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Does a research article's country of origin affect perception of its quality and relevance? A national trial of US public health researchers.

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Abstract

Objectives: The source of research may influence one's interpretation of it in either negative or positive ways however there are no robust experiments to determine the extent to which source impacts on one's judgment of the research article. We determine the impact of source (country and institution) on respondents' assessment of the quality and relevance of selected research abstracts.

Design: Web-based survey design consisting of four healthcare research abstracts previously published and included in Cochrane Reviews randomized to have fictionalized high- or low-income sources.

Setting: All Council on the Education of Public Health-accredited Schools and Programmes of Public Health in the United States.

Participants: 899 core faculty members (full, associate and assistant professors)

Intervention: Participants each reviewed the same four abstracts with half randomized to receive abstracts with high-income country sources (country and institution), and half randomized to receive low-income country sources.

Primary outcome measures: Participants rated each abstract on two measures – strength of the evidence, and likelihood of referral to a peer (1 to 10 rating scale).

Incident Rate Ratio was calculated using Poisson regression adjusting for socio-demographic covariates.

Results – Participants that received high-income country source abstracts were equal in all known characteristics to the participants that received the abstracts with low-income country sources. For one of the four abstracts (a randomized, controlled trial of a pharmaceutical intervention) likelihood of referral to a peer was greater if the source was a high-income country (IRR 1.06, 1.01 to 1.12, $p<0.05$).

Conclusions: All things being equal, the respondents were influenced by a high-income country source in their rating of research abstracts in certain cases. More research may be needed to explore how the origin of a research article may lead to stereotype activation and application in research evaluation.

Article summary

Strengths and limitations of this study

- First study at national level in the US to determine the impact of country-of-origin on the rating of healthcare research abstracts.
- All core faculty members (full, associate and assistant professors) of every CEPH-accredited Schools and Programmes of Public Health in the United States were invited to participate in the study.
- Subjects blinded to the purpose of the study and randomised to receive high- or low-income source abstracts.
- Abstracts were rated on strength of the evidence and likelihood of referral to a peer.
- Although 899 full, associate and assistant professors participated in the study this corresponded to a 9.8% response rate.

Background

Ideally, research findings ought to be judged on the strength of the evidence and their relevance. However, there is subjectivity involved in interpreting research.[1] Research certainly does not 'speak for itself' – we give it a voice, and how we judge whether one piece of research constitutes evidence or not is complex and messy. Common standards for assessing the internal validity of research do not account for the potential cognitive biases in the consumption and interpretation of research *post*-publication and each of us may reach a different conclusion as to whether the research presents strong evidence and whether we consider the research useful. In practice, we see many idiosyncracies. A rigorous RCT may convince a surgeon to change a certain practice, but may not have the same effect on a primary care physician.[2] Government regulators consider the reliability of an innovation more positively than industrial scientists.[3] Clinicians are more likely to adopt an innovation if they believe it has come from current users with similar professional, cultural and socioeconomic backgrounds.[4] A legitimate source is important for innovation diffusion[5,6] but little is known about how legitimacy is defined or perceived. From the marketing literature, Bilkey and Nes (1982) showed that consumers tend to rate products from their own countries more favorably and that consumer preferences are positively correlated with the degree of economic development of the source country, probably evoked by the lower price cue of low-income country products.[7] Up to 30% of the variance of consumer product ratings can be attributed to the product's country-of-origin.[8]

In healthcare research, typically one of the first pieces of information that is provided in a research article is the author's name, the institution and country of the research. Understanding anchoring to be a feature of heuristic thought,[9-13] it follows that we should examine the extent to which the source affects our interpretation of that research. If one possesses a prior-held belief or attitude towards the source, how does this influence one's subsequent view of the research? All things being equal, would research conducted in Ethiopia be viewed in the same way as identical research conducted in the United States?[14]

The income and development level of the source country certainly seems to determine whether a manuscript is selected for publication.[15] The number of publications from low-income countries is significantly lower than the number from developed countries in various research fields.[15,16] In psychiatry, only 6% of literature is published from regions that represent 90% of the global population.[17] Similar underrepresentation exists in cardiology, HIV research and epidemiology.[18,19] One argument for this is that research from Low-Income Countries lacks the quality to meet publication criteria.[20] Others argue that there are systematic selection biases. Editorial board members of international biomedical journals are more likely to come from High-Income Countries.[21-23] Reviewers from OECD countries view articles from their own country more favourably than from other countries.[22,24] Studies recruiting participants from the US are more likely to be published.[21,23] In Peters and Ceci's controversial experiment, only one of the nine articles that were initially published in a highly regarded American journal was accepted upon resubmission to the same journal after fabricating the name of the original institutions.[25] Kleiwer et al demonstrated that articles from outside of North America were less likely to be accepted for publication.[26] It seems that source matters.

The major obstacle to this research question is that there are no controlled studies to ascertain the impact of the source of the research *post*-publication. To fill this research gap, we present here a randomized trial of Public Health research faculty in the United States. This national survey invites respondents, most of who are experienced healthcare researchers and peer reviewers, to rate identical, typical healthcare research abstracts. To ascertain the impact of the source (institution and country) of the abstracts, we ensured that the abstracts that the respondents received were identical in every respect except we fictionalized the sources into either high- or low-income countries and randomized the respondents to receive either type. We then compared their responses to two simple questions for each abstract – whether they think the evidence in the abstract is strong, and whether they would recommend the abstract to a peer. Under the null hypothesis, there should be no difference in the distribution of responses to the two types of abstract.

Methods

Survey design

We used a web-based survey using a Qualtrics survey platform. The survey was divided into two sections, the first to collect demographic and professional data and the second for the respondent to read and respond to four research abstracts. Each abstract was followed by the same two questions – first, how strong is the evidence presented in this abstract? And second, how likely are you to recommend this abstract to a colleague? Responses were on a scale (1 to 10) with 1 as the least (i.e. not at all strong, not at all likely) and 10 as the most (extremely strong, extremely likely). The time taken to read and respond to each abstract was measured by the survey platform. Each question was forced response to avoid the problem of missing data. Recipients were randomly allocated to one of two possible surveys. In the first, abstracts 1 and 4 were fictionalized to high-income country sources (UK and Germany) and Abstracts 2 and 3 were fictionalized to low-income country sources (Malawi and Ethiopia). These sources were reversed in the second survey. Therefore, each survey (Survey A and Survey B) had two abstracts from low-income country sources and two from high-income country sources (Figure 1).

In order to ensure that the abstracts were of a sufficient quality and internal validity, we purposively selected abstracts of papers that had been included in Cochrane Reviews and that were also likely to be of at least some interest to most public health academics and health service researchers. Each abstract had therefore already been vetted for sources of bias prior to publication, using the Cochrane risk of bias tool, and we only selected abstracts that had a high internal validity for the type of study that it was describing. There is a trade off between choosing abstracts of interest to all potential respondents and the length of the survey. We decided to choose four abstracts – one randomized controlled pharmaceutical trial, one randomized controlled service intervention, one pharmaceutical intervention of cross-sectional design and one service intervention of cross-sectional design – to give a balance in terms of content and design. All four abstracts were of similar length and complexity. The abstracts were presented as found in their PubMed format, with all technical content preserved and in a format familiar to any healthcare researcher, however for each abstract the institution and country of origin was fictionalized to one of four different high- or low-income sources. For one abstract, the trial acronym was removed to avoid the possibility that some respondents would recognize the research. High-income source countries were selected from the top ten countries by GDP per capita (>$36000 per capita), and OECD membership. Low-income source countries were selected from the bottom ten countries by GDP per capita (<$1046 per capita). The institutional affiliation was fictionalized to one of the top-five universities that also had a medical or healthcare faculty, in the respective countries. We used the 2014 Times Higher Education World rankings (http://www.timeshighereducation.co.uk/world-university-rankings/2014-15/world-ranking) for the high-income country sources, and the http://www.4icu.org website for international rankings of institutions for the low-income sources.

We ensured that the source of the abstract was equally visible in each abstract and was mentioned in at least three locations throughout the abstract - the title, under the title and in the abstract itself. To avoid a possible order effect, the order in which the abstracts were presented in the survey was randomized for each participant. Neither the original nor fictionalized journals were included in the source in order to avoid respondents reacting to the reputation of the publication type. Furthermore, in order to not influence the responses, the survey was described as a Speed Reading survey, designed to examine whether the time taken to read an abstract influences the interpretation of the information within it. The survey platform enabled us to measure the time taken to respond to the entire survey, and each abstract, and this information was provided to the respondent at the end of the survey to heighten the 'psychological realism' of the survey. The survey was pilot-tested with Masters in Public Health students at Imperial College London and some faculty members at New York University to ensure face validity of the questions and that the design and flow of the survey was straightforward.

Participants and survey management

We included all core faculty members of Schools and Programs of Public Health located in a US State that had publically available contact information and that were accredited by Council on the Education of Public Health (CEPH - http://ceph.org/accredited) (159 institutions) (see Appendix 1 for full listing). We excluded administrators, managers, adjunct faculty members and visiting faculty members, and faculty members from our own institution. From this universe of potential respondents (n=9421 once duplicates were removed), we randomized them to receive either Survey A or Survey B and sent them an invite to take the survey. Block randomization within respective institutions was used, with 4, 6 and 8 sequences, from a web-based randomization service (www.sealedenvelope.com, seed 137526655595533).

The survey was designed so that only the email recipient could open the link to the survey and that it could be taken only one time. The survey could not be sent anonymously, and was inaccessible to search engines. The survey was active only within the specified time frame (20th January to 4th February 2015, chosen so that faculty members were highly likely to be present at their institution) and two email reminders were sent on day 7 and day 14 following the first email invite (20th January 2015). Panel members did not receive prior invitation to participate in the survey however our email invite indicated clearly that all responses were to be de-identified, and analyzed in aggregate form only and only for the purposes of this research. It also indicated that there was no obligation to participate but by choosing to participate consent to use the response for research is implied. We offered participants entry into a lottery draw for a $500 Amazon voucher as an incentive to complete the survey. The study protocol, including the non-harmful deception around the ulterior motive of the study, was reviewed by the New York University Committee on Activities Involving Human Subjects and deemed exempt from full ethical review (#14-10332).

Statistical analysis and power calculation

Data was retrieved via Qualtrics in CSV format and analyzed using Stata/SE 13 (Statacorp, College Station, Texas). We used demographic covariates (age, sex), professional experience covariates (research exposure, peer review experience, educational attainment) and institutional covariates (region, CEPH accreditation type, and Ivy league status) to explain variation in the outcomes of interest. We group respondent age into categories based on a presumed mid-year birth and survey completion date of 31st January 2015. Educational attainment was categorized into two groups Academic and Clinical Academic based on the completed qualifications provided in the survey responses. We used Poisson regression models for the multivariable analysis and two-tailed t-tests to compare the differences in mean responses as well as for the descriptive characteristics of the survey samples. We also explored high and low cut points for the outcome variables in bivariate analysis and illustrate the distribution of scores as proportions of respondents at the high (≥8) and low (≤3) ends of the distribution.

We calculated that sample sizes of 400 respondents for each survey would provide enough power (80%) to detect a statistically significant (95% confidence level) difference of 0.35 in mean scores between the two groups [54].

Results

After randomization, 4711 potential respondents received email-invites for Survey A, and 4710 received email-invites for Survey B. 51 and 61 invitations bounced respectively. 567 started Survey A and 594 started Survey B. Of these, 433 completed Survey A and 466 completed Survey B. This corresponds to a response rate of 9.2% for Survey A and 9.9% for Survey B. Institutional characteristics (region and Ivy league representation) of responders and invitees were not significantly different, although there was a small over-representation of responders from CEPH accredited Programs in Public Health. The demographic characteristics of the respondents of both surveys were equal suggesting that randomization performed as was expected (Table 1). 90% of respondents of both survey types serve as peer reviewers for academic journals.

On average, respondents spent between 72.5-109.9 seconds on each abstract with no significant differences between the groups. Table 2 shows the mean (SD) ratings for strength and referral for the four abstracts by the type of source. Referral to a peer for Abstract 3 (Randomized controlled trial of a pharmaceutical intervention) was significantly more likely if the source was from a high-income country. There were no other significant differences between the abstracts based on the source. The findings were unchanged when using the proportion rating higher than 8 or lower than 3. As might be expected, strength rating for abstracts that described a more robust research design, specifically Randomized Controlled Trials (Abstract 1 and 3) scored higher for strength than Abstracts 2 and 4 that were of a cross-sectional design. Also, as might be expected, the disposal of these abstracts also correlated well with respondents' view of the strength of the evidence contained within them. Correlation between the scores given for strength of evidence and subsequent referral was high (Spearman correlation coefficients varied between 0.71-0.85).

Tables 3 and 4 show the results of the multivariable analysis. Controlling for individual and institutional covariates, high-income source was a significant predictor of referral for Abstract 3 only (IRR 1.06, 1.01-1.12). For three of the four abstracts, the time spent reviewing the abstract was negatively associated with the rating given to it (Abstract 1 IRR 0.84, 0.76-0.92; Abstract 2 IRR 0.87, 0.80-0.95); Abstract 3 IRR 0.91, 0.84-0.99). However, rating for Abstract 4 (both strength of evidence (IRR 1.16, 1.03-1.30) and referral to a peer (IRR 1.16, 1.03-1.30)) improved when more time was spent on it; individuals affiliated to CEPH Programs of Public Health were significantly more likely to rate the strength of the evidence for this abstract higher (IRR 1.09, 1.02-1.17) and to refer it to colleagues (IRR 1.17, 1.09-1.26) than individuals affiliated to Schools of Public Health; and finally, individuals that had earned a clinical or professional qualification were significantly less likely to refer the abstract to a peer (IRR 0.09, 0.82-1.00) than those with purely academic qualifications .

Discussion

Two sinister issues may be occurring if the source of the research affects one's judgement of it. First, poor research may be given undue significance in part because of the perceived legitimacy of its source. The MMR scandal in the UK may have been a painful example of this.[28] Secondly, good research from an unexpected source may be discounted early on, resulting in missed opportunities to learn from important innovations.

Low-Income Countries (LICs) have developed novel innovations and there are multiple opportunities to learn from LICs, for example around improved surgical procedures,[29] improved long-term outcomes in mental illness[30-34] improved skill mix with scaled use of community health workers.[35-37] However, there are strikingly few examples where these innovations have been adopted in High Income Countries (HICs).[38] Even in Health Links, where HICs and LICs collaborate explicitly and reciprocally, there are surprisingly few examples of attempts to adopt LIC innovations in high-income settings – HIC volunteers learn a lot personally and professionally however this does not translate into changes in their own health care systems and the learning and exchange of expertise is predominantly directed from the HICs towards the LICs.[39-42] The Reverse Innovation 'movement' sets out to unpack the barriers to adopting LIC innovations in HIC contexts. It is motivated in part by the rapidly changing global health landscape and has gained interest in the

US and UK because the unsustainable growth in healthcare expenditure means that there is likely to be a genuine need to learn from LICs.[43]

We know already from the Diffusion of Innovation literature that healthcare professionals perform poorly when it comes to adopting innovations or evidence from 'elsewhere.'[2,44] The not-invented-here culture prevails. However we also know that innovations are more likely to diffuse if actors perceive the source to be similar to their own. Health professionals are homophilus.[4] We might ask therefore whether health professionals are even more discriminating when presented with research from very 'unlikely' sources? Do they discriminate against sources that they might perceive to be so different from their own, or perceive to be so unlikely to produce good research, that the evidence is discounted early on?

We were motivated to conduct this study due to a strong expectation that there would be a bias against low-income country abstracts, or at least that source would make a difference to how the respondents viewed the strength of evidence in the abstract and whether they would chose to refer the abstract to a peer. Although we found no difference in three of the four abstracts, a high-income source did make a difference to participants' view of the relevance of one of the abstracts. This result was less dramatic than we expected and it suggests that explicit biases are small and difficult to detect across a relatively small group of abstracts. Alternatively, it suggests that an implicit bias, if it exists, does not manifest particularly strongly in explicit terms through research evaluation in this group of respondents.

For the former, this study provides an empirical baseline against which to compare future research into the effect of source on abstract evaluation. For the latter, we took several steps to ensure that if explicit biases were occurring we would capture them. We randomised the survey abstracts to control for known and unknown confounders and this was performed well as evidenced by the balanced characteristics of the two survey groups. We framed the research as a Speed Reading survey to encourage respondents to spend the minimum time assessing the abstract and allow anchoring to specific pieces of information in the abstract to occur and we made no reference to the hypothesis that we were testing to not influence the responses. We achieved a large sample size to be able to detect small, but meaningful differences in the distribution of the responses - the completed-survey response rate of nearly 10% is within the range expected for a time-consuming, internet-based survey with no pre-invitation recruitment.[45] The fact that the survey was presented as a Speed Reading test may also have reduced selection bias, in that its stated purpose would not necessarily appeal to one type of researcher, such as those with more global health experience.

In our study, respondents spent on average between 70-100 seconds per abstract. Rapid responders tended to rate abstracts higher, so it is possible that if less time is spent on the abstracts then anchoring to particular triggers might be having a greater effect. We did find that in Abstract 4, if more time is taken to respond to the abstract then opinion of it improves (for both strength of evidence and referral), however this is equal between both high and low income sources. We also found, as would be expected, that respondents tended to rate the randomised controlled trial abstracts higher for strength of evidence compared to the abstracts that were of a cross-sectional design.

