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**The applicability and transferability of public health
research from one setting to another: A survey of
maternal health researchers**

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INTRODUCTION

Little is known about the complex process of assessing whether a study conducted in one setting is applicable or transferable to a new setting [1].

Although applicability (the likelihood that an intervention could be replicated in a new setting) and transferability (the potential for a study's effectiveness to be repeated in a new setting) are two distinct concepts, they are generally considered together and so will be referred to as 'applicability/transferability' [2].

The issues are particularly challenging for health promotion interventions, which are often complex and multi-component, with long causal pathways and a wide range of outcome measures [3-4].

Poor judgements of applicability/transferability could lead to the inappropriate use of research where replication may not be possible or effective. Alternatively, they could lead to the under-use of appropriate research which could be successfully applied and transferred elsewhere.

In recent years there have been calls for greater attention to be paid to external validity (i.e. the generalisability of findings to other populations and settings) [5-6]. However applicability/transferability goes beyond external validity to look at a study's appropriateness to a specific new setting (rather than to a generic 'other'). Although a relatively new area of study, some articles have explored applicability/transferability [2, 7-9]. Most have been hypothetical, although

recently some studies have explored the perceptions of decision-makers [10-11].

Researchers often hope that their research could be of use beyond the original study setting. Understanding what factors they believe may affect applicability and transferability helps us to understand what issues researchers may focus on, in terms of collecting data and study reporting. Understanding these perceptions of researchers may in turn help to identify strategies for encouraging the appropriate use of research. Therefore the current study aimed to explore researchers' perceptions of applicability/transferability, and focused on individuals conducting maternal health research in low- and middle-income countries. It was conducted as part of a larger study in which semi-structured interviews were used to explore perceptions of applicability/transferability among maternal health decision-makers and researchers in Ghana [12].

METHODS

Survey design and content

A 23-item questionnaire was designed and managed using online survey software (HYPERLINK "http://www.surveymonkey.com"www.surveymonkey.com).

The questionnaire covered five main sections:

employment

- type of organisation
- main work activities,
- country based in
- country on which work focuses
- previous experience in decision-making roles

local applicability/transferability questions(described in more detail below)

perceptions of research use in policy/practice

- perception of the extent to which their own research had been used in policy/
practice

- perception of research use in national maternal health policy
- involvement in government activities or research:policy activities

involvement in health policy, management or practice

dissemination of research

- involvement in the dissemination of other people's research

For the questions about local applicability/transferability, respondents were shown four summaries of studies evaluating interventions aiming to increase access to healthcare for obstetric emergencies (see table 1). They were then asked which study was the most and least applicable/transferable to their context. Open-ended questions were asked about the reasons for their

decisions, as well as closed questions about the most and least important factors in their decision and what other information they would have liked to have had. The response options provided for these closed questions were based on preliminary analysis of sixteen interviews conducted for the larger project [12].

Table 1 - Study summaries for ranking exercise

Study country	Description
Tanzania ADDIN EN.CITE ADDIN EN.CITE.DATA [13]	Community-based plans for emergency transportation to health facilities were developed, using a community empowerment approach. Findings: 85% of villages had developed action plans; 19% used their system in the last three months. The cost of emergency transport fell markedly.

Niger

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<EndNote><Cite><Author>Bossyns</Author><Year>2005</Year><RecNum>818</RecNum><record><rec-number>818</rec-number><foreign-keys><key app="EN" db-id="peaf9d9audztfexxanxsx025f99af0wt2vr">818</key></foreign-keys><ref-type name="Journal Article">17</ref-type><contributors><authors><author>Bossyns, P.</author><author>Abache, R.</author><author>Abdoulaye, M. S.</author><author>Lerberghe, W. M.</author></authors></contributors><titles><title>Unaffordable or Cost-Effective?: introducing an emergency referral system in rural Niger</title><secondary-title>Tropical Medicine and International Health</secondary-title></titles><periodical><full-title>Tropical Medicine and International Health</full-title></periodical><pages>879 - 887</pages><volume>10</volume><number>9</number><dates><year>2005</year></dates><label>egot;</label><urls></urls></record></Cite></EndNote>[14]

A solar-powered radio link between health facilities and the district hospital was established. A land-cruiser vehicle with a mattress in the back was used to transport health emergencies. The cost for use depended on the distance travelled.

