MASCOT

Country report for Ghana

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SEVENTH FRAMEWORK PROGRAMME

WORK PACKAGES	**WP2: Mapping of current status of health inequalities** **WP3: Mapping of national health research systems and their role in maternal and child health research** **WP4: Impact of MCH research on the development of national policies and strategies addressing health inequalities**
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MASCOT aims to stimulate the cooperation between countries from 3 world regions in order to identify and implement adequate and efficient country-specific strategies for tackling maternal and child health inequalities. The project runs from October 2011 to March 2014, it involves eleven partners and is coordinated by the COuncil on Health REsearch for Development (COHRED). More information on the project can be found at http://www.mascotfp7.eu or by contacting the project manager Francisco Becerra (Becerra@cohred.org).

Special acknowledgement also goes to the Ghana Health Service (GHS) especially the Family Health (FHD) and the Research Development (RDD) Divisions, as well as the National Population Commission. This report also received immense contribution from the Kintampo, Dodowa and Navrongo Health Research Centres. All the inputs from the various Departments of the School of Public Health, University of Ghana are greatly appreciated. Finally, to all the MASCOT Stakeholders who provided information to complete this report, thank you very much.

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KEY MESSAGES

1. The three indicators from PROGRESS which mainly influence MCH in Ghana are Place of Residence, Education and Occupation. Living in the urban areas of Ghana is more protective against adolescent pregnancy and unmet need for contraception. Place of Residence also significantly affects ANC coverage because women in the rural areas are a a third of the time less likely to attend ANC, compared to 94.7% of urban women who attend ANC. Limited access to services due to transport costs is a possible reason. Rural-urban differences in skilled birthing are also striking as less than half of rural women than urban women deliver with skilled attendant. The rural-urban differences are also significant for formal PNC and child survival. Under-five children in urban areas have a better chance of surviving childhood than in rural areas.
2. Education and occupation also play very important roles in the health choices of many Ghanaian households. Most post-secondary and tertiary educated women with professional or semi-professional jobs are 2.5 times more likely to use contraception to avoid pregnancy, 15.5 times more likely to access antenatal care, and 94% of the time deliver with skilled attendant. Likewise, children of tertiary educated women are at an advantage because they are more likely than children of uneducated women to be exclusively breastfed (63.3%), vaccinated (61.5%) and less likely to be stunted (3.6%).
3. Rural-urban differences are addressed through various policies including the National Health Insurance Scheme (NHIS), which improves equity in healthcare financing. Pregnant women and children under-five in Ghana have free access to healthcare under the NHIS. The scheme also provides risk protection through premium exemptions to poor households who cannot afford health services. The Community-based Health Planning and Services (CHPS) is also an important policy that seeks to address MCH inequalities by re-orienting and relocating some primary and reproductive health services to convenient community locations called the CHPS Compounds. Also, Community Health Officers visit homes periodically to give preventive health services to women who cannot access the CHPS compounds. CHPS operates mainly in rural communities.
4. The Under Five Child Health Policy (UFCHP) organizes services along the continuum of care for both the mother and child. Under this policy, the Infant and Young Child Feeding Programme was established to educate and empower women and families about optimal feeding practices for infants and young children.
5. There is a need for more research on MCH. The absence of a national health research agenda or policy is evident of the lack of government's full commitment to health research. A total of 320 research proposals were approved for implementation between 2008 and 2009. Of the 179 research projects published in the 2008/2009 RDD Biennial Report, less than a third were projects on MCH or MCH inequalities. Also from the MASCOT online survey in Ghana, only one fifth of the total 216 research projects between January 2009 and December 2011 were dedicated to MCH or MCH inequalities.
6. The Research and Development Division of the Ghana Health Service will require more support and funding to establish an effective national health research system, as well as promote MCH research. There is also a need for capacity building and infrastructural development to meet the growing need of MCH research.

SUMMARY OF THE REPORT

Many African countries face a variety of obstacles to improved maternal and child health services. Insufficient data prevents government bodies from implementing health programmes efficiently and effectively, while the high cost of healthcare restricts access to available services. The socio-economic and geographical circumstances of Ghana constrain the fair and equitable delivery of health services, creating a disadvantage for residents of rural communities. Unequal distribution of income, assets and health services within the country have contributed to poverty, low levels of basic health care utilization and limited access to health services amongst certain social groups. The significant differences in infrastructural development between the regions of Ghana have also left many communities economically-deprived. The result is health inequalities.

Maternal and Child health inequalities in Ghana are influenced by social determinants including place of residence; ethnicity; occupation; gender; religion; education; and social capital. From the analysis of the Ghana Multi Indicator Cluster Survey (MICS); higher education, high-income occupation or wealth significantly lower the probability of adolescent pregnancy and increases the probabilities of contraception use and skilled birth attendance. Ethnicity and religion also presents significant MCH inequalities. Gender inequalities show an advantage of female children over male children in exclusive breastfeeding for six months. However, under-five male children are more likely than under-five female children to be stunted or receive antibiotics when suspected to have pneumonia. Other MCH inequalities also exist with determinants such as ethnicity and place of residence, in the areas of antenatal and postnatal care.

Research plays an important role in addressing MCH inequalities in Ghana. The Ministry of Health, Ghana Health Service and the Research and Development Division, as well as other health agencies and stakeholders play different roles in governance, research, policy and programme formulation, service delivery, funding, monitoring and evaluation. Policies and programmes designed to tackle MCH inequalities provide guidelines on health financing, equity, access and quality of care. Besides the four national health research centres which dominate the research landscape in Ghana, some academic institution and private research centres also investigate MCH issues of national interest.

MCH research attracts considerable funding to provide evidence-based solutions to MCH needs in Ghana. Although constrained by inadequate infrastructure and human resource, the national health research system has chalked many successes in producing explicit evidence for addressing disease prevention, equity of access to maternal and child health services and quality of care. Many MCH policies and programmes are informed by research evidence generated from the national health research centres as well as from international policy frameworks. Reports with high impact delivery from organizations such as the WHO, UNICEF, DFID and UNFPA have also informed some policies, programmes and strategic documents currently in use in Ghana.

Funding for health research remains a major challenge for the national health research system, as over 90% of funding is provided by external donors. Consequently, many health research projects are based on donor prerogative and not always on national priority.

CORE OF THE REPORT

I. Introduction

Ghana's 10 administrative regions are sub-divided into 171 distinctive districts, most of which are deprived. The social, economic and geographical circumstances of some regions constrain the fair and equitable delivery of social and health services. The mobility of health services in some communities is also greatly restricted by the lack of resources for facilities, transportation and infrastructure (Bawah et al, 2010).
Attention to the equity dimension of health care in Ghana is especially important because of its widespread poverty, extremely high under-five mortality (80/1000LB in 2008) and maternal mortality (163.2/100,000LB in 2010) rates, child undernutrition (causes 40% of all under-five deaths), low levels of basic health care utilization and financial obstacles to seeking health care (Vande Poel et al, 2007; GHS 2010 Annual Report). Maternal and child health (MCH) inequalities also persist due to significant rural-urban disparities in the quality and accessibility to health services. Health inequalities (HI) in Ghana are thus a reflection of unequal socio-economic development on lifestyle, individual behaviour and health choices.

Important national policies dedicated to the improvement of MCH and HI include the Reproductive Health Service Policy (RHSP), Community-based Health and Planning Services (CHPS), Under Five's Child Health Policy (UFCHP) and the National Health Insurance Scheme (NHIS) Policy. MCH programmes have also been developed to improve MCH as well as control social health inequalities which were either stagnant or declining for poorer women (Witter et al, 2007). They include the National Infants and Young Child Feeding Programme (NIYCFP), Maternal Emergency Obstetric and Newborn Care (EmONC), Antenatal and Postnatal care (ANC and PNC), Prevention of Mother to Child Transmission (PMTCT) of HIV and the Expanded Programme on Immunization (EPI). Services provided under these programmes are now available in about 80% to 98% of all government and mission hospitals in Ghana (National Assessment for Emergency Obstetric and Newborn Care, 2011).

The Ghana Ministry of Health (MOH) is responsible for the development and implementation of health policies and programmes, under the control of the Minister for Health. Ghana Health Service (GHS) which is the biggest agency of the MOH, in partnership with other agencies and stakeholders are also responsible for the implementation of policies and programmes, as well as monitoring and regulation of service delivery both at the regional and district levels. The GHS Research and Development Division (RDD) coordinates national health research activities through its three main national field research centers namely: Navrongo, Kintampo and Dodowa Health Research Centers. The research centers are strategically located in the northern, middle and coastal belts of the country to provide practical needs-based research of the highest quality with a pro-poor and gender and equity focus. A recent Onchocerciasis Chemotherapy Research Center (OCRC) has also been established in Hohoe, bringing the total number of national research centers to four. Research projects and activities in these centers are funded mainly by external donors. Government funding is usually for staff salaries as well as administrative overheads (2008/2009 RDD Biennial Report).

This report is based on data gathered from policies, programmes, guidelines and strategy documents related to MCH and inequalities in Ghana. Extensive search in PubMed on MCH inequalities between 2007 and 2012 also gave a result of 30 publications which were used in writing this report. Resources on MCH inequalities related to the PROGRESS framework (considered by the MASCOT Project) were prioritized highest. Those not specifically related were still carefully considered to guide the development of the country-level contexts. The electronic Multiple Indicator Cluster Survey (MICS) datasets was collected from the Ghana

Statistical Service (GSS) and analysed. In all, five key stakeholders from the GHS, RDD and Project Fives Alive (NGO) were interviewed. Some references were also made to the 2008 Ghana Demographic Health Survey report.

II. Health inequality status in Ghana

The following analysis comes from the UNICEF modified survey, which provided data for the Selected Mother and Child Health Categories and Selected Progress Categories. Three model questionnaires were designed for the Multi Indicator Cluster Survey 3: (1) the Household Questionnaire, (2) the Questionnaire for Individual Women and (3) the Questionnaire for Children under Five. Occupation and social capital however were excluded from the modified survey in most of the MCH categories which were used in this analysis.

Socio-demographic Characteristics of Households

The analysis presented showed that of the 3545 households sampled, 29.1% (1030) were in urban areas whereas 70.9% (2515) were in rural areas (Annex 7, Table 1). The larger proportion of the survey population was male 51.4% (1822) than female population 48.6% (1723). With regards to ethnic composition, Akans were the majority 38.1% (1347) followed by the Mole-Dagbanis 32.3% (1142). The Ewe and Ga/Dangme ethnic groups constituted 11.3% (398) and 5.7% (200) respectively.

By religious grouping, the Pentecostals/Charismatics were the largest constituting 26.7% (947), followed by the Muslim population 22.8% (809). Catholic and Protestant households were 13.8% (488) and 11.5% (409) respectively. The traditional religious group made up 13% (460) of households. Households with Other or No Religion were 8.2% (290), whilst Spiritualist households constituted the least of 4% (142).

Respondents from the households generally had not attained high education qualifications. The majority of respondents had middle level or primary education 87.6% (1603), whilst secondary school graduates were 7.5% (138). Respondents with post-secondary or tertiary education constituted only 2.6% (49), indicating that the lifestyle, health behaviour, problem-solving ability and social relations of the respondents may be greatly influenced by this education pattern.

The majority of households fell within the poorest quintile 29.8% (1035). The number of households decreased as wealth quintile increased from the second to fourth quintile. Households in the richest quintile were the minority 12.5% (433).

