

A review of methodologies for research uptake in eco-health projects conducted in rural communities in Sub-Saharan Africa

ABSTRACT

This review analyses research uptake methods which have been used by researchers in sub-Saharan Africa to determine which methods are effective for communities. The key area of the study is research uptake methods applicable at rural community level. The study analyses how effective these methods are in getting research findings adopted by the community, stirring behaviour change and raising awareness about a problem. The review makes recommendations for research projects that seek to conduct research uptake in the rural areas of sub-Saharan Africa. A systematic search for articles was done using Medline, PubMed and Google Scholar. Articles on the uptake of eco-health research findings at a community level were screened and analysed using narrative synthesis. Results showed that strategies involving media, educational materials and interpersonal communication with the communities worked most effectively. Some examples of these were use of radio programmes, film productions, community theatre, field workers, community meetings, educational programmes, peer education and point of care displays. The study concluded that to enhance research uptake in communities, innovative methods which capture the context of the communities involved need to be used. Selected strategies should use the eco-health approach, engage the community and incorporate indigenous knowledge systems.

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INTRODUCTION

Research uptake is useful in health promotion and, according to Speller and colleagues, it must influence systems and structures as well as individuals to support change from behaviour that leads to continued infection (Speller, Wimbush, & Morgan, 2005). The purpose for doing this research is to investigate studies in sub-Saharan Africa which have addressed the concept of research uptake in rural communities in sub-Saharan Africa which are at a disadvantage when it comes to access to information. Rural communities have limited access to information because of lack of electricity, few libraries, poor media outreach, and low levels of literacy (Rasila & Mudau, 2012). To enhance research uptake in such communities, innovative methods appropriate for these underdeveloped communities ought to be used.

This review looks at channels which have been used by other researchers and organisations to conduct research uptake in rural and underdeveloped communities and compares them to identify best practices. In literature, there is an unclear, interchangeable use of these terms (knowledge uptake and research uptake) to refer to the process of translating research findings to target populations or decision makers. For the sake of this article we have adopted the term research uptake since it describes the process of extracting research-based evidence/findings and applying them to the communities for whom the research has been conducted and targeted to benefit.

Research uptake, also known as knowledge translation, is defined as a dynamic and iterative translation process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge or researcher findings within a complex system of relationships among researchers and knowledge users to improve health, provide more effective health services and products, and strengthen the health care system (Straus, Tetroe & Graham, 2009) (Ellen et al. 2011). Research uptake occurs in different ways in a formal or informal manner, and for it to be effective, the use of systematic and strategic approaches is necessary (Haines, Kuruvilla, & Borchert, 2004). When conducting research, we come to know something; we determine if what we know is the truth or reality; and whether it counts as new knowledge within the community complex which we seek to influence.

The motive for conducting research is to gain knowledge about any existing problem or phenomenon and to proffer solutions to communities affected by those phenomena. Those conducting research determine the nature and form of the knowledge they acquire; they also determine how it can be communicated to targeted communities (Kivunja & Kuyini, 2017). Eventually, when knowledge has been gathered, the next step is to find ways in which the knowledge can be made relevant to targeted populations. Knowledge interventions can be presented as “know how” and “know what” interventions, which in health promotion can be broken down to represent various activities in the education and training of communities (Boshoff, 2014).

The distinction in knowledge type and format derives from the purpose for which the knowledge has been developed. Is the knowledge about how to do something or is it about what something

does or is? The “know how” type of knowledge includes factual knowledge, propositional knowledge, theoretical knowledge, explicit knowledge or declarative knowledge (Boshoff, 2014). Such knowledge can be used for educating the public and eliminating certain practices that lead to infections or health burdens such as schistosomiasis, malaria, HIV, TB, etc. The “know what” type of knowledge presents facts that enhance our understanding of the research findings. This type of knowledge may be procedural knowledge, practical knowledge, implicit knowledge, experiential knowledge, tacit abilities and skills (Boshoff, 2014). The “know what” knowledge is useful for informing health workers and community educators on diseases; what they do and what they should be on the lookout for in these diseases.

Both “know how” and “know what” type of knowledge are important for dissemination and uptake of knowledge at the community level, especially for eco-health projects where the community is made a part of the research activities. Eco-health research is the embodiment of ecological and health sciences into one research activity with the aim of solving human health problems by looking at how humans interact with wildlife and ecosystems (Wilcox et al., 2004). Other than the interactions between humans and the environment, eco-health research brings in a more dynamic approach to solving problems, by incorporating transdisciplinary researchers into one research team, thereby enabling the generation of knowledge that links health and ecology to solve problems. The eco-health systems approach also engages community members through participatory action research.

Research uptake as an activity incorporates community engagement aimed at achieving knowledge sharing and exchange with targeted populations. There are some knowledge uptake activities which fall within the scope of participatory action research. Seeing that most diseases or community problems are related to the interaction of humans with the environment they live in, knowledge of such things as infection risks in infected water bodies, or contact with animals, as well as other common risks such as poverty, poor sanitation and, more critically, lack of awareness. This where this study seeks to make an impact, that is, in finding strategies that can be effective in translating eco-health research and raise awareness about the infections which may continue affecting people due to their merely being unaware of the solutions and precautions presented in research.

There is, an increasing recognition amongst researchers that the goal of knowledge generation and uptake activities is utilisation (Bowen & Martens, 2005). The challenge to this however, is in making the evidence from multiple disciplines of science accessible and comprehensible to the general community (Priest, 2010). Communities are comprised of various levels of associations and affiliations. These levels of affiliations and socio-cultural interactions influence how they authenticate and assimilate knowledge presented to them. Greater attention should be paid to the specific cultural referents of the user groups involved, particularly those with lower levels of education (Heffernan & Nielsen, 2007). In a study conducted in the Amazon, it was discovered that gender, age, religion, education, subsistence activities, and spatial distribution of households were key elements that affected the involvement of the community in coming up with solutions to the health and environmental problems affecting them. To promote equal participation and

the benefits of sharing knowledge, the researchers suggested integrating research findings and knowledge from the community through the action of participatory research (Mertens et al., 2005). One of the major drivers of these knowledge sharing acts in rural communities has been the sustainable use of technological innovations. These have opened new possibilities to lift people trapped at the bottom of the rural social pyramid out of poverty and underdevelopment (Rasila & Mudau, 2012).