If implicit bias exists but is not manifesting explicitly, then the implications of this study are encouraging for the population that participated. It suggests that even when the source of the abstract matters to the individual in either a positive or negative way, overall this bias does not seem to manifest explicitly. The two groups of survey respondents treated three of the four abstracts almost identically irrespective of the source. For those interested in exploring the barriers to Reverse Innovation, or types of publication bias, this finding may be encouraging. Public health faculty in the US seem to be doing what is expected of them. Research is being assessed, by and large, according to its content rather than its origin. Nonetheless, the significant difference in referral for Abstract 3 does suggest that source might still matter in some instances. All things being equal, our sample population considered the Randomised Controlled Trial of the pharmaceutical intervention to be significantly more relevant to their peer group if its source was from the UK rather than from Malawi.

We also note that the wide standard deviations in the outcomes indicate that, despite the large sample size, there is considerable variation in how readers view and consume research. GRADE[46] and Jadad[47] scores are widely used but usually to assess entire research articles against judgement of research quality, risk of bias, inconsistency, indirectness, imprecision and publication bias.[48-54] Our study, designed purposefully to be a rapid appraisal only of the research abstract, demonstrated extremely wide variation in the assessment of the limited information provided in the abstracts. This finding may have implications for systematic reviews, meta-analyses and for reviewers of abstracts submitted for conferences.

We cannot speculate as to the triggers individuals identify with when reading each individual abstract under relatively rapid, timed conditions but it is encouraging that, despite the wide variation in scores given to the abstracts, that overall there were few differences between the two survey groups. As highly trained researchers in public health we could expect an explicit bias to be extremely small if present at all. It is possible that in other population groups this survey would present different findings. Policy-makers, clinicians, journalists, health service managers are all important actors in innovation diffusion processes, and may also be involved in peer-review processes for academic publication. Our strategy to include academic public health professionals in this survey is based on a best-case assessment of likely bias. Future research ought to modify the approach we have chosen in accordance with the target population, using other abstracts or developing a research design that allows respondents to serve as their own controls. The 8th International conference on peer review in biomedical research sets the stage for a more detailed examination of cognitive biases in healthcare evidence interpretation.[55]

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Author Contributions

MH conceived and designed the research, collected and cleaned the data, helped to analyze the data, wrote the first draft and revised subsequent drafts for important intellectual content. JM analyzed the data and helped to design the research, and revised the drafts for important intellectual content. MM conducted an initial pilot of the survey, helped to collect data, contributed to the first draft and revised subsequent drafts for important intellectual content. GJ helped to collect data, design the research and revised subsequent drafts for important intellectual content. CA helped to clean the data and analyze it, and revised subsequent drafts for important intellectual content.

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Conflict of Interests

None declared. All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author)

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Table 1. Respondent characteristics for Survey A and Survey B

	All respondents (n=899)	Survey A (n=433)	Survey B (n=466)
Males, %	42.05	42.49	41.63
Age, mean	50.26	50.35	50.17
Academic credentials only [a] %	84.58	84.69	84.48
Clinical credentials [b] %	15.42	15.31	15.52
US born [c], %	81.65	82.68	80.69
Reads research daily [d], %	60.07	61.20	59.01
CEPH Program of Public Health [e], %	35.48	34.64	36.27
Ivy league university [f], %	12.46	12.93	12.02
Region Northeast %	28.03	26.79	29.18
South %	42.05	43.42	40.77
Midwest %	18.24	17.32	19.1
West %	11.68	12.47	10.94

[a] e.g. BSc, BA, MSc, MPH, PhD

[b] e.g. MD, MBBS, MBChB

[c] versus non-US born

[d] versus reads research less than daily

[e] versus CEPH School of Public Health

[f] versus non-Ivy league institution

Table 2: Abstract rating for strength and referral

	Source	Abstract 1 High Income	Abstract 1 Low Income	Abstract 1 All	Abstract 2 High Income	Abstract 2 Low Income	Abstract 2 All	Abstract 3 High Income	Abstract 3 Low Income	Abstract 3 All	Abstract 4 High Income	Abstract 4 Low Income	Abstract 4 All
Strength	Mean	5.77	5.78	5.77	4.92	4.90	4.91	6.92	6.76	6.84	3.95	4.05	4.00
	(SD)	(2.30)	(2.11)	(2.20)	(1.95)	(2.04)	(1.99)	(2.02)	(2.03)	(2.02)	(2.14)	(2.06)	(2.10)
	≥8 (%)	27.61	24.78	26.15	10.13	12.06	11.06	47.63	43.16	45.47	6.96	4.74	5.81
	≤3 (%)	22.04	18.10	20.00	27.59	30.63	29.05	8.19	9.05	8.60	48.49	45.91	47.15
Referral	Mean	5.14	5.38	5.27	4.50	4.56	4.53	6.05*	5.68	5.87	3.79	3.96	3.88
	(SD)	(2.54)	(2.36)	(2.45)	(2.21)	(2.26)	(2.23)	(2.40)	(2.45)	(2.43)	(2.23)	(2.21)	(2.22)
	≥8 (%)	21.58	23.71	22.68	10.34	11.60	10.95	32.97	27.61	30.39	7.66	7.33	7.49
	≤3 (%)	30.63	24.78	27.60	36.64	37.35	36.98	17.46	21.81	19.55	51.74	46.77	49.16
	Mean time (s)	87.4	87.4	87.4	109.9	103.0	106.2	109.8	97.3	103.8	72.5	79.4	76.0

*p<0.05

Abstract 1=RCT/Service

Abstract 2=Cross-sectional/Service

Abstract 3=RCT/Pharmaceutical

Abstract 4=Cross-sectional/Pharmaceutical

Table 3: Predictors of abstract strength ratings [a]

	Abstract 1	Abstract 2	Abstract 3	Abstract 4
	IRR 95% CI	IRR 95% CI	IRR 95% CI	IRR 95% CI
High v low country origin	1.00 0.95,1.06	1.00 0.94,1.06	1.02 0.97,1.08	0.99 0.92,1.05
Male (v female)	1.00 0.94,1.05	0.97 0.91,1.03	1.01 0.96,1.06	0.95 0.89,1.02
41-50 years (vs 21-40)	0.96 0.89,1.04	0.93 0.85,1.01	1.00 0.93,1.07	0.95 0.87,1.04
51-60 years (vs 21-40)	0.96 0.89,1.03	0.93 0.86,1.01	1.01 0.94,1.09	0.92 0.84,1.01
61+ years (vs 21-40)	0.94 0.87,1.02	0.97 0.89,1.05	1.02 0.95,1.10	0.95 0.87,1.05
Clinical academic credentials (vs academic only)	0.96 0.89,1.04	0.9* 0.83,0.98	0.98 0.91,1.05	0.91 0.83,1.00
US born (vs not)	1.02 0.95,1.10	0.95 0.88,1.03	0.99 0.93,1.06	0.97 0.89,1.06
Reads research daily (vs < daily)	1.01 0.95,1.06	0.98 0.92,1.04	0.98 0.93,1.03	1.03 0.96,1.10
CEPH program (vs school)	1.02 0.96,1.08	1.01 0.95,1.08	1.00 0.94,1.05	1.09* 1.02,1.17
Ivy league institution (vs others)	0.97 0.87,1.07	0.92 0.82,1.04	1.01 0.92,1.12	1.03 0.91,1.17
South region (vs Northeast)	0.94 0.87,1.02	1.03 0.94,1.12	0.97 0.90,1.05	1.01 0.92,1.12
Midwest region (vs Northeast)	0.97 0.89,1.07	1.05 0.95,1.16	1.01 0.93,1.10	1.02 0.91,1.14
West region (vs Northeast)	1.01 0.91,1.12	1.03 0.92,1.16	1.01 0.91,1.11	0.97 0.85,1.10
60-<120 seconds spent reading (vs <60s)	0.92** 0.86,0.98	0.97 0.90,1.04	0.99 0.93,1.05	1.09* 1.02,1.17
120+ seconds spent reading (vs <60s)	0.86*** 0.79,0.94	0.94 0.87,1.02	0.92* 0.86,1.00	1.16* 1.03,1.30
N[b]	895	895	895	895

[a] Poisson models controlling for all variables in each column.

[b] Only survey responses with no missing data included in the multivariate analysis

*p<0.05

Abstract 1=RCT/Service; Abstract 2=Cross-sectional/Service; Abstract 3=RCT/Pharmaceutical; Abstract 4=Cross-sectional/Pharmaceutical

Table 4: Predictors of abstract referral ratings [a]

	Abstract 1 IRR 95% CI	Abstract 2 IRR 95% CI	Abstract 3 IRR 95% CI	Abstract 4 IRR 95% CI
High v low country origin	1.05	0.98	1.06*	0.97
	0.99,1.11	0.92,1.04	1.01,1.12	0.90,1.03
Male (v female)	0.99	0.94*	1.01	0.93
	0.93,1.05	0.88,1.00	0.96,1.07	0.87,1.00
41-50 years (vs 21-40)	1.00	0.96	1.02	0.95
	0.93,1.08	0.88,1.04	0.94,1.10	0.87,1.04
51-60 years (vs 21-40)	0.98	0.94	1.03	0.93
	0.90,1.06	0.86,1.03	0.95,1.11	0.85,1.02
61+ years (vs 21-40)	1.01	1.03	1.03	0.96
	0.93,1.10	0.94,1.13	0.95,1.12	0.87,1.06
Clinical academic credentials (vs academic only)	0.98	0.93	0.97	0.9*
	0.90,1.06	0.85,1.02	0.90,1.05	0.82,1.00
US born (vs not)	0.99	0.93	0.97	1.01
	0.92,1.06	0.86,1.01	0.90,1.04	0.92,1.10
Reads research daily (vs < daily)	0.99	0.99	1.00	1.02
	0.94,1.05	0.93,1.05	0.94,1.05	0.96,1.10
CEPH program (vs school)	1.06	1.03	1.02	1.17***
	0.99,1.12	0.96,1.10	0.96,1.08	1.09,1.26
Ivy league institution (vs others)	0.94	0.9	0.97	0.99
	0.84,1.05	0.79,1.02	0.87,1.08	0.87,1.13
South region (vs Northeast)	0.98	1.04	0.98	1.00
	0.90,1.07	0.94,1.14	0.90,1.06	0.91,1.11
Midwest region (vs Northeast)	1.03	1.1	1.01	1.06
	0.93,1.13	0.99,1.22	0.92,1.10	0.95,1.19
West region (vs Northeast)	1.04	1.05	0.95	0.98
	0.94,1.17	0.93,1.19	0.86,1.06	0.86,1.12
60-<120 seconds spent reading (vs <60s)	0.9**	0.92*	1.00	1.1*
	0.85,0.96	0.86,0.99	0.93,1.06	1.02,1.18
120+ seconds spent reading (vs <60s)	0.84***	0.87**	0.91*	1.16*
	0.76,0.92	0.80,0.95	0.84,0.99	1.03,1.30
N[b]	895	895	895	895

[a] Poisson models controlling for all variables in each column.

[b] Only survey responses with no missing data included in the multivariate analysis

*p<0.05

Abstract 1=RCT/Service; Abstract 2=Cross-sectional/Service; Abstract 3=RCT/Pharmaceutical; Abstract 4=Cross-sectional/Pharmaceutical

Figure 1: List of abstracts used in the survey and the fictionalized sources and institutions

	Abstract 1	Abstract 2	Abstract 3	Abstract 4
Original article title	Lay health worker intervention with choice of DOT superior to standard TB care for farm dwellers in South Africa: a cluster randomized control trial.	The use of routine monitoring and evaluation systems to assess a referral model of family planning and HIV service integration in Nigeria.	C-reactive protein lowering with rosuvastatin in the METEOR study.	Profiles of self-reported HIV-risk behaviors among injection drug users in methadone maintenance treatment, detoxification, and needle exchange programs.
Original first author	Clarke M	Chabikuli NO	Peters SA	Mark HD
Original journal	International Journal of Tuberculosis and Lung Disease	AIDS	Journal of Internal Medicine	Public Health Nursing
Original source	Sweden	Nigeria	The Netherlands	USA
Source Cochrane Review	Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases	Integration of HIV/AIDS services with maternal, neonatal and child health, nutrition, and family planning services	Statins for the primary prevention of cardiovascular disease	Oral substitution treatment of injecting opioid users for prevention of HIV infection
Year	2005	2009	2010	2006
Degree of internal validity from Cochrane Review	+++++	++++	+++++	+++++
Fictional Source Survey A	Faculty of Medicine, University of Freiburg, Freiburg, Germany RSH	College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia XSL	Faculty of Health Sciences, Mzuzu University, Mzuzu, Malawi RPL	Department of Public Health and Primary Care, Oxford University, Oxford, United Kingdom XPH
Fictional Source Survey B	College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia RSL	Faculty of Medicine, University of Freiburg, Freiburg, Germany XSH	Department of Public Health and Primary Care, Oxford University, Oxford, United Kingdom RPH	Faculty of Health Sciences, Mzuzu University, Mzuzu, Malawi XPL

*R=Randomized Controlled Trial; X=Cross-sectional design; S=Service delivery; P=Pharmaceutical; H=High Income; L=Low Income

Appendix 1: CEPH accredited Institutions

Institution	Department/Division	CEPH School or Program
Johns Hopkins Bloomberg School of Public Health	Health Policy and Management	School
	International Health	School
	Health Behaviour and Society	School
	Population Family and Reproductive Health	School
	Epidemiology	School
	Environmental Health Sciences	School
	Molecular Microbiology	School
	Biostatistics	School
	Mental Health	School
Harvard School of Public Health	Biostatistics	School
	Environmental Health	School
	Epidemiology	School
	Genetics	School
	Global Health	School
	Health Policy	School
	Immunology	School
	Nutrition	School
	Social and Behavioural	School
Columbia Mailman School of Public Health	Biostatistics	School
	Environmental Health Science	School
	Epidemiology	School
	Health Policy and Management	School
	Population Health and Family Health	School
	Sociomedical Sciences	School
Boston University - School of Public Health	Biostatistics	School
	Community Health sciences	School
	Environmental Health	School
	Epidemiology	School
	Global Health	School
	Health Law, Bioethics and Human Rights	School
	Health Policy and Management	School
	Dept. Family Medicine	School
	Dept. Paediatrics*	School
	Dept. Psychiatry and Human Behaviour	School
Colorado School of Public Health	Biostatistics	School
	Community and Behaviour	School

	Environmental and Occupational Health	School
	Epidemiology	School
	Health Systems Management	School
CUNY School of Public Health		School
Geisel School of Medicine, Dartmouth	Institute for Health Policy and Clinical Practice	Program
Drexel School of public health	Epidemiology and Biostatistics	School
	Health Management and Policy	School
	Environmental and Occupational Health	School
	Community Health and Prevention	School
East Tennessee State University College of Public Health	Biostatistics	School
	Community and Behavioural Health	School
	Environmental Health	School
	Health sciences	School
	Health Services Management and Policy	School
Emory Rollins School of Public Health	Behavioural Science	School
	Biostatistics	School
	Environmental Health	School
	Epidemiology	School
	Health Policy and Management	School
	Global Health	School
Florida A and M University Institute of Public Health		Program
Florida International University Rob Stempel College of Public Health and	Biostatistics	School
	Dietetics and nutrition	School
	Environmental and occupational health	School
	Epidemiology	School
	Health policy and management	School
	Health promotion and disease prevention	School
	Social work	School
George Washington university Milken Institute School of Public Health	Environmental and occupational health	School
	Epidemiology and Biostatistics	School
	Global Health	School
	Exercise and nutrition sciences	School
	Health policy	School
	Health services management and leadership	School
	Prevention and Community Health	School
Georgia Regents University Institute of Public and Preventative Health	Biostatistics and Epidemiology	Program
Georgia Southern University Jiann-Ping Hsu College of Public Health	Biostatistics	School
	Dept. Community Health	School
	Environmental Health	School

	Dept. of Epidemiology	School
	Dept. Health Policy and Management	School
Georgia State University MPH program		Program
Icahn School of Medicine at Mount Sinai Grad program in Public Health		Program
Indiana University Richard M Fairbanks School of Public Health	Epidemiology	School
	Behavioural Sciences	School
	Health Policy and Management	School
	Environmental Health	School
	Biostatistics	School
Loma Linda University School of Public Health*		School
Louisiana State University Health Sciences Centre School of Public Health	Behavioural and Community Health Sciences	School
	Biostatistics	School
	Environmental and Occupational Health Sciences	School
	Epidemiology	School
	Health Policy and Systems Management	School
Mercer University Master of Public Health Programme		Program
New York Medical College and Institute of Public Health - School of Medicine/Grad School of Basic Medical Sciences		Program
New York Medical College and Institute of Public Health - School of		Program
North-eastern University Master of Public Health Programme in Urban		Program
North-western University Feinberg School of Medicine Programs in Public		Program
Ohio State University College of Public Health	Biostatistics	School
	Centre for public health practice*	School
	Environmental health sciences	School
	Epidemiology	School
	Health behaviour and health promotion	School
	Centre for health outcomes	School
	Health services management and policy	School
Oregon Health and Science University/Portland State University		Program
Oregon State University College of Public Health and Human Sciences*		School
Pennsylvania State University MPH Program	Biostatistics and bioinformatics	Program
	Epidemiology	Program
	Health services and behavioural research	Program
Rutgers School of Public Health		School
Saint Louis State University College for Public Health and Social Justice	Dept. behavioural science and education	School
	Dept. biostatistics	School
	Dept. environmental and occupational helath	School
	Dept. epidemiology	School