Disparities in Adolescent Pregnancy in Ghana

Of a total of 1,199 adolescents who were interviewed in the survey only 2.6% (31) were currently pregnant. Whereas only 1.7% (9) of adolescents in urban areas reported a current pregnancy, 3.3% (22) of adolescents in rural areas were currently pregnant. This difference was significant only at 10% confidence level. The odds of an adolescent getting pregnant were 1.96 times more likely in rural areas than in urban areas of Ghana.

Having middle school education or higher was protective against an adolescent falling pregnant (OR-0.49) with a p-value of 0.05. Adolescents attending vocational training centres for example were 2.5 times at risk of getting pregnant than adolescents with primary education. The proportion of adolescents with primary education reporting pregnancy was 3.8% (12) and 1.9% (10) for adolescents in middle school, which forms the lowest level of education. There were no adolescents in post-secondary and tertiary schools reporting pregnancy.

The poorer a household the more likely an adolescent would fall pregnant. In consequence, whereas 3.4% (9) of the poorest adolescents reported pregnancy, none of the adolescents from the richest quintile reported a pregnancy. Being rich was protective against adolescent pregnancy with odds of 0.000 and a p-value of 0.0016. Adolescent pregnancy did not vary by ethnicity and religion.

Disparities in Contraceptive Use among Women in Ghana

Of 5501 women who were interviewed on current use of methods to avoid pregnancy, 2,263 women lived in urban areas whereas 3238 where resident in rural areas. Current use of methods to avoid pregnancy among these women was 13.7% (756). Rural-urban differences were observed in the use of methods with women in urban areas reporting 15.7% (356) current use of methods to avoid pregnancy than 12.4% (400) of rural women. This difference was significant (P<0.000). Living in a rural area therefore was less protective in relation to contraceptive use (OR: 0.76).

There were also ethnic differences in contraceptive use among the women. Highest contraceptive use was among the Ga/Dangme 18.6% (73) and lowest contraceptive use was observed among women of the Mole-Dagbani ethnic group 10.9% (136). Women from the Ga/Dangme were 1.18 times more likely to use family planning than the rest of the ethnic groups in Ghana. The lowest contraceptive use was observed among the Mole Dagbani with as few as 136 women of 1108 women reporting current contraceptive use. A Mole-Dagbani woman was 0.63 times at risk of not using contraceptive than women from other ethnic origins.

The religion of a woman also influenced her contraceptive use with women belonging to the Seventh Day Adventist (SDA) 29.5% (38/129) and Pentecostal/Charismatic group 16.9% (237/1402) and women belonging to non-classified religions 17.7% (3/17) using more contraceptives to avoid pregnancy than other denominations such as Catholics (14.4%), Protestants (14.5%) and Muslim (9.9%). The odds of using contraception to avoid pregnancy were 2.48 times more likely among SDA's than all other religions and denominations.

The use of contraceptives was also determined by level of education. The higher a woman's level of education the higher the proportion of that woman using contraceptives to avoid pregnancy. Contraceptive use was 12.9% (134) among women with primary education and 17.4% (317) among women with Middle or Junior Secondary education (Table 2). Surprisingly however women with Vocational /Commercial or vocational training were the highest users of contraceptives to avoid pregnancy. Though this appears inconsistent with observed contraceptive use patterns among educated women, it serves to confirm the high proportion of pregnancy reported by this group. These differences were significant with women with vocational or technical training 2.0 times more likely to use contraceptives to avoid a pregnancy (P<0.002).

A pattern was observed where women from wealthiest households were 2.5 times more likely to use a method to avoid pregnancy than women from the poorest quintile. The proportion of women using a method to avoid pregnancy was as high as 17.7% (204) among wealthiest households and only 7.9% (99) among the poorest households.

Disparities in Antenatal Care Coverage in Ghana

Antenatal care during pregnancy is generally high with an average of 94% (1364) of 1450 women visiting antenatal clinics during their current pregnancy. Of these women, 94.7% (390) lived in urban areas. There were also disparities in antenatal care (ANC) attendance by occupation, ethnicity, religion and by level of education of the woman and by the wealth of the household. Women living in urban areas had higher 94% (390) ANC attendance than women in

rural areas 85.9% (892) at a p-value of 0.000. Women living in rural areas were therefore 35% of the time less likely to attend ANC.

Similarly women who were in the professional working class had higher ANC visits in both urban and rural areas 88.4% (1282) than women with semi-professional or no professional jobs 5.9% (86) at all. The level of education did however not affect attendance at ANC. This may be due to the fact that over 90% of these women had primary or middle and Junior Senior High level education.

There were also disparities in ANC visits by ethnicity with the Mole-Dagbani 88.2% (358), Grusi 87% (28) and other ethnic groups 84.6% reporting low ANC visits. These differences were significant (P<0.000). The Guans had the highest visits of 95.7% (67) and were 2.16 times more likely to make an ANC visit. Most of these women were in the professional job category.

Women belonging to the traditional religion (83%) or women without any religious affiliation (82.4%) had the lowest ANC attendance. Those belonging to the Catholic faith (99%) had the highest ANC attendance. Those belonging to the Traditional or No religious groups were less protective against visiting ANC during pregnancy. These differences were statistically significant.

Whereas only 89.5% of women from the poorest quintile visited ANC during pregnancy, almost hundred percent (98.8%) of women in the richest quintile received antenatal care during this pregnancy. These differences are so wide that the odd of a woman in the richest quintile receiving antenatal care was 15.5 times that of a woman from the poorest quintile.

Disparities in Skilled Birth Attendance in Ghana

Disparities in skill birthing were striking with rural-urban differences being 82.3% (311) for urban settlers and only 40.8% (317) of women living in rural areas. A woman living in an urban area and having a professional career was 15.7 times more likely to deliver with a skilled birth attendant than women in rural areas, and women in semi-professional or unqualified professional jobs.

The Akan ethnic group had the highest proportion of women in professional's careers delivering with a skilled birth attendant. It was only among the Mole-Dagbani ethnic group that more women in unqualified jobs delivered with skilled birth attendants. This may be attributed to the low level of education among women of this ethnic origin. The differences observed between professional and semi-professionals/unqualified probability of delivering with a skilled birth attendant was significant (P<0.000).

Religious groupings also significantly affected whether a woman will deliver with a skilled birth attendant or not. In this survey over 59% of unqualified professional women belonging to the traditional religion delivered with a skilled birth attendant. Among the professional career women, many women belonging to Protestant (69%) or Pentecostal groups (69%) delivered with a skilled birth attendant. The odds of delivering with a skilled birth attendant were 18% for women professing Traditional religion or No religion (15%).

There was a consistency in the number of women delivering with a skilled birth attendant and the level of education of the woman. Among professional career women, the higher the education, the higher the number of women delivering with a skilled birth attendants. About 58.3% (123) of professional career women with primary education delivered with skilled birth attendants whereas as many as 94% of professional women with secondary education and above delivered with skilled birth attendants. Thus a woman with secondary education and in a professional career was 2.2 times more likely to also deliver with a skill birth attendants.

Disparities in postnatal care in Ghana

The pattern of postnatal care (PNC) coverage showed that the highest percentage of care was received at home at 56.4% (821) compared to 43.6% (635) of women who received PNC from a Private/Public facility. This is far below the formal PNC target of 60% set for the period at the time of the survey (2007 GHS Annual Report). Of the 1042 women who lived in rural areas, only 30.5% (318) received formal PNC in a facility. A greater percentage 76.6% (317) of women in urban areas received formal PNC at a facility. This also indicates that a woman's place of residence significantly affects where PNC is received. Women and children who live in rural areas have a probability 7.4 times higher to receive care at home than those who live in urban areas. The big difference between ANC coverage (94%) on one hand and PNC coverage (43.6%) for women attending health facilities on the other is cause for concern.

Less ethnic disparities exist between the Akans, Ewes and Grusis with the place where PNC is received (Table 3). The OR measured (Equal odds: Pr>chi2 = 0.0000) indicates that women of Other Ethnic groups have a 4 times higher probability than the Ga/Dangme group to receive post natal care at Home. Also, 63.7% (274) of the Mole-Dagbanis and 70.5% (129) of Other ethnic groups received PNC at home.

The distribution by religion indicated that the Muslim and Pentecostal/Charismatic group have the largest number of people in the survey. There were inequalities observed with where PNC was received. Women of Traditional religion were 3.7 times more likely than Catholics to receive PNC at home. Likewise, women of Spiritual and No Religion groups were 2.7 and 2 times respectively more likely than Catholics to receive PNC at home. Being a Protestant, Pentecostal or Charismatic was protective against receiving PNC at home. Muslim women however have a 1.3 times higher probability than Catholics to receive PNC at home and not in a public or private facility.

A large number of women with Primary level education received PNC at home. A higher level of education was protective against PNC at home. Women who had Middle, Secondary, Post-Secondary or Tertiary education were less likely to receive PNC at home. For women with Tertiary level education, 91.7% received PNC in a Public or Private facility, whilst only 8.3 % received PNC at Home (Table 3). However from the odds ratio, having a Post Secondary education was the most protective against receiving PNC at home (Pr> chi2 = 0.0000). Women with primary had a 14 times higher probability than the Tertiary education group to receive PNC at Home. For women with Middle education, they were 7 times more likely to receive PNC at home. For women with secondary education, they had a 3 times higher probability than the Tertiary group of receiving PNC at home, whilst the Vocational group had a probability twice than the Tertiary group (Table 3) to receive PNC at home.

By socio-economic grouping, the poorest group had the highest proportion of women reciving PNC at home (76.8 %) and the lowest proportion receiving PNC in a Private/Public facility (23.2%). The Richest group had the lowest PNC at home. There is a statistically significant association (Pr> chi2 = 0.0000) among the different socioeconomic levels. In fact, the poorest socioeconomic group had a 27 times higher probability than the Richest Group to receive PNC at home, whilst the Second Group was 20 times more likely with reference to the richest group.

Disparities in Under-5 Child Stunting in Ghana

The percentage of children under five years of age who were stunted was 23%. In rural areas, 26.9% of under-five children were stunted compared to 13.3% of children in urban areas. The probability of a child under-five being stunted in a rural area was 2.4 times higher than a child in the urban area.

By ethnic groupings, the Ewe group had the lowest percentage (14.8 %) of stunted children. Children of the Ga/Dangme, Guan and Gruma were less likely than children from the Akan ethnic group to be stunted. On the other hand, children from the ethnic groups in Northern Ghana:

Mole-Dagbani and Grusi were more likely than children of Akan descent to be stunted. The Other Ethnic group children were at 1.3 times higher risk of stunting compared with Akan children.

The religious distribution showed that 32.7% of children under-5 years who were stunted belonged to the Traditional group (OR = 4.4). About 27.3% of stunted children belonged to the Spiritualist group (OR = 3.4) whilst 19.6% belonged to the Pentecostal/Charismatic group. Being Protestant or Pentecostal/Charismatic was protective against stunting compared with Catholics. The Moslem, Traditionalist and Spiritual groups however were more likely than Catholics to have children who were stunted.

By level of education, 20.5% of children under-5 years stunted were children of women with Primary level education. About 18.6%, 12.7% and 3.6 % of stunted children were children of women who had Middle level education (OR = 6.2), Secondary level (OR = 3.9) and Tertiary level (OR = 1) respectively. Having Middle to Tertiary level education was more protective against child stunting compared with primary level education.

Considering socioeconomic quintiles, 29 % of children under-5 years of age who were stunted belonged to the poorest level (OR=5.3). The poorer a household, the more likely a child would be stunted. Children from the Richest quintile are the most protected from stunting (OR=1), whilst children from Poorest quintile are the least protected (OR=2.3).