Many researchers in sub-Saharan Africa have conducted research uptake but used different methods and approaches. It is therefore important to analyse the outcomes of these different approaches and identify best practices. Hence, we carry out this review of research uptake literature to find out what has worked in rural communities and how it has been done. Researchers, especially in the interdisciplinary field of science communication, have tried to define appropriate methodologies for research uptake in communities. Suggestions have emerged which advance the use of audiovisual materials that researchers can solicit from their design, communications, public relations, marketing and other related colleagues to help curate an effective dissemination strategy (Nguyen, 2014). This can also boost its ultimate applicability, creativity and reach.

Another tool identified in literature is the implementation of innovation processes to commercialise research outputs – where products are commercialised, research output is indirectly taken up by the use and implementation of the innovated product, artefact or service (Grobbelaar, 2013). The other method identified is contract research, where the research outputs are directly consumed because the client has contracted it (Grobbelaar, 2013). These and other methods have been identified in literature as effective strategies for research uptake, including edutainment in the form of applied theatre. Several advantages have been put forward for using applied theatre in the dissemination of research findings, including its ability to draw understanding and comprehension through the use of spoken word, imagery and the universal language of physical theatre (Stuttaford et al., 2006).

In clinical settings, the challenge is slowly being overcome, with many forms of research appearing in various journals that explain the process of evidence-based practice by clinical practitioners (Grol & Grimshaw, 2003). For the public and/or community settings, achieving the same feat requires more decentralised approaches which this review tries to figure out and describe. This study focuses on research uptake articles in communities especially those in under-developed areas of sub-Saharan Africa. It will include papers on health research uptake. The review will investigate the effectiveness of the research uptake activities used in sub-Saharan Africa with the aim of finding the most suitable methods for populations at community level without the involvement of policy makers/decision makers. Research uptake, when done right, leads to an understanding of the importance of using high-quality health care based on evidence from research findings (Graham et al., 2006).

1. THEORETICAL CONCEPTUALISATION

Research uptake is a process concerned with the transfer of knowledge generated by researchers on the numerous types of health and social problems that affect the populations in environmental and disease-burdened communities. This study of getting research into practice is rapidly growing and has acquired many competing names (McKibbon et al., 2010). Research uptake is just one of the many terms used to refer to the process of educating people to adopt research findings. There are other terms used to describe this activity of applying research findings to groups for whom the messages in the research findings are meant, and there is no one term that can be identified as being the most appropriate (MacGregor et al., 2014). Examples of other terms used interchangeable with research uptake are: implementation science, knowledge mobilisation, research utilisation, knowledge transfer, knowledge exchange, translation and dissemination (MacGregor et al., 2014; McKibbon et al., 2010).

Research uptake is notably different from the simple dissemination of research findings that occurs at the end of a study; it is more concerned with spreading ideas across multiple levels of the socio-ecological framework, which may include groups at the organisational and community levels (Tabak et al., 2012). Many institutions implementing research projects do not have an uptake or dissemination plan. Results from a study by Lutkamu and colleagues showed that most research projects do not have communication plans for ensuring uptake of findings by other stakeholders such as policy makers, input suppliers, traders and manufacturers (Lutkamu, Shetto, & Hatibu, 2005). Most often the resources for research are rather allocated to conducting fieldwork and less so for producing and disseminating knowledge-sharing products (Lutkamu, Shetto, & Hatibu, 2005).

The ability of universities to respond to the research needs of its stakeholders in the design and undertaking of work forms part of a comprehensive research uptake approach (Grobelaar, 2013). Research uptake is enhanced within the public through interventions such as education and communication; in both formal and informal sectors (Thakadu & Tau, 2013). Other scholars have suggested that research uptake activities have strands that connect together to make uptake a success. These are stakeholder engagement, capacity building, communication, and the monitoring and evaluation of uptake. These strands are also useful to consider for projects that are not research based; for example, a practical innovation project or field-based pilots (ELRHA, 2014).

According to Ellen et al. (2011), research uptake has different approaches which can be used successfully by institutions to disseminate research findings: push, pull and exchange activities. The push approach includes activities undertaken by researchers to package and disseminate research evidence outside the scholarly community, while the pull activities focus on the efforts by health system managers and policy makers to access and use research evidence (Ellen et al., 2011). Exchange activities focus on building and maintaining relationships between researchers and managers and policy makers (Ellen et al., 2011). According to Grobelaar (commenting on the DRUSSA initiative to drive uptake in Southern African universities), facilitating push factors

means the university (i.e. the research teams engaged in projects) needs to facilitate the process of pushing knowledge into its external environment (Grobbelaar, 2013). This is achieved by focusing on staffing for RUM (research uptake management) and establishing an enabling environment for the RU (research uptake) process (Grobbelaar, 2013).

Staffing for RUM is a big consideration hence sufficient capacity should exist within the university to manage and facilitate the RU cycle. It is also important to ensure that individual researcher's skills and capacity become developed so that they have a good grasp of the process of RU for knowledge to practice, policy, research, publicity, extension work, health support services and commercialisation to optimise the universities' capacity to meet stakeholder needs (Grobbelaar, 2013). According to the UKZN strategic plan, community engagement is deemed to add value if it is within the framework of the university's mission and vision and fits within the local and national development imperatives; addresses issues of significant concern and importance to the community's interest and wellbeing; and disseminates and applies knowledge generated by the university (relations, 2008).