	Dept. health management and policy	School
San Diego State university graduate school of public health		School
St Georges University Department of Public Health and Preventative	Epidemiology	Program
	Environmental and occupational track	Program
	Health policy and administration track	Program
	MD/MPH track	Program
Stony Brook University Program in Public Health		Program
SUNY Downstate Medical Centre School of Public Health		School
Temple University College of Public Health		Program
Texas A+M Health Science Centre School of Public Health		School
Thomas Jefferson University, School of Population Health		Program
Touro University - California MPH Program		Program
Tufts University School of Medicine, Public Health Program		Program
Tulane University School of Public Health and Tropical Medicine	Biostatistics and Bioinformatics	School
	Epidemiology	School
	Global Community health	School
	Global environmental sciences	School
	Tropical medicine	School
	Global health systems and development	School
UCLA Jonathan and Karin Fielding School of Public Health	Environmental Health Sciences	School
	Epidemiology	School
	Community Health Sciences	School
	Health Policy and Management	School
	Biostatistics	School
Uniformed Services University of the Health Sciences Public Health Program*		Program
University at Albany SUNY School of Public Health	Biomedical sciences Infectious diseases	School
	Environmental health sciences	School
	Epidemiology and biostatistics	School
	Health policy management and behaviour	School
University at Buffalo SUNY School of Public Health and Health Professions	Biostatistics	School
	Community health and health behaviour	School
	Epidemiology and environmental health	School
	Exercise and nutrition sciences	School
	Rehabilitation science	School
University of Alabama at Birmingham School of Public Health	Biostatistics	School
	Environmental health sciences	School
	Epidemiology	School
	Health behaviour	School
	Healthcare organization and behaviour	School

University of Arizona Mel and Enid Zuckerman College of Public Health	Biostatistics	School
	Environmental Health Sciences	School
	Epidemiology	School
	Family and Child Health	School
	Health Behaviour and Health promotions	School
	Health services administrations	School
	Public health policy and management	School
	Public health practice	School
University of Arkansas for Medical Sciences Fay W. Boozman College of	Biostatistics	School
	Environmental and Occupational Health	School
	Epidemiology	School
	Health behaviour and health education	School
	Health Policy and Management	School
University of California, Berkeley School of Public Health	Biostatistics	School
	Environmental Health sciences	School
	Epidemiology	School
	Health and Social Behaviour	School
	Health Policy and Management	School
	Health services and policy analysis	School
	Infectious disease and vaccinology	School
	Maternal and Child Health	School
	Public Health nutrition	School
University of California, Davis MPH Program		Program
University of California, Irvine Program in Public Health		Program
University of Cincinnati College of Medicine MPH Program	Biostatistics	Program
	Environmental Public Health	Program
	Epidemiology	Program
	Health education	Program
	Health services Management	Program
	Occupational Public Health	Program
University of Florida College of Public Health and Health Professions	Behavioural science and community health	School
	Biostatistics	School
	Clinical and health psychology	School
	Environmental and global health	School
	Epidemiology	School
	Health services research management and policy	School
	Occupational health	School
	Physical therapy	School
	Rehabilitation science	School

	Speech language and hearing sciences	School
University of Georgia College of Public Health	Epidemiology and biostatistics	School
	Environmental health science	School
	Health policy and management	School
	Health promotion and behaviour	School
University of Hawaii, Manoa Public Health Program		Program
University of Illinois at Chicago School of Public Health	Community health sciences	School
	Environmental and occupational health sciences	School
	Epidemiology and biostatistics	School
	Health policy and administration	School
University of Iowa College of Public Health	Biostatistics	School
	Community and behavioural health	School
	Epidemiology	School
	Health management and policy	School
	Occupational and environmental health	School
University of Kansas School of Medicine KU - MPH Program Kansas City		Program
University of Kansas School of Medicine KU - MPH Program Wichita		Program
University of Kentucky College of Public Health	Biostatistics	School
	Epidemiology	School
	Gerontology	School
	Health behaviour	School
	Health management and policy	School
	Preventative medicine and environmental health	School
University of Louisville School of Public Health and Information Sciences	Biostatistics and bioinformatics	School
	Environmental and occupational health sciences	School
	Epidemiology and population health	School
	Health management and systems science	School
	Health promotion and behavioural science	School
	Health hazards preparedness	School
University of Maryland School of Public Health	Behavioural and community health	School
	Applied environmental health	School
	Epidemiology and biostatistics	School
	Family science	School
	Health services administration	School
	Kinesiology	School
University of Massachusetts-Amherst School of Public Health and Health	Biostatistics	School
	Community health education	School
	Environmental health sciences	School
	Epidemiology	School

	Health policy and management	School
University of Miami Department of Public Health Sciences		Program
University of Michigan School of Public Health	Biostatistics	School
	Environmental health sciences	School
	Epidemiology	School
	Health behaviour and health education	School
	Health management and policy	School
University of Minnesota School of Public Health	Biostatistics	School
	Environmental health science	School
	Epidemiology	School
	Health policy and management	School
University of Nebraska Medical Centre College of Public Health	Biostatistics	School
	Environmental, agricultural and occupational health	School
	Epidemiology	School
	Health promotion, social and behavioural health	School
	Health services research and administration	School
University of New England Graduate Programs in Public Health		Program
University of New Mexico Public Health Program		Program
University of North Carolina Gillings School of Global Public Health	Biostatistics	School
	Environmental sciences and engineering	School
	Epidemiology	School
	Health behaviour	School
	Health policy and management	School
	Maternal and child health	School
	Nutrition	School
	Public health leadership	School
University of North Texas Health Science Centre School of Public Health		School
University of Oklahoma Health Sciences Centre College of Public Health	Biostatistics and epidemiology	School
	Health administration and policy	School
	Health promotion sciences	School
	Occupational and environmental health	School
University of Pennsylvania Master of Public Health Program		Program
University of Pennsylvania Master of Public Health Program - Centre for		Program
University of Pittsburgh Graduate School of Public Health	Behavioural and community health sciences	School
	Biostatistics	School
	Environmental and occupational health	School
	Epidemiology	School
	Health policy and management	School
	Human genetics	School

	Infectious diseases and microbiology	School
University of South Carolina Arnold School of Public Health	Communication sciences	School
	Environmental health sciences	School
	Epidemiology and biostatistics	School
	Exercise science	School
	Health policy and management	School
	Health promotion, education and behaviour	School
University of South Florida College of Public Health	Community and family health	School
	Environmental and occupational health	School
	Epidemiology and biostatistics	School
	Global health	School
	Health policy and management	School
University of Southern California MPH Program	Health education and promotion	Program
	Biostatistics and epidemiology	Program
	Health communication	Program
	Child and family health	Program
	Global health leadership	Program
	Public health policy	Program
	Environmental health	Program
University of Tennessee Department of Public Health		Program
University of Texas Medical Branch at Galveston Graduate Program in Public		Program
University of Texas School of Public Health	Management policy and community health	School
	Health promotion and behavioural sciences	School
	Biostatistics	School
	Epidemiology, human genetics and environmental	School
University of Virginia MPH Program	Biostatistics	Program
	Health policy, management and regulation	Program
	Comparative effectiveness, quality and outcomes	Program
	Data sciences	Program
	Bioethics	Program
University of Washington School of Public Health	Biostatistics	School
	Environmental health and occupational sciences	School
	Epidemiology	School
	Global health	School
	Health services	School
Vanderbilt University Institute for Medicine and Public Health	Biomedical informatics	Program
	Biostatistics	Program
	Epidemiology	Program
	Public health	Program

Virginia Commonwealth University MPH Program		Program
Washington University in St. Louis Brown School Public Health Programs		Program
West Virginia University School of Public Health	Biostatistics	Program
	Epidemiology	Program
	Health policy management and leadership	Program
	Occupational, environmental health sciences	Program
	Social and behavioural sciences	Program
Yale School of Public Health	Biostatistics	School
	Chronic disease epidemiology	School
	Environmental health sciences	School
	Epidemiology of microbial diseases	School
	Global health	School
	Health policy and management	School
	Social and behavioural sciences	School
Arcadia University MPH program		Program
Armstrong State University MPH program in Community Health Education		Program
Baylor University MPH program		Program
Benedictine University MPH program*		Program
Brigham Young University MPH program in Health Promotion		Program
Brown University MPH program		Program
California State University Fresno		Program
California State University Fullerton		Program
California State University Long Beach		Program
California State University Northridge		Program
Case Western Reserve University MPH Program*		Program
Central New York MPH Program*		Program
Charles Drew University of Medicine and Science MPH program in Urban		Program
Claremont Graduate University MPH program		Program
Consortium of Eastern Ohio MPH Program		Program
DePaul University MPH program		Program
Des Moines University MPH program		Program
East Carolina University		Program
East Stroudsburg University MPH program in Community Health Education		Program
Eastern Kentucky University Public Health Program		Program
Eastern Virginia Medical School MPH program		Program
Florida State University MPH program		Program
George Mason University MPH program		Program
Idaho State University MPH program		Program
Purdue University Indianapolis Public Health Program^		Program

Indiana University at Bloomington MPH program		Program
Jackson State university Public Health program		Program
Kansas State University MPH program		Program
Medical College of Wisconsin MPH program*		Program
Meharry Medical College MSc in Public Health program		Program
Missouri State University MPH program		Program
Morehouse School of Medicine MPH program*		Program
Morgan State University Public Health Program		Program
National University MPH program		Program
New Mexico State University MPH program in Community Health Education		Program
Northern Illinois University MPH program		Program
Northwest Ohio Consortium for Public Health		Program
Nova South-eastern University MPH program		Program
San Francisco State University MPH program in Community Health Education		Program
San Jose State University MPH Program in Community Health Education		Program
Simon Fraser University Public Health Program		Program
Southern Connecticut State University Public Health Program		Program
Southern Illinois University Carbondale MPH program*		Program
University of Alaska, Anchorage MPH program		Program
University of Connecticut Graduate Program in Public Health		Program
University of Illinois at Urbana-Champaign MPH program		Program
University of Maryland at Baltimore, MPH Program		Program
University of Missouri, Columbia MPH program		Program
University of Montana MPH program		Program
University of Nevada Las Vega MPH program	Environmental and Occupational health	Program
	Epidemiology and Biostatistics	Program
	Healthcare administration and policy	Program
	Social and behavioural health	Program
University of Nevada, Reno		Program
University of New Hampshire MPH program		Program
University of North Carolina, Greensboro MPH program in Community		Program
University of North Carolina at Charlotte Public Health Programs		Program
University of North Florida MPH program		Program
University of Rochester MPH program	Epidemiology	Program
	Health policy and outcomes research	Program
	Social and behavioural sciences	Program
University of San Francisco MPH program		Program
University of Southern Mississippi MPH program		Program
University of Texas at El Paso MPH program		Program

University of Utah Public Health program*	Program
University of West Florida MPH Program	Program
University of Wisconsin La Crosse MPH program in Community Health	Program
University of Wisconsin Madison MPH program	Program
Virginia Tech Public Health Program	Program
Wayne State University MPH program	Program
West Chester University MPH program	Program
Western Kentucky University Public Health Programs	Program
Westminster College Public Health Program*	Program
Wright State University MPH program	Program

*No directory available or accessible

^CEPH listing duplicated with Indiana Fairbanks School of Public Health

BMJ Open

Does a research article's country of origin affect perception of its quality and relevance? A national trial of US public health researchers.

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Does a research article's country of origin affect perception of its quality and relevance? A national trial of US public health researchers.

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Abstract

Objectives: The source of research may influence one's interpretation of it in either negative or positive ways however there are no robust experiments to determine how source impacts on one's judgment of the research article. We determine the impact of source on respondents' assessment of the quality and relevance of selected research abstracts.

Design: Web-based survey design using four healthcare research abstracts previously published and included in Cochrane Reviews.

Setting: All Council on the Education of Public Health-accredited Schools and Programmes of Public Health in the United States.

Participants: 899 core faculty members (full, associate and assistant professors)

Intervention: Each of the four abstracts appeared with high-income source half of the time, and low-income source half of the time. Participants each reviewed the same four abstracts, but were randomly allocated to receive two abstracts with high-income source, and two abstracts with low-income source allowing for within-abstract comparison of quality and relevance

Primary outcome measures: Within-abstract comparison of participants rating score on two measures – strength of the evidence, and likelihood of referral to a peer (1 to 10 rating scale). Odds Ratio was calculated using a generalized ordered logit model adjusting for socio-demographic covariates.

Results – Participants that received high-income country source abstracts were equal in all known characteristics to the participants that received the abstracts with low-income country sources. For one of the four abstracts (a randomized, controlled trial of a pharmaceutical intervention) likelihood of referral to a peer was greater if the source was a high-income country (OR 1.28, 1.02 to 1.62, $p<0.05$).

Conclusions: All things being equal, the respondents were influenced by a high-income country source in their rating of research abstracts in certain cases. More research may be needed to explore how the origin of a research article may lead to stereotype activation and application in research evaluation.

Article summary

Strengths and limitations of this study

- First study at national level in the US to determine the impact of country-of-origin on the rating of healthcare research abstracts.
- All core faculty members (full, associate and assistant professors) of every CEPH-accredited Schools and Programmes of Public Health in the United States were invited to participate in the study.
- Subjects blinded to the purpose of the study and randomised to receive high- or low-income source abstracts.
- Abstracts were rated on strength of the evidence and likelihood of referral to a peer.
- Although 899 full, associate and assistant professors participated in the study this corresponded to a 9.8% response rate.

Background

Ideally, research findings ought to be judged on the strength of the evidence and their relevance. However, there is subjectivity involved in interpreting research.[1] Research certainly does not 'speak for itself' – we give it a voice, and how we judge whether one piece of research constitutes evidence or not is complex and messy. Common standards for assessing the internal validity of research do not account for the potential cognitive biases in the consumption and interpretation of research *post*-publication and each of us may reach a different conclusion as to whether the research presents strong evidence and whether we consider the research useful. In practice, we see many idiosyncracies. A rigorous RCT may convince a surgeon to change a certain practice, but may not have the same effect on a primary care physician.[2] Government regulators consider the reliability of an innovation more positively than industrial scientists.[3] Clinicians are more likely to adopt an innovation if they believe it has come from current users with similar professional, cultural and socioeconomic backgrounds.[4] A legitimate source is important for innovation diffusion[5,6] but little is known about how legitimacy is defined or perceived. From the marketing literature, Bilkey and Nes (1982) showed that consumers tend to rate products from their own countries more favorably and that consumer preferences are positively correlated with the degree of economic development of the source country, probably evoked by the lower price cue of low-income country products.[7] Up to 30% of the variance of consumer product ratings can be attributed to the product's country-of-origin.[8]

In healthcare research, typically one of the first pieces of information that is provided in a research article is the author's name, the institution and country of the research. Understanding anchoring to be a feature of heuristic thought,[9-13] it follows that we should examine the extent to which the source affects our interpretation of that research. If one possesses a prior-held belief or attitude towards the source, how does this influence one's subsequent view of the research? All things being equal, would research conducted in Ethiopia be viewed in the same way as identical research conducted in the United States?[14]

The income and development level of the source country certainly seems to determine whether a manuscript is selected for publication.[15] The number of publications from low-income countries is significantly lower than the number from developed countries in various research fields.[15,16] In psychiatry, only 6% of literature is published from regions that represent 90% of the global population.[17] Similar underrepresentation exists in cardiology, HIV research and epidemiology.[18,19] One argument for this is that research from Low-Income Countries lacks the quality to meet publication criteria.[20] Others argue that there are systematic selection biases. Editorial board members of international biomedical journals are more likely to come from High-Income Countries.[21-23] Reviewers from OECD (Organization for Economic Cooperation and Development) countries view articles from their own country more favourably than from other countries.[22,24, 25] Studies recruiting participants from the US are more likely to be published.[21,23] In

Peters and Ceci's controversial experiment, only one of the nine articles that were initially published in a highly regarded American journal was accepted upon resubmission to the same journal after fabricating the name of the original institutions.[26] Kleiwer et al demonstrated that articles from outside of North America were less likely to be accepted for publication.[27] It seems that source matters.

The major obstacle to this research question is that there are no controlled studies to ascertain the impact of the source of the research *post*-publication. To fill this research gap, we present here a randomized trial of Public Health research faculty in the United States. This national survey invites respondents, most of who are experienced healthcare researchers and peer reviewers, to rate identical, typical healthcare research abstracts. To ascertain the impact of the source (institution and country) of the abstracts, we ensured that the abstracts that the respondents received were identical in every respect except we fictionalized the sources into either high- or low-income countries and randomized the respondents to receive either type. We then compared their responses to two simple questions for each abstract – whether they think the evidence in the abstract is strong, and whether they would recommend the abstract to a peer. Under the null hypothesis, there should be no difference in the distribution of responses to the two types of abstract.

Methods

Survey design

We used a web-based survey using a Qualtrics survey platform. The survey was divided into two sections, the first to collect demographic and professional data and the second for the respondent to read and respond to four research abstracts. Each abstract was followed by the same two questions – first, how strong is the evidence presented in this abstract? And second, how likely are you to recommend this abstract to a colleague? Responses were on a scale (1 to 10) with 1 as the least (i.e. not at all strong, not at all likely) and 10 as the most (extremely strong, extremely likely). The time taken to read and respond to each abstract was measured by the survey platform. Each question was forced response to avoid the problem of missing data. Recipients were randomly allocated to one of two possible surveys. In the first, abstracts 1 and 4 were fictionalized to high-income country sources (UK and Germany) and Abstracts 2 and 3 were fictionalized to low-income country sources (Malawi and Ethiopia). These sources were reversed in the second survey. Therefore, each survey (Survey A and Survey B) had two abstracts from low-income country sources and two from high-income country sources (Figure 1).