Exclusive Breastfeeding for 6 Months

The ethnic groupings (Mother tongue of head) showed that 72.3% of Mole-Dagbani children were breastfed exclusively for 6 months. This percentage was 58.3% and 56.8% in the Ewe and Other ethnic groups respectively. The Akan group had the lowest percentage 45%, and was 2.6 times less likely to exclusively breastfeed their children. Children of the Mole-Dgabani ethnic group were on the other hand 2.12 times more likely to be breastfed exclusively compared with Akan children, whilst Ga-Dangme children were 1.67 times more likely to be breastfed.

The gender distribution showed that 59.4% of female children were breastfed exclusively, while about 54.3% male children (OR = 1.2) were exclusively breastfed. Considering religious grouping, 67.4% of children from the Muslim group were exclusively breastfed (OR = 6.2 and 6). In the Catholic and Pentecostal/Charismatic group, this percentage was 57.1% and 55.9% respectively, and 46.7% (OR = 2.6) in the Protestant group. The group with No Religion reports 53.1% (OR = 3.4) of exclusive breast-feeding. The disparities were however not statistically significant.

By level of education, 100% of children who belonged to the Pre-School Group were exclusively breastfed. There was a successive decline in the proportion of children who were breastfed for higher levels of education (56.9% for the Primary Group; 52.1% for the Middle Group; 41.2% in the Secondary Group and 40% in the Vocational group). The results seem to suggest that the higher the level of education the less likely that such children will be breastfed though the odds ratio reported below show no significant variation.

According to socioeconomic status in quintiles, 60.8% of children from the Poorest level were breastfed exclusively (OR = 1.4). For the Richest quintile, this was 63.3% (OR = 1.6) and 59.3% (OR = 1.3). The differences were not statistically significant.

DTP3 Vaccination

About 50.8% of infants received DTP3 vaccination. Only 37.5% of children in the rural areas had been vaccinated compared with 65.5% of children in urban areas. Children in urban areas are almost twice as likely to be vaccinated as their rural counterparts.

By ethnic groupings (Mother tongue of head), the Ga-Dangme group reported 80% of infants who received DTP3 vaccine and 63.6% in the Mole Dagbani group. In the Akan group, this was

57.1%. The Ewe group had the lowest proportion of children receiving DTP3 (28.6% (OR = 1). Ga-Dangme children were 2.3 times more likely than Akan children to be vaccinated against DTP3.

The distribution of religion showed that both the Spiritualist and Catholic groups had the highest proportion of vaccinated children; 66.7% and 75% respectively, as compared to children from the Protestant (40 %).

Considering the educational level, 100 % of infants in the Pre-School group of women received the DTP3 vaccine. In the Primary group, 71.4% received the vaccine whilst 50% in the Middle group. The children of the secondary education group of women made up 66.7% of vaccinated children. The influence of education on DTP3 vaccination however was statistically insignificant.

There were some disparities in DTP3 vaccination by socio-economic status. About 71.4% of the infants in the Middle group received DTP3 vaccine (OR = 8.8), followed by the Richest group (61.5%, OR = 5.6), the Fourth group (45.4%, OR = 2.9) and the Second group (42.9% OR = 2.6). The group with the lowest coverage (22.2%) was the Poorest group (OR = 1).

Antibiotic Treatment for Pneumonia

About 31.6% of infants with suspected pneumonia received antibiotics. In rural areas this was 32.4%, compared to 27.8% in those living in urban areas (OR = 1.2). The differences were however not significant.

Actual outcomes by ethnic group (Mother tongue of head) showed that in the Other ethnicity group, 45% of infants with suspected pneumonia received antibiotics. In the Akan group this was 38% and for those belonging to the Mole-Dagbani group it was 24.6%. The Ga-Dangme group had the lowest percent (7.7%).

Looking at the proportion of suspected pneumonia cases by gender, 32.6% of male infants with Suspected pneumonia received antibiotics compared with 30.5% in the case of female infants (OR = 0.9). Gender was however not a significant cause of disparities for pneumonia treatment.

With regard to religious groupings, a much higher percentage (44.4%, OR =3.2) was observed in the Traditional religious infants. In the Protestant group this was 37.5%, followed by the Catholic group (33.3%), compared with the Spiritualist group that had the lowest percentage (20 % OR = 1). The differences were statistically insignificant.

Considering the level of schooling, in the Tertiary group, 50% of infants with suspected pneumonia received antibiotics (OR = 2.2). In the Primary group this was lower 42.2% (OR = 1.6). The Middle Group had the lowest percentage 30.9% (OR = 1). The influence of education on pneumonia treatment was statistically insignificant also.

Grouping by wealth quintile, 40% infants from the Fourth stratum with suspected pneumonia had received antibiotics (OR = 1.8), followed by the Middle group with 34.4% (OR = 1.4) and the Second Group with 27.6% (OR = 1). The Richest group has the lowest coverage 27.3% (OR = 1), and were 1.2 times more likely than the poorest group to treat their infants suspected with pneumonia. Wealth was however not a significant indicator of pneumonia treatment in children.

Limitation

The Maternal and Child Health (MCH) inequality section of this report is based on the results from the UNICEF modified Multi Indicator Cluster Survey (MICS) 3. Other survey reports such as the Ghana Demographic Health Survey (GDHS), the Ghana Statistical Service (GSS) Maternal Health Survey, in collaboration with Macro International Inc. and the Ghana Health Service, may produce different figures of MCH indicators in Ghana. These inconsistencies are as a result of the differences in study population and method of sampling, as well as the electoral areas used by

the various surveys. The MICS however made use of clusters and mainly focused on women and children rather than the general population.

III. National research for health system and its role in maternal and child health research

A. Commissioning of research for health

1. General context: governance of research for health

The establishment of a national Health Research Unit (HRU) in 1990 underscored the need for research as a tool for decision making and planning within the health sector. The HRU which matured into the RDD of the GHS in January 2009 is mandated to generate relevant research, strengthen decision-making, fine tune and set health research priorities in Ghana (GHS 2010 Annual Report).

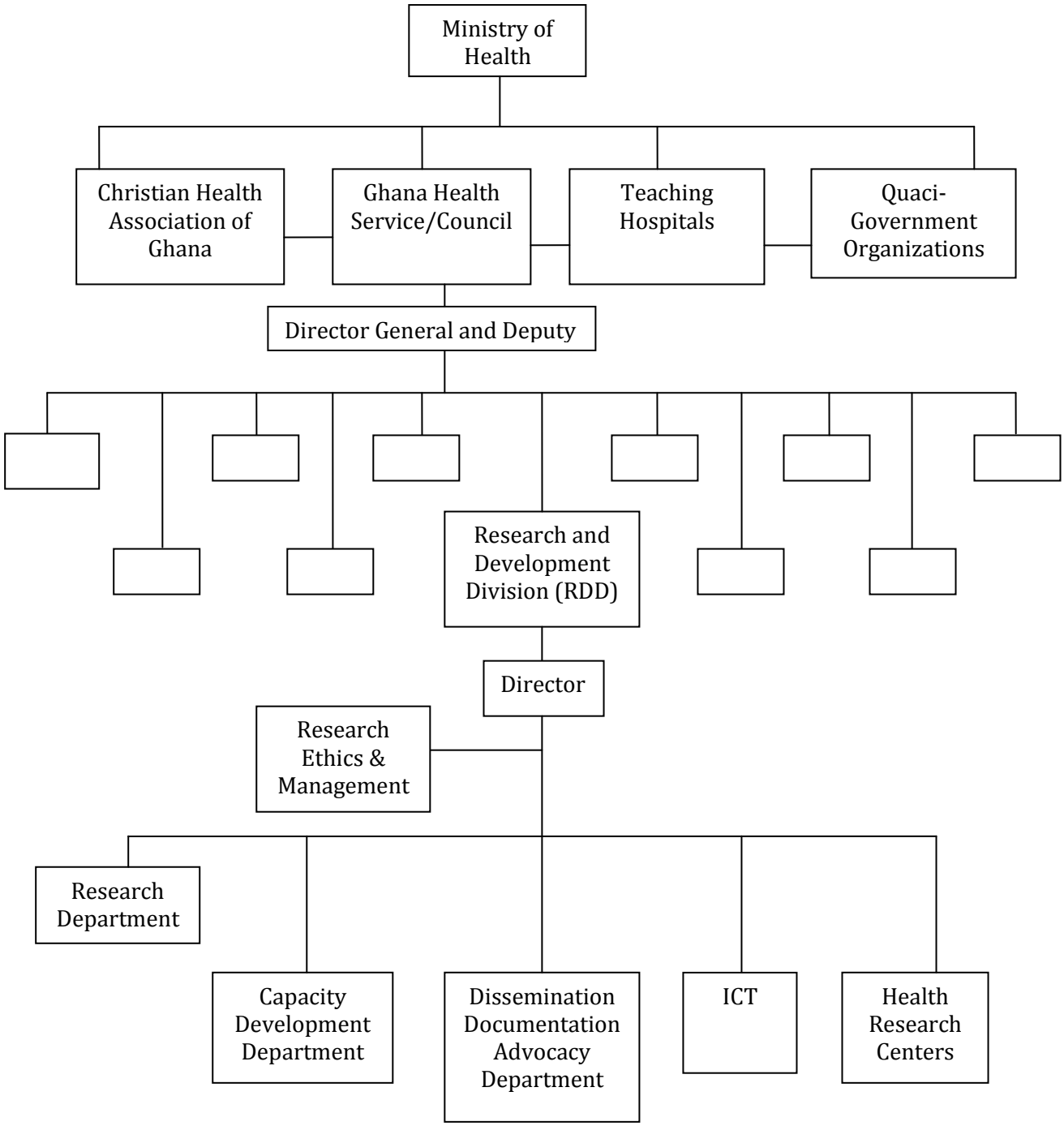
The RDD governs and determines the research orientations in the country through its four national health research centres: NHRC, KHRC, DHRC and recently the OCRC. The Centers work closely with programme implementers and policy makers in defining health problems; designing appropriate health research methods to find answers to health problems and reporting appropriately. In addition, the Centers facilitate policy dialogue and undertake monitoring and evaluation of health interventions. RDD supervises and ensures that the Centres provide practical needs-based research of the highest quality (RDD 2008/2009 Biennial Report).

The RDD also provides technical support for regional and district operational research teams set up to augment the activities of regional and district health management teams. The Division maintains strong link with in-country research and academic institutions such as the:

a. Noguchi Memorial Institute for Medical Research (NMIMR) of the University of Ghana, Accra.
b. Kumasi Center for Collaborative Research in Tropical Medicine (KCCR), Kumasi.
c. University of Ghana Medical School, Accra and
d. Ghana Statistical Service, Accra.
e. The School of Public Health, University of Ghana

International collaboration with partners such as the WHO, London and Liverpool Schools of Hygiene and Tropical Medicine, IDRC Canada and other, remains paramount to the RDD and its Centers.
There is no national research strategy or policy in existence. However, research management and coordination are undertaken by the RDD, with support from its collaborative partners. The Ethical Review Committee (ERC) of the Division addresses ethical considerations in research projects and also coordinates and review research projects within the GHS.

The major reform in the national health research system has been the transformation of the HRU which was a department under the Policy Planning Monitoring and Evaluation Division (PPMED) of the GHS into a separate division called the RDD. The hierarchy and link relations between the MoH, GHS and the RDD are represented in the organogram below. However, the proposed structure of the RDD shown is yet to receive a formal approval from the GHS Council (RDD 2008/2009 Biennial Report).



Funding remains a major challenge for the RDD because funding for service delivery in Ghana is generally inadequate (RDD 2008/2009 Biennial Report). The annual budget for research is

therefore not clearly stated. The Division continues to advocate for Budget Management Centers (BMC) of the various divisions of the GHS to dedicate at least 1% of their resources for operational research to boost the gathering of evidence in support of programme implementation.

