literature about how financial interests could and have influenced scientists' and practitioners' behaviours. There are also numerous guidelines and recommendations for management of real or potential conflicts of interest. Despite much speculation and anxiety, how members of the public view conflicts of interest in science and, furthermore, how these views relate to their trust in scientists has been less documented.

The present study largely confirms previous suppositions about the relationship between the perceived management of conflicts of interest and trust in scientists, i.e. when the public believe that scientists will act independently of financial interests, they also are more trusting of the scientists and satisfied with scientific research. In addition, the study also reveals a high percentage of respondents who

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basically did not know how scientists would behave if they were in a state of financial conflict of interest.

Public uncertainty about how scientists would behave in the face of financial conflicts of interest offers both trust-building as well as trust-damaging opportunities. Within the literature on trust there is a truism that has received empirical support: 'Trust is easier lost than gained'[55]. There are in all probability fewer circumstances that would result in a greater loss of trust than realizing that the source of information was double-dealing or deceitful in their communications because of a conflict of interest. Thus, scientists arguably can lose trust if the 'undecided voters' decide that scientists would behave in their own interest when faced with conflict. In contrast, if scientists' actions and their resulting research show that those scientists hold the public's interest above their or their funding organization's interests, then public trust in the science and health communication messages may grow. In short, reducing the uncertainty or equivocality surrounding the management of conflicts of interest may serve to bolster trust and satisfaction with scientists and their research.

For translational research, ensuring that appropriate and defensible methods are in place to manage real or potential conflicts of interest among scientists is vital. What this research also suggests is that an effort to increase communication 'downstream' with the public about how conflicts of interest are or were managed is also important in maintaining public trust in science.

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