The field of research uptake/knowledge translation (KT) which is the exchange, synthesis, and ethically sound application of research findings became popular in the late nineties (McKibbin et al., 2010) when it became widely adopted in clinical practice as evidence-based practice and in grant projects where it was prescribed as knowledge to action for community development projects and policy making. Innumerable discoveries in clinical treatment and community health have been made by researchers, leading to the stimulation of interest in the application of these findings to the communities and individuals to whom they could benefit (Graham et al., 2006). This knowledge-to-action (KTA) phenomenon has been described by Graham and many others as encompassing the uptake of knowledge by practitioners, policy makers, patients, and the public (Graham et al., 2006). KTA has grown to influence many institutions, especially those concerned with health and community centred research, hence as a matter of concern funding agencies are probing all funded projects to have a component of research uptake attached to their project objectives. In the context of health promotion, the call for research uptake is directed towards the need to fill the gap between knowledge about disease and implementation of that knowledge, especially in poor countries (Sanders & Haines, 2006).

In this review the focus is on research uptake application articles describing interventions done in communities especially those in under-developed areas of sub-Saharan Africa to improve knowledge about health and environmental concerns and also to correct behaviours that exacerbate the health or environmental challenge. Application papers are described as studies or projects set in specific settings to assess the factors related to uptake of interventions (McKibbin et al., 2010). Studies that are concerned with the uptake of research findings fall under the discipline of implementation research (Sanders & Haines, 2006), which is not only an emerging discipline but also very multidisciplinary (McKibbin et al., 2010) since it requires expertise in epidemiology, statistics, anthropology, sociology, health economics, political science, policy analysis, ethics, and other disciplines (Sanders & Haines, 2006). Such projects could either be assessing factors that increase the implementation of an intervention or factors that hinder the uptake of such

interventions. Examples of application papers can be papers dealing with evaluation projects to improve health and environmental sustainability, implementing vaccination programmes, uptake of screening procedures, infection prevention programmes, disease treatment/elimination approaches, soil conservation programmes, water and sanitation improvement, etc.

To classify these types of projects, the term implementation research is used. Implementation research is viewed as an action of transferring what is known by researchers to the communities that are affected by the problem. This action, when successful, leads to the communities taking up the findings and implementing them in their day-to-day activities. Evaluation of intervention programmes leads to an understanding of the importance of using high quality health care based on evidence from research findings (Graham et al., 2006). Experts conducting implementation research focus on all aspects of the communities and professionals whom they seek to influence to develop solutions that can be both sustainable and operational at all levels of the societies concerned. This will encompass the social, cultural, political, environmental and health aspects of the community.

The evidence of various developmental programmes is not reflected in the quality of lives of rural people despite the many programmes claiming to improve the lives of rural dwellers; there is lack of successful transfer of developmental information to rural areas (Ifukor, 2013). Clinical and health services research is continually producing new findings that may contribute to effective and efficient patient care. Despite the considerable resources devoted to such research, a consistent finding is that the transfer of research findings into practice is unpredictable and can be a slow and haphazard process (Eccles et al., 2005).

Substantial evidence suggests that it is possible to change behaviour, but this change generally requires comprehensive approaches at different levels tailored to specific settings and target groups (Grol & Grimshaw, 2003). Evidence from contributions made by various authors shows that there are different methods of information acquisition and dissemination for rural dwellers (Ifukor, 2013). But improving dissemination is challenged by the low readership of academic journals by health workers and the community in general. There might be a need to make existing journals more practitioner-based by including practice-oriented abstracts, inviting practitioners to provide commentaries on research articles, and providing awards to articles for practice contributions.

Barriers to uptake in health systems include the low credibility of academic research, inadequate research dissemination, neglect of practitioner concerns, and lack of external pressures for adopting researched practices (Gautam 2008). Key solutions to this problem include educating practitioners about research, collaborative studies with practitioners, adapting research to practitioner needs, and holding organisations accountable for adopting evidence-based change (Gautam 2008)

To make the problem of research uptake less problematic, research institutions should aim at publishing their findings through practice-oriented journals. These are specific journals that target particular groups in the health industry and that deal with emergent practice issues such as rural/

teaching hospitals, supply chain, public relations, etc. (Kanak 2008) Research uptake involves the use of many methods. The channels of information communication that are currently used by various agents to disseminate information to rural dwellers are elitist and urban-centred (Ifukor, 2013). All the factors that interfere with the intended message and prevent it from either being received or from being correctly interpreted by users can be regarded as barriers to effective communication.

Sustainable use of technological innovations has opened new possibilities to lift people trapped at the bottom of the rural social pyramid out of poverty and underdevelopment (Rasila & Mudau, 2012). In research uptake, communities are presented with research evidence intended to help them overcome disease burden. Evidence from research findings helps them to live according to measured and tested stipulations that make life better and disease free. Awareness of the key elements that decrease barriers in communicating research helps to shape productive conversations, avoid misunderstandings and increases subsequent knowledge sharing (Nguyen, 2014).

Rasila and Mudau argue that government's current models of communication are good for consultation and do not involve community members, thereby making them only good for mobilisation and not sustainable for community participation (Rasila & Mudau, 2012). Community members are involved when they are active in identifying their own development challenges, in seeking solutions and taking decisions about how to best implement solutions, plus being active in monitoring and evaluating the implementation plans (Rasila & Mudau, 2012).

2. PURPOSE OF THE STUDY

This review seeks to identify suitable methods for the uptake of research findings on health improvement, treatment interventions and control measures for health and ecological burdens that affect rural communities in sub-Saharan Africa. The review will help to identify what other scholars and funded projects dealing with community health promotion have done in terms of disseminating knowledge, encouraging behaviour change and increasing the number of people who get treated. Through this review, suitable methods for achieving uptake of community health research findings can be identified and used as a benchmark for the eco-health study conducted in uMkhanyakude by Malaria and Bilharzia in Southern Africa (MABISA) and the Tackling Infections to Benefit Africa (TIBA) project. It may also be relevant to other research projects considering incorporating research uptake in their projects.

