Barriers, Facilitators and Perspectives of Reverse Innovation in NHS England

by

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Thesis submitted in partial fulfillment of
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Master of Science in the Duke Global Health Institute
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ABSTRACT

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Abstract

Given the rising budget constraints facing NHS overall, the aim of this study was to assess the barriers, facilitators and attitudes towards Reverse Innovation in NHS England. In this study Reverse Innovation was defined as a healthcare innovation from a Low or Middle Income Country (LMIC) adapted and implemented in a High Income Country. Eight semi-structured interviews were conducted with participants in order to ascertain their experiences with Reverse Innovation in NHS England. A thematic analysis identified systematic barriers to Reverse Innovation were identified as well as potential barriers to Reverse Innovation. Innovation Vetting protocols and procedures were identified as a key barrier to Reverse Innovation with the NHS. Given this, Barriers to Reverse Innovation in NHS England appear to be similar to those faced by other types of innovation. Recommendations generated for NHS England include streamlining the innovation vetting process as well as ensuring that formal partnerships, such as THET are indeed reciprocal. Recommendations for LMIC innovators include highlighting the frugality of their innovations and partnering with an Academic Health Science Network or similar organization before entering the NHS market.

Dedication

For my father, whom I love dearly.

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List of Abbreviations

AHSN	Academic Health Science Network
CCG	Clinical Commissioning Group
EEA	European Economic Area
LMIC	Low or Middle Income Country
NHS	National Health Service
NHS England	National Health Service England
UK	United Kingdom

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1. Introduction

Rising income inequality is a challenge faced both by individuals within specific countries as well as between countries. According to OECD data, the richest ten percent of the population owns 9.5 times that of the poorest ten percent.[1] However, within this resource constrained context, frugal innovation functions as a way in which to improve or solve problems despite limited resources. Bhatti and Ventresca define frugal innovation as "a means and ends of doing more with less for more people."[2] Utilizing this definition, frugal innovation includes products, services, and business models, even within the health care sector. This qualitative study looks at a subset of frugal innovation, Reverse Innovation, identifying barriers, perspectives and potential facilitators within the specific context of NHS England.

For this study, Reverse Innovation generally refers to health care innovations adapted from low or middle income countries to high income ones. LMICs are defined by the World Bank criteria. The World Bank uses gross national income (GNI) per capita in order to classify countries into lending groups.[3] Any country with a GNI per capita under $12,236 is considered a LMIC.[4] Although Reverse Innovation originated as a business innovation term for multinational corporations, it has swiftly grown in

[1] Cingano, "Trends in Income Inequality and Its Impact on Economic Growth."
[2] Bhatti and Ventresca, "How Can 'Frugal Innovation' Be Conceptualized?"
[3] The World Bank, "World Bank Country and Lending Groups."
[4] The World Bank.

popularity in the field of Global Health.[5] Given its broad definition, there are as many types of Reverse Innovations as there are types of innovations. Reverse Innovations can be classified based on the features it delivers such as a product, technology, care delivery or type of business model. The aim of the innovation is to improve healthcare in a unique way, never before seen in this particular market. The "reverse" of Reverse Innovation refers to the idea that these types of innovations appear to reverse the traditional flow of innovation from high income countries to low income ones. Often because these innovations originate in resource poor settings, these types of innovations are Frugal Innovations as well.

Studies on Reverse Innovation in Global Health have been published on innovations within the UK and the US, such as the Community Healthcare Workers (CHW). In Haiti, the use of CHWs by Partners in Health (PIH) is an example of frugal innovation.[6] CHWs help fill the gap in the limited healthcare infrastructure by hiring workers from the community and training them to help with basic healthcare needs among a small portion of the local population. In this way, less technical tasks are shifted to CHWs, allowing doctors and nurses to focus on delivering more specialized healthcare to those who truly need it. PIH spent between $150 and $250 treating tuberculosis utilizing CHWs compared to $15,000 in the United States, illustrating the

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[5] Vijay Govindarajan and Chris Trimble, *Reverse Innovation: Create Far from Home, Win Everywhere*; Crisp, "Mutual Learning and Reverse Innovation–where Next?"
[6] Vijay Govindarajan and Chris Trimble, *Reverse Innovation: Create Far from Home, Win Everywhere*.

cost-effective nature of the intervention.[7] However, community based health care workers are not limited to the emerging economy of Haiti.

In Boston, inspired by Partners in Health, CHWs were introduced to provide homebased services to members of the local HIV patient population with limited access to services.[8] This intervention, adapted to focus on preventative healthcare within the US context, relies on CHWs to assist patients with managing appointments and medications in an effort to overcome local barriers to healthcare.[9] This domestic innovation is known as Prevention and Access to Care and Treatment (PACT).[10] This act of adapting and implementing an innovation to a High Income country, which originated in a LMIC is also known as Reverse Innovation.

According to the literature, other western countries have noted the positive impact of CHWs in LMICs. In the U.K., there was an attempted a pilot study to ascertain whether the Brazilian CHW model could be adapted to help patients in North Wales.[11] The interest in high income countries around adapting cost-saving innovations which originated in LMICs demonstrates the utility and versatility of both frugal and reverse innovation.

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[7] Vijay Govindarajan and Chris Trimble.
[8] Vijay Govindarajan and Chris Trimble.
[9] "Prevention and Access to Care and Treatment (PACT) | Justice Resource Institute."
[10] "Prevention and Access to Care and Treatment (PACT) | Justice Resource Institute."
[11] Johnson et al., "Learning from the Brazilian Community Health Worker Model in North Wales."

The first known mention of Reverse Innovation was in 2008 by Govindarajan and Trimble.[12] Since then, numerous articles have been published including those specifically pertaining to this occurrence in healthcare. Overall, despite the growing body of literature on the topic there is still not a consensus as to the proper definition of Reverse Innovation, beyond adapting an innovation from a low-income context to a high income one.[13] Reverse innovation originated with multinational corporations developing cheaper products in developing markets and then bringing that same product to developed markets.[14] A well-known example of this is GE's MAC 400, a portable ECG machine.[15]

In his typology of Reverse Innovation, von Zedtwitz identifies ten distinct Reverse Innovation flows depending on its path from development to implementation in a high income setting.[16] DePasse and Lee proposed a model for the reverse innovation process flow in 2013, breaking the process into several phases including finding a common problem to address in both high and low income countries to crossover into high income countries from a low income country, and diffusion and spread in both high and low income countries.[17] Utilizing this model, this study focuses on the

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[12] von Zedtwitz et al., "A Typology of Reverse Innovation"; Vijay Govindarajan and Chris Trimble, *Reverse Innovation: Create Far from Home, Win Everywhere*.
[13] Hadengue, Marcellis-Warin, and Warin, "Reverse Innovation."
[14] Vijay Govindarajan and Chris Trimble, *Reverse Innovation: Create Far from Home, Win Everywhere*.
[15] Vijay Govindarajan and Chris Trimble; Bhatti et al., "The Search for the Holy Grail."
[16] von Zedtwitz et al., "A Typology of Reverse Innovation."
[17] DePasse and Lee, "A Model for 'Reverse Innovation' in Health Care."

crossover of the innovation to a high income country and the initial implementation, not the diffusion afterwards.