In order to ensure that the abstracts were of a sufficient quality and internal validity, we purposively selected abstracts of papers that had been included in Cochrane Reviews and that were also likely to be of at least some interest to most public health academics and health service researchers. Each abstract had therefore already been vetted for sources of bias prior to publication, using the Cochrane risk of bias tool, and we only selected abstracts that had a high internal validity for the type of study that it was describing. There is a trade off between choosing abstracts of interest to all potential respondents and the length of the survey. We decided to choose four abstracts – one randomized controlled pharmaceutical trial, one randomized controlled service intervention, one pharmaceutical intervention of cross-sectional design and one service intervention of cross-sectional design – to give a balance in terms of content and design. All four abstracts were of similar length and complexity. The abstracts were presented as found in their PubMed format, with all technical content preserved and in a format familiar to any healthcare researcher, however for each abstract the institution and country of origin was fictionalized to one of four different high- or low-income sources. For one abstract, the trial acronym was removed to avoid the possibility that some respondents would recognize the research. High-income source countries were selected from the top ten countries by GDP per capita (>$36000 per capita), and OECD membership. Low-income source countries were selected from the bottom ten countries by GDP per capita (<$1046 per capita). The institutional affiliation was fictionalized to one of the top-five universities that also had a medical or healthcare faculty, in the respective countries. We used the 2014 Times Higher Education World rankings (http://www.timeshighereducation.co.uk/world-university-rankings/2014-15/world-ranking) for the high-income country sources, and the http://www.4icu.org website for international rankings of institutions for the low-income sources.

We ensured that the source of the abstract was equally visible in each abstract and was mentioned in at least three locations throughout the abstract - the title, under the title and in the abstract itself. To avoid a possible order effect, the order in which the abstracts were presented in the survey was randomized for each participant. Neither the original nor fictionalized journals were included in the source in order to avoid respondents reacting to the reputation of the publication type. Furthermore, in order to not influence the responses, the survey was described as a Speed Reading survey, designed to examine whether the time taken to read an abstract influences the interpretation of the information within it. The survey platform enabled us to measure the time taken to respond to the entire survey, and each abstract, and this information was provided to the respondent at the end of the survey to heighten the 'psychological realism' of the survey. The survey was pilot-tested with Masters in Public Health students at Imperial College London and some faculty members at New York University to ensure face validity of the questions and that the design and flow of the survey was straightforward.

Participants and survey management

We included all core faculty members of Schools and Programs of Public Health located in a US State that had publically available contact information and that were accredited by Council on the Education of Public Health (CEPH - http://ceph.org/accredited) (159 institutions) (see Appendix 1 for full listing). We excluded administrators, managers, adjunct faculty members and visiting faculty members, and faculty members from our own institution. From this universe of potential respondents (n=9421 once duplicates were removed), we randomized them to receive either Survey A or Survey B and sent them an invite to take the survey. Block randomization within respective institutions was used, with 4, 6 and 8 sequences, from a web-based randomization service (www.sealedenvelope.com, seed 137526655595533).

The survey was designed so that only the email recipient could open the link to the survey and that it could be taken only one time. The survey could not be sent anonymously, and was inaccessible to search engines. The survey was active only within the specified time frame (20th January to 4th February 2015, chosen so that faculty members were highly likely to be present at their institution) and two email reminders were sent on day 7 and day 14 following the first email invite (20th January 2015). Panel members did not receive prior invitation to participate in the survey however our email invite indicated clearly that all responses were to be de-identified, and analyzed in aggregate form only and only for the purposes of this research. It also indicated that there was no obligation to participate but by choosing to participate consent to use the response for research is implied. We offered participants entry into a lottery draw for a $500 Amazon voucher as an incentive to complete the survey. The study protocol, including the non-harmful deception around the ulterior motive of the study, was reviewed by the New York University Committee on Activities Involving Human Subjects and deemed exempt from full ethical review (#14-10332).

Statistical analysis and power calculation

Data was retrieved via Qualtrics in CSV format and analyzed using Stata/SE 13 (Statacorp, College Station, Texas). We used demographic covariates (age, sex), professional experience covariates (research exposure, peer review experience, educational attainment) and institutional covariates (region, CEPH accreditation type, and Ivy league status) to explain variation in the outcomes of interest. We grouped respondent age into categories based on a presumed mid-year birth and survey completion date of 31st January 2015. Educational attainment was categorized into two groups Academic and Clinical Academic based on the completed qualifications provided in the survey responses. We used a generalized ordered logit model for the multivariable analysis and two-tailed t-tests to compare the differences in mean responses as well as for the descriptive characteristics of the survey samples. We also explored high and low cut points for the outcome variables in bivariate analysis and illustrate the distribution of scores as proportions of respondents at the high (≥8) and low (≤3) ends of the distribution.

We calculated that sample sizes of 400 respondents for each survey would provide enough power (80%) to detect a statistically significant (95% confidence level) difference of 0.35 in mean scores between the two groups[28].

Results

After randomization, 4711 potential respondents received email-invites for Survey A, and 4710 received email-invites for Survey B. 51 and 61 invitations bounced respectively. 567 started Survey A and 594 started Survey B. Of these, 433 completed Survey A and 466 completed Survey B. This corresponds to a response rate of 9.2% for Survey A and 9.9% for Survey B. Institutional characteristics (region and Ivy league representation) of responders and invitees were not significantly different, although there was a small over-representation of responders from CEPH accredited Programs in Public Health. The demographic characteristics of the respondents of both surveys were equal suggesting that randomization performed as was expected (Table 1). 90% of respondents of both survey types serve as peer reviewers for academic journals.

Table 1. Respondent characteristics for Survey A and Survey B

	All respondents (n=899)	Survey A (n=433)	Survey B (n=466)
Males, %	42.05	42.49	41.63
Age, mean	50.26	50.35	50.17
Academic credentials only [a] %	84.58	84.69	84.48
Clinical credentials [b] %	15.42	15.31	15.52
US born [c], %	81.65	82.68	80.69
Reads research daily [d], %	60.07	61.20	59.01
CEPH Program of Public Health [e], %	35.48	34.64	36.27
Ivy league university [f], %	12.46	12.93	12.02
Region Northeast %	28.03	26.79	29.18
South %	42.05	43.42	40.77
Midwest %	18.24	17.32	19.1
West %	11.68	12.47	10.94

[a] e.g. BSc, BA, MSc, MPH, PhD
[b] e.g. MD, MBBS, MBChB
[c] versus non-US born
[d] versus reads research less than daily
[e] versus CEPH School of Public Health
[f] versus non-Ivy league institution

On average, respondents spent between 72.5-109.9 seconds on each abstract with no significant differences between the groups. Table 2 shows the mean (SD) ratings for strength and referral for the four abstracts by the type of source. Referral to a peer for Abstract 3 (Randomized controlled trial of a pharmaceutical intervention) was significantly more likely if the source was from a high-income country. There were no other significant differences between the abstracts based on the source. The findings were unchanged when using the proportion rating higher than 8 or lower than 3. As might be expected, strength rating for abstracts that described a more robust research design, specifically Randomized Controlled Trials (Abstract 1 and 3) scored higher for strength than Abstracts 2 and 4 that were of a cross-sectional design. Also, as might be expected, the disposal of these abstracts also correlated well with respondents' view of the strength of the evidence contained within them. Correlation between the scores given for strength of evidence and subsequent referral was high (Spearman correlation coefficients varied between 0.71-0.85).

Table 2: Abstract rating for strength and referral

	Source	Abstract 1 High Income	Abstract 1 Low Income	Abstract 1 All	Abstract 2 High Income	Abstract 2 Low Income	Abstract 2 All	Abstract 3 High Income	Abstract 3 Low Income	Abstract 3 All	Abstract 4 High Income	Abstract 4 Low Income	Abstract 4 All
Strength	Mean	5.77	5.78	5.77	4.92	4.90	4.91	6.92	6.76	6.84	3.95	4.05	4.00
	(SD)	(2.30)	(2.11)	(2.20)	(1.95)	(2.04)	(1.99)	(2.02)	(2.03)	(2.02)	(2.14)	(2.06)	(2.10)
	≥8 (%)	27.61	24.78	26.15	10.13	12.06	11.06	47.63	43.16	45.47	6.96	4.74	5.81
	≤3 (%)	22.04	18.10	20.00	27.59	30.63	29.05	8.19	9.05	8.60	48.49	45.91	47.15
Referral	Mean	5.14	5.38	5.27	4.50	4.56	4.53	6.05*	5.68	5.87	3.79	3.96	3.88
	(SD)	(2.54)	(2.36)	(2.45)	(2.21)	(2.26)	(2.23)	(2.40)	(2.45)	(2.43)	(2.23)	(2.21)	(2.22)
	≥8 (%)	21.58	23.71	22.68	10.34	11.60	10.95	32.97	27.61	30.39	7.66	7.33	7.49
	≤3 (%)	30.63	24.78	27.60	36.64	37.35	36.98	17.46	21.81	19.55	51.74	46.77	49.16
	Mean time(s)	87.4	87.4	87.4	109.9	103.0	106.2	109.8	97.3	103.8	72.5	79.4	76.0
	(SD)	(68.4)	(118)	(97.3)	(169)	(200)	(186)	(131)	(304)	(237)	(56.4)	(146)	(112)

*p<0.05

Abstract 1=RCT/Service

Abstract 2=Cross-sectional/Service

Abstract 3=RCT/Pharmaceutical

Abstract 4=Cross-sectional/Pharmaceutical

Tables 3 and 4 show the results of the multivariable analysis. Controlling for individual and institutional covariates, high-income source was a significant predictor of referral for Abstract 3 only (OR 1.28, 1.02-1.62). For some abstracts, the time spent reviewing the abstract was negatively associated with the rating given to it for strength of evidence (Abstract 1 OR 0.49, 0.34-0.71; Abstract 3 OR 0.65, 0.46-0.92) or referral to a peer (Abstract 1 OR 0.50, 0.35-0.72; Abstract 2 OR 0.61, 0.44-0.84; Abstract 3 OR 0.66, 0.44-0.84). However, rating for Abstract 4 (both strength of evidence (OR 1.63, 1.06-2.51) and referral to a peer (OR 1.55, 1.01-2.38) improved when more time was spent on it. Individuals affiliated to CEPH Programs of Public Health were significantly more likely to rate the strength of the evidence for this abstract higher (OR 1.38, 1.07-1.78) and to refer it to colleagues (OR 1.67, 1.30-2.15) than individuals affiliated to Schools of Public Health.

Table 3: Predictors of abstract strength ratings [a]

	Abstract 1 OR 95% CI	Abstract 2 OR 95% CI	Abstract 3 OR 95% CI	Abstract 4 OR 95% CI
High v low country origin	1.03	1	1.16	0.94
	0.82,1.30	0.80,1.26	0.92,1.46	0.74,1.18
Male (v female)	0.93	0.87	0.97	0.87
	0.73,1.18	0.68,1.10	0.76,1.23	0.68,1.10
41-50 years (vs 21-40)	0.81	0.71*	1.01	0.87
	0.59,1.12	0.52,0.97	0.73,1.39	0.64,1.20
51-60 years (vs 21-40)	0.79	0.74	1.14	0.77
	0.57,1.09	0.54,1.03	0.82,1.58	0.56,1.06
61+ years (vs 21-40)	0.76	0.85	1.12	0.82
	0.54,1.06	0.60,1.19	0.80,1.57	0.58,1.15
Clinical academic credentials (vs academic only)	0.83	0.65**	0.95	0.78
	0.60,1.14	0.47,0.89	0.68,1.32	0.57,1.08
US born (vs not)	1.06	0.83	0.94	0.89
	0.78,1.44	0.62,1.13	0.69,1.28	0.66,1.21
Reads research daily (vs < daily)	1.03	0.94	0.85	1.14
	0.81,1.31	0.74,1.20	0.67,1.08	0.89,1.45
CEPH program (vs school)	1.12	1.06	1.03	1.38*
	0.87,1.45	0.82,1.36	0.80,1.32	1.07,1.78
Ivy league institution (vs others)	0.78	0.67	1.14	1.08
	0.50,1.21	0.43,1.06	0.73,1.78	0.69,1.68
South region (vs Northeast)	0.71	1.08	0.84	1.05
	0.50,1.00	0.77,1.52	0.59,1.18	0.74,1.47
Midwest region (vs Northeast)	0.82	1.17	1.14	1.07
	0.55,1.23	0.78,1.74	0.76,1.71	0.72,1.59
West region (vs Northeast)	0.93	1.11	1.05	0.89
	0.59,1.46	0.72,1.74	0.66,1.67	0.56,1.40
60-<120 seconds spent reading (vs <60s)	0.67**	0.87	0.98	1.33*
	0.51,0.87	0.66,1.15	0.74,1.28	1.04,1.70
120+ seconds spent reading (vs <60s)	0.49***	0.77	0.65*	1.63*
	0.34,0.71	0.56,1.07	0.46,0.92	1.06,2.51
N[b]	895	895	895	895

[a] Generalised ordered logit model controlling for all variables in each column.

[b] Only survey responses with no missing data included in the multivariate analysis

*p<0.05

Abstract 1=RCT/Service; Abstract 2=Cross-sectional/Service; Abstract 3=RCT/Pharmaceutical; Abstract 4=Cross-sectional/Pharmaceutical

Table 4: Predictors of abstract referral ratings [a]

	Abstract 1 OR 95% CI	Abstract 1 OR 95% CI	Abstract 3 OR 95% CI	Abstract 4 OR 95% CI
High v low country origin	0.85	0.94	1.28*	0.9
	0.67,1.07	0.75,1.19	1.02,1.62	0.71,1.13
Male (v female)	0.95	0.78*	0.98	0.84
	0.75,1.20	0.61,0.99	0.78,1.25	0.66,1.06
41-50 years (vs 21-40)	0.98	0.85	1.06	0.83
	0.72,1.34	0.62,1.16	0.77,1.46	0.61,1.15
51-60 years (vs 21-40)	0.92	0.83	1.15	0.8
	0.67,1.28	0.60,1.15	0.83,1.60	0.58,1.11
61+ years (vs 21-40)	1.07	1.09	1.16	0.84
	0.77,1.50	0.77,1.54	0.83,1.63	0.60,1.18
Clinical academic credentials (vs academic only)	0.92	0.75	0.92	0.79
	0.67,1.26	0.54,1.04	0.66,1.28	0.57,1.08
US born (vs not)	0.91	0.8	0.84	1.01
	0.67,1.23	0.59,1.09	0.61,1.14	0.74,1.38
Reads research daily (vs < daily)	0.95	0.97	0.93	1.1
	0.75,1.21	0.76,1.23	0.74,1.19	0.86,1.39
CEPH program (vs school)	1.26	1.12	1.11	1.67***
	0.98,1.62	0.87,1.43	0.86,1.43	1.30,2.15
Ivy league institution (vs others)	0.8	0.71	0.92	0.96
	0.52,1.24	0.46,1.11	0.59,1.43	0.62,1.49
South region (vs Northeast)	0.91	1.14	0.93	1.01
	0.65,1.29	0.80,1.61	0.66,1.30	0.72,1.43
Midwest region (vs Northeast)	1.09	1.39	1.04	1.23
	0.73,1.63	0.93,2.07	0.70,1.55	0.83,1.84
West region (vs Northeast)	1.16	1.2	0.88	0.97
	0.74,1.82	0.77,1.89	0.56,1.39	0.62,1.52
60-<120 seconds spent reading (vs <60s)	0.65**	0.73*	0.97	1.31*
	0.50,0.84	0.55,0.96	0.74,1.28	1.02,1.67
120+ seconds spent reading (vs <60s)	0.5***	0.61**	0.66*	1.55*
	0.35,0.72	0.44,0.84	0.47,0.93	1.01,2.38
N[b]	895	895	895	895

[a] Generalised ordered logit models controlling for all variables in each column.

[b] Only survey responses with no missing data included in the multivariate analysis

*p<0.05

Abstract 1=RCT/Service; Abstract 2=Cross-sectional/Service; Abstract 3=RCT/Pharmaceutical; Abstract 4=Cross-sectional/Pharmaceutical

Discussion

Two sinister issues may be occurring if the source of the research affects one's judgement of it. First, poor research may be given undue significance in part because of the perceived legitimacy of its source. The MMR scandal in the UK may have been a painful example of this. In this case, vaccination rates for the MMR immunisation plummeted when a study published by a high profile research group in a prestigious journal claimed a tenuous (and later discredited) connection between the immunisation and rates of autism.[29]

Secondly, good research from an unexpected source may be discounted early on, resulting in missed opportunities to learn from important innovations. Low-Income Countries (LICs) have developed novel innovations and there are multiple opportunities to learn from LICs, for example around improved surgical procedures,[30] improved long-term outcomes in mental illness[31-35] improved skill mix with scaled use of community health workers.[36-38] However, there are strikingly few examples where these innovations have been adopted in High Income Countries (HICs).[39] Even in Health Links, where HICs and LICs collaborate explicitly and reciprocally, there are surprisingly few examples of attempts to adopt LIC innovations in high-income settings – HIC volunteers learn a lot personally and professionally however this does not translate into changes in their own health care systems and the learning and exchange of expertise is predominantly directed from the HICs towards the LICs.[40-43] The Reverse Innovation 'movement' sets out to unpack the barriers to adopting LIC innovations in HIC contexts. It is motivated in part by the rapidly changing global health landscape and has gained interest in the US and UK because the unsustainable growth in healthcare expenditure means that there is likely to be a genuine need to learn from LICs.[44]

We know already from the Diffusion of Innovation literature that healthcare professionals perform poorly when it comes to adopting innovations or evidence from 'elsewhere.'[2,45] The not-invented-here culture prevails. However we also know that innovations are more likely to diffuse if actors perceive the source to be similar to their own. Health professionals are homophilus.[4] We might ask therefore whether health professionals are even more discriminating when presented with research from very 'unlikely' sources? Do they discriminate against sources that they might perceive to be so different from their own, or perceive to be so unlikely to produce good research, that the evidence is discounted early on?