Villagers living in bilharzia endemic areas are at risk of contracting infections and hence they require knowledge about ways through which they can reduce the burden of the disease. Researchers from MABISA (Malaria and Bilharzia in Southern Africa) and TIBA (Tackling Infections to Benefit Africa) have conducted research in Ingwavuma to determine the prevalence of schistosomiasis in the area. Their work has concluded that there is a high incidence and prevalence of schistosomiasis in the area (Kabuyaya et al., 2017; Kabuyaya, Chimbari, & Mukaratirwa, 2018; MABISA, 2015). Hence, research uptake is required which engages many

players and ultimately produces results which are intended to build community capacities to deal with problems that affect their well-being (Bennett & Jessani, 2011). An analysis of the health, educational and social communication platforms used and accessed by villagers and stakeholders in rural areas is conducted to determine how information on bilharzia can be extensively supplied to the uMkhanyakude community in a contextual and sustainable manner in order to significantly reduce the burden of infections in this area.

3. METHODOLOGY

The systematic review methodology was used to synthesise and analyse research uptake articles on medical science, public health and environmental research (eco-health) conducted at a rural community level in sub-Saharan Africa. Studies dealing with communities (i.e. women, children or men) living in impoverished settings were reviewed. The review focused on articles that reported on interventions directly aimed at communities. It sought to determine research uptake interventions directed towards groups of people living in rural community settings such as a village, a farming area or settlement. Studies focusing on theory of research uptake were excluded. The question addressed in the review was: *What are the research uptake strategies commonly used in sub-Saharan Africa at a rural community level?* The keywords for the article search were: research, knowledge, uptake, community, rural areas, health, and environment. In the abstracts we included the specific country groups and community settings, methodology used, type of population targeted, type of intervention and outcome of the interventions.

4. SEARCH STRATEGY

A systematic search was done for articles using google scholar, Medline and PubMed with the following search phrases: (research OR knowledge AND uptake AND “rural areas” OR communities OR “developing countries” AND health OR “environment management”). The results from the search were significantly high. However, the high number of hits on google scholar and Pubmed were made manageable by further screening in the abstract using country names to tease out literature which was not from sub-Saharan Africa.

Screening of the articles found was done using search filters that considered the location of the study, the health or environmental context in which the study was applied (mass drug administration, vaccination programmes, prevention or intervention programmes for diseases such as HIV and AIDS, malaria, TB, farming and environmental conservation projects). Using the term knowledge uptake features dominantly in place of research uptake because “knowledge” implicitly means primary scientific findings which can be embodied, constructed, performed and collectively negotiated to create value and interest that serves at most the interests of funders or elitists (Greenhalgh & Wieringa, 2011).

5. SELECTION – INCLUSION AND EXCLUSION CRITERIA

Articles were sampled for the review following a sample criteria based on country. Only articles from sub-Saharan African countries were considered: Comoros, Democratic Republic of the Congo, Republic of the Congo, Cote d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

Other criteria were area of dwelling (articles selected had to represent communities dwelling in poor or remote areas, rural areas and under-developed communities), population (the research uptake activities had to be directed at communities and not policy makers and professionals) and research disciplines/fields (whether the articles were on environmental or health research projects). Articles that sought to promote health and disease management; and sustainability of programmes concerned with ecosystems, environmental management and climate change at the community level were considered as eligible. The articles that were selected were published between 1990 and 2016. The search went thus far back to try and incorporate the available literature which has been written since the 1990s on the practice of research uptake as a discipline. The search was done during 2016 and 2017. Figure 1 provides details of the steps followed to identify articles for review.

Excluded articles were those not dealing with the community directly, i.e. woman, men and children within a community setting. These included recommendations directed at clinic staff, nurses, doctors, health officers, university students and environmental workers. The selection was specifically for community-based studies which involved people in community settings. Selected studies were only those that had clear strategies for increasing uptake of research findings. Those that were not clear on the strategy used were excluded. Also, excluded from the review were articles based on clinical settings advancing solutions for clinicians and health practitioners.