2. Setting of research for health agenda: actors involved and their relations

Ghana does not have a national research agenda yet. There is no clear strategy, programme or policy on research for health. This is because research activities is heavily funded by external donors (over 90%), and are therefore donor-driven. As a result, research activities do not always address issues of national interests. There is a need for the national health research system to have a national agenda, as well as mobilize funding to carry out and coordinate research of national interest.

The RHSP addresses major MCH needs. Certain guidelines in the RHSP suggest that research activities into reproductive health be adequately disseminated to appropriate institutions and individuals involved in reproductive health activities. Research activities mentioned were acceptability studies; clinical trials; operations research; social behaviour in relation to reproductive health; indigenous contraceptive methods and adolescent sexuality. Public actors involved in the preparation of the RHSP included the GHS, MOH, National Population Council, Nurses and Midwives Council, Ghana Registered Midwives Association, Ghana Social Marketing Foundation, the Judicial Service, National Youth Council, University of Ghana Medical School and the National Council on Women and Development. Non-Governmental Organizations (NGO's) included the Planned Parenthood Association of Ghana (PPAG) and the 31st December Women's Movement. The policy was also supported by international partners including PRIME II Intrahealth, USAID, UNFPA and DFID (Reproductive Health Service Policy, 2003).

3. Overview of the main funding programmes in research for health and MCH research

The main two sources of funding for research are from the Government of Ghana (GOG) through the Global Fund and donor agencies. Donor agencies contribute over 90% of the total funds received for research activities by the RDD. Funding received between 2008/2009 was from external agencies including The Royal Netherlands Embassy; Bill Gates- Liverpool; Liverpool School of Tropical Medicine; The World Health Organization Geneva and Accra; The Population Council, New York; International Trachoma Initiative; The World Bank; International Development Center, Canada; International Development Research Center; Department of International Development; London School of Hygiene and Tropical Medicine; and European Union. Precise details on the results of donor funding, where it is received or how it is disbursed amongst the research centres is unavailable.

Government funding to these research centers is mainly staff salaries as well as administrative overheads. Increased donor funding is used as a tool to improve maternal and child health research. The mechanisms for financing programmes or allocation of funds for research projects is however unclear. Research on sexual and reproductive health conducted in the past aimed at poverty reduction and the achievement of Millennium Development goals (RDD Biennial Report 2008/2009). MCH research projects between 2009 and 2012 mainly targets newborns, children under 5 years, pregnant women and mothers.

B. List of funding programmes dedicated to research for health

1. Research funding programmes relevant to "MCH issues and inequalities"

Name of the programme	Year	Main activities funded and for whom	Main topics	Budget
Newborn Home Intervention Study (NEWHINTS) Funded by Save the Children/Saving Newborn Lives (SC/SNL) WHO and DFID	2009	To develop a feasible and sustainable community-based approach in rural Ghana to improve newborn care practices and care-seeking during pregnancy and childbirth, and by so doing improve neonatal survival. *Mainly for Newborns*	1. To link with District Health Management Teams (DHMTs) to develop a feasible and sustainable intervention to improve newborn care practices and care-seeking. This will be done through training the current network of community based surveillance volunteers (CBSVs) to identify pregnant women in the community, and to conduct two home visits during pregnancy and three in the first week of life of the neonate. 2. To evaluate the impact of these home visits on all cause neonatal mortality. 3. To evaluate their impact on newborn care practices	NA
Newborn Vitamin A Supplementation Trial (NEOVITA) Funded by WHO	2009	To determine if vitamin A supplementation (50,000 IU) given to neonates once orally either on the day of birth or in the next 2 days will reduce mortality in the first half of infancy by at least 15% as compared to placebo *Mainly for newborns*	1. To determine the efficacy of vitamin A supplementation (50,000 IU) given to neonates once orally either on the day of birth or in the next 2 days in reducing mortality in infancy (0-11 months). 2. To determine the efficacy of vitamin A supplementation (50,000 IU) given to neonates once orally either on the day of birth or in the next 2 days in reducing mortality in the neonatal period (first month of life). 3. To determine the efficacy of the above intervention in reducing the incidence of severe morbidity defined as hospitalizations due to any illness in the first 6 months of infancy. 4. To document the potential adverse effects of vitamin A such as bulging fontanels, vomiting, irritability, fever, diarrhea, inability to suck or feed, convulsions or any other condition that caused parents to be concerned, in the 3 day period	NA

			following administration of the supplement. 5. To determine the vitamin A and c reactive protein (CRP) status of a subsample of infants at 2 weeks and 3 months of age in the vitamin A supplementation and placebo groups.	
The Oxytocin Initiative: Determining the effect of prophylactic administration of oxytocin in Uniject™ on postpartum hemorrhage at the community level in four districts in Ghana **(Oxytocin Study)** Funded by PATH through the Bill and Melinda Gates Foundation.	2010	To determine if intramuscular administration of 10 IU of oxytocin in Uniject™ during the third stage of labor by a Community Health Officer (CHO) will reduce the risk of postpartum hemorrhage, defined as blood loss of 500ml or more within two hours after delivery, by 50% relative to deliveries attended by the same type of provider who does not provide the intervention. *Mainly for Pregnant women*	1. To document the frequency of inappropriate use of oxytocin (administration prior to the delivery of the baby) by CHOs. 2. To document the occurrence of adverse maternal and fetal/newborn outcomes which are associated with inappropriate and appropriate use of oxytocin by CHOs 3. To document logistical issues pertaining to expanded coverage of oxytocin for postpartum hemorrhage prevention, i.e. the arrival of CHOs in time to intervene, adequate storage, appropriate disposal of the Uniject™ device and changes over time in CHO practice. 4. To assess the reliability of women's self-report on medical and traditional care received during labor and delivery	NA
MAL055 (Malaria 055)	2009-2013	Vaccine trials for Glaxo Smith Kline Biologicals	Phase III clinical trial of RTS,S malaria vaccine.	€ 3,703,000,00
TSAP (Typhoid Fever Surveillance in Africa Project)	2010-2012	Typhoid fever surveillance program in Africa for WHO, US CDC, Institut Pasteur and the BNITM	Typhoid fever surveillance program in Sub-Saharan Africa.	€ 165,000
ANGLO 1 (AngloGold)	2011	Assessment of the level of	Assessment of malaria parasite rates in sentinel schools in	€ 21,000

		parasitaemia in children in the Obuasi municipality for the Anglogold Ashanti	preparation for an indoor residual spray intervention	
CDS (Child Development Study)	2010-2012	The impact of specific diseases as measures of child development the German Research Council (DFG)	The impact of certain diseases as measures of child development in children and among pregnant mothers.	€ 634,000
Malaria in pregnancy project	Active	To determine the optimum method of managing malaria in pregnancy in women who sleep under an LLIN in areas of seasonal malaria transmission	1. To determine if scheduled screening and treatment during ANC visits is as effective in protecting against LBW and maternal anaemia as standard IPTp-SP in primi- and secundigravidae who sleep under LLIN. 2. To evaluate the cost-effectiveness of delivering the alternate strategy measured as the cost per cases of maternal anaemia and antenatal malaria averted.	$767,052
Mobile technology for health (Navrongo Subcontract)	Active	To develop mobile-phone-based health information technology and test the proposition that improved health outcomes. *To support maternal and newborn health*	1. To assess community health service information needs and health management information systems 2. To develop community health service zones for testing mobile phone-based data capture 3. To develop software needed to accommodate mobile phone-transmitted service information and to support the provision of emergency health services 4. To develop data visualization and information management tools for evidence based decisions making 5. To evaluate impact on health service volume and delivery, and disseminate lessons learned	$294,073

2. Research funding programmes relevant to the "sociological field and determinants of health"

Name of the programme	Year	Main activities funded and for whom	Main topics	Budget
Delivery and Postnatal Care: Mothers' experiences and recall **(Funded by SNL)**	2010	This qualitative study aimed to determine what mothers know and recall about immediate newborn and postnatal care in order to formulate/ and pilot a set of quantitative questions for surveys such as the Demographic and Health Surveys. For Women with children less than a year.	The specific research questions are: **1) What questions, and over what time period, can we ask mothers about newborn and postnatal care:** a. What do mothers know and recall about what happens during delivery and immediately after birth? b. How does knowledge and/or recall differ among those who delivered at home, with a traditional birth attendant or in a facility? c. How does recall differ among those who delivered 0-3 months ago and those who delivered between 1-2 years ago? **2) How best can we phrase questions about newborn and postnatal care:** a. What terms and concepts related to newborn and postnatal care are unambiguous and easily understood by mothers? b. Are there key events during delivery and immediately after birth that can be used as reference points when asking about newborn care? c. How are a set of proposed quantitative questions on newborn and postnatal care interpreted and understood by mothers?	$ 32, 422
Rapid Mortality Monitoring in Real Time (BDR+)	Active	To estimate the timeliness of vital events recording at the community level	To make available to rural populations vital registration. Vital registration for mothers in rural communities will enable the planning of effective services for children e.g vaccination programs	$650,000

3. Research funding programmes relevant to the "health policy development"

Name of the programme	Year	Main activities funded and for whom	Main topics	Budget
Quality of prenatal and maternal care: bridging the know-do gap (QUALMAT)	2009-2013	To improve the quality of maternal and neonatal care through addressing the existing gap between knowing what to do and doing what you know.	1. To improve staff motivation through developing and implementing a system of performance-based incentives for healthcare workers. 2. Introducing a computer-assisted clinical decision support system to aid providers to comply with established standards of care.	€493,492
Ghana Essential Health Intervention Project (GEHIP) (Navrongo Subcontract)	Active	To accelerate efforts aimed at attaining MDG 4 & 5	GEHIP seeks to strengthen the core pillars of the health system with particular focus on activities that improves the prevention, treatment and management of diseases towards improving maternal and child health. Re-orientation of staff pays attention to the health needs of vulnerable community members	$284,481
Home Management of Malaria and Pneumonia in children under 5 in a rural district in Ghana	2006-2009/2010	Home and community management of malaria and pneumonia in children under-five: a cluster randomised controlled trial in southern Ghana	1. To develop and implement an intervention for home and community management of malaria and pneumonia that is feasible, acceptable, achieves high coverage and adherence, and is safe. 2. To implement strategies that will increase the extent of early appropriate treatment of fevers in children through a home and community approach for presumptive treatment and management of malaria and pneumonia.	$800,000
APARET (African Programme for Advanced Research Epidemiology Training) Funded by European Union	2011-2013	To stimulate research activities by assigning several qualified fellows to conducting programmes to build capacity	To build sustainable research capacities in Africa.	€74,000.00

4. Research funding programmes relevant to the "biomedical field"

Name of the programme	Year	Main activities funded and for whom	Main topics	Budget
RTS,S Phase 3 Trial (MAL 055 study) **Funded by MVI** Mainly for children 6-12 weeks and 5-17months.	2009	1. To evaluate the protective efficacy of RTS,S/AS01E against clinical malaria disease caused by *Plasmodium falciparum* in African children whose age at first dose will be **6-12 weeks** and will receive vaccine in co-administration with DTPwHepB/Hib antigens (Tritanrix HepB/Hib) and OPV. 2. To evaluate the protective efficacy of RTS,S/AS01E against clinical malaria disease caused by Plasmodium falciparum in African children whose age at first dose will be from **5-17 months**.	1. To evaluate the protective efficacy of RTS,S/AS01E on a primary schedule with and without booster dose against severe malaria disease. Duration of follow up will extend to 30 months after completion of primary course. 2. To evaluate the protective efficacy of RTS,S/AS01E on a primary schedule with and without booster dose against incident severe anemia and malaria hospitalization. Duration of follow up will extend to 30 months after completion of primary course. 3. To evaluate the duration of protective efficacy of a primary schedule of RTS,S/AS01E with no booster dose against clinical malaria disease. Duration of follow up will extend to 30 months after completion of primary course.	$
Risk of Obesity and Diabetes Among Migrants African Population (RODAM) funded by European Union	2012-2014	The interplay between various factor and Type 2 Diabetes and obesity	The interplay between environment, behaviour and genetic features in T2D and obesity among one homogeneous.	€280,300
TB5 (Tuberculosis) Funded by German Ministry of Education and Research	2011-2012	Potential genetic factors involved in protecting individuals form TB	Potential genetic factors involved in either protecting individuals from TB or making them susceptible to the disease.	€35,000

