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Matthews, Z, *et al* (2011) Poverty and Maternal Health in Ghana: A Spatial Analysis of Exclusion from Care  
 ESRC End of Award Report, RES-167-25-0343. Swindon: ESRC

## ECONOMIC AND SOCIAL RESEARCH COUNCIL END OF AWARD REPORT



For awards ending on or after 1 November 2009

This End of Award Report should be completed and submitted using the **grant reference** as the email subject, to **reportsofficer@esrc.ac.uk** on or before the due date.

<b>Grant Reference</b>	RES-167-25-0343		
<b>Grant Title</b>	Poverty and maternal health in Ghana: A spatial analysis of exclusion from care		
<b>Grant Start Date</b>	Start date: 21/07/2008	<b>Total Amount Expended:</b>	£202,931.28 (at 100% costs)
<b>Grant End Date</b>	Original end date: 20/07/2010 Requested extension to: 20/01/2011 due to delays in data acquisition		
<b>Grant holding Institution</b>	University of Southampton		
<b>Grant Holder</b>	Z.Matthews		
<b>Grant Holder's Contact Details</b>	<b>Address</b>	<b>Email</b>	
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<b>Co-Investigators (as per project application):</b>		<b>Institution</b>	
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Project team	PI: Zoë Matthews, <i>University of Southampton</i> ; Co PI: Angela Baschieri, <i>London School Hygiene &amp; Tropical Med</i> Co PI: Peter Gething, <i>University of Oxford</i>  Researcher Philomena E. Nyarko, <i>University of Ghana</i> ; Researcher Faustina Frempong-Aiguah, <i>University of Ghana</i> ; Researcher Fiifi Amoako-Johnson, <i>University of Southampton</i>  Co PI: Peter Atkinson, <i>University of Southampton</i> ; Co PI: Francis Nii-Amoo Dodoo, <i>University of Ghana</i> Co PI: Jane Falkingham, <i>University of Southampton</i>
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## 1. NON-TECHNICAL SUMMARY

Please provide below a project summary written in non-technical language. The summary may be used by ESRC to publicise your work and should explain the aims and findings of the project. *[Max 250 words]*

At least half of pregnant women are excluded from lifesaving health services at childbirth in Ghana and our **spatial analysis of exclusion from care** aimed to find out how much individual and community poverty is responsible for this crucial shortcoming. We have looked at the part played by physical access to services, and the effects of living near or next to very poor communities. The results have provided policymakers with maps and explanations for exclusion from care throughout Ghana.

- From our spatial analysis** we found that distance to facility is a key exclusionary factor in rural Ghana, regardless of wealth status, education and ethnicity. We also found that surrounding and neighbouring pockets of 'human capacity' poverty can be as important for access to healthcare as the poverty level in the community itself.
- From our policy analysis** we found that the Government of Ghana's recent fee exemption scheme operated in certain zones of the country for pregnant women had a positive impact on the use of vital services, notably amongst the poor and uneducated. However, improvements have been short-lived.
- From our accessibility analysis** we found that existing information on the accessibility of general health facilities to the Ghanaian population is not a good proxy for the proximity of women to maternity services. As travel times of more than two hours can endanger women's lives if they are suffering from fast-acting complications at childbirth – the right information is needed to prioritise scarce resources to remote districts.

## 2. PROJECT OVERVIEW

### a) Objectives

Please state the aims and objectives of your project as outlined in your proposal to the ESRC. *[Max 200 words]*

Our project aimed to quantify the spatial links between poverty and poor utilisation of maternal health services in Ghana. It sought to establish whether there is a relationship between deprivation within communities and use of health services during pregnancy, childbirth and the postpartum period after controlling for physical access, and characteristics of the woman herself. The research has facilitated an understanding of the effect of poverty on patterns of spatial variation in service use.