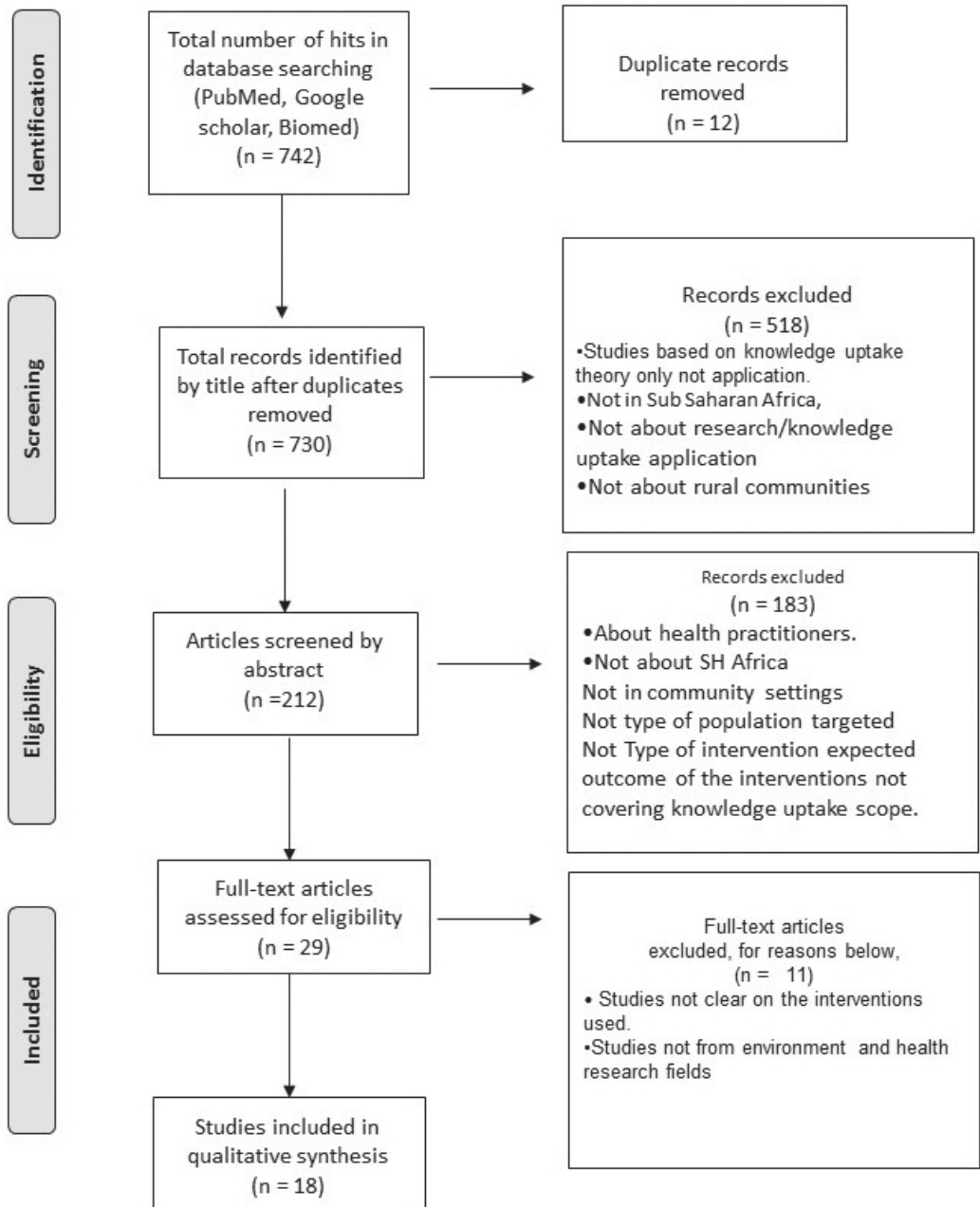


Figure 1: Prisma diagram showing selection criteria for articles included in the review

6. RESULTS

The purpose of this review was to find out what research uptake studies have been conducted in sub-Saharan Africa (SSA). Since research uptake is a relatively new concept in the field of scientific research, not many articles were found. We found 18 papers from sub-Saharan Africa (SSA) that dealt specifically with health and environmental research uptake projects directed at under-developed communities. The country with the highest number of research uptake studies in sub-Saharan Africa was Kenya (22%), followed by South Africa and Nigeria (16%) Malawi and Uganda (11%), the fewest were from Zimbabwe, Zambia, Tanzania, and Botswana (5%). The results show that 50% of the papers were on infectious diseases (tuberculosis, schistosomiasis, malaria and HIV/AIDS, which had plenty papers). Twelve percent of the articles in the review were on health interventions which are not disease related (e.g. female condom and breast pump). Another 12.5% were on non-communicable diseases (cervical cancer and stroke) and the other 25% of articles were on ecosystem management, (climate change, agriculture, environmental management and integrated soil fertility management).

The papers reported on different types of communities and audiences with a bias for under-developed areas, such as rural areas, settlements, and farming areas. The targeted audiences for the papers included old women, mothers with children, primary school students, teachers, farmers, patients with diseases, and health workers working within the community. The audiences basically varied according to the community that was being addressed or the research area dealt with. HIV affected and infected people were featured mostly in the articles reviewed (Maticka-Tyndale, Wildish, & Gichuru, 2010; Nixon et al., 2013; Sodhi et al., 2011; van Zyl et al., 2014; Wanyama et al., 2012; Willms, Arratia, & Makondesa, 2004).

Hospital patients (men and woman) were the least targeted, appearing only in one study. Farmers appeared in two studies, school students appeared in three studies and teachers appeared in two of the studies. Women of childbearing age and women with infants appeared most, featuring in six studies. Lastly there were four studies that involved the whole community (i.e. all household members). These target audiences were from different settings including urban poor, rural community, farming areas and new settlements. The most common types of methodology were the quasi-experimental followed by the participatory action research.

Table 1: Summary of articles reviewed

| | Author | Country | Knowledge/ Research area | Uptake method used. | Outcome of study | Study type | Population targeted |
|---|--------------------------------|--------------|--------------------------|---|--|--------------------------------|--------------------------|
| 1 | Wanyama et al., 2012 | Uganda | HIV/AIDS | Board game | Educational game significantly resulted in higher uptake of knowledge of HIV and STIs | Randomised Control Trial (RCT) | Patients – Men and women |
| 2 | Pinchoff et al., 2016 | Zambia | Woman condom | IPC (Interpersonal communication) and Mass Media | Trial study, still ongoing | RCT | Women |
| 3 | van Zyl, et al., 2014 | South Africa | HIV/AIDS | E-Learning, Classroom learning, E-forum for discussions. | E-learning proved superior technique to classroom instruction for HIV/AIDS knowledge uptake. | Quasi-experimental | School students |
| 4 | Cherotich, Saidu, & Bebe, 2012 | Kenya | Climate change | Radio, extension support services, local administration, indigenous knowledge | Radio most preferred by young women, indigenous methods preferred by elderly women. Extension workers also preferred most. | Cross-sectional survey | Women |
| 5 | Stuttaford et al., 2006 | South Africa | Stroke | Applied Theatre | The study found that applied theatre worked better in smaller community groups. | Pilot study | Rural community |
| 6 | Odhiambo et al., 2016 | Kenya | Schistosomiasis | Community Directed Intervention (CDI) | The study found that using community health workers (CHW) in implementing CDI strategy works effectively. | Longitudinal qualitative study | Urban poor |

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|----|------------------------------------|----------|---|---|---|---|--------------------------|
| 7 | Sodhi et al., 2011 | Malawi | Antiretroviral Therapy (ART) and HIV care | Peer-to-peer educational outreach approach | respondents exposed to peer education demonstrated in-depth knowledge of ART therapy. | Cluster randomised trial | Community health workers |
| 8 | Ritchie et al., 2016 | Malawi | Tuberculosis | The point of care reminder, Health worker training. | Inform the efforts of knowledge users within TB care. | Cluster randomised control | Health workers |
| 9 | Thakadu & Tau, 2013 | Botswana | Climate and Environment | Radio and kgotla community meetings | Wider communication intervention impacts can be achieved through a use of radio and a hybrid of kgotla-workshop. | Multi-case study | Villagers |
| 10 | Willms, Arratia, & Makondesa, 2004 | Malawi | HIV/AIDS | Faith Communities | Conceptual events (intercultural training sessions and theological events) found to be effective in supporting HIV/AIDS issues and awareness. | Participatory Action Research (PAR) | Christian congregations |
| 11 | Gwandu et al., 2014 | Zimbabwe | Integrated soil fertility management ISFM | Learning centre | Field-based learning centre, and Extension agents, found to be effective in ensuring uptake of ISFM information. | Participatory research approaches (PAR) | Farmers |
| 12 | Masuki et al., 2010 | Uganda | Agricultural Information | Mobile phones | Use of phones opened opportunities such as emerging of strong collective action among social groups. | Systematic action research, and process documentation | Farmers |