Barriers and facilitators to Reverse Innovation in health care are still being identified and verified.[18] The literature includes various qualitative studies including case studies.[19] Recently, in 2017 and 2018, quantitative studies have been published on this topic, utilizing a variety of study designs including surveys, the Delphi method to reach expert consensus and one randomized control trial.[20] Some articles mention the negative perceptions of key decision makers as a barrier to the Reverse Innovation implementation process.[21] The implicit bias of healthcare professionals and researchers against LMICs has also been identified in the literature as a barrier to Reverse Innovation.[22] Other authors looked into the role of knowledge translation and reverse innovation.[23] Specifically in the UK, authors have looked at Formal Partnerships

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[18] Hadengue, Marcellis-Warin, and Warin, "Reverse Innovation."
[19] Vijay Govindarajan and Chris Trimble, *Reverse Innovation: Create Far from Home, Win Everywhere*; Harris et al., "'They Hear "Africa" and They Think That There Can't Be Any Good Services' – Perceived Context in Cross-National Learning"; Harris et al., "That's Not How the Learning Works – the Paradox of Reverse Innovation."
[20] Bhattacharyya et al., "Criteria to Assess Potential Reverse Innovations"; Ibe et al., "From Kisiizi to Baltimore."
[21] Harris et al., "'They Hear "Africa" and They Think That There Can't Be Any Good Services' – Perceived Context in Cross-National Learning."
[22] Harris et al., "Explicit Bias Toward High-Income-Country Research"; Harris et al., "Measuring the Bias against Low-Income Country Research."
[23] Harris et al., "That's Not How the Learning Works – the Paradox of Reverse Innovation"; Crisp, "Mutual Learning and Reverse Innovation–where Next?"; Ibe et al., "From Kisiizi to Baltimore"; Busse, Aboneh, and Tefera, "Learning from Developing Countries in Strengthening Health Systems"; Basu et al., "The Role of South-North Partnerships in Promoting Shared Learning and Knowledge Transfer"; Jones et al., "Do Health Partnerships with Organisations in Lower Income Countries Benefit the UK Partner?"; Kulasabanathan et

between UK hospitals and hospitals in low-income countries, questioning if these partnerships are truly as reciprocal as they claim.[24] There are few articles looking into the facilitators of Reverse Innovations in healthcare and even fewer articles addressing Reverse Innovation within the specific context of the National Health Service (NHS) or NHS England.[25]

Originally established in 1948, the continued growth of the health care system alongside with the UK population results in soaring costs to operate the NHS.[26] Analysts have estimated that by 2019 the NHS will have a £30 billion gap in funds needed per year to provide high quality health care for its citizens.[27] In its Five Year Forward Plan, the NHS makes innovation a priority in improving health care delivery.[28] Given the budget constraints, frugal innovations are among the innovations considered for their capacity to aid the health care system, which provides an exciting opportunity for Reverse Innovation in the NHS as well.

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al., "Do International Health Partnerships Contribute to Reverse Innovation?"; Syed et al., "Developed-Developing Country Partnerships: Benefits to Developed Countries?"

[24] Kulasabanathan et al., "Do International Health Partnerships Contribute to Reverse Innovation?"; Jones et al., "Do Health Partnerships with Organisations in Lower Income Countries Benefit the UK Partner?"

[25] Vijay Govindarajan and Chris Trimble, *Reverse Innovation: Create Far from Home, Win Everywhere*; DePasse and Lee, "A Model for 'Reverse Innovation'in Health Care."

[26] N.H.S., "The NHS History (1948-1959) - NHS England - NHS Choices"; N.H.S. Choices, "About the National Health Service in England."

[27] N.H.S., "NHS Five Year Forward Plan."

[28] N.H.S.

Despite the strong potential for Reverse Innovation to benefit the NHS, there is little to suggest that Reverse Innovation is occurring in the UK healthcare system. Reverse Innovation can provide novel ideas through increasing the breadth and diversity of innovation along with the cost saving measures the NHS desperately needs. Reverse Innovations such as task-shifting could aid the NHS as it faces staffing challenges. Similarly, cost-effective Reverse Innovation could ease the NHS financial burden in given the forecast increase in expenditures.

This study seeks to understand the barriers, facilitators and attitudes towards Reverse Innovation in NHS England, especially given that the literature indicates that there is so little Reverse Innovation implementation occurring within this specific context. This study identifies these crucial elements which can potentially serve to improve and increase Reverse Innovation within the UK health care system. This could potentially facilitate the uptake of Reverse Innovation in the NHS, helping the institution to cut costs. The study also has the potential to help LMIC innovators interested in entering the NHS market.

2. Methods

2.1 Setting

The United Kingdom of Great Britain and Northern Ireland (U.K.) is an island country located in the North Atlantic Ocean off the Northwestern coast of Europe.[1] This study was based in London, the capital city of the United Kingdom, has over 8.6 million residents.[2] As of 2016, 65.64 million people live in the U.K.[3] The country is made up of the sovereign nations of England, Scotland, Wales and Northern Ireland.[4] In this constitutional monarchy, Queen Elizabeth II is head of state while the current Prime Minister is Theresa May of the Conservative Party.[5] Each country within the United Kingdom has their own sovereign government beyond the combined parliament.[6] Although it is still formally a member of the EU, the currency of the UK is the pound sterling.[7]

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[1] Encyclopedia Britannica, "The United Kingdom."
[2] "London and UK Population - Office for National Statistics"; Osborne, "London Population Growth Rate Twice That of UK, Official Figures Show."
[3] The World Bank, "UK Population Total."
[4] Encyclopedia Britannica, "The United Kingdom."
[5] Encyclopedia Britannica.
[6] Encyclopedia Britannica.
[7] Encyclopedia Britannica.

2.1.1 The Health Care System

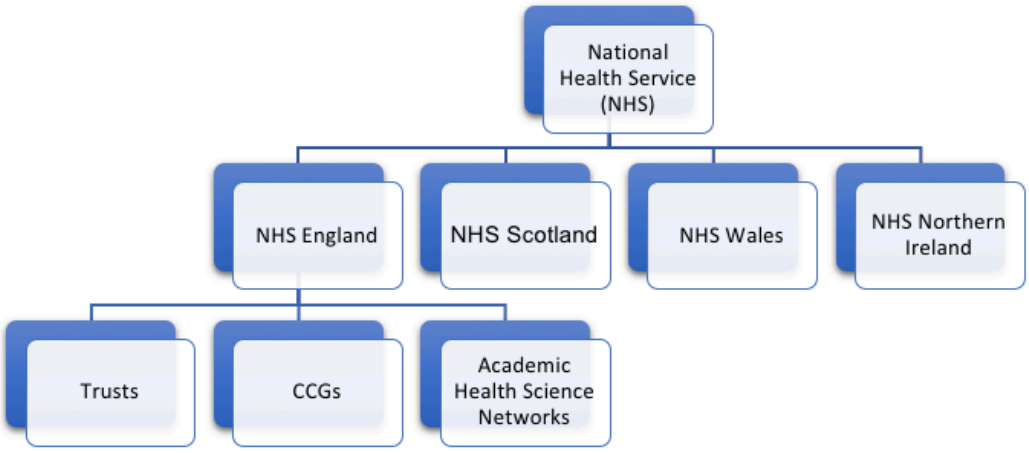

Figure 1: Diagram of the National Health Service. NHS England is featured divided in order to highlight the sub-organizations important to this study.

The National Health Service (NHS) was founded on July 5, 1948.[8] It provides comprehensive free health care at the point of delivery. The only services for which patient are charged are dentistry, ophthalmic and pharmaceutical services. However, the cost of these services may still be covered for children under the age of 16, elderly patients as well as those with insufficient incomes.[9] Additionally, there are also fee exemptions for those with certain medical conditions including diabetes mellitus and pregnant mothers.[10]

Presently, the NHS is an enormous organization, employing approximately 1.4 million people, making it one of the largest employers and the largest health system in

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[8] N.H.S., "The NHS History (1948-1959) - NHS England - NHS Choices."
[9] Encyclopedia Britannica, "United Kingdom | Health."
[10] N.H.S., "The NHS History (1948-1959) - NHS England - NHS Choices"; N.H.S. Choices, "Help with Prescription Costs - Health Costs - NHS Choices."

the world.[11] When it was first created, the NHS had a three-part structure: hospitals, general practice and local health authorities.[12] As the organization grew over the years, the structure evolved as well. The Health and Social Care Act of 2012 announced wide-ranging reforms for the NHS, including placing clinicians in charge of NHS commissioning, creating Clinical Commissioning Groups (CCGs).[13] Currently, the objectives of the NHS are articulated in the Five-Year Forward Plan, which launched in October 2014.[14] In the plan, the NHS describes its intention to partner with local organizations through Sustainable Transformation Partnerships focused on integrated care.