We were motivated to conduct this study due to a strong expectation that there would be a bias against low-income country abstracts, or at least that source would make a difference to how the respondents viewed the strength of evidence in the abstract and whether they would chose to refer the abstract to a peer. Although we found no difference in three of the four abstracts, a high-income source did make a difference to participants' view of the relevance of one of the abstracts. This result was less dramatic than we expected and it suggests that explicit biases are small and difficult to detect across a relatively small group of abstracts. Alternatively, it suggests that an implicit bias, if it exists, does not manifest particularly strongly in explicit terms through research evaluation in this group of respondents.

For the former, this study provides an empirical baseline against which to compare future research into the effect of source on abstract evaluation. For the latter, we took several steps to ensure that if explicit biases were occurring we would capture them. We randomised the survey abstracts to control for known and unknown confounders and this was performed well as evidenced by the balanced characteristics of the two survey groups. We framed the research as a Speed Reading survey to encourage respondents to spend the minimum time assessing the abstract and allow anchoring to specific pieces of information in the abstract to occur and we made no reference to the hypothesis that we were testing to not influence the responses. We achieved a large sample size to be able to detect small, but meaningful differences in the distribution of the responses - the completed-survey response rate of nearly 10% is within the range expected for a time-consuming, internet-based survey with no pre-invitation recruitment.[46] The fact that the survey was presented as a Speed Reading test may also have reduced selection bias, in that its stated purpose would not necessarily appeal to one type of researcher, such as those with more global health experience.

In our study, respondents spent on average between 70-100 seconds per abstract. Rapid responders tended to rate abstracts higher, so it is possible that if less time is spent on the abstracts then anchoring to particular triggers might be having a greater effect. We did find that in Abstract 4, if more time is taken to respond to the abstract then opinion of it improves (for both strength of evidence and referral), however this is equal between both high and low income sources. We also found, as would be expected, that respondents tended to rate the randomised controlled trial abstracts higher for strength of evidence compared to the abstracts that were of a cross-sectional design. As the study was framed as a Speed Reading survey participants might have felt the need to speed-read the abstracts and which may not mirror normal practice.

If implicit bias exists but is not manifesting explicitly, then the implications of this study are encouraging for the population that participated. It suggests that even when the source of the abstract matters to the individual in either a positive or negative way, overall this bias does not seem to manifest explicitly. The two groups of survey respondents treated three of the four abstracts almost identically irrespective of the source. For those interested in exploring the barriers to Reverse Innovation, or types of publication bias, this finding may be encouraging. Public health faculty in the US seem to be doing what is expected of them. Research is being assessed, by and large, according to its content rather than its origin. Nonetheless, the significant difference in referral for Abstract 3 does suggest that source might still matter in some instances. All things being equal, our sample population considered the Randomised Controlled Trial of the pharmaceutical intervention to be significantly more relevant to their peer group if its source was from the UK rather than from Malawi.

We also note that the wide standard deviations in the outcomes indicate that, despite the large sample size, there is considerable variation in how readers view and consume research. The wide standard deviations might have reduced our ability to detect differences and further work should be conducted to validate measurement constructs in this context. GRADE[47] and Jadad[48] scores are widely used but usually to assess entire research articles against judgement of research quality, risk of bias, inconsistency, indirectness, imprecision and publication bias.[49-55] Our study, designed purposefully to be a rapid appraisal only of the research abstract, demonstrated extremely wide variation in the assessment of the limited information provided in the abstracts. This finding may have implications for systematic reviews, meta-analyses and for reviewers of abstracts submitted for conferences.

We cannot speculate as to the triggers individuals identify with when reading each individual abstract under relatively rapid, timed conditions but it is encouraging that overall there were few differences between the two survey groups. As highly trained researchers in public health we could expect an explicit bias to be extremely small if present at all. It is possible that in other population groups this survey would present different findings. Policy-makers, clinicians, journalists, health service managers are all important actors in innovation diffusion processes, and may also be involved in peer-review processes for academic publication. Our strategy to include academic public health professionals in this survey is based on a best-case assessment of likely bias. Future research ought to modify the approach we have chosen in accordance with the target population, using other abstracts or developing a research design that allows respondents to serve as their own controls. Although we found only one of the four abstracts to elicit a small (yet statistically significant) difference in rating, it is unclear whether this proportion would hold across the population level in practice. It certainly raises the question of whether abstracts and articles submitted for peer-review should be masked to country-of-origin.[56] The 8th International conference on peer review in biomedical research sets the stage for a more detailed examination of cognitive biases in healthcare evidence interpretation.[57,]

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Author Contributions

MH conceived and designed the research, collected and cleaned the data, helped to analyze the data, wrote the first draft and revised subsequent drafts for important intellectual content. JM analyzed the data and helped to design the research, and revised the drafts for important intellectual content. MM conducted an initial pilot of the survey, helped to collect data, contributed to the first draft and revised subsequent drafts for important intellectual content. GJ helped to collect data, design the research and revised subsequent drafts for important intellectual content. CA helped to clean the data and analyze it, and revised subsequent drafts for important intellectual content.

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Conflict of Interests

No, there are no competing interests

Data sharing

No additional data available.

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Figure 1: List of abstracts used in the survey and the fictionalized sources and institutions

	Abstract 1	Abstract 2	Abstract 3	Abstract 4
Original article title	Lay health worker intervention with choice of DOT superior to standard TB care for farm dwellers in South Africa: a cluster randomized control trial.	The use of routine monitoring and evaluation systems to assess a referral model of family planning and HIV service integration in Nigeria.	C-reactive protein lowering with rosuvastatin in the METEOR study.	Profiles of self-reported HIV-risk behaviors among injection drug users in methadone maintenance treatment, detoxification, and needle exchange programs.
Original first author	Clarke M	Chabikuli NO	Peters SA	Mark HD
Original journal	International Journal of Tuberculosis and Lung Disease	AIDS	Journal of Internal Medicine	Public Health Nursing
Original source	Sweden	Nigeria	The Netherlands	USA
Source Cochrane Review	Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases	Integration of HIV/AIDS services with maternal, neonatal and child health, nutrition, and family planning services	Statins for the primary prevention of cardiovascular disease	Oral substitution treatment of injecting opioid users for prevention of HIV infection
Year	2005	2009	2010	2006
Degree of internal validity from Cochrane Review	+++++	++++	+++++	+++++
Fictional Source Survey A	Faculty of Medicine, University of Freiburg, Freiburg, Germany RSH	College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia XSL	Faculty of Health Sciences, Mzuzu University, Mzuzu, Malawi RPL	Department of Public Health and Primary Care, Oxford University, Oxford, United Kingdom XPH
Fictional Source Survey B	College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia RSL	Faculty of Medicine, University of Freiburg, Freiburg, Germany XSH	Department of Public Health and Primary Care, Oxford University, Oxford, United Kingdom RPH	Faculty of Health Sciences, Mzuzu University, Mzuzu, Malawi XPL

*R=Randomized Controlled Trial; X=Cross-sectional design; S=Service delivery; P=Pharmaceutical; H=High Income; L=Low Income

321x202mm (96 x 96 DPI)

Appendix 1: CEPH accredited Institutions

Institution	Department/Division	CEPH School or Program
Johns Hopkins Bloomberg School of Public Health	Health Policy and Management	School
	International Health	School
	Health Behaviour and Society	School
	Population Family and Reproductive Health	School
	Epidemiology	School
	Environmental Health Sciences	School
	Molecular Microbiology	School
	Biostatistics	School
	Mental Health	School
Harvard School of Public Health	Biostatistics	School
	Environmental Health	School
	Epidemiology	School
	Genetics	School
	Global Health	School
	Health Policy	School
	Immunology	School
	Nutrition	School
	Social and Behavioural	School
Columbia Mailman School of Public Health	Biostatistics	School
	Environmental Health Science	School
	Epidemiology	School
	Health Policy and Management	School
	Population Health and Family Health	School
	Sociomedical Sciences	School
Boston University - School of Public Health	Biostatistics	School
	Community Health sciences	School
	Environmental Health	School
	Epidemiology	School
	Global Health	School
	Health Law, Bioethics and Human Rights	School
	Health Policy and Management	School
	Dept. Family Medicine	School
	Dept. Paediatrics*	School
	Dept. Psychiatry and Human Behaviour	School
Colorado School of Public Health	Biostatistics	School
	Community and Behaviour	School

	Environmental and Occupational Health	School
	Epidemiology	School
	Health Systems Management	School
CUNY School of Public Health		School
Geisel School of Medicine, Dartmouth	Institute for Health Policy and Clinical Practice	Program
Drexel School of public health	Epidemiology and Biostatistics	School
	Health Management and Policy	School
	Environmental and Occupational Health	School
	Community Health and Prevention	School
East Tennessee State University College of Public Health	Biostatistics	School
	Community and Behavioural Health	School
	Environmental Health	School
	Health sciences	School
	Health Services Management and Policy	School
Emory Rollins School of Public Health	Behavioural Science	School
	Biostatistics	School
	Environmental Health	School
	Epidemiology	School
	Health Policy and Management	School
	Global Health	School
Florida A and M University Institute of Public Health		Program
Florida International University Rob Stempel College of Public Health and	Biostatistics	School
	Dietetics and nutrition	School
	Environmental and occupational health	School
	Epidemiology	School
	Health policy and management	School
	Health promotion and disease prevention	School
	Social work	School
George Washington university Milken Institute School of Public Health	Environmental and occupational health	School
	Epidemiology and Biostatistics	School
	Global Health	School
	Exercise and nutrition sciences	School
	Health policy	School
	Health services management and leadership	School
	Prevention and Community Health	School
Georgia Regents University Institute of Public and Preventative Health	Biostatistics and Epidemiology	Program
Georgia Southern University Jiann-Ping Hsu College of Public Health	Biostatistics	School
	Dept. Community Health	School
	Environmental Health	School

	Dept. of Epidemiology	School
	Dept. Health Policy and Management	School
Georgia State University MPH program		Program
Icahn School of Medicine at Mount Sinai Grad program in Public Health		Program
Indiana University Richard M Fairbanks School of Public Health	Epidemiology	School
	Behavioural Sciences	School
	Health Policy and Management	School
	Environmental Health	School
	Biostatistics	School
Loma Linda University School of Public Health*		School
Louisiana State University Health Sciences Centre School of Public Health	Behavioural and Community Health Sciences	School
	Biostatistics	School
	Environmental and Occupational Health Sciences	School
	Epidemiology	School
	Health Policy and Systems Management	School
Mercer University Master of Public Health Programme		Program
New York Medical College and Institute of Public Health - School of		Program
New York Medical College and Institute of Public Health - School of		Program
North-eastern University Master of Public Health Programme in Urban		Program
North-western University Feinberg School of Medicine Programs in Public		Program
Ohio State University College of Public Health	Biostatistics	School
	Centre for public health practice*	School
	Environmental health sciences	School
	Epidemiology	School
	Health behaviour and health promotion	School
	Centre for health outcomes	School
	Health services management and policy	School
Oregon Health and Science University/Portland State University		Program
Oregon State University College of Public Health and Human Sciences*		School
Pennsylvania State University MPH Program	Biostatistics and bioinformatics	Program
	Epidemiology	Program
	Health services and behavioural research	Program
Rutgers School of Public Health		School
Saint Louis State University College for Public Health and Social Justice	Dept. behavioural science and education	School
	Dept. biostatistics	School
	Dept. environmental and occupational helath	School
	Dept. epidemiology	School

	Dept. health management and policy	School
San Diego State university graduate school of public health		School
St Georges University Department of Public Health and Preventative	Epidemiology	Program
	Environmental and occupational track	Program
	Health policy and administration track	Program
	MD/MPH track	Program
Stony Brook University Program in Public Health		Program
SUNY Downstate Medical Centre School of Public Health		School
Temple University College of Public Health		Program
Texas A+M Health Science Centre School of Public Health		School
Thomas Jefferson University, School of Population Health		Program
Touro University - California MPH Program		Program
Tufts University School of Medicine, Public Health Program		Program
Tulane University School of Public Health and Tropical Medicine	Biostatistics and Bioinformatics	School
	Epidemiology	School
	Global Community health	School
	Global environmental sciences	School
	Tropical medicine	School
	Global health systems and development	School
UCLA Jonathan and Karin Fielding School of Public Health	Environmental Health Sciences	School
	Epidemiology	School
	Community Health Sciences	School
	Health Policy and Management	School
	Biostatistics	School
Uniformed Services University of the Health Sciences Public Health Program*		Program
University at Albany SUNY School of Public Health	Biomedical sciences Infectious diseases	School
	Environmental health sciences	School
	Epidemiology and biostatistics	School
	Health policy management and behaviour	School
University at Buffalo SUNY School of Public Health and Health Professions	Biostatistics	School
	Community health and health behaviour	School
	Epidemiology and environmental health	School
	Exercise and nutrition sciences	School
	Rehabilitation science	School
University of Alabama at Birmingham School of Public Health	Biostatistics	School
	Environmental health sciences	School
	Epidemiology	School
	Health behaviour	School
	Healthcare organization and behaviour	School

University of Arizona Mel and Enid Zuckerman College of Public Health	Biostatistics	School
	Environmental Health Sciences	School
	Epidemiology	School
	Family and Child Health	School
	Health Behaviour and Health promotions	School
	Health services administrations	School
	Public health policy and management	School
	Public health practice	School
University of Arkansas for Medical Sciences Fay W. Boozman College of	Biostatistics	School
	Environmental and Occupational Health	School
	Epidemiology	School
	Health behaviour and health education	School
	Health Policy and Management	School
University of California, Berkeley School of Public Health	Biostatistics	School
	Environmental Health sciences	School
	Epidemiology	School
	Health and Social Behaviour	School
	Health Policy and Management	School
	Health services and policy analysis	School
	Infectious disease and vaccinology	School
	Maternal and Child Health	School
	Public Health nutrition	School
University of California, Davis MPH Program		Program
University of California, Irvine Program in Public Health		Program
University of Cincinnati College of Medicine MPH Program	Biostatistics	Program
	Environmental Public Health	Program
	Epidemiology	Program
	Health education	Program
	Health services Management	Program
	Occupational Public Health	Program
University of Florida College of Public Health and Health Professions	Behavioural science and community health	School
	Biostatistics	School
	Clinical and health psychology	School
	Environmental and global health	School
	Epidemiology	School
	Health services research management and policy	School
	Occupational health	School
	Physical therapy	School
	Rehabilitation science	School

	Speech language and hearing sciences	School
University of Georgia College of Public Health	Epidemiology and biostatistics	School
	Environmental health science	School
	Health policy and management	School
	Health promotion and behaviour	School
University of Hawaii, Manoa Public Health Program		Program
University of Illinois at Chicago School of Public Health	Community health sciences	School
	Environmental and occupational health sciences	School
	Epidemiology and biostatistics	School
	Health policy and administration	School
University of Iowa College of Public Health	Biostatistics	School
	Community and behavioural health	School
	Epidemiology	School
	Health management and policy	School
	Occupational and environmental health	School
University of Kansas School of Medicine KU - MPH Program Kansas City		Program
University of Kansas School of Medicine KU - MPH Program Wichita		Program
University of Kentucky College of Public Health	Biostatistics	School
	Epidemiology	School
	Gerontology	School
	Health behaviour	School
	Health management and policy	School
	Preventative medicine and environmental health	School
University of Louisville School of Public Health and Information Sciences	Biostatistics and bioinformatics	School
	Environmental and occupational health sciences	School
	Epidemiology and population health	School
	Health management and systems science	School
	Health promotion and behavioural science	School
	Health hazards preparedness	School
University of Maryland School of Public Health	Behavioural and community health	School
	Applied environmental health	School
	Epidemiology and biostatistics	School
	Family science	School
	Health services administration	School
	Kinesiology	School
University of Massachusetts-Amherst School of Public Health and Health	Biostatistics	School
	Community health education	School
	Environmental health sciences	School
	Epidemiology	School

	Health policy and management	School
University of Miami Department of Public Health Sciences		Program
University of Michigan School of Public Health	Biostatistics	School
	Environmental health sciences	School
	Epidemiology	School
	Health behaviour and health education	School
	Health management and policy	School
University of Minnesota School of Public Health	Biostatistics	School
	Environmental health science	School
	Epidemiology	School
	Health policy and management	School
University of Nebraska Medical Centre College of Public Health	Biostatistics	School
	Environmental, agricultural and occupational health	School
	Epidemiology	School
	Health promotion, social and behavioural health	School
	Health services research and administration	School
University of New England Graduate Programs in Public Health		Program
University of New Mexico Public Health Program		Program
University of North Carolina Gillings School of Global Public Health	Biostatistics	School
	Environmental sciences and engineering	School
	Epidemiology	School
	Health behaviour	School
	Health policy and management	School
	Maternal and child health	School
	Nutrition	School
	Public health leadership	School
University of North Texas Health Science Centre School of Public Health		School
University of Oklahoma Health Sciences Centre College of Public Health	Biostatistics and epidemiology	School
	Health administration and policy	School
	Health promotion sciences	School
	Occupational and environmental health	School
University of Pennsylvania Master of Public Health Program		Program
University of Pennsylvania Master of Public Health Program - Centre for		Program
University of Pittsburgh Graduate School of Public Health	Behavioural and community health sciences	School
	Biostatistics	School
	Environmental and occupational health	School
	Epidemiology	School
	Health policy and management	School
	Human genetics	School