Findings: the number of obstetric emergencies evacuated and dealt with increased markedly.

India
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<EndNote><Cite><Author>Fullerton</Author><Year>2005</Year><RecNum>833</RecNum><record><rec-number>833</rec-number><foreign-keys><key app="EN" db-id="peaf9d9audztvfexxanxsx025f99af0wt2vr">833</key></foreign-keys><ref-type name="Journal Article">17</ref-type><contributors><authors><author>Fullerton, J. T.</author><author>Killian, R.</author><author>Gass, P. M.</author></authors></contributors><titles><title>Outcomes of a Community- and Home-Based Intervention for Safe Motherhood and Newborn Care</title><secondary-title>Health Care for Women International</secondary-title></titles><periodical><full-title>Health Care for Women International</full-title></periodical><pages>561 - 576</pages><volume>26</volume><number>7</number><dates><year>2005</year></dates><label>egot;</label><urls></urls></record></Cite></EndNote>[15]

Women and their primary family caregivers were trained in home-based lifesaving skills.

Findings: There was a statistically significant increase in the number of women who had developed at least one aspect of a birth preparedness plan (82% after compared to 15% before). Despite this, there were few referrals to facilities. Maternal deaths fell, although the study sample was not large enough to know if this was due to the intervention or due to chance.

Nigeria

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Sample

The sampling frame included identifiable authors of published public health articles on the topic of maternal health. Three methods were used to identify authors: a literature search, a review of authors from a previous systematic review [17] and snowballing (respondents were asked to name up to five others to be invited to participate). The literature search was conducted in five databases (Medline, Popline, Embase, Global Health and Africa Healthline) (see appendix 1 for details of terms used). Authors were included if they:

- had published an article on access to maternal health services in a low- or middle-income country
- published in or after 2002 (to attempt to limit those without a valid email address), up to 2008
- wrote in English (to reduce the chance of non-response due to language difficulties)
- provided a valid email address (or if an internet search of their name and institution identified one)
- were not based in Ghanaian institution (to avoid duplication, since interviews were being conducted in Ghana for the other component of the study)

If other (e.g. second) author's email addresses were provided by the database or article, these were also included.

Administration of the survey

The survey was piloted with twelve volunteers, leading to refinements of its structure and content. The pilot suggested that it took approximately ten minutes to complete.

The survey was conducted in September - November 2008. A randomised controlled trial (RCT) was nested within the survey, to assess the effect of different invitations to participate on response rates [18]. Reminder emails were sent to non-respondents both one and four weeks after the original invitation.

Ethical approval was granted by the London School of Hygiene & Tropical Medicine (ref: 5221, granted on 3rd January 2008). Respondents' were provided with information about the study in invitation emails and at the beginning of the survey and their data were anonymised.

Analysis

Descriptive statistics were conducted on the quantitative data using SPSS 16.

Open-ended questions were analysed using thematic content analysis. A set of codes was developed inductively using a subset of responses. Once finalised,

these were applied to the entire set of responses.

RESULTS

Sample Description

In total, 685 people were invited to participate, although only 625 had a valid email address. 317 people responded, although 31 respondents' work focused on high-income countries (and so were ineligible) and three submitted surveys had no questions answered. After excluding these, 283 respondents were included in the analysis, giving a response rate of 41%.

Although respondents were based in, and focused on, a wide range of low- and middle-income countries, there was a notable concentration in and on a small number of countries. Nearly half the respondents were based in the USA, UK, Nigeria and India, with less than ten respondents based in each of the remaining 47 represented countries (see web table 1). Respondents reported focusing their work on 56 different countries in total, although nearly half focused on one of seven countries (Nigeria, India, Bangladesh, Tanzania, Nepal, Kenya and Burkina Faso).