The NHS is split into separate organizations on the country level. Each organization is separately managed and funded through the UK government directly through taxation.[15] This study was undertaken exclusively within NHS England. The current CEO of NHS England is Simon Stevens.[16] NHS England operates as a commissioner for health care services along with CCGs in England.[17] NHS England is responsible for commissioning highly specialized services, managing a budget of £100

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[11] Nigel Crisp, *Turning the World Upside Down: The Search for Global Health in the 21st Century*.
[12] N.H.S. Choices, "The NHS in the 1960s - The NHS in England - NHS Choices."
[13] N.H.S. Choices, "NHS History 2010s - NHS in England - NHS Choices"; N.H.S., "Health and Social Care Act of 2012 Overview."
[14] N.H.S., "NHS Five Year Forward Plan."
[15] N.H.S., "The NHS History (1948-1959) - NHS England - NHS Choices."
[16] "NHS England » Board Members."
[17] NHS Clinical Commissioners, "About CCGs."

billon.[18] CCGs generally handle the remainder of commissioning responsibilities, including primary care, controlling approximate two-thirds of NHS England's budget.[19]

Clinical Commissioning Groups are member based organizations where local GP practices have memberships.[20] CCG leadership is made up of doctors and other clinicians.[21] The focus of the CCGs is to improve health care outcomes in that specific population within the UK. The average CCG is responsible for populations of approximately 250,000 people.[22] There are 32 CCGs in London.[23] CCGs replaced NHS Primary Trusts after the Health and Social Care Act of 2012.[24] CCGs commission a wide variety of services including primary and secondary care.[25] In addition to commissioning services for their local communities, CCGs also work with local authorities though health and wellbeing boards in order to improve health outcomes within their specific population.[26]

Within the NHS, health care services are commissioned from NHS Trusts.[27] NHS Trusts are responsible for overseeing health care services provided by hospitals, clinics

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[18] N.H.S. Choices, "The Structure of the NHS in England - NHS Choices."
[19] NHS Clinical Commissioners, "About CCGs."
[20] NHS Clinical Commissioners.
[21] NHS Clinical Commissioners.
[22] NHS Clinical Commissioners.
[23] NHS England, "NHS England London » CCGs and Acute Trusts."
[24] N.H.S., "Health and Social Care Act of 2012 Overview."
[25] NHS Clinical Commissioners, "About CCGs."
[26] NHS Clinical Commissioners.
[27] N.H.S. Choices, "Authorities and Trusts - The NHS in England - NHS Choices."

and GP practices as well as other health care facilities.[28] Health care services provided span across the spectrum including emergency services and mental health services.[29] Additionally, NHS Trusts employ health care workers such as clinicians and nurses.[30] NHS Foundation Trusts differ slightly from Trusts in that they have unique financial arrangements that permit them to raise money from public and private sectors among other benefits.[31] NHS Trusts and Foundation Trusts report to NHS Improvement, an umbrella organization created in 2016 through the merging of several NHS organizations including the NHS Trust Development Authority and Patient Safety.[32]

The final NHS England organization that is pertinent to this study is the Academic Health Science Network (AHSN). AHSNs bridge the gap between research and practice within NHS England. There are 15 AHSNs in England.[33] AHSNs operate as autonomous enterprises with five year licenses from NHS England. AHSNs value innovation across all areas of health care, fostering collaboration in order to accelerate innovation adaptation in the NHS.[34] One of the core objectives of AHSNs is to facilitate innovation into the NHS by increasing adaption and spread.[35] This in turn should improve health care outcomes and increase cost savings. Academic Health Science

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[28] N.H.S. Choices.
[29] N.H.S. Choices.
[30] N.H.S. Choices.
[31] N.H.S. Choices.
[32] N.H.S. Choices; NHS Improvement, "Who We Are | NHS Improvement."
[33] Health Innovation Network South London, "Health Innovation Network."
[34] NHS England, "NHS England » Academic Health Science Networks."
[35] NHS England.

Networks have partnerships across sectors including researchers at academic institutions and entrepreneurs.[36]

2.2 Participants

For this study, participants were selected using the following criteria: the individual must currently work at the NHS or with the NHS or have worked at the NHS within in the past 10 years. Additionally, the individual must either be working currently with a Reverse Innovation or have a working understanding of Reverse Innovation while working in the innovation sector of the NHS for at least five years.

Participants were purposively sampled in conjunction with snowball sampling in order to maximize the amount of potential participants contacted as well as to ensure that data saturation was reached. Participants were approached via email, using a message that was approved by both the Duke Institutional Review Board as well as the Health Research Authority. Participants who were referred to the study by snowball sampling were not made aware by the researcher who referred them to the study, unless the prior participant gave their explicit permission to inform them.

Participants were not given any incentives to participate in the study. This decision was made based upon the professional status of the participant in comparison to that of the researcher. Because the researcher was "interviewing up" it was deemed that an incentive need not be necessary.

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[36] NHS England.

2.3 Procedures

Once participants agreed to participate in the study, they signed an informed consent form, which detailed the specifics of the study, including the expectations of the research team, and who to contact should they have any questions. The participant also gave their verbal and written for the interview to be audio-recorded, with the understanding that this recording as well as various personal information would be taken by the researcher out of the European Economic Area (EEA), digitized and filed under an anonymous name. The consent form was provided to the participant in-person or over email. Digital signatures were accepted. The form was signed by both the researcher and the participant and dated accordingly. If the consent form was signed on paper, it was then scanned onto the computer and saved in three separate places: a password protected folder, a password protected USB drive, as well as Duke Box.

Semi-structured interviews were conducted with participants either face to face or over the phone. Interviews were conducted at a location to facilitate ease of access for the participant, therefore the location varied depending on the participant. The interview guide that was used had five key questions that were asked to every participants. Questions were crafted to ascertain the participant's experience with Reverse Innovation without being leading. Questions were also asked about participant's understanding of the term Reverse Innovation as well as how the participant view Reverse Innovation in the current context of NHS England. The latter

question was created specifically to gain data on participants' attitudes towards Reverse Innovation within the context of the study setting. The interview guide contained three sections: Introductory Questions, Key Questions and Closing Questions. Additional questions were asked through probing and varied with each participant. See Appendix A for further details. Before being administered to participants, the interview guide was piloted before fieldwork in the US as well as during fieldwork in the UK. The instrument was pilot tested with two MSc-GH master students who were not familiar with the topic as well as researchers in the field who were familiar with the study topic. Interviews were to be no shorter than 30 minutes, although they were preferably 45 minutes in length. Interviews were recorded on two separate devices in case one should fail. The recording was then uploaded to the researcher's laptop directly after the interview.

All study procedures were approved by the ethics review boards at Duke University and NHS England: the Duke University Institutional Review Board and the Health Research Authority of NHS England. Authorization was given to conduct research within the NHS exclusively in England and necessary forms and procedures were followed. Trusts and other NHS organizations where participants were employed were provided notice of this study.

2.4 Analysis

This study utilized thematic analysis.[37] Thematic analysis is an inherently iterative process.[38] This analytical approach was implemented throughout both data collection and data analysis phases. During data collection, memoing was used in order to ascertain key themes that emerged during each interview. After each interview, a memo was created highlighting the major themes that were discussed. This allowed the researcher to keep a written record of the themes that emerged throughout data collection, which is an important determinant in reaching data saturation.[39]

According to the literature, data saturation is commonly defined as when no new themes emerge in the data.[40] Although this is a standard method employed in qualitative studies, researchers disagree with the amount of interviews necessary to achieve saturation. Some state that the requisite number is as small as six while other studies quote figures as large as sixteen.[41] However, there is a general consensus that once data saturation is reached, then the researcher has acquired enough data to begin a validated analysis of the key themes.[42] For this reason this study was flexible in the amount of interviews obtained, with the objective of conducting between twelve and thirty-five

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[37] Guest, MacQueen, and Namey, *Applied Thematic Analysis*; Braun and Clarke, "Using Thematic Analysis in Psychology"; Hsieh and Shannon, "Three Approaches to Qualitative Content Analysis."
[38] Guest, MacQueen, and Namey, *Applied Thematic Analysis*.
[39] Guest, MacQueen, and Namey; "Memos and Memoing."
[40] Given, *The SAGE Encyclopedia of Qualitative Research Methods*.
[41] Fusch and Ness, "Are We There Yet? Data Saturation in Qualitative Research"; Given, *The SAGE Encyclopedia of Qualitative Research Methods*.
[42] Guest, MacQueen, and Namey, *Applied Thematic Analysis*; Fusch and Ness, "Are We There Yet? Data Saturation in Qualitative Research."

total interviews. The data was consistently analyzed through memoing in order ascertain whether or not data saturation had been reached and whether participant recruitment needed to continue.[43] Interviews were transcribed verbatim and inputted into NVivo 11 to assist with the thematic analysis of the data.