	Infectious diseases and microbiology	School
University of South Carolina Arnold School of Public Health	Communication sciences	School
	Environmental health sciences	School
	Epidemiology and biostatistics	School
	Exercise science	School
	Health policy and management	School
	Health promotion, education and behaviour	School
University of South Florida College of Public Health	Community and family health	School
	Environmental and occupational health	School
	Epidemiology and biostatistics	School
	Global health	School
	Health policy and management	School
University of Southern California MPH Program	Health education and promotion	Program
	Biostatistics and epidemiology	Program
	Health communication	Program
	Child and family health	Program
	Global health leadership	Program
	Public health policy	Program
	Environmental health	Program
University of Tennessee Department of Public Health		Program
University of Texas Medical Branch at Galveston Graduate Program in Public		Program
University of Texas School of Public Health	Management policy and community health	School
	Health promotion and behavioural sciences	School
	Biostatistics	School
	Epidemiology, human genetics and environmental	School
University of Virginia MPH Program	Biostatistics	Program
	Health policy, management and regulation	Program
	Comparative effectiveness, quality and outcomes	Program
	Data sciences	Program
	Bioethics	Program
University of Washington School of Public Health	Biostatistics	School
	Environmental health and occupational sciences	School
	Epidemiology	School
	Global health	School
	Health services	School
Vanderbilt University Institute for Medicine and Public Health	Biomedical informatics	Program
	Biostatistics	Program
	Epidemiology	Program
	Public health	Program

Virginia Commonwealth University MPH Program		Program
Washington University in St. Louis Brown School Public Health Programs		Program
West Virginia University School of Public Health	Biostatistics	Program
	Epidemiology	Program
	Health policy management and leadership	Program
	Occupational, environmental health sciences	Program
	Social and behavioural sciences	Program
Yale School of Public Health	Biostatistics	School
	Chronic disease epidemiology	School
	Environmental health sciences	School
	Epidemiology of microbial diseases	School
	Global health	School
	Health policy and management	School
	Social and behavioural sciences	School
Arcadia University MPH program		Program
Armstrong State University MPH program in Community Health Education		Program
Baylor University MPH program		Program
Benedictine University MPH program*		Program
Brigham Young University MPH program in Health Promotion		Program
Brown University MPH program		Program
California State University Fresno		Program
California State University Fullerton		Program
California State University Long Beach		Program
California State University Northridge		Program
Case Western Reserve University MPH Program*		Program
Central New York MPH Program*		Program
Charles Drew University of Medicine and Science MPH program in Urban		Program
Claremont Graduate University MPH program		Program
Consortium of Eastern Ohio MPH Program		Program
DePaul University MPH program		Program
Des Moines University MPH program		Program
East Carolina University		Program
East Stroudsburg University MPH program in Community Health Education		Program
Eastern Kentucky University Public Health Program		Program
Eastern Virginia Medical School MPH program		Program
Florida State University MPH program		Program
George Mason University MPH program		Program
Idaho State University MPH program		Program
Purdue University Indianapolis Public Health Program^		Program

Indiana University at Bloomington MPH program		Program
Jackson State university Public Health program		Program
Kansas State University MPH program		Program
Medical College of Wisconsin MPH program*		Program
Meharry Medical College MSc in Public Health program		Program
Missouri State University MPH program		Program
Morehouse School of Medicine MPH program*		Program
Morgan State University Public Health Program		Program
National University MPH program		Program
New Mexico State University MPH program in Community Health Education		Program
Northern Illinois University MPH program		Program
Northwest Ohio Consortium for Public Health		Program
Nova South-eastern University MPH program		Program
San Francisco State University MPH program in Community Health Education		Program
San Jose State University MPH Program in Community Health Education		Program
Simon Fraser University Public Health Program		Program
Southern Connecticut State University Public Health Program		Program
Southern Illinois University Carbondale MPH program*		Program
University of Alaska, Anchorage MPH program		Program
University of Connecticut Graduate Program in Public Health		Program
University of Illinois at Urbana-Champaign MPH program		Program
University of Maryland at Baltimore, MPH Program		Program
University of Missouri, Columbia MPH program		Program
University of Montana MPH program		Program
University of Nevada Las Vega MPH program	Environmental and Occupational health	Program
	Epidemiology and Biostatistics	Program
	Healthcare administration and policy	Program
	Social and behavioural health	Program
University of Nevada, Reno		Program
University of New Hampshire MPH program		Program
University of North Carolina, Greensboro MPH program in Community		Program
University of North Carolina at Charlotte Public Health Programs		Program
University of North Florida MPH program		Program
University of Rochester MPH program	Epidemiology	Program
	Health policy and outcomes research	Program
	Social and behavioural sciences	Program
University of San Francisco MPH program		Program
University of Southern Mississippi MPH program		Program
University of Texas at El Paso MPH program		Program

University of Utah Public Health program*	Program
University of West Florida MPH Program	Program
University of Wisconsin La Crosse MPH program in Community Health	Program
University of Wisconsin Madison MPH program	Program
Virginia Tech Public Health Program	Program
Wayne State University MPH program	Program
West Chester University MPH program	Program
Western Kentucky University Public Health Programs	Program
Westminster College Public Health Program*	Program
Wright State University MPH program	Program

*No directory available or accessible

^CEPH listing duplicated with Indiana Fairbanks School of Public Health

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Does a research article's country of origin affect perception of its quality and relevance? A national trial of US public health researchers.

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Does a research article's country of origin affect perception of its quality and relevance? A national trial of US public health researchers.

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Abstract

Objectives: The source of research may influence one's interpretation of it in either negative or positive ways however there are no robust experiments to determine how source impacts on one's judgment of the research article. We determine the impact of source on respondents' assessment of the quality and relevance of selected research abstracts.

Design: Web-based survey design using four healthcare research abstracts previously published and included in Cochrane Reviews.

Setting: All Council on the Education of Public Health-accredited Schools and Programmes of Public Health in the United States.

Participants: 899 core faculty members (full, associate and assistant professors)

Intervention: Each of the four abstracts appeared with high-income source half of the time, and low-income source half of the time. Participants each reviewed the same four abstracts, but were randomly allocated to receive two abstracts with high-income source, and two abstracts with low-income source allowing for within-abstract comparison of quality and relevance

Primary outcome measures: Within-abstract comparison of participants rating score on two measures – strength of the evidence, and likelihood of referral to a peer (1 to 10 rating scale). Odds Ratio was calculated using a generalized ordered logit model adjusting for socio-demographic covariates.

Results – Participants that received high-income country source abstracts were equal in all known characteristics to the participants that received the abstracts with low-income country sources. For one of the four abstracts (a randomized, controlled trial of a pharmaceutical intervention) likelihood of referral to a peer was greater if the source was a high-income country (OR 1.28, 1.02 to 1.62, $p<0.05$).

Conclusions: All things being equal, in one out of the four abstracts, the respondents were influenced by a high-income source in their rating of research abstracts. More research may be needed to explore how the origin of a research article may lead to stereotype activation and application in research evaluation. More research may be needed to explore how the origin of a research article may lead to stereotype activation and application in research evaluation.

Article summary

Strengths and limitations of this study

- First study at national level in the US to determine the impact of country-of-origin on the rating of healthcare research abstracts.
- All core faculty members (full, associate and assistant professors) of every CEPH-accredited Schools and Programmes of Public Health in the United States were invited to participate in the study.
- Subjects blinded to the purpose of the study and randomised to receive high- or low-income source abstracts.
- Abstracts were rated on strength of the evidence and likelihood of referral to a peer.
- Although 899 full, associate and assistant professors participated in the study this corresponded to a 9.8% response rate.

Background

Ideally, research findings ought to be judged on the strength of the evidence and their relevance. However, there is subjectivity involved in interpreting research.[1] Research certainly does not 'speak for itself' – we give it a voice, and how we judge whether one piece of research constitutes evidence or not is complex and messy. Common standards for assessing the internal validity of research do not account for the potential cognitive biases in the consumption and interpretation of research *post*-publication and each of us may reach a different conclusion as to whether the research presents strong evidence and whether we consider the research useful. In practice, we see many idiosyncracies. A rigorous RCT may convince a surgeon to change a certain practice, but may not have the same effect on a primary care physician.[2] Government regulators consider the reliability (the degree to which an innovation is communicated as being consistent in its results) of an innovation more positively than industrial scientists.[3] Clinicians are more likely to adopt an innovation if they believe it has come from current users with similar professional, cultural and socioeconomic backgrounds.[4] A legitimate source is important for innovation diffusion[5,6] but little is known about how legitimacy is defined or perceived. From the marketing literature, Bilkey and Nes (1982) showed that consumers tend to rate products from their own countries more favorably and that consumer preferences are positively correlated with the degree of economic development of the source country, probably evoked by the lower price cue of low-income country products.[7] Up to 30% of the variance of consumer product ratings can be attributed to the product's country-of-origin.[8]

In healthcare research, typically one of the first pieces of information that is provided in a research article is the author's name, the institution and country of the research. Understanding anchoring to be a feature of heuristic thought,[9-13] it follows that we should examine the extent to which the source affects our interpretation of that research. If one possesses a prior-held belief or attitude towards the source, how does this influence one's subsequent view of the research? All things being equal, would research conducted in Ethiopia be viewed in the same way as identical research conducted in the United States?[14]

The income and development level of the source country certainly seems to determine whether a manuscript is selected for publication.[15] The number of publications from low-income countries is significantly lower than the number from developed countries in various research fields.[15,16] In psychiatry, only 6% of literature is published from regions that represent 90% of the global population.[17] Similar underrepresentation exists in cardiology, HIV research and epidemiology.[18,19] One argument for this is that research from Low-Income Countries lacks the quality to meet publication criteria.[20] Others argue that there are systematic selection biases. Editorial board members of international biomedical journals are more likely to come from High-Income Countries.[21-23] Reviewers from OECD (Organization for Economic Cooperation and Development) countries view articles from their own country more favourably than from other countries.[22,24, 25] Studies recruiting participants from the US are more likely to be published.[21,23] In Peters and Ceci's controversial experiment, only one of the nine articles that were initially published in a highly regarded American journal was accepted upon resubmission to the same journal after fabricating the name of the original institutions.[26] Kleiwer et al demonstrated that articles from outside of North America were less likely to be accepted for publication.[27] It seems that source matters.

The major obstacle to this research question is that there are no controlled studies to ascertain the impact of the source of the research *post*-publication. To fill this research gap, we present here a randomized trial of Public Health research faculty in the United States. This national survey invites respondents, most of who are experienced healthcare researchers and peer reviewers, to rate identical, typical healthcare research abstracts. To ascertain the impact of the source (institution and country) of the abstracts, we ensured that the abstracts that the respondents received were identical in every respect except we fictionalized the sources into either high- or low-income countries and randomized the respondents to receive either type. We then compared their responses to two simple questions for each abstract – whether they think the evidence in the abstract is strong, and whether they would recommend the abstract to a peer. Under the null hypothesis, there should be no difference in the distribution of responses to the two types of abstract.

Methods

Survey design

We used a web-based survey using a Qualtrics survey platform. The survey was divided into two sections, the first to collect demographic and professional data and the second for the respondent to read and respond to four research abstracts. Each abstract was followed by the same two questions – first, how strong is the evidence presented in this abstract? And second, how likely are you to recommend this abstract to a colleague? Responses were on a scale (1 to 10) with 1 as the least (i.e. not at all strong, not at all likely) and 10 as the most (extremely strong, extremely likely). The time taken to read and respond to each abstract was measured by the survey platform. Each question was forced response to avoid the problem of missing data. Recipients were randomly allocated to one of two possible surveys. In the first, abstracts 1 and 4 were fictionalized to high-income country sources (UK and Germany) and Abstracts 2 and 3 were fictionalized to low-income country sources (Malawi and Ethiopia). These sources were reversed in the second survey. Therefore, each survey (Survey A and Survey B) had two abstracts from low-income country sources and two from high-income country sources (Figure 1).

In order to ensure that the abstracts were of a sufficient quality and internal validity, we purposively selected abstracts of papers that had been included in Cochrane Reviews and that were also likely to be of at least some interest to most public health academics and health service researchers. Each abstract had therefore already been vetted for sources of bias prior to publication, using the Cochrane risk of bias tool, and we only selected abstracts that had a high internal validity for the type of study that it was describing. There is a trade off between choosing abstracts of interest to all potential respondents and the length of the survey. We decided to choose four abstracts – one randomized controlled pharmaceutical trial, one randomized controlled service intervention, one pharmaceutical intervention of cross-sectional design and one service intervention of cross-sectional design – to give a balance in terms of content and design. All four abstracts were of similar length and complexity. The abstracts were presented as found in their PubMed format, with all technical content preserved and in a format familiar to any healthcare researcher, however for each abstract the institution and country of origin was fictionalized to one of four different high- or low-income sources. For one abstract, the trial acronym was removed to avoid the possibility that some respondents would recognize the research. High-income source countries were selected from the top ten countries by GDP per capita (>$36000 per capita), and OECD membership. Low-income source countries were selected from the bottom ten countries by GDP per capita (<$1046 per capita). The institutional affiliation was fictionalized to one of the top-five universities that also had a medical or healthcare faculty, in the respective countries. We used the 2014 Times Higher Education World rankings (http://www.timeshighereducation.co.uk/world-university-rankings/2014-15/world-ranking) for the high-income country sources, and the http://www.4icu.org website for international rankings of institutions for the low-income sources.

We ensured that the source of the abstract was equally visible in each abstract and was mentioned in at least three locations throughout the abstract - the title, under the title and in the abstract itself. To avoid a possible order effect, the order in which the abstracts were presented in the survey was randomized for each participant. Neither the original nor fictionalized journals were included in the source in order to avoid respondents reacting to the reputation of the publication type. Furthermore, in order to not influence the responses, the survey was described as a Speed Reading survey, designed to examine whether the time taken to read an abstract influences the interpretation of the information within it. The survey platform enabled us to measure the time taken to respond to the entire survey, and each abstract, and this information was provided to the respondent at the end of the survey to heighten the 'psychological realism' of the survey. The survey was pilot-tested with Masters in Public Health students at Imperial College London and some faculty members at New York University to ensure face validity of the questions and that the design and flow of the survey was straightforward.

Participants and survey management

We included all core faculty members of Schools and Programs of Public Health located in a US State that had publically available contact information and that were accredited by Council on the Education of Public Health (CEPH - http://ceph.org/accredited) (159 institutions) (see Appendix 1 for full listing). We excluded administrators, managers, adjunct faculty members and visiting faculty members, and faculty members from our own institution. From this universe of potential respondents (n=9421 once duplicates were removed), we randomized them to receive either Survey A or Survey B and sent them an invite to take the survey. Block randomization within respective institutions was used, with 4, 6 and 8 sequences, from a web-based randomization service (www.sealedenvelope.com, seed 137526655595533).

The survey was designed so that only the email recipient could open the link to the survey and that it could be taken only one time. The survey could not be sent anonymously, and was inaccessible to search engines. The survey was active only within the specified time frame (20th January to 4th February 2015, chosen so that faculty members were highly likely to be present at their institution) and two email reminders were sent on day 7 and day 14 following the first email invite (20th January 2015). Panel members did not receive prior invitation to participate in the survey however our email invite indicated clearly that all responses were to be de-identified, and analyzed in aggregate form only and only for the purposes of this research. It also indicated that there was no obligation to participate but by choosing to participate consent to use the response for research is implied. We offered participants entry into a lottery draw for a $500 Amazon voucher as an incentive to complete the survey. The study protocol, including the non-harmful deception around the ulterior motive of the study, was reviewed by the New York University Committee on Activities Involving Human Subjects and deemed exempt from full ethical review (#14-10332).

Statistical analysis and power calculation

Data was retrieved via Qualtrics in CSV format and analyzed using Stata/SE 13 (Statacorp, College Station, Texas). We used demographic covariates (age, sex), professional experience covariates (research exposure, peer review experience, educational attainment) and institutional covariates (region, CEPH accreditation type, and Ivy league status) to explain variation in the outcomes of interest. We grouped respondent age into categories based on a presumed mid-year birth and survey completion date of 31st January 2015. Educational attainment was categorized into two groups Academic and Clinical Academic based on the completed qualifications provided in the survey responses. We used a generalized ordered logit model for the multivariable analysis and two-tailed t-tests to compare the differences in mean responses as well as for the descriptive characteristics of the survey samples. We also explored high and low cut points for the outcome variables in bivariate analysis and illustrate the distribution of scores as proportions of respondents at the high (≥8) and low (≤3) ends of the distribution, using a univariate logistic regression model containing the binary outcome (i.e. above/below a certain threshold) and a binary indicator of the abstract's country of origin. The corresponding test is a Wald test of the beta coefficient for the abstract country of origin.

We calculated that sample sizes of 400 respondents for each survey would provide enough power (80%) to detect a statistically significant (95% confidence level) difference of 0.35 in mean scores between the two groups[28].

Results

After randomization, 4711 potential respondents received email-invites for Survey A, and 4710 received email-invites for Survey B. 51 and 61 invitations bounced respectively. 567 started Survey A and 594 started Survey B. Of these, 433 completed Survey A and 466 completed Survey B. This corresponds to a response rate of 9.2% for Survey A and 9.9% for Survey B. Institutional characteristics (region and Ivy league representation) of responders and invitees were not significantly different, although there was a small over-representation of responders from CEPH accredited Programs in Public Health. The demographic characteristics of the respondents of both surveys were equal suggesting that randomization performed as was expected (Table 1). 90% of respondents of both survey types serve as peer reviewers for academic journals.