Our objectives were as follows:

- To prepare spatial data on use of maternal health services, poverty and physical accessibility at various levels of aggregation and create a district level maternal health and poverty map of Ghana.
- Given the estimates produced under objective 1 above, to identify, by means of multi-level spatial regression, the key factors determining service exclusion in different parts of the population – with an emphasis on how a context of poverty interacts with individual poverty to produce effective exclusion from services for Ghanaian women.
- To provide a more precise understanding of maternal health service utilisation in case study areas of Ghana and to interpret the findings based on local and national understandings.

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## b) Project Changes

Please describe any changes made to the original aims and objectives, and confirm that these were agreed with the ESRC. Please also detail any changes to the grant holder's institutional affiliation, project staffing or funding. *[Max 200 words]*

### ***Staffing***

Dr Peter Gething moved from University of Southampton to Oxford University but was able to keep working on the project.

As agreed with ESRC – 6 months no cost extension was granted to cover the following changes/delays:

### ***Finance***

Problems with the transfer of monies to RIPS Ghana have meant that delays crept into the system.

### ***Travel***

More travel than expected was undertaken at the beginning of the project to initiative activities and to aid acquisition of data.

### ***Acquisition and preparation of data***

Both the acquisition of GIS as well as socioeconomic data took longer than expected

- Acquisition of geographical data: The project team needed to put in place an official MOU between University of Southampton, the Regional Institute for Population Studies and the University of Ghana's CERSGIS in order to acquire GIS data on roads, topography, rivers etc.
- Acquisition of socioeconomic data: In order to obtain socioeconomic and health data from the Ghana Statistical Services in Accra, social scientists in the project team have needed to be present in Ghana much more than expected.
- The data acquisition needed to be accompanied by filling 'holes' is the GIS network, and linking the geographies to the survey data.

## c) Methodology

Please describe the methodology that you employed in the project. Please also note any ethical issues that arose during the course of the work, the effects of this and any action taken. *[Max. 500 words]*

By linking nationally representative georeferenced survey datasets with digital maps of health facilities and physical features for Ghana – a country rich in health-related data - this project derived spatially disaggregated estimates of welfare, maternal health service utilisation and accessibility of services. After quantifying the spatial links found between these variables by means of regression techniques first at district, and then at individual level, the project went on to explore two regions – Volta and Central in more detail – using much more spatially precise GIS techniques. The study consisted of phases as follows:

- Using a range of Ghanaian survey data on living standards and health and various outputs from the 2000 Census of Ghana, spatially disaggregated estimates of poverty and maternal health/use of health services were derived at the district level and brought together in a 'map book' called the 'Ghana Atlas of Birth' for policymakers and advocates.
- These district level estimates of poverty were then linked to a maternal health service utilisation data to identify the determinants of exclusion for maternal health care at the district and individual level. Outcomes of interest included antenatal care utilisation, use of a health facility and skilled attendant at childbirth, and postnatal checks. Furthermore, using a national level digital land cover and transportation map linked with the maps of Ghana's maternal health facilities we included physical accessibility to health facilities in our analyses. The analysis was supplemented by economic and service information from administrative data. We carried out regression analyses to provide a picture of the spatial heterogeneity of the districts and to understand barriers to health service use in Ghana.

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- Using existing survey data which included distances from homes to maternity services in 2 case study regions we have attempted to quantify access to services much more accurately than previously using a high precision GIS-based predictive model. The calibration of this model is being used to predict cost-surface estimates across the whole country. This model attempts to take into account the effect of the local road and footpath network; natural barriers to access such as rivers, swamps, and enclosed areas; and local gradient and topography.
- Discussions with key stakeholders are a part of our ongoing dissemination strategy, in which we are also engaging local advocates such as the Ghanaian Alliance for Reproductive Health Rights and the White Ribbon Alliance. Discussions of results are being based on visual representations which are conceptually simple and attractive for stakeholders to interact with. We are timing our dissemination meeting in with local political priorities and events.