A codebook was constructed before the data analysis process to include known themes in the literature about barriers to Reverse Innovation, as well as the themes highlighted in the interview guide questions, such as participant attitudes on the definition of Reverse Innovation and the role of Reverse Innovation in NHS England.[44] During the analysis, the codebook was revised to include themes that arose in the data including more nuanced codes of sub-themes.[45]

Using thematic analysis, various barriers were identified as described by participants. For the purposes of this paper, barriers are defined as challenges and aspects that impeded the Reverse Innovation implementation process. Here, innovation implementation is used broadly to refer to any aspect of the innovation process from identification to full implementation in the hospital setting.

In this study, a facilitator is defined as an aspect that makes the innovation implementation process easier, allows it to move forward quicker or avoids known barriers. However, this is most certainly an area for further research. Facilitators were

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[43] "Memos and Memoing."
[44] Given, *The SAGE Encyclopedia of Qualitative Research Methods*.
[45] Given.

identified using an iterative analytical process, identifying what went well in the innovations described in the data. Often participants did not articulate what made an innovation process easier or reflect upon the innovation's successes. Instead a critical close reading of the data was undertaken in order to ascertain potential characteristics that made an innovation possible or aided a participant in overcoming a specifically mentioned barrier. In order to do this, barriers were analyzed and coded prior to potential facilitators.

Participant attitudes were coded and identified based on their perspective and opinions about specific innovation experiences. The attitude code was also utilized in relation to specific questions on the interview guide such as the question asking participants to define Reverse Innovation, as well as the question asking participants whether they believed that Reverse Innovation had a place in the NHS.

3. Results

3.1 Participant Characteristics

Table 1: Participant Characteristics

Participant	Gender	Advanced Degree	Organization	RI Experience
1	Male	MD / PhD	Academic Institution	Y
2	Male	PhD	Academic Institution	Y
3	Male	--	AHSN	Y
4	Female	Psychiatrist	NHS Trust	Y
5	Female	PhD psychology	AHSN	N
6	Female	--	AHSN	Y
7	Female	Nurse / PhD	Academic Institution	N
8	Female	Psychiatrist	NHS Trust	Y

Eight semi-structured interviews were conducted between August 2017 through November 2017. Although the study only comprised of eight participants, data saturation was reached upon analysis. Three in-person interviews were conducted at the participant's organization. The fourth in-person interview was conducted at the participant's house. The remaining four interviews occurred over the phone, using internet phone conferencing software. The software varied with each participant, again to facilitate ease off access. Software that was used includes Skype as well as online conferencing software provided by the participant.

Four participants were health care workers, 1 was exclusively in academia, 3 worked for Academic Health Science Network organizations, and 2 participants were trained healthcare professionals who were currently in academia. Of the three AHSN employees, two were in leadership positions. All but two participants had experience

working with a Reverse Innovation. The longest interview was 82 minutes long, while the shortest interview was 35 minutes long.

3.2 Reverse Innovation Vignettes

During the course of this study three reverse innovations were identified: one was identified but was still in the pre-implementation process. One was in the process of being adapted and the final one had already been adapted and diffused across the entirety of the NHS. The first two innovations were surgical tools and the last was a mental health innovation. The surgical tool innovations are also classified as a business innovation and as a frugal innovation. The mental health innovation is a narrative therapy approach that can also be viewed as task-shifting.

For the purposes of privacy, participants have asked for strict confidentiality regarding the two surgical innovations that are still in progress. However, since the mental health innovation diffused across the NHS, the innovation itself is not anonymized, although certain aspects are redacted in order to maintain the confidentiality of my participants' identities.

3.2.1 The Surgical Tool

A team of academics were interested in seeking out more frugal innovations. The same two frugal innovations were continually mentioned in the literature, and this team wanted to change that. They were not interested in which country the innovations originated, simply in their ability to save costs without compromising patient safety or the quality of care delivered. To do so they scoured the internet, searching through

databases of innovations for those that could potentially be useful for the NHS setting. Once they had found an assortment of innovations that matched their criteria, they presented the results to an assembled group of doctors, who would be utilizing the innovation, and procurement leads who would be purchasing the innovation on behalf of the hospital.

After the meeting, the team settled on an innovation that would be most useful, right now in their current state for NHS hospitals: a frugal surgical tool that could potentially save the health system tens of thousands of British Pound Sterling (GBP). The academics reached out to the company that manufactures the tool. The surgical tool is currently in use in three Sub-Saharan African countries. Although its primary markets are in Sub-Saharan Africa, it is a North American company. After reaching out to the business, the academic team wrote up a business case about them as well as helped them form an economic model. Afterwards the academic team along with the innovators partnered with the local Academic Health Science Network, an NHS organization working to increase the total amount of innovations in the NHS. The AHSN helped them to hone the business model and present to Procurement leads at a local hospital. The AHSN identified aspects of the presentations that appeared to be too business oriented and sales motivated. Collectively, the team identified aspects of the surgical tool that the team would need to fix before it could even be piloted in the NHS. The now-extended innovation team needed to find a doctor willing to use this surgical tool

in the UK. In order to convince the potential consultant, they flew him to Africa to see the surgical tool in action.

Although the team finally convinced the doctor to join them, this innovation still has a long way to go before it can be implemented in a single hospital in the NHS. Primarily, the team still faces pushback from the hospital itself, wanting to receive monetary compensation for piloting the innovation, and uncooperative individuals who do not believe that such an innovation has a place in the UK. One such person, who occupies a leadership position in the Clinical Sterilization Services Department must be convinced before the project can move forward. Additionally, there are still numerous logistics to work out before a pilot can commence including how the surgical tool can be sterilized using an autoclave and a key member of the team, a PhD student was about to graduate. It remains to be seen how long it will take for this very promising cost-saving reverse innovation to be implemented in the NHS. Certainly, it required the input and assistance from a variety of stakeholders spanning across three countries and three continents.

3.2.2 The Mental Health Innovation

One psychiatrist was tasked with encouraging more Black men living with mental illness to attend cognitive behavioral therapy at the NHS trust when she worked. However, she thought that the real reason that this particular group of men may not be seeking out care was because the trust was not meeting a need in this community. Mindful of the history of discrimination and mistrust between this community and the

NHS, she conducted focus groups in order ascertain the reasons why this specific population of men avoided care. She discovered that these men craved a connection with their culture and their healthcare, wanted to be understood as complete person, not simply a mental health problem to be fixed. They wanted their heritage and culture to be seen as a strength and they felt that CBT talking therapies were Eurocentric and focused on the negative. They also wanted a therapy where their spirituality and religion were not seen as another symptom, where the patient could feel as though they control their own narrative.

In talking with a colleague, she realized that she might have found a solution for her clients. What they needed was not CBT, but narrative therapy. Her colleague had come across a specific narrative therapy approach called the Tree of Life in an Australian journal. Later, she attended a conference with the creator of this therapy approach. Nzcelo Ncube pioneered the approach in South Africa, while working with teens who had lost their parents due to HIV/AIDS. This group-based approach encourages participants to think holistically about their lives, their support-system. Each participant creates their own tree, representing their life, with different aspects represented in each part of the tree: roots, trunk, branches and leaves. At the end of the workshop, participants post their trees all together, creating a forest of life. Using this therapy approach participants did not focus so much on the trauma of losing their parents, dwelling in it.