Table 1. Respondent characteristics for Survey A and Survey B

	All respondents (n=899)	Survey A (n=433)	Survey B (n=466)
Males, %	42.05	42.49	41.63
Age, mean	50.26	50.35	50.17
Academic credentials only [a] %	84.58	84.69	84.48
Clinical credentials [b] %	15.42	15.31	15.52
US born [c], %	81.65	82.68	80.69
Reads research daily [d], %	60.07	61.20	59.01
CEPH Program of Public Health [e], %	35.48	34.64	36.27
Ivy league university [f], %	12.46	12.93	12.02
Region Northeast %	28.03	26.79	29.18
South %	42.05	43.42	40.77
Midwest %	18.24	17.32	19.1
West %	11.68	12.47	10.94

[a] e.g. BSc, BA, MSc, MPH, PhD
[b] e.g. MD, MBBS, MBChB
[c] versus non-US born
[d] versus reads research less than daily
[e] versus CEPH School of Public Health
[f] versus non-Ivy league institution

On average, respondents spent between 72.5-109.9 seconds on each abstract with no significant differences between the groups. Table 2 shows the mean (SD) ratings for strength and referral for the four abstracts by the type of source. Referral to a peer for Abstract 3 (Randomized controlled trial of a pharmaceutical intervention) was significantly more likely if the source was from a high-income country. There were no other significant differences between the abstracts based on the source. The findings were unchanged when using the proportion rating higher than 8 or lower than 3. As might be expected, strength rating for abstracts that described a more robust research design, specifically Randomized Controlled Trials (Abstract 1 and 3) scored higher for strength than Abstracts 2 and 4 that were of a cross-sectional design. Also, as might be expected, the disposal of these abstracts also correlated well with respondents' view of the strength of the evidence contained within them. Correlation between the scores given for strength of evidence and subsequent referral was high (Spearman correlation coefficients varied between 0.71-0.85).

Table 2: Abstract rating for strength and referral

		Abstract 1			Abstract 2			Abstract 3			Abstract 4		
	Source	High Income	Low Income	All	High Income	Low Income	All	High Income	Low Income	All	High Income	Low Income	All
Strength	Mean	5.77	5.78	5.77	4.92	4.90	4.91	6.92	6.76	6.84	3.95	4.05	4.00
	(SD)	(2.30)	(2.11)	(2.20)	(1.95)	(2.04)	(1.99)	(2.02)	(2.03)	(2.02)	(2.14)	(2.06)	(2.10)
	≥8 (%)	27.61	24.78	26.15	10.13	12.06	11.06	47.63	43.16	45.47	6.96	4.74	5.81
	≤3 (%)	22.04	18.10	20.00	27.59	30.63	29.05	8.19	9.05	8.60	48.49	45.91	47.15
Referral	Mean	5.14	5.38	5.27	4.50	4.56	4.53	6.05*	5.68	5.87	3.79	3.96	3.88
	(SD)	(2.54)	(2.36)	(2.45)	(2.21)	(2.26)	(2.23)	(2.40)	(2.45)	(2.43)	(2.23)	(2.21)	(2.22)
	≥8 (%)	21.58	23.71	22.68	10.34	11.60	10.95	32.97	27.61	30.39	7.66	7.33	7.49
	≤3 (%)	30.63	24.78	27.60	36.64	37.35	36.98	17.46	21.81	19.55	51.74	46.77	49.16
	Mean time(s)	87.4	87.4	87.4	109.9	103.0	106.2	109.8	97.3	103.8	72.5	79.4	76.0
	(SD)	(68.4)	(118)	(97.3)	(169)	(200)	(186)	(131)	(304)	(237)	(56.4)	(146)	(112)

*p<0.05

Abstract 1=RCT/Service

Abstract 2=Cross-sectional/Service

Abstract 3=RCT/Pharmaceutical

Abstract 4=Cross-sectional/Pharmaceutical

Tables 3 and 4 show the results of the multivariable analysis. Controlling for individual and institutional covariates, high-income source was a significant predictor of referral for Abstract 3 only (OR 1.28, 1.02-1.62). For some abstracts, the time spent reviewing the abstract was negatively associated with the rating given to it for strength of evidence (Abstract 1 OR 0.49, 0.34-0.71; Abstract 3 OR 0.65, 0.46-0.92) or referral to a peer (Abstract 1 OR 0.50, 0.35-0.72; Abstract 2 OR 0.61, 0.44-0.84; Abstract 3 OR 0.66, 0.44-0.84). However, rating for Abstract 4 (both strength of evidence (OR 1.63, 1.06-2.51) and referral to a peer (OR 1.55, 1.01-2.38) improved when more time was spent on it. Individuals affiliated to CEPH Programs of Public Health were significantly more likely to rate the strength of the evidence for this abstract higher (OR 1.38, 1.07-1.78) and to refer it to colleagues (OR 1.67, 1.30-2.15) than individuals affiliated to Schools of Public Health.

Table 3: Predictors of abstract strength ratings [a]

	Abstract 1 OR 95% CI	Abstract 2 OR 95% CI	Abstract 3 OR 95% CI	Abstract 4 OR 95% CI
High v low country origin	1.03	1	1.16	0.94
	0.82,1.30	0.80,1.26	0.92,1.46	0.74,1.18
Male (v female)	0.93	0.87	0.97	0.87
	0.73,1.18	0.68,1.10	0.76,1.23	0.68,1.10
41-50 years (vs 21-40)	0.81	0.71*	1.01	0.87
	0.59,1.12	0.52,0.97	0.73,1.39	0.64,1.20
51-60 years (vs 21-40)	0.79	0.74	1.14	0.77
	0.57,1.09	0.54,1.03	0.82,1.58	0.56,1.06
61+ years (vs 21-40)	0.76	0.85	1.12	0.82
	0.54,1.06	0.60,1.19	0.80,1.57	0.58,1.15
Clinical academic credentials (vs academic only)	0.83	0.65**	0.95	0.78
	0.60,1.14	0.47,0.89	0.68,1.32	0.57,1.08
US born (vs not)	1.06	0.83	0.94	0.89
	0.78,1.44	0.62,1.13	0.69,1.28	0.66,1.21
Reads research daily (vs < daily)	1.03	0.94	0.85	1.14
	0.81,1.31	0.74,1.20	0.67,1.08	0.89,1.45
CEPH program (vs school)	1.12	1.06	1.03	1.38*
	0.87,1.45	0.82,1.36	0.80,1.32	1.07,1.78
Ivy league institution (vs others)	0.78	0.67	1.14	1.08
	0.50,1.21	0.43,1.06	0.73,1.78	0.69,1.68
South region (vs Northeast)	0.71	1.08	0.84	1.05
	0.50,1.00	0.77,1.52	0.59,1.18	0.74,1.47
Midwest region (vs Northeast)	0.82	1.17	1.14	1.07
	0.55,1.23	0.78,1.74	0.76,1.71	0.72,1.59
West region (vs Northeast)	0.93	1.11	1.05	0.89
	0.59,1.46	0.72,1.74	0.66,1.67	0.56,1.40
60-<120 seconds spent reading (vs <60s)	0.67**	0.87	0.98	1.33*
	0.51,0.87	0.66,1.15	0.74,1.28	1.04,1.70
120+ seconds spent reading (vs <60s)	0.49***	0.77	0.65*	1.63*
	0.34,0.71	0.56,1.07	0.46,0.92	1.06,2.51
N[b]	895	895	895	895

[a] Generalised ordered logit model controlling for all variables in each column.

[b] Only survey responses with no missing data included in the multivariate analysis

*p<0.05

Abstract 1=RCT/Service; Abstract 2=Cross-sectional/Service; Abstract 3=RCT/Pharmaceutical; Abstract 4=Cross-sectional/Pharmaceutical

Table 4: Predictors of abstract referral ratings [a]

	Abstract 1 OR 95% CI	Abstract 1 OR 95% CI	Abstract 3 OR 95% CI	Abstract 4 OR 95% CI
High v low country origin	0.85	0.94	1.28*	0.9
	0.67,1.07	0.75,1.19	1.02,1.62	0.71,1.13
Male (v female)	0.95	0.78*	0.98	0.84
	0.75,1.20	0.61,0.99	0.78,1.25	0.66,1.06
41-50 years (vs 21-40)	0.98	0.85	1.06	0.83
	0.72,1.34	0.62,1.16	0.77,1.46	0.61,1.15
51-60 years (vs 21-40)	0.92	0.83	1.15	0.8
	0.67,1.28	0.60,1.15	0.83,1.60	0.58,1.11
61+ years (vs 21-40)	1.07	1.09	1.16	0.84
	0.77,1.50	0.77,1.54	0.83,1.63	0.60,1.18
Clinical academic credentials (vs academic only)	0.92	0.75	0.92	0.79
	0.67,1.26	0.54,1.04	0.66,1.28	0.57,1.08
US born (vs not)	0.91	0.8	0.84	1.01
	0.67,1.23	0.59,1.09	0.61,1.14	0.74,1.38
Reads research daily (vs < daily)	0.95	0.97	0.93	1.1
	0.75,1.21	0.76,1.23	0.74,1.19	0.86,1.39
CEPH program (vs school)	1.26	1.12	1.11	1.67***
	0.98,1.62	0.87,1.43	0.86,1.43	1.30,2.15
Ivy league institution (vs others)	0.8	0.71	0.92	0.96
	0.52,1.24	0.46,1.11	0.59,1.43	0.62,1.49
South region (vs Northeast)	0.91	1.14	0.93	1.01
	0.65,1.29	0.80,1.61	0.66,1.30	0.72,1.43
Midwest region (vs Northeast)	1.09	1.39	1.04	1.23
	0.73,1.63	0.93,2.07	0.70,1.55	0.83,1.84
West region (vs Northeast)	1.16	1.2	0.88	0.97
	0.74,1.82	0.77,1.89	0.56,1.39	0.62,1.52
60-<120 seconds spent reading (vs <60s)	0.65**	0.73*	0.97	1.31*
	0.50,0.84	0.55,0.96	0.74,1.28	1.02,1.67
120+ seconds spent reading (vs <60s)	0.5***	0.61**	0.66*	1.55*
	0.35,0.72	0.44,0.84	0.47,0.93	1.01,2.38
N[b]	895	895	895	895

[a] Generalised ordered logit models controlling for all variables in each column.

[b] Only survey responses with no missing data included in the multivariate analysis

*p<0.05

Abstract 1=RCT/Service; Abstract 2=Cross-sectional/Service; Abstract 3=RCT/Pharmaceutical; Abstract 4=Cross-sectional/Pharmaceutical

Discussion

Two sinister issues may be occurring if the source of the research affects one's judgement of it. First, poor research may be given undue significance in part because of the perceived legitimacy of its source. The MMR scandal in the UK may have been a painful example of this. In this case, vaccination rates for the MMR immunisation plummeted when a study published by a high profile research group in a prestigious journal claimed a tenuous (and later discredited) connection between the immunisation and rates of autism.[29]

Secondly, good research from an unexpected source may be discounted early on, resulting in missed opportunities to learn from important innovations. Low-Income Countries (LICs) have developed novel innovations and there are multiple opportunities to learn from LICs, for example around improved surgical procedures,[30] improved long-term outcomes in mental illness[31-35] improved skill mix with scaled use of community health workers.[36-38] However, there are strikingly few examples where these innovations have been adopted in High Income Countries (HICs).[39] Even in Health Links, where HICs and LICs collaborate explicitly and reciprocally, there are surprisingly few examples of attempts to adopt LIC innovations in high-income settings – HIC volunteers learn a lot personally and professionally however this does not translate into changes in their own health care systems and the learning and exchange of expertise is predominantly directed from the HICs towards the LICs.[40-43] The Reverse Innovation 'movement' sets out to unpack the barriers to adopting LIC innovations in HIC contexts. It is motivated in part by the rapidly changing global health landscape and has gained interest in the US and UK because the unsustainable growth in healthcare expenditure means that there is likely to be a genuine need to learn from LICs.[44]

We know already from the Diffusion of Innovation literature that healthcare professionals perform poorly when it comes to adopting innovations or evidence from 'elsewhere.'[2,45] The not-invented-here culture prevails. However we also know that innovations are more likely to diffuse if actors perceive the source to be similar to their own. Health professionals are homophilus.[4] We might ask therefore whether health professionals are even more discriminating when presented with research from very 'unlikely' sources? Do they discriminate against sources that they might perceive to be so different from their own, or perceive to be so unlikely to produce good research, that the evidence is discounted early on?

We were motivated to conduct this study due to a strong expectation that there would be a bias against low-income country abstracts, or at least that source would make a difference to how the respondents viewed the strength of evidence in the abstract and whether they would chose to refer the abstract to a peer. Although we found no difference in three of the four abstracts, a high-income source did make a difference to participants' view of the relevance of one of the abstracts. All things being equal our sample population considered the Randomised Controlled Trial of the pharmaceutical intervention to be significantly more relevant to their peer group if its source was from the UK rather than from Malawi.

We did take several steps to ensure that if explicit biases existed then we would capture them. We randomised the survey abstracts to control for known and unknown confounders and this was performed well as evidenced by the balanced characteristics of the two survey groups. We framed the research as a Speed Reading survey to encourage respondents to spend the minimum time assessing the abstract and allow anchoring to specific pieces of information in the abstract to occur and we made no reference to the hypothesis that we were testing to not influence the responses. We achieved a large sample size to be able to detect small, but meaningful differences in the distribution of the responses - the completed-survey response rate of nearly 10% is within the range expected for a time-consuming, internet-based survey with no pre-invitation recruitment.[46] The fact that the survey was presented as a Speed Reading test may also have reduced selection bias, in that its stated purpose would not necessarily appeal to one type of researcher, such as those with more global health experience.

However, the result was less dramatic than we expected, occurring in only one of the four abstracts, and it suggests that explicit biases are small and difficult to detect across a relatively small group of abstracts. The study provides an empirical baseline against which to compare future research into the effect of source on abstract evaluation. Indeed, it could be argued that the implications of this study are encouraging for the population that participated because the two groups of survey respondents treated three of the four abstracts almost identically irrespective of the source. Public health faculty in the US seem to be doing what is expected of them. Research is being assessed, by and large, according to its content rather than its origin. For those interested in exploring the barriers to Reverse Innovation, or types of publication bias, this finding may be encouraging.

In our study, we also found that respondents spent on average between 70-100 seconds per abstract. Rapid responders tended to rate abstracts higher, so it is possible that if less time is spent on the abstracts then anchoring to particular triggers might be having a greater effect. We did find that in Abstract 4, if more time is taken to respond to the abstract then opinion of it improves (for both strength of evidence and referral), however this is equal between both high and low income sources. We also found, as would be expected, that respondents tended to rate the randomised controlled trial abstracts higher for strength of evidence compared to the abstracts that were of a cross-sectional design. As the study was framed as a Speed Reading survey participants might have felt the need to speed-read the abstracts and which may not mirror normal practice.

We also note that the wide standard deviations in the outcomes indicate that, despite the large sample size, there is considerable variation in how readers view and consume research. The wide standard deviations might have reduced our ability to detect differences and further work should be conducted to validate measurement constructs in this context. GRADE[47] and Jadad[48] scores are widely used but usually to assess entire research articles against judgement of research quality, risk of bias, inconsistency, indirectness, imprecision and publication bias.[49-55] Our study, designed purposefully to be a rapid appraisal only of the research abstract, demonstrated extremely wide variation in the assessment of the limited information provided in the abstracts. This finding may have implications for systematic reviews, meta-analyses and for reviewers of abstracts submitted for conferences.

Considering the volume of abstracts read and consumed on a daily basis from all parts of the globe, if source impacts on one's perception, even though by a tiny margin, this might at scale be an observable phenomenon. We cannot speculate as to the triggers individuals identify with when reading each individual abstract under relatively rapid, timed conditions but it is encouraging that overall there were few differences between the two survey groups. As highly trained researchers in public health we could expect an explicit bias to be extremely small if present at all. It is possible that in other population groups this survey would present different findings. Policy-makers, clinicians, journalists, health service managers are all important actors in innovation diffusion processes, and may also be involved in peer-review processes for academic publication. Our strategy to include academic public health professionals in this survey is based on a best-case assessment of likely bias. Future research ought to modify the approach we have chosen in accordance with the target population, using other abstracts or developing a research design that allows respondents to serve as their own controls. Although we found only one of the four abstracts to elicit a small (yet statistically significant) difference in rating, it is unclear whether this proportion would hold across the population level in practice. It certainly raises the question of whether abstracts and articles submitted for peer-review should be masked to country-of-origin.[56] The 8^{th} International conference on peer review in biomedical research sets the stage for a more detailed examination of cognitive biases in healthcare evidence interpretation.[57,]

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Author Contributions

MH conceived and designed the research, collected and cleaned the data, helped to analyze the data, wrote the first draft and revised subsequent drafts for important intellectual content. JM analyzed the data and helped to design the research, and revised the drafts for important intellectual content. MM conducted an initial pilot of the survey, helped to collect data, contributed to the first draft and revised subsequent drafts for important intellectual content. GJ helped to collect data, design the research and revised subsequent drafts for important intellectual content. CA helped to clean the data and analyze it, and revised subsequent drafts for important intellectual content.

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Conflict of Interests

None declared. All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author)

Data sharing:

No additional data available.