| | | | | | | | |
|----|---|--------------|----------------------|---|---|---|---|
| 13 | Maticka-Tyndale, Wildish, & Gichuru, 2010 | Kenya | HIV | School-based education program | Gains demonstrated in pupil HIV research uptake. | Quasi-experimental project | School students and teachers. |
| 14 | Mens et al., 2011 | Nigeria | Malaria in Pregnancy | Peer education campaign. (workshops, door to door campaigns, rallies) | Peer education had impact in raising knowledge on malaria in pregnancy | Survey (pre- and post-intervention study) | Women of childbearing age |
| 15 | Friend & Chertok, 2009 | Kenya | Breast pump use | Educational intervention (use of flip chart with photographs and diagrams for instructions) | Flip chart significantly increased women's knowledge regarding breast pump use. | Pilot study | Women with infants |
| 16 | Nixon et al., 2013 | South Africa | HIV | Dissemination (feedback sessions at schools) using facilitators. | Accrued benefit through feedback session. | Qualitative and Quantitative Survey | School learners, parents, teachers, programme facilitators. |
| 17 | Abiodun, et al., 2014 | Nigeria | Cervical cancer | Multimedia health education based on Movie | The movie was effective in raising knowledge and perception for cervical cancer. Improved uptake of screening | Quasi-experimental | Adult woman |
| 18 | Amoran, Senbanjo, & Asagwara, 2011 | Nigeria | Malaria | Educational intervention (use of posters, reading material, large format sign post) | Study shows a statistically significant increase in ITN utilisation after health education in the experimental group. | Quasi-experimental | Women |

Strategies identified focused on community-based activities and activities occurring in the health centres. The identified strategies can be divided into two categories: those involving interpersonal communication and those involving educational material or media tools. In strategies involving interpersonal communication, communities would receive support and information through field or extension workers, peer educators, community gatherings organised by villagers, and opinion leaders. The other strategies involving educational materials and media tools involved the use of; radio programmes, text messages, educational games, applied theatre, etc. See Table 2 for a summary of how we grouped of methods.

6.1 Learning games

In Uganda the use of a board game to translate research findings to targeted audiences was studied. The board game was used to improve uptake of HIV/AIDS knowledge to participants drawn from the Centre for Infectious Disease in a Ugandan hospital (Wanyama et al., 2012). The board game fused the concepts of learning and playing, incorporating knowledge about HIV/AIDS which players would learn about during the game. This board game method was evaluated at the end of the study using a questionnaire and interviews. Respondents in the study felt the method was more effective for assimilating HIV and AIDS knowledge compared to oral lessons conducted by health workers in the centre.

6.2 Mass media

Mass media was used for research uptake in three studies (Cherotich et al., 2012) (Thakadu & Tau, 2013; Abiodun et al., 2014). In the study by Cherotich et al., radio services were chosen by young women for uptake of weather forecasts and early warning systems for floods and drought. In the study by Thakadu and Tau, elderly women who were interviewed confirmed their preference for the radio citing the use of local languages on the radio station as the major reason for relying on it for environmental and farming research uptake. In the study by Abiodun et al., a movie was employed to raise knowledge about cervical cancer among women and to improve uptake of cervical cancer screening services.

6.3 Electronic learning

The use of electronic learning at schools to improve uptake of HIV and AIDS knowledge was identified in one study (van Zyl et al., 2014). In this study, e-learning was used as a way of ensuring that learners take interest in the knowledge they were being given about HIV and AIDS. The e-learning was combined with an e-forum platform for pupils to explore and share their newly acquired knowledge on HIV and AIDS. Findings from this study indicated that the e-learning method provided better results in retaining knowledge about HIV and AIDS among the learners compared to conventional classroom learning. The effectiveness of the method was evaluated using a test determining how much knowledge the students had gained in the whole exercise. Students reported this method as being fun and interactive.

6.4 School educational programmes

School-based educational programmes were identified in one study (Maticka-Tyndale et al., 2010) which investigated the effectiveness of incorporating HIV lessons into the school curriculum. In this particular study, teachers were trained and given instructional material for incorporating into their lesson plans. In addition, question boxes, school health clubs, information corners and other school activities such as assemblies, drama, music and literary performances were used to facilitate learning about HIV and AIDS. The teaching intervention was conducted throughout the school year, with each class being evaluated at the end of the

year to test the amount of knowledge they had taken up on HIV and AIDS, their attitudes and a general change in behaviour after going through the programme.

6.5 Health workers

Interpersonal communication (IPC) through health workers was used in a couple of studies in the review. The method uses informants or health workers who visit people in their homes to discuss with them the benefits of using a certain product or intervention. Three studies in this review used this method (Pinchoff et al., 2016; Odhiambo et al., 2016; Ritchie et al., 2016). Apart from home visits, the use of extension support services was identified in two studies (Cherotich et al., 2012; Gwandu et al., 2014). This was described as the use of stations where farmers and/or villagers could come to get information and support for their environmental management and farming needs. These stations were manned by extension workers whose job was to relay information from researchers and regional or district level managers to the local communities.

6.6 Community gatherings and meetings

Community gatherings/meetings were also identified in one study (Thakadu & Tau, 2013) as a means of disseminating and guaranteeing uptake of knowledge among the rural communities. This strategy involves the use of community gatherings facilitated by village heads and key community members. During these gatherings, communities interact with one another and are encouraged to adopt evidence-based health practices. Another strategy similar to community gatherings is that of faith communities (churches or religious groups); these were identified as being influential in uptake of knowledge on health issues by religious groups (Willms et al., 2004). In Willms's study, religious leaders were considered to be very influential amongst communities. They cite the use of pastors, priests, ministers of the word, etc. as being useful in pushing health messages and encouraging adoption of research interventions.