It is this culturally sensitive approach that attempts to highlight the whole person that the colleague decided to try it out herself with a small patient group of adults in the UK who were living with HIV and also coping with loss and trauma in their lives, which she implemented after a small pilot with herself and two colleagues, one of which being her supervisor. The trial was so successful that they wrote it up and published a short article afterwards.

The psychiatrist with which this story began attempted to model her intervention after her colleague on a larger scale. She partnered with another local NHS organization that worked with the local Black community. However, they were concerned that this therapy could be considered to be infantilizing the men, since it originated from a child psychologist. However, once the community NHS organization realized that it had been successful with a group of adults, they were much more inclined to reconsider its implementation. Once the project had buy-in from community partners, the psychiatrist did a pilot with select patients and colleagues. The patients were interested upon hearing that the therapy was created by an Africa psychologist and implemented in Africa. Afterwards, the innovation spread across the NHS, being used in both out-patient and in-patient facilities. The innovation spread informally through word of mouth among colleagues as well as formally through conference presentations and workshops. It is now lauded in local mental health conferences as an example of Reverse Innovation.

3.3 Barriers

The barriers identified in this data were systematic barriers, firmly tied to the institutional setting of NHS England. The systematic barriers described below are different from some barriers addressed in the literature, such as negative perceptions of key decision makers. While bias is how the opinions of one person can be damaging to the innovation implementation process, these systemic barriers are built into the institution itself through formal rules that must be followed or aspects around the workplace that make it difficult to implement a Reverse Innovation. A hierarchy of the barrier themes is shown in the figure below.

Table 2: Barrier Thematic Codes

	Key Themes	*Sub-Themes*
Systematic Barriers	**Innovation Vetting**	▪ Securing the Necessary Approvals ▪ Identifying the Right People
	Culture of Change	▪ National Politics ▪ Resistance to Change ▪ Change Fatigue
	Knowledge Translation	▪ Dissemination ▪ Sourcing
	Misaligned Financial Incentives	No identified sub-themes

3.3.1 Misaligned Financial Incentives

One of the systematic barrier themes to emerge from the data was misaligned financial incentives, which participants described in a variety of capacities.

One participant spoke of incentives on the organization-level, explaining his attempt to implement a cost-saving interventions, such as reverse innovations.

> "So, it'll save the CCG money…it'll be cheaper for you to do it and cheaper for us to pay for it. But then the Trust goes well hang on a minute, why would I do something that's cheaper for me when I make £130 for seeing a patient and you're going to pay me £30 for seeing this patient but I still legally have to take the same responsibility? So it's a really complicated situation when you get right down into the weeds." – Participant 1

In this instance, the barrier to innovation is at the organizational level: payment schemes. The payment schemes in the NHS have evolved over the years.[1] Although an innovation could save a Clinical Commissioning Group money, it could be to the detriment of the budget of a Trust. The NHS as a whole is looking to save money, however the individual organizations that make up the NHS also do not want to lose money due to a decreasing budget, which the Trust could see in the situation detailed above.

Another participant presented the following dilemma:

> "It's quite difficult to make a business case, if you're saying pick up this innovation that reduces the chance of that anal sphincter injury happening…you're basically saying just buy this. It costs more than the current system on the market and you will also lose income because these instances will no longer be happening. So although clinically and ethically people still want to buy the scissors, they still have to make sure that they balance their finances…so

[1] Marshall, Charlesworth, and Hurst, "The NHS Payment System."

> sometimes the reimbursement system drives activity and doesn't necessarily drive innovations that can make things more efficient…because that results in lost income for a hospital."- Participant 6

Both of these quotes are from participants who have worked as healthcare providers in the NHS. Participants mentioned the examples above in order to help them explain the challenges they viewed facing Reverse Innovation implementation in NHS England. Examples such as these mentioned in the study data were product innovations.

3.3.2 Lack of a Culture of Change

The concept of incentives was also raised in what participants identified as a culture of change. Participant Three, an employee at an Academic Health Science Network, stated: "So I think that there's a cultural attitude around expertise that that can prevent things from happening quickly that are different." Another participant in a leadership position at an AHSN highlighted these challenges in a different way, stating:

> "Some of the other challenges has been very much around…a resistance to change…it's automatically met with kind of met with resistance as opposed to an attitude of hey this is great. How can we work around it? How can we make this happen? …and that can be quite that can be quite challenging" –Participant 5

Participants continually raised this idea that the NHS was in and of itself resistant to change. However, it is difficult to assign blame to an entire organization, especially one as large and as multifaceted as the NHS. When participants spoke of this theme in more specific terms, they did so by pointing to it at an individual level, speaking about how managers are "constantly" changing, how doctors and nurses are

resistant to change, and how the NHS as a whole is slow to change. Participant One phrased it in the following manner:

> "You're in this horrible cycle of…feeling like you're constantly trying to deliver care on…quicksand...So you might be a clinician in a hospital for 25 years but your manager may change every 6 months and every time someone new comes in, they're incentivized personally to make a difference, to make a change, right?"

Additionally, participants mentioned how changing priorities on the national level could affect the longevity of the innovation. Key community partners could disappear due to a lack of government funding which occurred with the mental health innovation. The community organization that helped launch the innovation was funded through the NHS however when politics shifted the organization was left without the NHS as a funder. The organization was closed shortly afterwards.

3.3.3 Innovation Vetting

The next theme identified in the data as a systematic barrier is Innovation Vetting. This includes the necessary protocols and procedures required for an innovation, including Reverse Innovations to be implemented in NHS England, as well as identifying the right team of people required for the implementation to be successful. Participants described the sheer amount of paperwork, often necessary to vet the innovation in order to ensure patient safety as a challenge as they worked to implement their reverse innovations. Similarly, participants described the need to pilot test the intervention in the UK, as an added burden. A pilot test for the Mental Health Innovation involved documenting the innovation in a workshop setting with a group of

co-workers and a small number of carefully selected patients, after the approval of a manager. However, for the Surgical Tool the pilot study necessitates operating on injured patients in a hospital, requiring ethics approval as well as the buy-in and approval of the hospital, doctors and staff who need to sign off on the procedure. Additionally, the current project lead is a PhD student, who expressed frustration in filling out lengthy paperwork only to graduate before the pilot study begins.

Participant One, who worked on the Surgical Tool Innovation summarized the challenge as the following:

> "But you know it's one thing after the other after the other with time delay…if you could get everyone in one position, line the ducks up: yes yes yes…it would be easier. But the bureaucracy of the system just stops that from happening. It will take us 18 months to get to a point where, where we're able to do anything useful."

Paired with the challenges detailed above, innovators also need to construct a team of individuals to buy-in to the innovation. This group includes people who will pay for the innovation, utilize the innovation or adapt the innovation.

Describing her work with the mental health innovation, Participant Four spoke about the necessity of convincing her supervisor that the narrative therapy approach was an effective idea. She had to use supporting evidence about her patients to convince her supervisor. The same participant also spoke about her challenge to convince community partners that she was operating in good faith, especially given that she was the only white person working on a project that concerned the Black communities in London.

It was challenging for the surgical tool innovation as well to deal with a variety of stakeholders who have a role in the innovation adaptation process. The academic team liaised with health care workers, and procurement leads in addition to the innovators. In order to convince a hospital to allow a pilot test they also had to find a clinician willing to use the surgical product innovation. They flew the doctor out to hospitals in East Africa where he could see the surgical tool in use. Additionally, the Trust wants the company to pay them to host the pilot study. Exemplifying the challenges faced by the surgical tool innovation, Participant One described his difficulty convincing the lead in Compliant Sterilization Services Department just to meet with the team.

> "We've tried to get a meeting with the lead…and that's taken a month. She's basically saying 'I don't think you should be doing this in the UK.' You know, this person is not a clinician. This person has never actually treated a patient, has no idea what it's like to be a surgeon or perform an operation but yet is prepared to say I'm going to put a block on this."