There were some differences between respondents based in low- and middle-income countries and those in high-income countries. For example, compared

to respondents in high-income countries more low- and middle-income respondents were involved in clinical practice (18.9% vs 3.7%) and fewer reported that research was their main activity (41.3% vs 58.2%).

Perceptions of Local Applicability/Transferability

When asked to rank the four study summaries (table 1), most respondents considered either the Tanzanian or the Indian interventions to be most applicable/transferable to their setting; the Nigerien and Nigerian were less likely to be considered most applicable (see table 2). When asked to rank the least applicable/transferable, the reverse was found, with more respondents selecting the Nigerien, followed by the Nigerian, Indian and finally the Tanzanian study (see table 2).

Table 2: Studies ranked most and least applicable/transferable

Study	Most	Least
Tanzania	80 (28%)	18 (6%)
India	75 (27%)	60 (21%)
Nigeria	40 (14%)	69 (24%)
Niger	34 (12%)	78 (28%)
Not stated	54 (19%)	58 (21%)

Five broad issues were identified from open-ended responses about the

reasons for ranking decisions: setting-specific factors, intervention characteristics, effectiveness, knowledge/experience of similar interventions and comparison of the respondent's own setting and the study setting. Overall, it seemed that respondents focused more on applicability (i.e. ease of implementation), rather than the transferability of interventions' effects (ie the effectiveness of the intervention in a new setting).

1. Setting-specific factors

The most common reasons given for both most and least applicable/transferable rankings related to the respondents' own setting. These typically related to the underlying cause, or severity, of the problem in the new setting. Thus if the intervention was felt to address an issue that was felt to be the cause of the problem in the new setting, it would be ranked highly:

“Most of the rural women prefer home delivery but when emergencies develop there are either no vehicles to take them to health facilities or even when available there is no money to pay for the transportation and subsequent health facility charges.”

ID35 (rated Nigerian study as most applicable/transferable)

Other reasons given related to factors that affect how easy the intervention

would be to implement in the new setting (e.g. the healthcare system, geographical terrain or socio-cultural norms). So, for example, where socio-cultural norms in the new setting were considered receptive to the intervention, the study was highly ranked.

2. Intervention characteristics

Reasons relating to the interventions' characteristics were the second most common type of reason given for ranking decisions. These included the intervention's approach or focus, its perceived ease of implementation, sustainability, cost, or its adaptability.

“Seem to be a practical realistic way to arrange emergency transport.”

ID202 (rated Nigerian study as most applicable/transferable)

Respondents' belief that the intervention approach was good/the best, was a particularly common reason given for ranking the Tanzanian study as most applicable/transferable; almost half of these reasons related to positive views of its 'community empowerment approach'.

“Community empowerment is the best way to develop health care facilities.”

ID274 (rated Tanzanian study as most applicable/transferable)

3. Effectiveness

Reasons relating to perceived effectiveness of the intervention tended to refer to the perceived potential impact or potential success of the intervention in the respondents' own setting, rather than referring explicitly to the studies' findings.

“This will limit the delays in decision to get proper care if the instructions are carried out to the letter”

ID40 (rated Indian study as most applicable/transferable)

Only a small number referred to the effectiveness in the original studies. Factors influencing the effectiveness and the cost-effectiveness of the intervention were also mentioned by only a few respondents. Respondents were more likely to mention effectiveness in reasons for their 'most applicable/transferable' choice than for their 'least'.

4. Knowledge or experience of a similar intervention

Some respondents mentioned that they knew of an intervention similar to one of the study summaries. This was more commonly given as a reason for selecting a study as most applicable/transferable, rather than least (e.g. 'it has already

worked here’, rather than, ‘we tried it here already and it didn’t work’).

“It was a bit like the commune-based co-operative medical care provision that had worked for a long time in rural China.”

ID305 (rated Tanzanian study as most applicable/transferable)

A separate question was asked about knowledge of similar interventions. For all studies, a greater proportion of respondents who reported knowing of a similar intervention ranked it as most applicable/transferable compared to those who did not report knowing about a similar intervention (see web table 2). This suggests that those who knew of a similar intervention may have been more likely to select that study as most applicable. This correlates with findings from interviews with decision-makers and researchers in Ghana (in the other component of this study) [12].