6.7 Printed display media

Printed display media with messages, photographs and diagrams for instructions were employed in three studies (Amaran et al., 2011; Friend & Chertok, 2009; Ritchie et al., 2016). Friend and Chertok employed the use of an educational poster displaying instructional steps for breast milk extraction using an advanced device. This intervention had a significant impact on increasing women's knowledge about the device. In the study by Ritchie et al, display cards with information on two sides, one for the patient and the other side for the health worker, were used to help patients visiting clinics for consultations to understand how to use TB medication. In the study by Amaran et al, a combination of posters and signposts mounted in the community health centre depicting health messages and pictorial descriptions was used with success, to promote uptake of bed nets for malaria prevention.

6.8 Workshops

Workshops were discussed in three studies (Mens et al., 2011; Nixon et al., 2013; Stuttaford et al., 2006). In these studies, local facilitators were trained and given scripts to follow in making presentations to participants during workshops. This facilitated feedback and exchange dialogues between the researchers and the participants of the research (Nixon et al., 2013). In one of the studies, workshop facilitators incorporated applied theatre during community workshops held in rural areas. This intervention was directed at educating the targeted audience about the problem through drama performance. It involved the use of public spaces where people would gather to be addressed by peer educators or local facilitators. The facilitators would introduce the problem and show how it could be dealt with using their performance. This strategy was seen to be more effective in smaller groups like audiences in a training workshop or community gathering (Stuttaford et al., 2006).

6.9 Cellphones

There was one study, (Masuki et al., 2010) that investigated the use of mobile phones to link health workers in different areas and to provide support to villagers who needed to access information from experts located at distant places. They reported that using mobile phones saved time and money for travelling up and down to meet with the community health workers. If there was any new information needing to be passed on to the members in distant areas, a simple text message would save the cost of bus fare to travel to the area, hence saving time and money.

7. ANALYSIS AND DISCUSSION

This review sought to identify common research uptake methods used for rural communities in sub-Saharan Africa among women, men and children. This section of the paper, discusses the shortcomings and advantages of using the methods which were identified. We discuss, analyse and compare the methods for effectiveness in rural and under-developed settings. We identified more than fifteen key methods (Table. 2) which can be applied to rural communities. Examples of these are multimedia channels such as the radio and television, field workers, community meetings, educational outreach programmes, peer education and point of care displays such as printed media like brochures, posters and banners.

The use of applied theatre was identified in the review but this was only limited to small community gatherings. In view of this, we suggest incorporating theatre into multimedia for distribution to households. Another suggestion would be combining theatre, folklore and song into research uptake programmes, since these are common practices in African cultures. This could apply to communities, as a form of communicating health messages, because of the longstanding culture of folklore, performance and dance. Applied theatre can have a resounding effect on young children and women.

Table 2. Findings from the review, showing the common research uptake methodologies used by researchers in the area.

| Print, multimedia and internet-based methods | |
|---|---|
| 1. | Board Game |
| 2. | TV |
| 3. | Newspaper |
| 4. | Radio |
| 5. | Movie (educational drama, documentary) |
| 6. | Billboard/road-sign |
| 7. | Posters and brochures (Photographs and diagrams for instructions) |
| 8. | E-learning |
| 9. | E-forum for discussions |
| 10. | Mobile phones (SMS notification) |
| Interpersonal communication methods | |
| 11. | Extension support services |
| 12. | Applied theatre |
| 13. | Community-directed Intervention |
| 14. | Workshops, door to door campaigns, rallies |
| 15. | Peer-to-peer educational outreach |
| 16. | Health worker training |
| 17. | Community meetings |
| 18. | Faith communities |
| 19. | Learning centres |
| 20. | School-based education programme |
| 21. | Feedback sessions using local facilitators. |

There were a few studies in the review that used local traditional leaders or indigenous knowledge systems to facilitate research uptake to the communities. The only traditional channels identified in this review were from Thakadu’s study (Thakadu & Tau, 2013) and Cherotich (Cherotich et al., 2012), who identified community gatherings chaired by the chief (Kotla in Setswana) and use of indigenous knowledge systems for predicting weather disasters, respectively. These two studies, however, did not go on to evaluate how effective the strategies were, hence leaving a gap for more research on the use of these channels as research uptake strategies for rural communities in Africa.

Depending on the context of the problem to be addressed, it would be worthwhile to combine African traditional channels with modern transfer strategies such as information media and interpersonal communication. By using traditional healers, local health workers and community leaders such as traditional chiefs as ambassadors for research uptake, the messages and

interventions portrayed could have a lasting impact on the targeted users. In a review on the role of mass media and interpersonal communication in development in Latin America, Africa and Asia it was discovered that mass media can be helpful in driving modernisation, but when used alone it cannot be effective in achieving the integration of innovations into the villagers way of life. Hence, combining mass media with interpersonal communication methods such as community forums and indigenous communication methods such as traditional village theatre and traveling storytellers was recommended. The authors proposed that combining these methods can lead to changes in developmental outcomes. This, they suggest, can be made even more effective if modern electronic and print media are brought into the mix as well (Rogers, 1974).

Research uptake should follow community recommended strategies

Another observation made in the review is that most of the work in the reviewed articles was on researcher-led research uptake approaches which detected the way interventions were to be delivered to communities, without considering the preferences of the targeted audiences or their ability to adopt these strategies. This is not effective because research uptake is different from the simple dissemination of findings; it is more about the utilisation of information by the consumers for whom it is meant. It is concerned with the transfer and utilisation of knowledge by audiences through communication channels that exist in communities and institutions.

Consultation prior to execution helps in identifying what these channels are and how they can be made more practicable. Rural people cannot read or write, and it is recommended that indigenous languages be used for mass media communication, especially radio and television programming targeted at information dissemination for rural people. Moreover, modern and traditional knowledge sharing channels should be adopted by knowledge agents working in rural areas, and the study also recommends discovering acceptable channels for each category of rural community (Ifukor, 2013).