In order for an innovation to become part of the NHS, it must prove that it meets the criteria as instructed by the organization, especially those regarding safety. Securing those approvals could be challenging and time consuming, ensuring that all the paperwork is completed through the proper channels. This was most frequently highlighted in the data with the requirement of pilot testing in the UK before any innovation, including a Reverse Innovation can be implemented. This is certainly apparent with the two innovations highlighted in this study. Another requirement

detailed by participants as challenging was CE marking.[2] CE marking is required for medical devices in the European Economic Area (EEA). It ensures that the devices meet the health and safety requirements of the European Union (EU) and marks the product compliant with EU legislation. It also allows the product to be traded in the European market. It remains unclear whether such legislation would remain once the UK leaves the EU.

Perhaps one of the best examples of the complexities of securing the necessary approvals comes from the autoclaving difficulties of the surgical tool. In order for the surgical tool to be used safely on multiple occasions, it must be sterilized after use. In LMIC settings, the surgeon sterilizes the tool after each use. However, in the NHS, instruments requiring autoclaving are sent to collectively to separate autoclaving facilities and returned. The surgical tool reverse innovation was manufactured for autoclaving for a certain amount of time at a certain temperature. However these specifications are incompatible with the current autoclaving protocols of NHS England, which has a different standardized autoclaving duration and temperature. The innovators are now required to present a solution to this logistical problems. If they do not resolve this logistical problem, this innovation cannot proceed in the NHS. In this case, the current policy requirements around medical devices pose an unexpected

[2] Department for Business, Energy & Industrial Strategy, "CE Marking."

barrier to this innovation. Participant Two summarized this challenge in the following manner:

> "So let us say that we gave that autoclave unit as—along with the [tool] so that it could be autoclaved right there in the room…instead of having to be sent off to a different facility but if we were to pitch that as a possible solution then we have to also understand the policy guidelines around national sterilization procedures…whether they allow that kind of decentralized local sterilization by the clinicians themselves is a question mark and if not, can we actually change those policy guidelines to allow that to be hap—to, to you know, enable these frugal devices to be used."

3.3.4 Knowledge Translation

The next systematic barrier theme identified in the data was Knowledge Translation, which included subthemes of dissemination and idea sourcing. Several participants remarked on the need for formal forums of knowledge exchange, such as conferences. NHS Trusts have formal partnerships with hospitals in LMICs, however my participants felt that this exchange is often one-sided. Participant One spoke of the expertise of the medical professionals he worked with while volunteering for an extended amount of time in a Sub-Saharan African country, stating that while their training had been different than that of the UK, it was also more focused on a certain area. He concluded that just because the health care worker was not a western trained doctor did not mean that there was nothing to learn from their experience. Participant Four echoed this sentiment, stating:

> "So for example, one of the things that we've got in our Trust is this kind of exchange project with Uganda…What seems to happen is that people from our service go over there and teach and people from Uganda come over here and

> learn…so it's all one-way…And I kept saying this, you know, when are we going to learn from the people coming from Uganda?"

A second sub-theme emerged from the interviews; the sourcing of innovations also appeared to be a barrier to Reverse Innovation specifically. When asked which countries they looked to as the source of innovations or innovation inspiration, participants either stated that the geographic location made no difference, or they mentioned high income countries. Countries that were mentioned the most in the data were the United States, Canada, and Australia.

Participants also sourced innovations by topic and subscribed to relevant journals. Participants did not speak of actively seeking out innovations from low resource countries. The academic team researching frugal innovations did seek out databases that included frugal innovations which are often from resource poor settings. However, when participants receive applications from innovators at AHSNs or actively look for innovations or innovative ideas they generally talked about high income countries unless they are already looking for frugal innovation which seem to occur more in low resource settings.

Two participants are in leadership positions in two separate Academic Health Science Networks and they mentioned the limited experience that they have had with Reverse Innovations. One program did not see any applicants from LMICs, despite opening the process internationally. She mentioned that the time commitment could perhaps be a deterrent. She also suggested that innovators in LMICs are still not aware

of these opportunities, and the question becomes how to reach them. Of the two examples of Reverse Innovation highlighted in this paper, an academic team actively sought out the innovators operating in LMICs. The second innovation was sourced through word of mouth among colleagues as well as an article published in an Australian academic journal.

3.4 Potential Facilitators

In order to identify facilitators, aspects of the innovation were identified that avoided or prevented the barriers identified previously. There was not enough in the data to state for certain that these factors were definitely facilitators within the context of the identified Reverse Innovations, however there is some data to suggest that these factors may be important to consider when searching for facilitators to Reverse Innovation. This is why the terminology of 'potential facilitator' is used instead of simply 'facilitator.'

3.4.1 Preemptively Identifying Helpful Individuals and Organizations

The first key theme described in this section is preemptively identifying helpful individuals and organizations. This directly addresses the barriers listed under Innovation Vetting. One example of helpful organizations is Academic Health Science Networks. AHSN employees understand the health system and implementation process, and are working to develop frameworks and checklists for innovation implementation. Important individuals to identify would be those that could aid the innovation in its

legitimacy, such as the surgeon identified for the surgical tool reverse innovation who volunteered to use it in the operation room.

3.4.2 Need-led interventions

Another key theme of potential facilitators that was identified in the data was need-led interventions. This category can be classified in two different sections: Evidence-based or NHS Stated Goal. For evidence-based, in the Mental Health Reverse Innovation Vignette, data collected about her patient perspectives on Cognitive Behavioral Therapy helped the psychiatrist convince her colleagues in the community as well as her supervisor that the Tree of Life narrative therapy was a good option for her patients. She had the data to support what her patients were looking for in their mental healthcare and why they were not seeking out Cogitative Behavioral Therapy. Additionally, when she could point to an article published by her colleague who trialed the innovation with adults she was able to show colleagues of the community organization the reality of what this specific type of therapy had to offer. In this case, both data collected by the NHS in terms of patient information as well as data describing innovation impact proved useful in helping the psychiatrist to convince the necessary persons to give this innovation an opportunity.

3.4.3 NHS Stated Goal

An additional potential facilitator theme that emerged from the data was that the innovation aligns with a current NHS initiative. Participants in ASHNs especially highlighted the necessity for the NHS to source innovations that will help the NHS

England achieve the aim of cutting its costs while maintaining the quality of care delivered. Cost-saving innovations were pointed to as types of innovations that the NHS was looking for, especially by AHSN leadership.

The Surgical Tool innovation matched with two different aspects of the five year forward plan: funding and efficiency and harnessing technology and innovation. The Tree of Life Reverse Innovation through its task-shifting and narrative therapy approach highlighted the target areas of innovation, mental health and funding and efficiency. The workshop approach to this therapy requires less providers to be available to help each patient in contrast to the general one to one approach of CBT.

3.4.4 Innovation Type & Size

Another notable potential facilitators include simply the characteristics of the innovation including the innovation type, such as whether the innovation is a product or a care delivery intervention, as represented by the data. Innovation size could also potentially play a role. This is represented in the data through the Tree of Life innovation. The innovation involved task shifting and they were able to pilot it with a small group of patients and staff. The innovation affected less staff, patients and departments, which potentially made it easier to implement as a pilot study.

3.4.5 Formal Forums of Knowledge Exchange

The final potential facilitator identified in the data is Formal Forums of Knowledge Exchange. An example of this mentioned by the participants is Conferences. Conferences were described in both Reverse Innovation vignettes, playing a key role in

the diffusion process. During the interviews, participants noted the lack of formal forums which facilitated the even exchange of information and expertise between LMIC health care professionals and those working in the NHS. Similarly, the surgical tool innovation was featured in a health care conference while Participant Four learned about the Tree of Life from a conference on narrative therapy.

3.5 Participant Attitudes

Several key themes that emerged from the data around participant attitudes. The first theme is country context. Some participant viewed the innovation's origin country as a positive, while others thought it was irrelevant. Several participants expressed a willingness to understand how different aspects of health care were undertaken in different countries, especially countries different from the Western culture that is prevalent in the UK. During his interview, Participant Three wondered aloud whether Social Care could be improved in the UK due to innovative practices originating in Asia, where the participant perceived cultures to have a greater respect for the elderly.