#### d) Project Findings

Please summarise the findings of the project, referring where appropriate to outputs recorded on the ESRC website. Any future research plans should also be identified. *[Max 500 words]*

- **From our spatial regression analysis to identify the relationship between poverty and exclusion from care** we found that distance to facility is a key exclusionary factor in rural Ghana, with women who live less than 15 minutes from a facility more than three times as likely to travel there when in labour than those living more than an hour away. These results apply regardless of wealth status, education and other key factors – such as the finding that communities which are generally less educated, and of particular ethnic compositions are generally less likely to use health services. More interestingly we found that in northern Ghana the characteristics of closely surrounding communities also affect a woman’s chances of being excluded from care at birth - especially if those neighbouring communities have a high proportion of unemployed people or those not employed in the modern sector. In other words – surrounding and neighbouring pockets of ‘human capacity’ poverty can be as important for access to healthcare as the poverty level in the community itself.

*These relationships are described in more detail in Output 5 – our presentation given by AB at the IUSSP conference session on spatial health and poverty, and Output 6 – the subsequent working paper which is currently an invited paper for the Journal of Mathematical Demography.*

- **From our spatial analyses of maternal health policy** we found that the Government of Ghana’s fee exemption scheme operated in certain zones for women at childbirth certainly did have a positive impact on utilisation, notably amongst the poor and uneducated. However, increases in utilisation were short-lived, and as the changes also benefitted the rich, the policy did not reduce rich-poor differences. Spatial analysis of the community midwife and health post policy (CHPS scheme) intended to reach the poor and physically remote with services, has been so far inconclusive – but the lack of progress in rolling out the scheme has been a barrier to substantial impact.

*These findings are described in more detail in Output 7 (CHPS) and Outputs 11-13 (fee exemption policy) – and the related papers will shortly be submitted for publication.*

- **From our analysis of physical barriers to accessing maternal healthcare** we found that existing information on the accessibility of health facilities to the Ghanaian population is not a good proxy for the proximity of women to maternity services. These can be better calculated by using survey data that was particularly focussed on journey times to a maternity hospital and using it to calibrate a model of distance to facility based on GIS techniques applied to detailed physical barrier and health facility maps of Ghana. When these analyses are completed – fresh information and maps will be available that are vital to tackling local policies to achieve MDG5.

*These approaches were presented at the recent Global Maternal Health Conference in Delhi (Output 14) and the journal paper is under development*

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### **e) Contributions to wider ESRC initiatives (e.g. Research Programmes or Networks)**

If your project was part of a wider ESRC initiative, please describe your contributions to the initiative's objectives and activities and note any effect on your project resulting from participation. *[Max. 200 words]*

This research was funded under the joint ESRC/DFID scheme. The aim of the scheme is to enhance the quality and impact of social science research addressing the key international development goal of reducing poverty amongst the poorest countries and peoples of the world. This research achieves this in three ways:

1. Focussing on remote rural areas with no health facilities
2. Focussing on women – usually the poorest members of society
3. Working with local researchers to improve local research capacity

## **3. EARLY AND ANTICIPATED IMPACTS**

### **a) Summary of Impacts to date**

Please summarise any impacts of the project to date, referring where appropriate to associated outputs recorded on the ESRC website. This should include both scientific impacts (relevant to the academic community) and economic and societal impacts (relevant to broader society). The impact can be relevant to any organisation, community or individual. *[Max. 400 words]*

#### **Scientific impacts**

##### ***New technology developed and used in developing countries: Small area estimation for maternal health indicators***

This adaptation of a poverty-mapping approach to maternal health is bringing local level data on maternal health to districts in Ghana. Most surveys are not able to produce estimates at district level because of the small samples involved – raising the sample size would make surveys unaffordable. However, our team have estimated maternal health indicators for each district of Ghana using 'borrowed strength' from Census data and published these in the form of a map book for policy makers. This approach has never before been used on health data. A talk was given on this topic by Dr Philomena Nyarko at the DFID office, Accra in the early part of the project, and in an unforeseen development, Dr Nyarko has now been successful in her application to be the Deputy Statistician in Ghana – responsible for the 2010 Census – and so the potential for applying this work is considerable.