5. Comparison of respondents’ own setting with the study setting

Only a small number of responses compared the study setting to the respondent’s own setting, either highlighting similarities or differences in either the settings or the problems experienced, or the geographical proximity of the two countries. Similarities were more often cited than differences (i.e. this was more commonly a reason for most applicable/transferable choices than least

applicable/transferable).

“Physical and social conditions are almost similar in both countries. If the program is success in India, it is more likely that it will also be success in Bangladesh.”

ID183 (rated Indian study as most applicable/transferable)

Differences between studies

Respondents did not make their ranking decisions using the same criteria for all studies. For example, the reasons given by those selecting the Tanzanian study as most applicable/transferable frequently related to its intervention focus (i.e. the fact that it used a community empowerment approach). In contrast, those ranking the Nigerien study as most applicable most frequently stated that problems of transportation or accessing facilities in their setting was the reason for their choice. The most common reasons given for ranking the Nigerien and Nigerian studies as least applicable/transferable related to concerns about the ease of implementation (e.g. corruption) or the nature of the problem in their own setting (e.g. because the prevalence of mobile telephones made radio communication unnecessary).

The Indian study polarised views the most, with similar proportions selecting it as most and least applicable/transferable. The most common reason for

selecting it as either most or least applicable/transferable related to the causal factors in respondents' own setting (i.e. a high prevalence of home births or whether there was a policy to encourage skilled attendance/discourage use of TBAs).

“60% of women in Malawi deliver at home and it is there that most fatalities occur”

ID49 (rated Indian study as most applicable/transferable)

“Only midwives or skilled birth attendant excluding TBA's are eligible to attend pregnant women. All women are encouraged to deliver their babies at health facilities...over 95 % of deliveries in this country are attended by skilled personnel.”

ID71 (rated Indian study as least applicable/transferable)

Closed-question responses

After the open-ended questions, respondents were asked, in closed-question format, to select up to three 'main reasons' for their ranking decision. The most popular reason was the adaptability of the intervention, followed by similarities of context/location and the interventions' acceptability (see table 3). Less common reasons were the need for the intervention, followed by its potential

effect, ease of implementation and its congruence with existing knowledge/ ideologies.

Table 3: What were the three main reasons for your ranking decision?

Reason	Main reasons (up to 3)	Least important factor
Adaptability of intervention	122 (43%)	15 (5%)
Similarities of context/ location (i.e. between study setting and your setting)	107 (38%)	39 (14%)
Acceptability	100 (35%)	16 (6%)
Need for intervention (e.g. public health burden)	92 (33%)	14 (5%)
Potential effect	84 (30%)	4 (2%)
Ease of implementation (e.g. challenges faced, staffing requirements, cost)	71 (25%)	41 (14%)
Congruence (i.e. it is consistent with existing knowledge/ ideology)	34 (12%)	71 (25%)
Other	13 (5%)	11 (4%)
Not stated	57 (20%)	72 (25%)

Congruence with existing knowledge/ideology was most frequently rated as the least important, followed by the ease of implementation of the intervention and the similarities of context/location (see table 3). The difference between

responses to the open and closed questions is interesting; similarities between the original study context and the respondent's setting were rarely explicitly considered in the open-ended questions. In addition, congruence and ease of implementation were more commonly presented in the open-ended questions than the closed-ended ones.

Respondents were then asked what additional information they would have liked to have had when making their ranking decisions. More information was most commonly desired on the study context/location, the ease of implementing the intervention and its effectiveness (see table 4). This was more consistent with responses to the other closed questions but interestingly these were not the most common reasons given in the open-ended responses.

Table 4: What additional information would you have liked?