Participants One and Two, researchers at the same academic institution, spoke about the UK as not being as conducive to Reverse Innovation as other high-income countries. They pointed to the systematic barriers of NHS England and highlighted the United States as a country that was better suited for Reverse Innovation, mentioning smaller decentralized healthcare systems and better aligned financial incentives.

The same participants also felt that the innovation country of origin was irrelevant. They were purely interested in the cost-saving nature of innovations and for

this reason they researched Frugal Innovations. For these participants, the utility of Reverse Innovations was strictly tied to their frugal nature. Additionally, this sentiment was echoed by AHSN employees in leadership roles. While AHSN employees overall expressed a desire for innovations that would increase the diversity of their current pool of innovations, employees in leadership positions included the caveat that any innovation considered by an AHSN should be maintaining or improving the quality of care delivered while reducing costs.

When asked about Reverse Innovations that were not simultaneously Frugal Innovations, a participant in a leadership role at an AHSN adamantly stated that the AHSN would not consider any innovations that were not cost-saving in nature. She specified that this was directly due to the problems currently faced by the NHS overall. The participant pointed out that the NHS simply does not have the resources to direct towards innovations that are not cost-saving in some capacity. Although the definition of Reverse Innovation is inherently tied to country context, participant attitudes also pointed to a Reverse Innovation's frugality as a defining characteristic for the innovation's value to NHS England.

4. Discussion

Perhaps the strongest finding of this study was that the primary barriers to Reverse Innovation identified in the data were systematic. They were inherently tied to the protocols and structure of the NHS England. This finding was surprising given the literature review conducted prior to data collection, which revealed negative perceptions of key decision makers as a barrier to Reverse Innovation along with implicit bias against the innovation's origin country.[1] While some participants mentioned this topic briefly, it was not the primary theme that emerged from the data. The participants' emphasis on systematic barriers within the NHS could potentially be due to the study design which looked exclusively at the barriers and facilitators to Reverse Innovation within the specific context of NHS England, instead of identifying barrier to Reverse Innovation in various high income countries around the world. Given how strongly these systematic barriers such as misaligned financial incentives, innovation vetting, and lack of a culture of change are reflected in the data, it begs the question whether systematic level change is required to facilitate Reverse Innovation uptake within the NHS England.

Additionally, the systematic barriers identified in the study were not exclusive to Reverse Innovation. They are barriers to innovation in general within the context of NHS England. This was explicitly stated by Participant Five, who occupies a leadership

[1] Harris et al., "Explicit Bias Toward High-Income-Country Research"; Harris et al., "Measuring the Bias against Low-Income Country Research."

role at an Academic Health Science Network. This is fascinating, given that the NHS overall is attempting to utilize innovation to improve how healthcare is delivered to its patients, as expressed in its Five Year Forward view. If there are systematic barriers preventing NHS England from implementing cost-saving innovations that the organization desires, this creates inefficiency which hinders the organization as it attempts to achieve its cost-cutting objective, while maintaining quality care.

The systematic barriers identified in this study are quite similar to barriers identified by the authors from the Academic Health Science Network Imperial College Health Partners in a 2016 article on diffusion of innovation in the NHS.[2] The authors detail how innovations face different barriers within the NHS depending on which of three categories they are classified: emergent, required, and optional.[3] The innovations identified in this study can be classified under optional because they are fully developed and have been adapted sporadically. An example of barriers faced by these innovations include lack of a clear regulatory pathway to market as well as lack of capacity and skills to systematically identify problems and identify solutions.[4] The article also details examples of the categories of barriers faced by innovations in the NHS including regulatory, structural and cultural, and operational.[5] The systematic barriers to Reverse Innovation identified in this study can all be classified under one of those categories.

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[2] Heitmueller, Bull, and Oh, "Looking in the Wrong Places."
[3] Heitmueller, Bull, and Oh.
[4] Heitmueller, Bull, and Oh.
[5] Heitmueller, Bull, and Oh.

Innovation vetting and lack of a culture of change best fit under both regulatory, and cultural and operational while misaligned financial incentives falls under structural. These barriers to Reverse Innovation in NHS England fit quite well into the framework provided by the AHSN. Perhaps this finding should be unsurprising given that Reverse Innovations are first and foremost innovations.

Knowledge translation was also identified as a systematic barrier. However, this barrier is specific to Reverse Innovation, unlike the ones previously discussed. In the Reverse Innovation literature knowledge translation has indeed been identified as pertinent to the Reverse Innovation implementation process.[6] Additionally, researchers actively question whether the one-sided nature of formal partnerships such as THET is conducive to the reciprocal nature of knowledge exchange required for Reverse Innovation to flourish.[7] This was also supported by this study, evident by the first sub-theme of the knowledge translation barrier: dissemination. It is also reflected in the data by the formal forums of knowledge exchange potential facilitator. Although the data suggests that increasing the amount of formal partnerships and conferences could potentially be a facilitator for Reverse Innovation in NHS England, it is important to note that such formal forums of knowledge exchange should also be reciprocal in nature. This is further confirmed in the literature, however some authors question

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[6] Crisp, "Mutual Learning and Reverse Innovation–where Next?"; Bhattacharyya et al., "Criteria to Assess Potential Reverse Innovations."

[7] Kulasabanathan et al., "Do International Health Partnerships Contribute to Reverse Innovation?"; Jones et al., "Do Health Partnerships with Organisations in Lower Income Countries Benefit the UK Partner?"; Syed et al., "Developed-Developing Country Partnerships: Benefits to Developed Countries?"

whether there is truly a consensus around how to make these one-sided partnerships truly reciprocal.[8] Given the data collected in this study, potential suggestions could be to allow LMIC clinicians to volunteer their services within the NHS England, similar to the work already performed by UK physicians in LMICs. Another suggestion is to provide forums for both UK physicians to share their experiences volunteering in LMIC hospitals to an audience of their peers, as well as allowing LMIC physicians to share their experiences to NHS England employees. These measures could perhaps begin to correct the imbalance noted in the literature and supported by this study. However, it cannot be assumed that these suggestions will render these partnerships completely reciprocal. It is merely a beginning and further investigation is required.

4.1 Implications for Policy and Practice

4.1.1 NHS England

Based upon the findings of the study, three recommendations have been generated for NHS England. The first is to increase the amount of formal forums for knowledge dissemination. Ensure that these forums provide equal opportunity for learning on both sides, with a focus on allowing health care professionals from LMICs share their experiences and not simply have a one-way transfer of expertise from the NHS to LMIC providers.

[8] Jones et al., "Do Health Partnerships with Organisations in Lower Income Countries Benefit the UK Partner?"; Syed et al., "Developed-Developing Country Partnerships: Benefits to Developed Countries?"

Another recommendation is to acknowledge that the innovation vetting process inherent in such a large organization could pose as a barrier to Reverse Innovation. This acknowledgement is important as the institution attempts to utilize innovation as a method of improvement. Perhaps streamlining certain internal innovation vetting processes could assist in this endeavor. One participant phrased this in the following manner: "[The NHS] wants entrepreneurs. They want innovation from low and middle income countries. They have to create the pathways and the mechanisms to let that happen. I can't create that. They have to."

The final recommendation is that NHS England continues to support Academic Health Science Networks. AHSNs played crucial role in the surgical tool innovation process, potentially indicating their utility in assisting Reverse Innovations. As evidenced above, AHSNs are also actively seeking out methods to overcome these systematic barriers.[9] NHS England should use AHSNs as an example of the organization's commitment to innovation even as these systematic barriers may serve as a detriment.

4.1.2 Innovators

Based upon the findings of this study, several recommendations were also generated for innovators interested in implementing Reverse Innovation in NHS England. These innovators include both LMIC innovators as well as NHS England

[9] Heitmueller, Bull, and Oh, "Looking in the Wrong Places."

employees. Innovators from LMICs should know that it is crucial to understand the setting of NHS England and join a network with useful NHS connections such as an Academic Health Science Network. Additionally, these innovators should be cognizant that specific barriers might be tied more closely to certain innovation characteristics, rather than simply negative perceptions or implicit bias. Above all, innovators should highlight the frugality of their innovations and showcase them as a way in which for the NHS to cut costs while maintaining quality care.