*These approaches are applied and described in our journal article at Output 4. Before submitting this article we gave a conference presentation on it -Output 8. This paper has been greeted by the local UNFPA office as very useful.*

##### ***Better understanding of neighbourhood factors facilitated by innovative analysis***

The use of spatially weighted indicators used to test the effect of neighbourhood poverty effects on health seeking behaviour is rare in analyses from developing countries. For the first time we have seen that the poverty levels of a neighbouring community is as important as the poverty level in a woman's own community as a driving force towards exclusion from maternal healthcare.

*These approaches are applied and described in our IUSSP presentation and subsequent working paper in Outputs 5 and 6.*

#### **Societal impacts**

##### ***District maps disseminated to Ghana's First Lady and used as example of powerful communication of findings to be used in advocacy***

As part of the development of the Ghana Atlas of Birth we used many of the maps on a poster

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presentation at the Accra ASADI conference (*Output 3*) which was then used in a meeting between our collaborators the White Ribbon Alliance and the First Lady of Ghana. The potential for seeing inequalities between the districts of Ghana in a very colourful and communicative way was seen as an extremely effective tool in raising awareness and holding governments to account for providing better care.

## **b) Anticipated/Potential Future Impacts**

Please outline any anticipated or potential impacts (scientific or economic and societal) that you believe your project might have in future. [*Max. 200 words*]

### **Scientific impacts**

#### ***Calibrating distance to maternity facility in Ghana***

The calibration analysis as described in *Output 14* and in the planned journal article for this work has the potential to eventually produce extremely useful monitoring data for the Ministry of Health. Advocates at all levels would also be very interested in how physically accessible are the maternity facilities in the country.

### **Societal impacts**

#### ***Evidence for Action***

When the Ghana Atlas of Birth and related flyer are launched later this year in *Output 1*, we use our considerable experience with the global Atlas of Birth and use of White Ribbon Alliance flyers in Nigeria, Kenya, Addis Ababa and others to make sure the dissemination meeting in Ghana has maximum impact. Advocates and accountability mechanisms can access this powerfully communicated format easily and this material has the possibility to fill the information gap that can galvanise political will towards the achievement of MDG5 in Ghana. This will be reinforced by the website (*Output 15*) of the same data featuring interactive mapping facilities online that can be used by journalists, advocates and researchers.

You will be asked to complete an ESRC Impact Report 12 months after the end date of your award. The Impact Report will ask for details of any impacts that have arisen since the completion of the End of Award Report.

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#### 4. DECLARATIONS

Please ensure that sections A, B and C below are completed and signed by the appropriate individuals.  
The End of Award Report will not be accepted unless all sections are signed.

Please note hard copies are NOT required; electronic signatures are accepted and should be used.

##### A: To be completed by Grant Holder

*Please read the following statements. Tick ONE statement under ii) and iii), then sign with an electronic signature at the end of the section (this should be a image of your actual signature).*

###### i) The Project

This Report is an accurate overview of the project, its findings and impacts. All co-investigators named in the proposal to ESRC or appointed subsequently have seen and approved the Report.	<input checked="" type="checkbox"/>
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###### ii) Submissions to the ESRC website (research catalogue)

Output and impact information has been submitted to the ESRC website. Details of any future outputs and impacts will be submitted as soon as they become available.	<input checked="" type="checkbox"/>
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**OR**

This grant has not yet produced any outputs or impacts. Details of any future outputs and impacts will be submitted to the ESRC website as soon as they become available.	<input type="checkbox"/>
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**OR**

This grant is not listed on the ESRC website.	<input type="checkbox"/>
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###### iii) Submission of Datasets

Datasets arising from this grant have been offered for deposit with the Economic and Social Data Service.	<input type="checkbox"/>
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**OR**

Datasets that were anticipated in the grant proposal have not been produced and the Economic and Social Data Service has been notified.	<input type="checkbox"/>
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**OR**

No datasets were proposed or produced from this grant.	<input checked="" type="checkbox"/>
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