	Response
Study context/location (e.g. population characteristics, health system)	117 (41%)
Ease of implementation (e.g. challenges faced, staffing requirements, cost)	113 (40%)
Effectiveness	111 (39%)
Acceptability (e.g. to target population)	73 (26%)
Need for intervention (e.g. public health burden)	50 (18%)
Adaptability of intervention	41 (15%)

Congruence (i.e. if it is consistent with existing knowledge/ideology)	21 (7%)
Other/comment	22 (8%)
Not stated	63 (22%)

DISCUSSION

At 41%, the response rate was not high, although it was greater than those achieved in other online surveys of similar populations, which ranged from 7.9% to 39% [19-23]. The sample represents the diversity of those researching maternal health, with respondents based in high-, middle- and low-income countries and including not only academic researchers but also government staff, health services personnel and those working for NGOs or international agencies.

Nearly half the respondents focused their research on one of seven countries, despite a total of 56 different country foci being reported; suggesting that a substantial amount of maternal health research is produced in these seven countries. Such a bias highlights the importance of enhancing understandings of applicability/transferability, in order that the usefulness of research conducted in these few countries can be accurately assessed and their utility maximised elsewhere, where appropriate.

The fact that nearly half the respondents were based in high-income countries, yet focused their work on low- or middle-income countries, may not be surprising to those familiar with the research environment in these settings. It has been argued elsewhere that this may have implications for low- and middle-income countries' capacity to produce and use its own research [24].

The most common reasons given (in the open-ended questions) for the respondents' choice of most and least applicable/transferable study related to their own setting, particularly the cause or severity of the problem, followed by intervention characteristics, notably its approach and perceived ease of implementation in the respondents' setting.

That there were differences between responses to the open-ended and closed questions is not unheard of [25-27]. Such differences may be because they elicit different aspects of responses [25]. Alternatively, they could reflect the differing locus of interpretation of responses, with open-ended responses interpreted by the authors, whilst the respondents interpreted the answer-options of the closed questions. It may also be that when presented with a pre-defined list of possible answers, responses become more 'rational' or idealistic than when using more subjective, open-ended responses. Similarities of between the study context/location and that of the respondent were frequently selected as important in the closed questions, yet rarely explicitly referred to in open-ended responses, where consideration of the intervention in relation to the new setting was more

important than the comparison of settings.

The adaptability of the intervention was most frequently cited as a reason for ranking decisions in the closed questions, but was mentioned less often in the open-ended questions. This difference may be explained by findings from the interviews conducted in the other part of the study, which found that adaptation was considered to be a crucial separate stage in the research use process, rather than an element within applicability/transferability assessments [12].

Effectiveness was not one of the most important factors in either the closed or the open-ended questions. Those that mentioned it as a reason for their rankings tended to discuss the potential effectiveness in the new setting, rather than the original study's actual effectiveness. As is often the case with complex interventions, each study measured different outcomes or proxy indicators; those that attempted to measure their primary outcome (i.e. maternal death) had insufficient power. This can make it difficult to directly compare the effectiveness of the original studies, which may explain why it was rarely mentioned.

This may explain why respondents paid more attention to applicability (i.e. ease of implementation in the new setting) than to the transferability of the effect shown in the original study.

This survey sampled researchers studying maternal health issues in low- and middle-income countries. As such, it is difficult to assure the generalisability of

its findings to other topics and research settings. Nevertheless, it provides a useful preliminary investigation into the issues perceived by researchers to be important in the assessment of the applicability/transferability of research.

CONCLUSION

The most common reasons given for ranking decisions related to the respondents' own setting, particularly the extent that the intervention was perceived to address the underlying cause of the problem. The intervention characteristics were also an important consideration. Other reasons included the interventions' potential effectiveness in the new setting, knowledge of similar interventions and, though less frequently, explicit comparison of the respondents' own setting with the studies' setting.

The difference in responses between open- and closed-ended questions confirms the importance of triangulating research methods and underlines the importance of more qualitative research for understanding concepts of applicability and transferability. This study found that the factors affecting perceptions of applicability/transferability are broader than those focused on by proponents of external validity [5-6]. This study suggests that focusing on issues such as the study sample (as is often the case with external validity) is unlikely to improve the potential utility of public health research. Instead, improved

reporting of intervention characteristics and factors relating to implementation appear to be particularly important for applicability/transferability assessments. Improved understandings of applicability/transferability could increase the usefulness – and appropriate use – of public health research in policy and practice.