Innovators who work in the NHS should be aware of where they are sourcing ideas including the countries and health systems, as well as peer reviewed publications. They should also ensure that they have cultivated good relationships with management and forge crucial relationships with an assortment of people who could be integral to the innovation and could aid in innovation design, piloting and implementation. Additionally, these innovators looking to address a specific issue in the NHS via Reverse Innovation should attempt to collect data in order to support their assessment of an identified problem. Finally, innovators should consider limiting the amount of resources required to implement the innovation in the pilot phase, as exemplified in the Tree of Life Reverse Innovation.

4.2 Implications for further research

This work contributes to the growing body of literature on Reverse Innovation in health care, and based upon the findings of this study there are several implications for further research. Researchers should consider how intersecting disciplines can impact

Reverse Innovation including topics such as knowledge translation and publication bias. If less articles are published on innovations from LMICs, it can become more difficult to use them as a source of inspiration for worker-led reverse innovations. Therefore, researchers should consider where innovation ideas are sourced from. An additional path of inquiry is to consider how specific sub-groups of Reverse Innovation, such as product or care delivery innovations, could have a greater or equal impact on the innovation adaptation process than simply the fact that the innovation originated in a different country. Finally, as the literature on Reverse Innovation in health care continues to grow, a systematic review should be conducted in order to synthesize these findings in one concise report.

4.3 Study Limitations

Despite the recommendations and implications detailed above, this study had several limitations. The qualitative nature of the study precludes drawing causal conclusions about the implementation of Reverse Innovation in NHS England, and it cannot be concluded that these results are generalizable across similar innovations. For this reason, it would be useful to confirm these findings quantitatively for other Reverse Innovations in NHS England. However, for such comprehensive quantitative studies to occur perhaps it would be necessary to wait until the overall amount of Reverse Innovations has increased in NHS England.

The second limitation of this study is the coder. Studies with multiple coders can utilize intracoder agreement to ensure data analysis reliability. Multiple coders

potentially allow to identify coding errors as well as develop different codes during the iterative analysis process that may have not been apparent to a single coder.[10]

Additionally, this study's participant sample was homogenous in one key area: all participants were involved in implementing innovation in NHS England, even though the group of participants were heterogeneous in other aspects, with a mix of participants from AHSNs, Academic Institutions and Trusts. This limitation of homogeneity potentially led to bias in participant attitudes towards innovation in which all expressed optimism about Reverse Innovation in the NHS England going forward. Perhaps, had there been other participants not involved in the innovation sector, the attitudes expressed by participants would have been different. While the attitudes identified in this study could potentially reflect those of many involved in the NHS innovation space, this does not suggest that they reflect the attitudes of decision makers and innovation stakeholders within NHS England overall.

A final limitation of this study is that it did not include interviews with people who were involved with the identified innovations that were not based in England. This was due to ethics clearance. This study was cleared by the Health Research Authority only for research based in NHS England, although the Duke University Institutional Review Board approved this study for research in the UK. Therefore, the individuals who created the Reverse Innovations identified in this study could not be included

[10] Campbell et al.

because ethics clearance was not obtained from their home countries, which were not in the UK.

4.4 Researcher's Reflection

I would like to take a moment to break the pane between writer and reader with a small reflection: my account on lessons learned from this graduate research experience. This project was the first research project that I ever conducted. It was my project alone; I did not join an ongoing study with my faculty advisor. This project taught me the nature of perseverance. I was the first person from my program to conduct fieldwork in the UK. This meant that I had to discover the ethics protocols and procedures all on my own. Within the NHS there were no set protocols and procedures in place for a master's student in a non-UK based academic program. My path to ethics approval took me to the upper-levels of my university's administration, requiring the sign-off of a senior-level official. Despite a month-long delay, I was eventually able to begin my data collection while I was still on the ground in London. I am deeply grateful to have been based with an amazing research team during my fieldwork, who truly understood my project's topic and helped me to navigate the terrain of a field that is barely a decade old.

Throughout this project I acquired leadership skills. I learned to leverage my thesis committee in order to secure opportunities and actively relied on their expertise for helpful advice. I learned the iterative nature of qualitative methods, learning to fall back on the literature if I felt as though my project was not proceeding according to plan. I learned to trust myself. This project allowed me to hone my skills as a global

health researcher, to learn how to manage an independent project across time zones, working with many professionals who had much more experience than I. I am humbled and exceedingly grateful for this experience, above all how it has served as a launch pad into my career in Global Health.

5. Conclusion

This study identified barriers, potential facilitators, and attitudes towards Reverse Innovation in NHS England. These findings are particularly useful as the NHS seeks to cut-costs while maintaining the quality of care. The findings of this study can also help potential innovators both in LMICs and in the UK as they seek to implement their own innovations in this setting. This study highlighted that among the most important aspects to consider is the systematic barriers: protocols and procedures inherent in an institution as large as NHS England. The findings of this study can potentially aid in increasing the number of Reverse Innovations in NHS England. The findings of this study confirm barriers already identified in the literature, while raising other questions about the evolving topic such as how different sub-groups of Reverse Innovations may experience different barriers and thereby require different facilitators. Overall, this study provided a unique look at the topic of Reverse Innovation in healthcare by focusing on the nationwide health system of NHS England. Perhaps by understanding the barriers faced by Reverse Innovation on a national scale, this can lead to nation-wide change, improving health care for many people in the years to come. Going forward, the next step for this project is to prepare the results for submission to a peer-reviewed journal.

Appendix A

Interview Guide
Version 5 – August 3, 2017

Hello, I am here to talk with you today about Reverse Innovation in the UK context, especially as the largest single-payer health system in the world. The goal of this project is to study the barriers to reverse innovation, seek common ways in which specific ones could be overcome in the future, as well as generate hypotheses about the potential impact about the implementation of reverse innovation in the future.

Thank you so much for agreeing to participate in this study. I'd like to start off with some basic introductory questions and then move on to the specific research topic from there.

Introductory Questions:

- What is your role here?
    - Probe:
        - What are your tasks and responsibilities?
        - Are they domestic or international in scale? Both?
        - Are you a supervisor? Who do you supervise?
- What work have you been involved with in the NHS?
    - Probe:
        - How long have you worked with the NHS?
- How did you end up working in the field of reverse innovation?

Key Questions:

- How do you understand the term "reverse innovation" within the context of heath care?
    - Probe:
        - Does the type of innovation matter? Just the idea dissemination? (eg. technology vs. delivery)
        - Does the type of country? Number of countries?
        - When did you first hear about the term?

- Can you give me an example of a reverse innovation that you've come across or worked on?
    - Probe:
        - What were the challenges you faced?
        - Did you experience anything unexpected in its implementation?
        - What enabled/helped this implementation?
        - If it worked: why did it work?
        - If it didn't work: why didn't it work? What could've been changed to make it better?

- Thinking about the situation of the NHS as it currently stands, do you think there's a role for reverse innovation going forward?
    - Probe:

- Why or why not?
- Cite the number of staff leaving in order to prompt questions about idea dissemination?
    - Ex. "over half highly skilled workers could leave UK in five years" (Guardian)
    - Ex. Nursing shortages / people quitting (focus on dissemination of ideas, too leading??)
    - Perhaps only bring up with probe if necessary?
- What about in the private sector?

Follow-up Questions and Misc.

I'd like to thank you once again for your participation in my study. Your responses are aiding me in researching into an ever-evolving topic. I would like to conclude with just a few miscellaneous questions.

- Is there anything that I haven't covered or asked about that you think is essential to the RI debate?
- Could you name 3-5 individuals working in RI in England that I may also be able to interview?
    - Probe:
        - At least one person/name would be nice
- May I contact you again if I have any need to clarify something from our conversation?

Thank you so much for your time. It has been a pleasure talking with you today.

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