Transforming research findings into knowledge which can be used by communities involves making comparisons, thinking about consequences and connections, and engaging others in conversation (Davenport & Prusak, 1998). Researchers assume that the knowledge they have produced is useful to the users, yet they do not understand the user's contexts and decision-making processes (Lemos, Kirchoff, & Ramprasad, 2012). A researcher-led approach to research uptake is not conducive to driving uptake of findings because it eliminates the role of indigenous knowledge systems which guide most African communities. Overlooking this important aspect puts users at a lower position intellectually, from which they begin to see themselves as being inferior to researchers. This inferiority complex affects the impact of the researcher's suggestions to the communities.

Demand-driven research uptake initiatives were reported as having a good impact. Kothari and Armstrong have suggested that research uptake may be more beneficial if the evidence being shared meets the needs of the communities being targeted and the decisions to conduct research uptake are based on both relevant research and community requirements (Kothari & Armstrong, 2011). For research to be adopted it must fit the user's needs and context; users will use

information if they regard it as being usable, salient, credible and legitimate (Cash et al., 2003). Few studies in this review reported their findings in the context of users. We therefore recommend that studies should have engagement strategies similar to the one proposed by Musesengwa and Chimbari, which guarantees inputs of communities and stakeholders throughout the study period (Musesengwa & Chimbari, 2016).

The study by Musesengwa and Chimbari found that consultations with local villagers acting as community advisory board members and research assistants yielded benefits for community engagement. Their study was centred in two rural districts in Zimbabwe and South Africa, where a multidisciplinary research project was conducted. Community members provided insights, advice and access into their community's way of life and how they interpreted the research in contrast to their own knowledge. This allowed for exchange of knowledge to occur through biannual meetings, and for the continuation of research implementation through the training of community research assistants and citizen science. (Musesengwa, Chimbari, & Mukaratirwa, 2017). Hence, it is important to convert research findings or interventions into information that is in accordance with the community's way of life, cultural values and status. Good research uptake should ideally bring about evidence as a tailored or demanded input; it should be aligned with community needs rather than with the needs or desires of funders (Kasonde & Campbell, 2012).

Research uptake strategies should be cost effective

Most of the strategies identified in the review were for short term interventions and the uptake activities were largely for single gender or homogenous groups. Few studies were aimed at heterogeneous and large populations. Therefore, there is need to formulate research uptake strategies that can be targeted at small homogenous groups whose social and cultural dynamics are related and synchronised and hence easy to adopt when filtering health and ecological innovations into the community. Another shortcoming of the studies reviewed is that costs involved in conducting the research uptake activities were not indicated.

There is a possibility that some research uptake activities may attract high costs that small projects cannot afford. Therefore, there is need to conduct more research on the costs of research uptake strategies and to determine what strategies would be cost-effective. Having noticed this, we recommend the use of eco-health approach which puts health in the centre and brings together the whole aspects of a community around it in order to achieve one goal. Eco health is an innovation in health projects and programmes which adopts an ecosystem approach to the application of health programmes and interventions. It connects ideas of environmental and social determinants of health with those of ecology and systems thinking in an action-research framework applied mostly within the context of social and economic development (Charron, 2012).

Using community engagement strategies is an innovative strategy that can be used to minimise costs for research uptake. The method involves using community research assistants and community advisory boards who, respectively, assist the researchers in collecting data in the communities and advise the researchers on how to approach the communities (Musesengwa & Chimbari, 2016). This strategy was used in two projects in Southern Africa namely MABISA

(in South Africa, Botswana and Zimbabwe) and SIMA (System wide Initiative on Malaria and Agriculture) in Botswana. It was found to be very effective in driving community led strategies for knowledge use and it reduced the cost of post research interventions to expand research uptake (Chimbari et al., 2006). Another area to explore would be the possibility of community buy-in, where local business people and organisations can bring their resources into the projects to sustain the research uptake work. Other methods would involve volunteers for peer education and community outreach programmes.

8. CONCLUSION

This review concludes that research projects dealing with research uptake in rural areas have used field or extension workers, peer educators, community gatherings, opinion leaders, online/web-based learning, radio programmes, text messages, educational board games, and applied theatre. These methods were shown to be effective in encouraging uptake of health and environment measures and increasing treatment amongst communities. The other conclusion drawn from this review also showed that research uptake is a dynamic process which has many channels and players involved. Examples of these include researchers, community members, leaders and institutions that support the people's welfare and equality. It is noted, also, that research uptake methods are not universal and applicable across all researched/affected areas; there is no one way of assessing research uptake in sub-Saharan Africa. The research also concludes that stakeholder's knowledge needs vary according to the conditions predominant in the communal areas being engaged. Therefore, researchers should be prudent and very tactful in choosing strategies especially for rural communities since they are dynamic, and their community structures vary by place and culture. As an ongoing process, research uptake is open to change and adjustment at any point. Therefore, it would work more effectively if the simplest methods are applied. Researchers working in rural communities need to apply methods that are specific and applicable to the study communities. The most effective research uptake methods, as noted in the review, would be those that enable interpersonal interaction with the targeted audiences and those that support indigenous knowledge systems. Therefore, there should be community participation in the process of selecting the media and interpersonal communication strategies. Decisive research uptake methods should closely meet cultural needs, consider homogeneity within communities, and afford ownership of the promotional activity by the targeted community.

ACKNOWLEDGMENTS

Firstly, I acknowledge God for establishing this ground breaking endeavour, secondly I acknowledge the input of my supervisor Prof Chimbari and co-author Dr Gunda. I would also like to acknowledge the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) and the Canadian International Development Research Centre (IDRC) for the financial support our project received from them. This study also received financial support from the College of Health Sciences of the University of KwaZulu-Natal through MMedSci studentship bursary award. Special thanks go to my colleagues from the MABISA team for their unreserved input into the review. Lastly, I acknowledge my family and friends for all the support rendered in the course of writing this paper.

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