TB6 (Tuberculosis) funded by the Deutche Lepra-und Tuberkulosehilfe (DAHW)	2010-2014	Influence of candidate microRNAs on the treatment success in acute TB	The role of candidate microRNAs in T-cell response during acute TB and latent TB infection.	€200,000
BAT (Bat) Funded by the German Research Council (DFG)	2009-2013	Virus biology, host ecology and human behaviour as determinants for coronaviral zoonoses	Zoonotic transmission of coronaviruses from bat to human.	€109,000.60
ANDI (African Network of Drugs and Diagnostics Innovation) Funded by WHO/TDR	2010-2014	A centre of excellence in applied biomedical research	Training of researchers in biomedical research	€23,700.00

C. Main characteristics of programmes dedicated to research for health

MCH projects at DHRC, KHRC and NHRC involve activities which aim to improve the health of pregnant women, mothers, newborns and children under the age of five years. The Ghana Essential Health Intervention Project (GEHIP), Oxytocin Initiative, Quality of Prenatal and Maternal Care (QUALMAT) and the Malaria in Pregnancy Project, have yielded feasible and sustainable health intervention programmes which have contributed to the reduction of maternal and child mortality in many communities.

Funding for the research projects originated from both public and private sources. The GOG contribute about 10% of funding through the Global Fund however the majority of MCH funding is generated from external donors. Saving Newborn Lives (SNL); PATH through the Bill and Melinda Gates Foundation; WHO; Save the Children; MVI and DFID, are amongst the sources currently supporting MCH research projects in Ghana. Other sources include the European Union (EU), German Ministry of Education and Research, German Research Council and Deutche Lepra-und Tuberkulosehilfe (DAHW). Funds allocated for these projects are usually stated in United States Dollars or Euros.

Award of funding to the DHRC, KHRC and NHRC are mostly through competitive calls for proposals. Collaboration with international partners improves the chances of winning proposals and awards of support. On rare occasions, some organisations may engage the Centres in solving their research questions through minor surveys or projects. These may provide a direct support to the Centres, although insignificant.

Major factors influencing MCH inequalities include quality of healthcare, availability of health services, infrastructure, attrition of health staff especially midwives and limited access to essential health services. MCH research projects therefore attempt to address some of the issues through investigative activities. Research activities in Ghana which attract funding are in areas of: community involvement and household empowerment, administration of medical products, improvement of service delivery, access to care, quality improvement strategies and capacity building. Research themes are concentrated on maternal health; neonatal care; malaria; tuberculosis; haemorrhage; obesity and diabetes; and healthcare financing.

D. Research implementation

1. Public organisations implementing research for health

a) Main research players

Research in Ghana involves multiple actors. Besides the national health research centres, universities and other private research institutes are involved with research activities which influence policy formulation and programme implementation processes in Ghana.

The DHRC, KHRC, NHRC and OCRC are the main organizations which dominate the public research for health landscape. The GHS with its various directorates also carry out research activities for use at the regional and districts levels within the health system. The University of Ghana Medical School; School of Medicine and Health Sciences, University of Development Studies and the School of Medical Sciences, KNUST; are academic institutions also engaged in research activities of national interest. The

Kumasi Centre for Collaborative Research (KCCR) is an international platform for biomedical research. The modus operandi of KCCR is based on collaboration between the KNUST and the Bernard-Nocht Institute for Tropical Medicine in Hamburg, Germany. The Noguchi Memorial Institute for Medical Research (NMIMR) is also affiliated with the University of Ghana Medical School.

The Council for Scientific and Industrial Research (CSIR), formally called the National Research Council, is also a public research group mandated to advance scientific and industrial research for the development of health, agriculture, medicine and other service sectors. The CSIR also conducts research to pursue the implementation of government policies on scientific research and development.

Below is a list of public organizations involved in research for health and their relative importance in the research landscape in Ghana.

	Research Organization	**Relative Importance (High/Middle/Low)**
1	Research and Development Division, Ghana Health Service	High
2	Navrongo Health Research Centre	High
3	Kintampo Health Research Centre	High
4	Dodowa Health Research Centre	High
5	Onchocerciasis Chemotherapy Research Centre	High
6	Ghana Health Service Greater Accra Regional Health Directorate	High
7	Department of Obstetrics and Gynecology, School of Medical Sciences, KNUST	Medium
8	Department of Obstetrics and Gynecology, University of Ghana Medical School	Medium
9	School of Public Health, University of Ghana	Medium
10	Noguchi Memorial Institute for Medical Research	High
11	Family Health Division, Ghana Health Service	High
12	INDEPTH Network	Low
13	Nursing and Midwifery Training College	Medium
14	Korle-bu Teaching Hospital	Medium
15	Department of Obstetrics and Gynecology, Komfo Anokye Teaching Hospital	Medium
16	Department of Nutrition and Food Science, University of Ghana	Medium
17	Department of Community Nutrition, School of Medicine and Health Sciences, University for Development Studies	Medium
18	Department of Community Health, School of Medical Sciences, KNUST	Medium
19	Institutional Care Division, Ghana Health Service	High
20	Council for Scientific and Industrial Research	High

b) Trends and needs in public research

Lacking formal approval for the proposed structure of the RDD has affected the recruitment of requisite staff. There is also the lack of technical and support staff to support regional and district teams in the conduct of research. There is a gap in human resource especially at the regional and district levels where operational research is important (RDD 2008/2009 Biennial Report).

Ghana has a low rate of scientific production because turning research work into manuscripts is a challenge for many researchers in Ghana. Training and short courses on scientific production is needed to improve upon the writing skills of inexperienced researchers especially.

More funding sources should be explored to increase funding to the national health research system. A national health research agenda or policy will also be important in guiding research activities into addressing issues of national interest and priority.

Efforts should also be put into translating research evidence into policy and service delivery.

2. Private organisations implementing research for health

a) Main actors

The private health sector in Ghana is a large and important actor for health-related goods and services. The private health research system also contributes to research on policy, advocacy and service delivery. However, little has been documented concerning the size and configuration of private research organizations or their contribution to health research outcomes (Country Assessment of the Private Health Sector in Ghana Draft Report, 2010).

Alliance for Reproductive Health Rights (ARHR) is a leading NGO which promotes rights-based approach to sexual and reproductive health in Ghana through advocacy, capacity building and research. ARHR consists of three national and 35 local NGO's as well as community-based organizations operating within 38 districts in Ghana. The main objective of ARHR is to improve equitable access to sexual and reproductive health services for the underserved communities. ARHR promotes information and knowledge generation and management through commissioning and conducting research for the Alliance. The Alliance also seeks to monitor and disseminate research on sexual and reproductive health by others (ARHR, 2012).

The Centre for Health and Social Services (CHeSS) undertakes health policy, systems and service delivery research and surveys that asses the functioning of the health sector both at facility and organizational levels. CHeSS solicits, or is commissioned to conduct research or part of it on behalf of foundations, governments, NGO's and international development partners or in collaboration and partnership with any of these institutions. CHeSS places priority on countries with high maternal and child mortality, and helps to develop systemic capacity to link health research to policy and population level interventions.

b) Trends and needs in private research

The needs of private research are similar to that of public research. In addition, information on private research organizations, their contribution to research financing in Ghana is limited. With better information about the size, scope, distribution and issues faced by private researchers, Ghana's public policy makers could engage more effectively with private research. Through dialogue and the use of regulatory and other tools, public policy could influence the practices and development the private research for health, to ensure that it better serves national health goals and objectives (Country Assessment of the Private Health Sector in Ghana Draft Report, 2010).

3. Overview of the main institutions in research for health and MCH research

There are four national health research centres, the GHS and other academic institutions which make up the public health sector implementing MCH research. Details of the institutions and research leaders are listed below:

Name of Institution	Location	MCH research group leader(s)	Contact details (email, phone)
Ghana Health Service (Greater Accra Regional Health Directorate)	Accra	Prof. Irene Agyepong-Amarteyfio	irene.agyepong@ghsmail.org iagyepong@hotmail.com
Dodowa Health Research Center	Dodowa	Dr. Margaret Gyapong	margaret.gyapong@ghsmail.org
Navrongo Health Research Center	Navrongo	Dr. Abraham Oduro, Fabian Sebastian Achana	aoduro@navrongo.mimcom.org fsachana@gmail.com
Kintampo Health Research Center	Kintampo	Dr. Seth Owusu-Agyei, Dr. Sam Newton, Charlotte Tawiah-Agyemang	seth.owusu-agyei@kintampo-hrc.org samkofinewton@yahoo.com charlotte.tawiah@kintampo-hrc.org
University of Ghana Medical School	Accra	Dr. Kwamena W. C. Sagoe	kwamenas@hotmail.com
Department of Obstetrics and Gynecology, Tamale Teaching Hospital	Tamale	Dr Solomon K Gumanga	gumangask@yahoo.co.uk
Noguchi Memorial Institute for Medical Research, University of Ghana	Accra	Dr. Kwadwo Ansah Koram, Dr. Daniel Arhinful	KKoram@noguchi.mimcom.org darhinful@noguchi.mimcom.org
Ghana Health Service (Family Health Division)	Accra	Dr. Gloria Quansah Asare Dr. Isabella Sagoe-Moses	gloasare1@yahoo.com isabelle.sagoemoses@ghsmail.org
Ghana Health Service (Research and Development Division)	Accra	Dr. Abraham Hodgson, Dr. Evelyn Ansah, Dr. Amanuah Chinbuah	abraham.hodgson@ghsmail.org
Kumasi Center for Collaborative Research	Kumasi	Dr. Augustina Annan	annan@kccr.de
School of Medical Science, Kwame Nkrumah University of Science and Technology	Kumasi	Dr. Frances Owusu-Daaku	owusudaakus@yahoo.co.uk
College of Health Sciences, University of Ghana	Accra	Prof. Richard Adanu	rmadanu@yahoo.com

4. Capacity building in research for health

a) Capacity building related to MCH inequalities

Strategies to increase health research capacity in Ghana include the establishment of the RDD within the GHS. This Division has four dedicated health research centres, which are responsible for conducting and coordinating biomedical, social and clinical research in health at the national and regional levels. In the last two years, health research units

have also been created in each of the regional health directorates, for the conduction of operational research as well as implementation research at the regional and district levels.

Through the initiative of the GHS, the School of Public Health, University of Ghana was also established in 1994, to train medics and paramedics in public health, as well as equip them with research skills to undertake research activities.

The University of Ghana in order to improve and build capacity for research has established the office of Research Innovation and Development. The Office attracts research grants and allocates grants for both academic staff to conduct research, and grants to students for research. Research grants are also awarded to academic staff applying to do PhD in various fields.

The Noguchi Memorial Institute for Medical Research was established to build capacity in clinical and scientific research. Currently, the Institute has received $5m from the Bill and Melinda Gates Foundation to offer post-doctoral fellowships to attract young and recently trained PhD holders within and outside Ghana, to build and improve capacity in health research.