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Web table 1: Characteristics of respondents

	N (total = 283)
<u>Location of respondent</u>	
High-income country	134
Middle-income country	58
Low-income country	85
Not stated	6
Africa	71
North & Central America	71
Europe	56
Asia	37
USA	59
UK	30
Nigeria	26
India	18
Other 47 countries, each	<10
<u>Main country-focus of work</u>	
Low income country	167
Lower-middle income country	68
Upper-middle income country	22
Not stated/multiple-countries	26
Nigeria	29
India	28
Bangladesh	18
Tanzania	15
Nepal	14
Kenya	11
Burkina Faso	10

<u>Employment</u>	
Academic institution	159
NGO/charity	31
Healthcare provider/health service	20
UN agency	14
Government research unit	12
Non-research government department	8
Think tank	1
Other (including consultancies/freelance consultancy)	36
Not stated	2
<u>Main activity</u>	
Research	140
Policy-level work	19
Programme/project work, or health service management	41
Clinical practice	32
Other (including teaching)	48
Not stated	3

Web table 2

Ranking decision and knowledge/experience of similar intervention

Study ranked most applicable/transferable	Knew of similar intervention	Did not know of similar intervention
Tanzanian	47.1% (CI 32.9% - 61.2%)	31.4% (CI 24.6% - 38.3%)
Nigerien	54.3% (CI 36.9% - 71.6%)	7.7% (CI 3.9% - 11.5%)
Indian	61.4% (CI 48.4% - 74.4%)	23.3% (CI 16.9% - 29.6%)
Nigerian	31.0% (CI 16.4% - 45.5%)	14.4% (CI 9.4% - 19.5%)

Appendix 1: Search terms

Search 1: 'delay in accessing maternal health care for obstetric emergencies'

1. transport*.ti,ab.
2. referral*.ti,ab.
3. "birth preparedness".ti,ab.
4. "birth plan".ti,ab.
5. exp health care access/
6. exp "traffic and transport"/
7. or/1-6
8. "emergency obstetric care".ti,ab.
9. (emergency adj2 fund*).ti,ab.
10. 8 or 9
11. exp Maternal Mortality/
12. exp Pregnancy Complication/
13. 11 or 12
14. 7 and 13
15. 10 or 14
16. limit 15 to yr="2002 - 2008"

Search 2: 'skilled attendance at birth'

1. "Patient Acceptance of Health Care"/
2. exp *Health Services Accessibility/
3. exp "Health Services Needs and Demand"/
4. uptake.tw.
5. or/1-4
6. *Maternal Health Services/
7. *Birthing Centers/
8. *"Obstetrics and Gynecology Department, Hospital"/
9. *Delivery, Obstetric/
10. Hospitals, Maternity/
11. Delivery Rooms/
12. (skilled and birth).tw.
13. or/6-12

14. Health Services/ or rural health services/ or urban health services/ or suburban health services/
15. exp "Delivery of Health Care"/
16. (skilled and attendan\$).tw.
17. or/14-16
18. exp *Parturition/
19. exp *Labor, Obstetric/
20. 18 or 19
21. 17 and 20
22. 13 or 21
23. 5 and 22
24. exp Hospitals/ut [Utilization]
25. Health Services/ut [Utilization]
26. Health Facilities/ut [Utilization]
27. or/24-26
28. 27 and 20
29. Birthing Centers/ut [Utilization]
30. Obstetrics/ut [Utilization]
31. "Obstetrics and Gynecology Department, Hospital"/ut [Utilization]
32. Maternal Health Services/ut [Utilization]
33. Delivery, Obstetric/ut [Utilization]
34. Hospitals, Maternity/ut [Utilization]
35. Delivery Rooms/ut [Utilization]
36. Home Childbirth/ut [Utilization]
37. or/29-36
38. 23 or 28 or 37