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Figure 1: List of abstracts used in the survey and the fictionalized sources and institutions

	Abstract 1	Abstract 2	Abstract 3	Abstract 4
Original article title	Lay health worker intervention with choice of DOT superior to standard TB care for farm dwellers in South Africa: a cluster randomized control trial.	The use of routine monitoring and evaluation systems to assess a referral model of family planning and HIV service integration in Nigeria.	C-reactive protein lowering with rosuvastatin in the METEOR study.	Profiles of self-reported HIV-risk behaviors among injection drug users in methadone maintenance treatment, detoxification, and needle exchange programs.
Original first author	Clarke M	Chabikuli NO	Peters SA	Mark HD
Original journal	International Journal of Tuberculosis and Lung Disease	AIDS	Journal of Internal Medicine	Public Health Nursing
Original source	Sweden	Nigeria	The Netherlands	USA
Source Cochrane Review	Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases	Integration of HIV/AIDS services with maternal, neonatal and child health, nutrition, and family planning services	Statins for the primary prevention of cardiovascular disease	Oral substitution treatment of injecting opioid users for prevention of HIV infection
Year	2005	2009	2010	2006
Degree of internal validity from Cochrane Review	+++++	++++	+++++	+++++
Fictional Source Survey A	Faculty of Medicine, University of Freiburg, Freiburg, Germany RSH	College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia XSL	Faculty of Health Sciences, Mzuzu University, Mzuzu, Malawi RPL	Department of Public Health and Primary Care, Oxford University, Oxford, United Kingdom XPH
Fictional Source Survey B	College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia RSL	Faculty of Medicine, University of Freiburg, Freiburg, Germany XSH	Department of Public Health and Primary Care, Oxford University, Oxford, United Kingdom RPH	Faculty of Health Sciences, Mzuzu University, Mzuzu, Malawi XPL

*R=Randomized Controlled Trial; X=Cross-sectional design; S=Service delivery; P=Pharmaceutical; H=High Income; L=Low Income

321x202mm (96 x 96 DPI)

Appendix 1: CEPH accredited Institutions

Institution	Department/Division	CEPH School or Program
Johns Hopkins Bloomberg School of Public Health	Health Policy and Management	School
	International Health	School
	Health Behaviour and Society	School
	Population Family and Reproductive Health	School
	Epidemiology	School
	Environmental Health Sciences	School
	Molecular Microbiology	School
	Biostatistics	School
	Mental Health	School
Harvard School of Public Health	Biostatistics	School
	Environmental Health	School
	Epidemiology	School
	Genetics	School
	Global Health	School
	Health Policy	School
	Immunology	School
	Nutrition	School
	Social and Behavioural	School
Columbia Mailman School of Public Health	Biostatistics	School
	Environmental Health Science	School
	Epidemiology	School
	Health Policy and Management	School
	Population Health and Family Health	School
	Sociomedical Sciences	School
Boston University - School of Public Health	Biostatistics	School
	Community Health sciences	School
	Environmental Health	School
	Epidemiology	School
	Global Health	School
	Health Law, Bioethics and Human Rights	School
	Health Policy and Management	School
	Dept. Family Medicine	School
	Dept. Paediatrics*	School
	Dept. Psychiatry and Human Behaviour	School
Colorado School of Public Health	Biostatistics	School
	Community and Behaviour	School

	Environmental and Occupational Health	School
	Epidemiology	School
	Health Systems Management	School
CUNY School of Public Health		School
Geisel School of Medicine, Dartmouth	Institute for Health Policy and Clinical Practice	Program
Drexel School of public health	Epidemiology and Biostatistics	School
	Health Management and Policy	School
	Environmental and Occupational Health	School
	Community Health and Prevention	School
East Tennessee State University College of Public Health	Biostatistics	School
	Community and Behavioural Health	School
	Environmental Health	School
	Health sciences	School
	Health Services Management and Policy	School
Emory Rollins School of Public Health	Behavioural Science	School
	Biostatistics	School
	Environmental Health	School
	Epidemiology	School
	Health Policy and Management	School
	Global Health	School
Florida A and M University Institute of Public Health		Program
Florida International University Rob Stempel College of Public Health and	Biostatistics	School
	Dietetics and nutrition	School
	Environmental and occupational health	School
	Epidemiology	School
	Health policy and management	School
	Health promotion and disease prevention	School
	Social work	School
George Washington university Milken Institute School of Public Health	Environmental and occupational health	School
	Epidemiology and Biostatistics	School
	Global Health	School
	Exercise and nutrition sciences	School
	Health policy	School
	Health services management and leadership	School
	Prevention and Community Health	School
Georgia Regents University Institute of Public and Preventative Health	Biostatistics and Epidemiology	Program
Georgia Southern University Jiann-Ping Hsu College of Public Health	Biostatistics	School
	Dept. Community Health	School
	Environmental Health	School

	Dept. of Epidemiology	School
	Dept. Health Policy and Management	School
Georgia State University MPH program		Program
Icahn School of Medicine at Mount Sinai Grad program in Public Health		Program
Indiana University Richard M Fairbanks School of Public Health	Epidemiology	School
	Behavioural Sciences	School
	Health Policy and Management	School
	Environmental Health	School
	Biostatistics	School
Loma Linda University School of Public Health*		School
Louisiana State University Health Sciences Centre School of Public Health	Behavioural and Community Health Sciences	School
	Biostatistics	School
	Environmental and Occupational Health Sciences	School
	Epidemiology	School
	Health Policy and Systems Management	School
Mercer University Master of Public Health Programme		Program
New York Medical College and Institute of Public Health - School of Medicine/Grad School of Basic Medical Sci		Program
New York Medical College and Institute of Public Health - School of		Program
North-eastern University Master of Public Health Programme in Urban		Program
North-western University Feinberg School of Medicine Programs in Public		Program
Ohio State University College of Public Health	Biostatistics	School
	Centre for public health practice*	School
	Environmental health sciences	School
	Epidemiology	School
	Health behaviour and health promotion	School
	Centre for health outcomes	School
	Health services management and policy	School
Oregon Health and Science University/Portland State University		Program
Oregon State University College of Public Health and Human Sciences*		School
Pennsylvania State University MPH Program	Biostatistics and bioinformatics	Program
	Epidemiology	Program
	Health services and behavioural research	Program
Rutgers School of Public Health		School
Saint Louis State University College for Public Health and Social Justice	Dept. behavioural science and education	School
	Dept. biostatistics	School
	Dept. environmental and occupational helath	School
	Dept. epidemiology	School

	Dept. health management and policy	School
San Diego State university graduate school of public health		School
St Georges University Department of Public Health and Preventative	Epidemiology	Program
	Environmental and occupational track	Program
	Health policy and administration track	Program
	MD/MPH track	Program
Stony Brook University Program in Public Health		Program
SUNY Downstate Medical Centre School of Public Health		School
Temple University College of Public Health		Program
Texas A+M Health Science Centre School of Public Health		School
Thomas Jefferson University, School of Population Health		Program
Touro University - California MPH Program		Program
Tufts University School of Medicine, Public Health Program		Program
Tulane University School of Public Health and Tropical Medicine	Biostatistics and Bioinformatics	School
	Epidemiology	School
	Global Community health	School
	Global environmental sciences	School
	Tropical medicine	School
	Global health systems and development	School
UCLA Jonathan and Karin Fielding School of Public Health	Environmental Health Sciences	School
	Epidemiology	School
	Community Health Sciences	School
	Health Policy and Management	School
	Biostatistics	School
Uniformed Services University of the Health Sciences Public Health Program*		Program
University at Albany SUNY School of Public Health	Biomedical sciences Infectious diseases	School
	Environmental health sciences	School
	Epidemiology and biostatistics	School
	Health policy management and behaviour	School
University at Buffalo SUNY School of Public Health and Health Professions	Biostatistics	School
	Community health and health behaviour	School
	Epidemiology and environmental health	School
	Exercise and nutrition sciences	School
	Rehabilitation science	School
University of Alabama at Birmingham School of Public Health	Biostatistics	School
	Environmental health sciences	School
	Epidemiology	School
	Health behaviour	School
	Healthcare organization and behaviour	School

University of Arizona Mel and Enid Zuckerman College of Public Health	Biostatistics	School
	Environmental Health Sciences	School
	Epidemiology	School
	Family and Child Health	School
	Health Behaviour and Health promotions	School
	Health services administrations	School
	Public health policy and management	School
	Public health practice	School
University of Arkansas for Medical Sciences Fay W. Boozman College of	Biostatistics	School
	Environmental and Occupational Health	School
	Epidemiology	School
	Health behaviour and health education	School
	Health Policy and Management	School
University of California, Berkeley School of Public Health	Biostatistics	School
	Environmental Health sciences	School
	Epidemiology	School
	Health and Social Behaviour	School
	Health Policy and Management	School
	Health services and policy analysis	School
	Infectious disease and vaccinology	School
	Maternal and Child Health	School
	Public Health nutrition	School
University of California, Davis MPH Program		Program
University of California, Irvine Program in Public Health		Program
University of Cincinnati College of Medicine MPH Program	Biostatistics	Program
	Environmental Public Health	Program
	Epidemiology	Program
	Health education	Program
	Health services Management	Program
	Occupational Public Health	Program
University of Florida College of Public Health and Health Professions	Behavioural science and community health	School
	Biostatistics	School
	Clinical and health psychology	School
	Environmental and global health	School
	Epidemiology	School
	Health services research management and policy	School
	Occupational health	School
	Physical therapy	School
	Rehabilitation science	School

	Speech language and hearing sciences	School
University of Georgia College of Public Health	Epidemiology and biostatistics	School
	Environmental health science	School
	Health policy and management	School
	Health promotion and behaviour	School
University of Hawaii, Manoa Public Health Program		Program
University of Illinois at Chicago School of Public Health	Community health sciences	School
	Environmental and occupational health sciences	School
	Epidemiology and biostatistics	School
	Health policy and administration	School
University of Iowa College of Public Health	Biostatistics	School
	Community and behavioural health	School
	Epidemiology	School
	Health management and policy	School
	Occupational and environmental health	School
University of Kansas School of Medicine KU - MPH Program Kansas City		Program
University of Kansas School of Medicine KU - MPH Program Wichita		Program
University of Kentucky College of Public Health	Biostatistics	School
	Epidemiology	School
	Gerontology	School
	Health behaviour	School
	Health management and policy	School
	Preventative medicine and environmental health	School
University of Louisville School of Public Health and Information Sciences	Biostatistics and bioinformatics	School
	Environmental and occupational health sciences	School
	Epidemiology and population health	School
	Health management and systems science	School
	Health promotion and behavioural science	School
	Health hazards preparedness	School
University of Maryland School of Public Health	Behavioural and community health	School
	Applied environmental health	School
	Epidemiology and biostatistics	School
	Family science	School
	Health services administration	School
	Kinesiology	School
University of Massachusetts-Amherst School of Public Health and Health	Biostatistics	School
	Community health education	School
	Environmental health sciences	School
	Epidemiology	School

	Health policy and management	School
University of Miami Department of Public Health Sciences		Program
University of Michigan School of Public Health	Biostatistics	School
	Environmental health sciences	School
	Epidemiology	School
	Health behaviour and health education	School
	Health management and policy	School
University of Minnesota School of Public Health	Biostatistics	School
	Environmental health science	School
	Epidemiology	School
	Health policy and management	School
University of Nebraska Medical Centre College of Public Health	Biostatistics	School
	Environmental, agricultural and occupational health	School
	Epidemiology	School
	Health promotion, social and behavioural health	School
	Health services research and administration	School
University of New England Graduate Programs in Public Health		Program
University of New Mexico Public Health Program		Program
University of North Carolina Gillings School of Global Public Health	Biostatistics	School
	Environmental sciences and engineering	School
	Epidemiology	School
	Health behaviour	School
	Health policy and management	School
	Maternal and child health	School
	Nutrition	School
	Public health leadership	School
University of North Texas Health Science Centre School of Public Health		School
University of Oklahoma Health Sciences Centre College of Public Health	Biostatistics and epidemiology	School
	Health administration and policy	School
	Health promotion sciences	School
	Occupational and environmental health	School
University of Pennsylvania Master of Public Health Program		Program
University of Pennsylvania Master of Public Health Program - Centre for		Program
University of Pittsburgh Graduate School of Public Health	Behavioural and community health sciences	School
	Biostatistics	School
	Environmental and occupational health	School
	Epidemiology	School
	Health policy and management	School
	Human genetics	School

	Infectious diseases and microbiology	School
University of South Carolina Arnold School of Public Health	Communication sciences	School
	Environmental health sciences	School
	Epidemiology and biostatistics	School
	Exercise science	School
	Health policy and management	School
	Health promotion, education and behaviour	School
University of South Florida College of Public Health	Community and family health	School
	Environmental and occupational health	School
	Epidemiology and biostatistics	School
	Global health	School
	Health policy and management	School
University of Southern California MPH Program	Health education and promotion	Program
	Biostatistics and epidemiology	Program
	Health communication	Program
	Child and family health	Program
	Global health leadership	Program
	Public health policy	Program
	Environmental health	Program
University of Tennessee Department of Public Health		Program
University of Texas Medical Branch at Galveston Graduate Program in Public		Program
University of Texas School of Public Health	Management policy and community health	School
	Health promotion and behavioural sciences	School
	Biostatistics	School
	Epidemiology, human genetics and environmental	School
University of Virginia MPH Program	Biostatistics	Program
	Health policy, management and regulation	Program
	Comparative effectiveness, quality and outcomes	Program
	Data sciences	Program
	Bioethics	Program
University of Washington School of Public Health	Biostatistics	School
	Environmental health and occupational sciences	School
	Epidemiology	School
	Global health	School
	Health services	School
Vanderbilt University Institute for Medicine and Public Health	Biomedical informatics	Program
	Biostatistics	Program
	Epidemiology	Program
	Public health	Program

Virginia Commonwealth University MPH Program		Program
Washington University in St. Louis Brown School Public Health Programs		Program
West Virginia University School of Public Health	Biostatistics	Program
	Epidemiology	Program
	Health policy management and leadership	Program
	Occupational, environmental health sciences	Program
	Social and behavioural sciences	Program
Yale School of Public Health	Biostatistics	School
	Chronic disease epidemiology	School
	Environmental health sciences	School
	Epidemiology of microbial diseases	School
	Global health	School
	Health policy and management	School
	Social and behavioural sciences	School
Arcadia University MPH program		Program
Armstrong State University MPH program in Community Health Education		Program
Baylor University MPH program		Program
Benedictine University MPH program*		Program
Brigham Young University MPH program in Health Promotion		Program
Brown University MPH program		Program
California State University Fresno		Program
California State University Fullerton		Program
California State University Long Beach		Program
California State University Northridge		Program
Case Western Reserve University MPH Program*		Program
Central New York MPH Program*		Program
Charles Drew University of Medicine and Science MPH program in Urban		Program
Claremont Graduate University MPH program		Program
Consortium of Eastern Ohio MPH Program		Program
DePaul University MPH program		Program
Des Moines University MPH program		Program
East Carolina University		Program
East Stroudsburg University MPH program in Community Health Education		Program
Eastern Kentucky University Public Health Program		Program
Eastern Virginia Medical School MPH program		Program
Florida State University MPH program		Program
George Mason University MPH program		Program
Idaho State University MPH program		Program
Purdue University Indianapolis Public Health Program^		Program

Indiana University at Bloomington MPH program		Program
Jackson State university Public Health program		Program
Kansas State University MPH program		Program
Medical College of Wisconsin MPH program*		Program
Meharry Medical College MSc in Public Health program		Program
Missouri State University MPH program		Program
Morehouse School of Medicine MPH program*		Program
Morgan State University Public Health Program		Program
National University MPH program		Program
New Mexico State University MPH program in Community Health Education		Program
Northern Illinois University MPH program		Program
Northwest Ohio Consortium for Public Health		Program
Nova South-eastern University MPH program		Program
San Francisco State University MPH program in Community Health Education		Program
San Jose State University MPH Program in Community Health Education		Program
Simon Fraser University Public Health Program		Program
Southern Connecticut State University Public Health Program		Program
Southern Illinois University Carbondale MPH program*		Program
University of Alaska, Anchorage MPH program		Program
University of Connecticut Graduate Program in Public Health		Program
University of Illinois at Urbana-Champaign MPH program		Program
University of Maryland at Baltimore, MPH Program		Program
University of Missouri, Columbia MPH program		Program
University of Montana MPH program		Program
University of Nevada Las Vega MPH program	Environmental and Occupational health	Program
	Epidemiology and Biostatistics	Program
	Healthcare administration and policy	Program
	Social and behavioural health	Program
University of Nevada, Reno		Program
University of New Hampshire MPH program		Program
University of North Carolina, Greensboro MPH program in Community		Program
University of North Carolina at Charlotte Public Health Programs		Program
University of North Florida MPH program		Program
University of Rochester MPH program	Epidemiology	Program
	Health policy and outcomes research	Program
	Social and behavioural sciences	Program
University of San Francisco MPH program		Program
University of Southern Mississippi MPH program		Program
University of Texas at El Paso MPH program		Program

University of Utah Public Health program*	Program
University of West Florida MPH Program	Program
University of Wisconsin La Crosse MPH program in Community Health	Program
University of Wisconsin Madison MPH program	Program
Virginia Tech Public Health Program	Program
Wayne State University MPH program	Program
West Chester University MPH program	Program
Western Kentucky University Public Health Programs	Program
Westminster College Public Health Program*	Program
Wright State University MPH program	Program

*No directory available or accessible

^CEPH listing duplicated with Indiana Fairbanks School of Public Health

Correction

Harris M, Macinko J, Jimenez G, *et al*. Does a research article's country of origin affect perception of its quality and relevance? A national trial of US public health researchers. *BMJ Open* 2015;5:e008993. The institutional affiliation of the last author of this paper is incorrect. Chloe Anderson's correct affiliation is: MDRC, New York, NY, USA; work supported and completed while at The Commonwealth Fund, New York, NY, USA.

BMJ Open 2016;**6**:e008993corr1. doi:10.1136/bmjopen-2015-008993corr1

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