As part of the research and development plan, the GHS aims to determine the impact of scaling-up HIV/AIDS interventions on human resources by identifying the health services most severely affected by HIV/AIDS and proposing relevant health service indicators to inform sector needs (GHS 2010 Annual Report).

To ensure proper human resources planning to address morbidity and mortality as well as its key social determinants, the GHS in conjunction with the School of Public Health, University of Ghana organized a training programme at Improving Management of Health Interventions (IMHI) for senior managers at the fore front of programme implementation (GHS 2010 Annual Report).

The addressing some of the challenging faced by the national health research system, the RDD aims to facilitate in-service training and short courses for existing staff to strengthen research capacity at various levels of service delivery (RDD 2008/2009 Biennial Report).

b) Research infrastructures

The main research infrastructures are the three main health research centres, and recently the Onchocerciasis Chemotherapy Research Centre in Hohoe. Currently, the only technology tool employed at the Centres for data capturing is the Personal Digital Assistant (PDA), which were purchased with specific project funds.

The gaps concerning infrastructure include weak infrastructure capacity such as inadequate office facilities, insecure water and electricity connection as well as inadequate staff housing, to meet the growing needs of the Centres. The RDD has been unable to provide the needed support to its Centres due to inadequate funds.

Poor maintenance of infrastructure and equipment is also a gap. The 2008/2009 year under review saw the dilapidation of some offices of the RDD. Six of the Divisions offices still leaked during the rainy season after extensive renovations were done a few years back (RDD 2008/2009 Biennial Report).

There is an interest to create joint infrastructures dedicated to research for health. The 2008/2009 Biennial Report of the RDD clearly states its mission to strengthen network partnerships and alliance between local and global research institutions (RDD 2008/2009 Biennial Report). The strategic plan to achieve this mission is however not stated.

c) International cooperation

International collaboration and cooperation remain paramount to the national health research system. Collaboration with partners such as the WHO, London and Liverpool Schools of Hygiene and Tropical Medicine, IDRC Canada has been sustained. Considering that the main source of funding to the RDD and research centres are from external sources, the national health system has maintained international partnership with donor agencies. Resource mobilization for research activities from both national and external sources remains a key objective of the RDD. Some of the donor agencies including the International Trachoma Initiative and International Development Research Center are examples of research partnerships. INDEPTH Network, Wellcome Trust and the Bill and Melinda Gates Foundation are also important partners of the RDD.

E. Health research system performance

1. Foresight, evaluation and monitoring

There are several activities within the health research system which are aimed at improving quality of research as well as health research system performance. The weekly technical/scientific meetings at the various Centres serve as the platform where the progress and limitations of research projects are reviewed. Manuscripts and scientific papers from health research projects are also reviewed before use for dissemination activities.

A multiple of indicators are employed in the measurement of research outputs in Ghana. National and international peer review journals, District and Regional Health Performance Reviews, Health Agency Performance Review and the Annual Health Summit are all platforms where research projects are publicized through publication or by conference presentations. The Annual Scientific Forum organized by the RDD is also one of the most recognized platforms for showcasing national research output.

On the national level, the Ethical Review Committee (ERC) of the RDD addresses the ethical considerations in research projects, as well as coordinates and review health research projects within and outside the GHS. The monthly participation by the ERC is encouraging and impressive. A total number of 320 research proposals were approved for implementation in 2008/2009. Of the 179 research projects published in the 2008/2009 Biennial Report, 53 were specifically projects on MCH or MCH inequalities (34 in 2008 and 19 in 2009).

As part of the projection for the future, the ERC seeks to:

a. Generate income to enable it carry out its obligations effectively and efficiently.
b. Conduct regular visits to on-going clinical sites to ensure that research projects are executed according to the approved protocol.
c. Explore the possibility of assisting members to attend international conferences to enhance their knowledge in health research ethics.
d. Set a sub-committee to review the Committee's operational guidelines on how to meet international standards.
e. Put in place measures to enforce the submission of periodic reports by investigators for on-going projects for continuous review and final project reports to the ERC

2. Major strengths

The Health Research Unit (HRU) which was once a department of PPMED is now RDD, a fully functional Division of the GHS. The RDD plays a major role in the policy formulation and implementation processes in the health sector. Research management and coordination are key operations of the Division. In conjunction with its four research centres, key issues on malaria, child health, maternal and reproductive health and the Demographic Surveillance System (DSS) have been addressed. This has improved upon efforts to bridge the gap between research and policy.

Through international collaboration, the RDD continue to get funding from donor agencies and health partners. Financial support from the GOG has also been sustained.

There are several platforms including the district and regional health performance reviews and Health Summit where research knowledge is transferred. Collaboration between research centres and District Health Management Teams (DHMT's) constitute an innovation potential. The RDD has been instrumental in attaching staff from the districts to the research centres to understudy preliminary results of on-going or nearly-completed research projects, to better understand and implement results at the district level. An example is the CHPS Project, a door-to-door health delivery service aimed at improving access to child and maternal health especially in rural communities. DHMT's from various districts were sent to the NHRC in Navrongo to understudy the operation of the CHPS and how to overcome implementation gaps. This exercise contributed to the smooth implementation of the CHPS in several districts after the pilot study.

3. Major weaknesses

The national health research system is beset with some weaknesses and challenges. Inadequate funds particularly for general administration and management is a weakness. Over 90% of funds dedicated to research activities are from external donor agencies. The remaining funds from the GOG through the Global Fund only cover the salaries of some staff as well as administrative overheads. As a result, research projects and activities are donor-driven and do not always address issues of national interest and priority.

Considering the number of research projects undertaken by the national research centres, scientific publications generated in Ghana falls below expectation. This is because there is a gap between research and translating data and results into manuscripts. Also, poor writing skills and the lack of interest of some policy makers in research results have contributed to the low scientific production. The wide communication gap which exists between researchers and policy makers is a limitation. This does not encourage the production of scientific papers or the use of research evidence in policy formulation.

Inadequate infrastructure to meet the growing needs of the health research system is a major weakness. The lack of requisite technical and support staff to provide guidance to District and Regional Teams in the conduct of research is also a major challenge. Strengthening research capacity through in-service training and short courses for staff at the various levels of service delivery will contribute to capacity building.

Increased funding from the GOG will support and improve efforts to build an effective health research system. Resource mobilization by exploring new funding sources should be intensified.

Efforts should also be made by the RDD to ensure that research evidence of national interest is disseminated to relevant policy makers and stakeholders. Workshop on writing skills and production of scientific papers should be organized frequently to

support the development of inexperienced researchers. These will contribute to the motivation for research publication.

4. Perspectives

Research has the potential to address MCH inequalities in Ghana. MCH research projects which were approved in 2009 addressed issues concerning the socio-economic determinants of health, economic burden of disease, healthcare financing, quality of care, equity of access, inequality gradient, maternal and child mortality as well as infant nutrition. The RDD has been instrumental in increasing research capacity in Ghana since its operation in 2009. Research units have been established in all the 10 regions of Ghana to enhance research activities at the regional level, as well as promote easy dissemination of research results.

The RDD continues to advocate for the Budget Management Centres of the various Divisions of the GHS to dedicate at least 1% of their resources for operational research in support of programme implementation at the operational level. Strengthening research capacity at various levels of service delivery is also part of the Division's efforts to build an effective health research system in Ghana. The RDD also aims to link research with development agenda by ensuring that research findings are utilized. The organization of periodic research dissemination fora is a strategy to facilitate this process.

The lack of reliable funding sources is a major challenge faced by the national health research system. Government contribution to research should be increased. Resource mobilization and exploration of new funding sources need to be intensified. Adequate funding is required to solve the infrastructure and capacity-building problems faced by the system.

The multilateral cooperation between north-south and south-south could help with policy advice and best practice on effective communication between research, policy and service delivery. The cooperation could also help with trainings for better staff development and capacity building. Funding to address the weaknesses of the RDD and regional research units would help in building a more effective and efficient health research system.

IV. Impact of health research on development of policies and programmes

A. Introduction

The CHPS, Reproductive Health Service Policy, Under Fives Child Health Policy (UFCHP), the National Health Insurance Scheme (NHIS) and many other policies and programmes have been developed to improve MCH in Ghana but are often challenged by bottlenecks and principal determinants of MCH inequalities. Poor quality of data on MCH for systematic investigation into MCH, also poses a major constraint on the monitoring and evaluation processes of maternal and child services (CHPS Policy, 2005).

There are major MCH needs in Ghana which hinder MCH improvement. They include barriers in accessing healthcare and healthcare providers as well as well as critical health services. This challenge is exacerbated by the geographic circumstances in many communities. The low financial capabilities of some mothers to meet treatment and drug needs contribute to poor health-seeking behaviours amongst the poor. Human resource constraints also continue to blight maternal healthcare provision, which is often exacerbated by the low rate of setting up healthcare facilities particularly in rural areas (2008 MDG Report, 2010). Furthermore, literacy rate amongst women in Ghana is low, and has translated into low women's empowerment and gender inequalities. Consequently in some parts of the country, household healthcare choices and practices are the sole prerogative of men (2008 MDG Report, 2010). Some MCH needs include inadequate post-abortion care, inadequate antenatal and postnatal care services, low rates of supervised delivery, inadequate family planning services and Prevention of Mother to Child Transmission (PMTCT) services (MAF, 2011).

Besides explicit evidence generated in Ghana, most MCH policies and programmes also draw their evidence from international policy frameworks and other reports from international organizations such as WHO, UNICEF and UNFPA (NIYCF, 2007; Reproductive Health Policy, 2003). The National Infant and Young Child Feeding Programme is an example developed on 14 references, only 4 of which are explicit research evidence generated in Ghana (NIYCF, 2007).

B. Policy and programmes addressing MCH inequalities

The main MCH policies addressing inequalities include:

i. Community-based Health and Planning Services (CHPS) policy
ii. Reproductive Health Service Policy
iii. Under Fives Child Health Policy (UFCHP)
iv. National Health Insurance Scheme (NHIS) policy
v. Prevention of Mother To Child Transmission (PMTCT) policy
vi. Ghana Shared Growth and Development (GSGD) policy

Important MCH programmes include:

i. National Infant and Young Child Feeding (NIFCF) programme
ii. Safe Motherhood programme

iii. Child Accelerated Development programme

iv. MDG Accelerated Framework (MAF) for maternal health.

v. Girl Child Education

The policies and programmes stated above are high impact delivery services which are informed by known research evidence, some of which were generated by national health research centers. They each outline key interventions which are equity-oriented and targeted at vulnerable populations. The CHPS policy is an important policy with multiple intervention elements and multi-level ownership, especially at the community level. The CHPS programme is highlighted below:

The Community-based Health and Planning Services (CHPS)

CHPS was based on an experiment at the Navrongo Health Research Center conducted in the Kassena-Nankana District. The Navrongo Experiment achieved extraordinary success in reducing childhood mortality. By mobilizing rural communities to develop local health systems and stationing nurses in these villages, child mortality was reduced by more than half in just 3 years, achieving MDG 4 in 7 years.

CHPS is structured into zones, with an assigned Community Health Officer/Nurse (CHO or CHN) offering community services including home visits to clients living in the zone. The CHO/CHN also engages each community within the zone in micro planning of health activities.

After the experiment was successfully replicated in eight additional districts, the government of Ghana expanded this community-based nursing through an initiative known as Community-based Health Planning and Services (CHPS), which provides a package of essential primary care services. CHPS became a national strategy for delivering community-level 'close-to-client' service by reorienting and relocating primary healthcare from sub-district health centres to convenient community locations. CHPS was adopted in 1999 as a national health policy initiative, with an initial focus on deprived and remote areas of rural districts. Today, there is at least one active CHPS program in 138 districts of Ghana's 171 substantive districts. The total number of CHPS zones is 1,675 as at 2011 (GHS 2011 Annual Report)

The 'Planning' component of CHPS was improved through collaboration with the transfer of knowledge from the Tanzania Essential Health Interventions Project (TEHIP). By giving local districts the tools to make evidence-based decisions about the allocation of healthcare resources, TEHIP enabled districts to provide services that met their burden of disease patterns. These efforts led to dramatic declines in child mortality in two rural districts (Rufiji and Morogoro) and TEHIP was later scaled up to 120 districts in Tanzania. The Ghana Ministry of Health and The Tanzania Ministry of Health are collaborating to share and transfer knowledge from the TEHIP and CHPS to improve service delivery in each country. The proposed project based on Tanzania TEHIP and Ghana CHPS research evidence will test the hypothesis that the country-to-country transfer of evidence-based programs that strategically complement each other will help ensure that essential health interventions reach under-served populations and thus progress towards MDG 4 and 5 targets is accelerated.

1. Dimensions of the policy and programme.

There are components of the above stated policies and programmes which have significantly contributed to the improvement of MCH in Ghana. Health inequalities are also tackled through various focused interventions under these policies and programmes. Community empowerment, equity, disease prevention, efficiency, capacity building, mobilising local resources for healthcare and sustaining financing of health service delivery, are among dimensions identified with the various policies and programmes stated above. Some of the stated components are specific to certain policies and programmes, but are also common threads for many MCH interventions in Ghana. Below are some examples:

Main dimensions: Equity of access, mobilizing community resource for healthcare, efficiency, disease prevention, quality of care, health systems management.

"The CHPS initiative is therefore the national strategy for implementing community-based service delivery by reorienting and relocating primary healthcare from sub-district health centers to convenient community locations." (CHPS, The Operational Policy, 2005 pp 5)

"Appropriate cadres of service providers shall be developed and distributed according to workload, as well geographical and access equity." (Reproductive Health Service Policy, 2003 pp 37)

"This strategy seeks to create an environment that will enable mothers, families and caregivers to make and implement informed choices about optimal feeding practices for infants and young children." (NIYCF, 2007 pp 3)

"The policy is organised along the continuum of care for the mother and child (pregnancy, birth and immediate newborn period, neonatal period, infants and children). It is also presented for cross-cutting areas that are important for delivering effective programs: planning and management; community, health communication, health systems, human resources, monitoring, evaluation and research and finance". (Under Fives Child Health Policy, pp 6)

2. Research utilization models.

Most MCH policies and programmes in Ghana have more implicit than explicit references. The NRHS policy is informed by the Ghana Demographic Health Survey (GDHS) of 1993 and 1998, as its source of regional variation in maternal and child health outcomes. It is however unclear what the research utilization models for this policy are (National Reproductive Health Policy, 2003). The CHPS policy is similar to the NRHS policy. Besides research conducted by Awoonor-Williams et al, 2004 and Debpuur et al 2002, the four other references which informed the development of the CHPS policy were implicit references from the MOH, GHS as well as from other initiatives for scaling up service delivery innovation (CHPS, The Operational Policy, 2005).

In replicating the results of CHPS in all communities, three key pilot districts were used (Nkwanta, Birim North and Asebu-Abura-Kwamankese). Due to the geographic and socio-cultural differences in the communities, some general ideas and recommendations were generated to shape the CHPS implementation strategies in various communities. Rolling out the national programme thus had both conceptual and symbolic use of the Navrongo reasearch results, but to a lesser extent. In summary, the utilization model for the CHPS policy was mainly instrumental. Due to the geographic and socio-cultural differences between the communities in Ghana, policy implementation at the

community level may consider conceptual or/and symbolic use of research results. This is important when scaling up health programmes across districts and regions in Ghana.'

Research utilization models: Instrumental use of research from the Navrongo Health Research Center.

"In an effort to provide 'close-to-client' doorstep health delivery, the Ministry of Health through the Ghana Health Service pioneered the implementation of a national programme to replicate the results of the Navrongo Community Health Family Planning Project initiative to key pilot districts…"(CHPS Policy, 2005 pp 5)

Symbolic:

"The first edition of the national Reproductive Health Service Policy served as the basis for the development of the Structured In-service Training Programme on reproductive health… it helped crystallize the importance of reproductive health as a priority area in the health sector". (National Reproductive Health Policy: Second Edition, 2003 pp vii)

Instrumental:

"This NIYCF strategy for Ghana is based on the WHO/UNICEF Global Strategy on Infant and Young Child Feeding. It has been prepared based on national needs and commitments to improve IYCF practices in line with the Global Strategy." (NIYCF Programme, 2007 pp iii)

C. MCH research projects impacts and influencing policy and programmes

The four core organizations which make up the national health research system are the NHRC, KHRC, DHRC and OCRC. Governmental departments and other agencies that also coordinate MCH research at the national level include the GHS, University of Ghana Medical School, Noguchi Memorial Institute for Medical Research (NMIMR) and the Department of Obstetrics and Gynecology, Tamale Teaching Hospital.

The institutions stated above lead scientific production which contributes to policy and programme development and implementation in the country. A total number of 216 health research projects were conducted in these research organizations between 2009 and 2011. Of these, 50 (23%) of the research projects were on MCH. From a systematic review of MCH scientific production in Ghana between 2009 and 2012, Pubmed produced 40 scientific papers on MCH, and 21 papers on MCH-equity publications. From the MASCOT Project online survey, 14 articles have been published in peer review journals. Exactly 12 scientific productions on MCH were uploaded by researchers.

Some publications have cross-cutting themes, but the main themes of the MCH production in Ghana boarders on:

i. Equity in healthcare financing
ii. Community empowerment for healthcare
iii. Quality of healthcare
iv. Equity in access to health services
v. Maternal and child health improvement

vi. Improving the health of vulnerable groups and at-risk population

1. MCH projects' characteristics

The main objective of the equity-oriented projects on access and healthcare financing were to improve equity in health care and provide risk protection to poor households under the NHIS (Jehu-Appiah et al, 2010). Some projects also aimed at assessing the feasibility and efficiency of the strategies used in identifying the poor for premium exemptions under the NHIS (Jehu-Appiah et al, 2009; Aryeetey et al, 2010). One thrust of the projects was to narrow the inequality gap between the better-off and worst-off by improving the health of the poorest and most-vulnerable.

Research projects which aimed at the improvement of MCH also had the overall objective of reducing maternal and child mortality (Bahl et al, 2012). Some projects on MCH improvement also assessed and projected the significance of community partnership and empowerment in tackling MCH inequalities (Tawiah-Agyemang et al, 2008). The intervention from these projects aimed at the community population.

MCH projects in Ghana were mainly targeted at pregnant women, newborns and children less than 5 years. Newborn and children projects were funded by WHO, DFID, Save Newborn Lives (SNL), Save the Children and the Malaria Ventures Initiative (MVI). PATH through the Bill and Melinda Gates Foundation are amongst funders of maternal health projects. From the online survey, researchers participating in at least three projects were more likely to involve high impact decision makers and programme managers in the project. A total number of 8 projects involved health decision makers and programme managers. Researchers on at least two projects had medium impact decision makers such as institutional directors and academic partners and project researchers. The main functions of the health system to which stakeholders were oriented were service delivery and financing.

The "Home management of fevers (malaria and pneumonia) in children under-five: a cluster randomized controlled trial in southern Ghana" project is based on the GHS home management of malaria strategy aimed at improving access to healthcare within 24 hours for children under-five with fever and pneumonia.

The Ghana Essential Interventions Project (GEHIP) has the objective of identifying and testing interventions to accelerate progress towards the MDG's in Ghana, such as using the CHPS and TEHIP (evidence-based approach to health planning and strengthening local governance) concepts to improve maternal and child health in urban and rural Ghana.

Reducing health gradient thrust: "To develop a feasible and sustainable community-based approach in rural Ghana to improve newborn care practices and care-seeking during pregnancy and childbirth, and by so doing improve neonatal survival" (Newborn Home Intervention Study (NEWHINTS) Project-Kintampo Health Research Center, 2009).

Improving the health of vulnerable group and at-risk population thrust:

"Evaluation of a conditional cash transfer for poor pregnant women in the Dangme West District" project. The aim is to assess the effect of transferring global social cash to poor pregnant women on the use of essential primary healthcare services (Dodowa Health Research Center, 2011).

2. Strategies and diffusion objectives

Executive summaries, policy briefs, bulletins and web pages are the commonest media platforms in Ghana where projects have been reported or intended to be published. These media platforms require succinct consideration of policy options for a particular audience, which include politicians, policy makers, health development practitioners and donors. The highest priority targets for diffusion efforts in Ghana are health programme managers and health workers. It is however unclear from the survey the closeness of health workers to policy makers or the extent to which they influence policy and programmes.

Programme managers help introduce innovation and amelioration into the implementation strategies of MCH programmes. The online survey provides a link between the work of programme managers and efforts to ensure efficient amelioration of MCH programmes. There is significant evidence that research projects provide better amelioration in the implementation of programmes in certain areas or amongst certain populations. There is also evidence that research projects provide a better understanding into MCH problems and the feasibility of MCH solutions to politicians, health development practitioners and programme managers. However, the extent to which research projects influence the objective and design of MCH policies and programmes is unclear.

Academics, advocacy groups, local health leaders and community leaders are the next largest group targeted for diffusion of research products. These stakeholders pay attention to both intellectual and logical criteria, and could play a significant role in decision making. Blogs and tweeter platforms are least patronised for health research dissemination.

Diffusion Strategies: 15 projects have been reported or are intended to be published on web pages, 13 in executive summaries, 11 in bulletins and newsletters and 9 in policy briefs. Newspaper articles, radio/television, blogs and tweeter platforms are least patronised for diffusion and dissemination of projects objectives or results. 36 projects listed in the online survey have not been reported and not intended to be published on these media platforms. Only one research had been published or was intended to be reported on a blogging platform (MASCOT Online Survey, 2012).

3. Tackling MCH inequalities

Health information, workforce, service delivery and community participation are health systems functions with the highest amelioration propositions in most research projects.

Tackling MCH inequalities: GEHIP seeks to strengthen the core pillars of the health system with particular focus on activities that improves the prevention, treatment and management of diseases towards improving maternal and child health (GEHIP Project, NHRC).

D. Pertinence of nationally and internationally produced scientific evidence in relation to the objective of tackling MCH inequalities

1. General characteristics

The 9 papers analyzed from international peer review journals are published articles related to health projects in Ghana active between 2009 and 2012. The publications are listed in the annex. The papers included 7 original research articles, 1 clinical case report and 1 short report.

Of the original research articles, 3 were related to healthcare financing. The healthcare financing papers looked at the equity aspects of Ghana's NHIS as well as the efficiency and feasibility of the strategies used by the scheme in identifying the poor for premium exemptions. The NHIS seeks to promote equity while providing risk protection to poor households. The papers therefore investigated equity in the enrolment of households into the scheme, as well as the predisposing factors and determinants (gender, marital status, education, occupation, health beliefs) which influenced enrolment (Jehu-Appiah et al, 2010; Jehu Appiah et al, 2011; Aryeetey et al, 2010).

Two of the original research paper investigated child health. One examined the quality of child birth services through the experiences and predictors of satisfaction with child birth services (Avortri et al, 2011). The other analyzed the impact of immunization on the association between poverty and child survival (Bawah et al, 2010). The research papers on maternal health looked at contraceptive use by women in Accra (Adanu et al, 2009); and factors associated with induced abortions among women in Hohoe, Ghana (Mote et al, 2010). A short report also explored contraceptive use among at-risk women in a metropolitan area in Ghana (Opoku, 2010).

A clinical case report on the efficacy of early neonatal vitamin A supplementation in reducing infant mortality in Ghana (Bahl et al, 2012) was also analyzed.

2. Dimensions of the evidence and their pertinence in relation to the country's MCH.

The papers on healthcare financing (Jehu-Appiah et al, 2010; Jehu Appiah et al, 2011; Aryeetey et al, 2010) were focused on improving the health of the poorest populations who have low access to healthcare and major financial obstacles to enrolling in Ghana's NHIS. One paper promoted more feasible, efficient and equitable strategies to identify the poor in low and high poverty incidence rural or urbanized settings (Jehu-Appiah, 2010). Another paper promoted the need for risk protection for poor households in the provision of healthcare. It assessed the determinant of demand across socio-economic groups and outlined some pre-disposing, enabling and social factors which influence enrolment in Ghana's NHIS. It steered the attention of policy makers to the complex factors which needs to be addressed in the design of interventions to stimulate enrolment (Jehu Appiah et al, 2011). The Health seeking behaviour amongst poor women is likely to increase when enrolment in the NHIS is made more feasible. The primary motivation of the paper was to inform implementation of the National Health Insurance policy of premium exemptions for poorest households (Aryeetey et al, 2010).

Two papers (Opoku, 2010; Adanu et al, 2009) explored the pattern of contraceptive use in women in Accra and at-risk women in Kumasi (who had at least three coital acts per week and at least two sexual partners in the previous three months). The papers promoted awareness of the use of contraception and also established the prevalence of contraception use in the Kumasi Metropolis. The papers also examined the predictors of

use of modern contraception amongst women and showed educational status as the most significant predictor of contraception use amongst women. It was emphasized that education should continue to be priority on the national agenda. The focus of the papers was to narrow the gaps in sexual health and reduce risk factors amongst sexually-active women in Ghana.

The paper which demonstrated the impact of immunization on the association between poverty and child survival, also expressed that childhood immunization offsets the detrimental effects of poverty and low educational attainment. The paper also commended policies which promote immunization as a strategic component of poverty-reduction programmes (Bawah et al, 2010). The paper tackles the social gradient on health by demonstrating that low-cost vaccines against preventable diseases reduce childhood mortality in all socio-economic groups.

Pertinence of MCH evidence in relation to MCH needs of Ghana

Reducing the health gradient: The adverse effects of poverty and educational attainment disappear and are reduced respectively in survival models that control for immunization status. This finding lends empirical support to policies that promote immunization as a strategic component to poverty reduction programmes (Bawah et al, 2010).

Improving the health of the poorest: There are clear differences in the determinants of enrolment in the NHIS between the rich and the poor. The predisposing factors (age, gender, education, occupation, family size, marital status, peer pressure and health beliefs etc), enabling factors (income, place of residence), need (health status) and social factors (perceptions) affect household decision to enrol and remain in the NHIS (Jehu Appiah et al, 2011).

E. MCH research utilization and impact on policy and program

The extent to which MCH research is used in the development of MCH policies and programmes to reduce inequalities in Ghana is average. More can be done in engaging policy makers especially at the facility and district levels in the design of MCH research. This will improve the adoption of research results and easy implementation at the facility and district levels.

The Government of Ghana could also dedicate funds for MCH research and health research in general, and thereby drive the research landscape into solving issues of national priority. Donors will continue to influence the research landscape in Ghana as long as they contribute over 90% of research funding.

V. Annexes

Annex 1: List of Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
ARHR	Alliance for Reproductive Health Rights
BMC's	Budget Management Centres
CHeSS	Centre for Health and Social Services
CHPS	Community-based Health and Planning Services
CSIR	Centre for Scientific and Industrial Research
DAHW	Deutche Lepra-und Tuberkulosehilfe
DFID	Department for International Development
DHMT's	District Health Management Teams
DHRC	Dodowa Health Research Centre
DSS	Demographic Surveillance System
EmONC	Emergency Obstetric and Newborn Care
EPI	Expanded Programme on Immunization
ERC	Ethical Review Committee
EU	European Union
GEHIP	Ghana Essential Health Interventions Programme
MCH	Maternal and Child Health
MDG	Millennium Development Goal
MICS	Multiple Indicator Cluster Survey
MOH	Ministry of Health
MVI	Malaria Vaccine Initiative
NEWHINTS	Newborn Home Intervention Study
NGO's	Non-Governmental Organizations
NHIS	National Health Insurance Scheme
NHRC	Navrongo Health Research Centre
NIYCFP	National Infant and Young Child Feeding Programme
NMIMR	Noguchi Memorial Institute for Medical Research
OCRC	Onchocerciasis Chemotherapy Research Centre
PATH	Programme for Appropriate Technology in Health
PDA	Personal Digital Assistant
PMTCT	Prevention of Mother to Child Transmission
PNC	Postnatal Care
PPAG	Planned Parenthood Association of Ghana

GHS	Ghana Health Service
GOG	Government of Ghana
GSS	Ghana Statistical Service
HI	Health Inequality
HIV	Human Immunodeficiency Virus
HRU	Health Research Unit
IDRC	International Development Research Centre
IMHI	Improving Management of Health Intervention
KCCR	Kumasi Centre for Collaborative Research
KHRC	Kintampo Health Research Centre
KNUST	Kwame Nkumah University of Science and Technology
MAF	MDG Accelerated Framework.
MASCOT	Multilateral Association for Studying health inequalities and enhancing north-south and south-south COoperaTion
PROGRESS	Mnemonic standing for Place of residence, Race/Ethnicity, Occupation, Gender, Religion, Education, Socio-economic status, Social capital, age and disabilities
QUALMAT	Quality of Maternal and Prenatal Care
RDD	Research and Development Division
RHSP	Reproductive Health Service Policy
SNL	Save Newborn Lives
TEHIP	Tanzania Essential Health Interventions Project
UFCHP	Under Fives Child Health Policy
UNFPA	United Nations Populations Fund
USAID	United States Agency for International Development
WHO	World Health Organization

Annex 2: References

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Annex 3: List of MCH protocols approved and cleared for implementation by the Ethics Research Committee in 2009 and research leaders.

	MCH Research Project	**Researcher(s)**
1.	Male Partner's Roles in Women's use of Emergency Contraception	Dawn S. Chin Quee
2.	Economic Burden of Malaria in Ghana: A Case of Children Under Five Years	Dr. Isaac Osei Akoto
3.	Causes of Infectious Diarrhoea Among Children Under Five Years in Accra, Ghana	Edem Binka
4.	A pilot Study to Assess the Feasibility of a Medicine in Pregnancy Registry in Ghana	Dr. Christine A. Clarke
5.	Seasonal Impact of Iron Fortification on Malaria Incidence in Ghanaian Children (protocol number RFA HD-08-028)	Dr. Seth Owusu-Agyei
6.	Endline Assessment of Reproductive and Child Health Services in Ghana	Mr. Richard Killian, Ms. Angela Bannerman, Dr. Cynthia Bannerman
7.	A Situational Assessment of Policy and Implementation of Antenatal Syphilis Screening in Ghana	Dr. Agnes Dzokoto
8.	Modified RAMOS Survey in the Sene District (rural Ghana) of the Brong Ahafo Region of Ghana to Improve Reporting of Maternal Mortality	Dr. Frank William Anderson
9.	Pregnancy Outcome in Patients with Sickle Cell	Fatou Ceesay
10.	A Trial of Intermittent Preventive Treatment with Sulfadoxine-pyrimethamine versus Intermittent Screening and Treatment of Malaria in Pregnancy	Dr. Abraham Hodgson
11.	Efficacy of Lipid-based Nutrient Supplement for Pregnant and Lactating Women and their Infants	Prof. Anna Lartey
12.	Assessment of Safety Tolerability and Therapeutic Efficacy of a Combination of Non-Arteminin-Based Combination Antimalaria drugs for possible use for IPTc in Ghanaian Children	Dr. Margaret Kweku
13.	Plasmodium-HIV Coinfection and Interaction in Pregnant Women in the Coastal Areas of Ghana	Orish Vermer Nduri
14.	Socio-cultural and Economic Factors Influencing Teenage Pregnancy in Osu-Klottey Sub-metro Area	Philip Nyinaku
15.	Efficiency of Neonatal Vitamin A Supplementation in Improving Child Survival in Rural Ghana	Dr. Sam Newton
16.	Perception of Undergraduate Students of the University of Ghana on Sexuality and Abortion Care	
17.	Assessment of Adolescent-friendly Sexual and Reproductive Health Service (AFSRHS) in a Public Facility on Ashiedu Keteke sub-Metropolitan Area	Rebecca Carl-Spencer
18.	Methods of Self-Induced Abortion: A Community Based Study in the Ga East District of Greater Accra Region	Yaoe Frederick Duah
19.	Determinants of Adolescent Pregnancy in Ashaiman Municipality	Sylvia Esinam Nutakor

Annex 4: Top 10 diseases in Ghana

	Disease
1.	Malaria
2.	All Other Diseases
3.	Acute Respiratory Infection
4.	Skin Disease and Ulcers
5.	Diarrhoea Diseases
6.	Hypertension
7.	Rheumatism and Joint Pain
8.	Intestinal Worms
9.	Anaemia
10.	Pregnancy and Pregnancy-related Infections

(2010 GHS Annual Report)

Annex 5: National health priorities as listed in Ghana's national health strategy.

Objective 1- Bridge the equity gaps in access to health care and nutrition services and ensure sustainable financing arrangements that protect the poor.

Objective 2- Improve governance and strengthen efficiency in health service delivery, including medical emergencies.

Objective 3- Improve access to quality maternal, neonatal, child and adolescent health services.

Objective 4- Intensify prevention and control of communicable and non-communicable diseases and promote healthy lifestyles.

Objective 5- Improve institutional care including mental health service delivery.

Objectives 1 and 3 are national priorities targeted to improve access to MCH services as well as reduce the burden of maternal and child mortality. The sub-objectives of 1 and 3 listed in the national strategic plan also address MCH inequalities which are specific to mothers and children in Ghana. The National Reproductive Health Policy and CHPS are amongst national policies dedicated to improve the quality of maternal and child care, and bridge equity gaps in access to essential health services. The NHIS Policy also addresses Objective 1 as it provides sustainable financing arrangement which benefit the poor through mutual health insurance schemes.

(National Health Policy)

Annex 6: Internationally-produced scientific evidence in relation to the objective of tackling MCH inequalities in Ghana.

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f. Bawah AA, Phillips JF, Adjuik M, Vaughan-Smith M, Macleod B, Binka FN. The impact of immunization on the association between poverty and child survival. Evidence from Kassena-Nankana District of northern Ghana. *Scandinavian Journal of Public Health* 2010; 38:95-103.

g. Mote CV, Otupiri E, Hindin MJ. Factors associated with induced abortion among women in Hohoe, Ghana. *African Journal of Reproductive Health* 2010; 14(4):115.

h. Adanu RMK, Seffah JD, Hill AG, Darko R, Duda RB, Anarfi JK. Contraceptive use by women in Accra, Ghana: Results from the 2003 Accra Women's' Health Survey. *African Journal of Reproductive Health* 2009; 13(1):123-133.

i. Opoku B. Contraceptive use among at-risk women in a metropolitan area in Ghana. *Acta Obstertrica et Gynecologica* 2010; 89:1105-1107.

Annex 7: CHPS Coverage

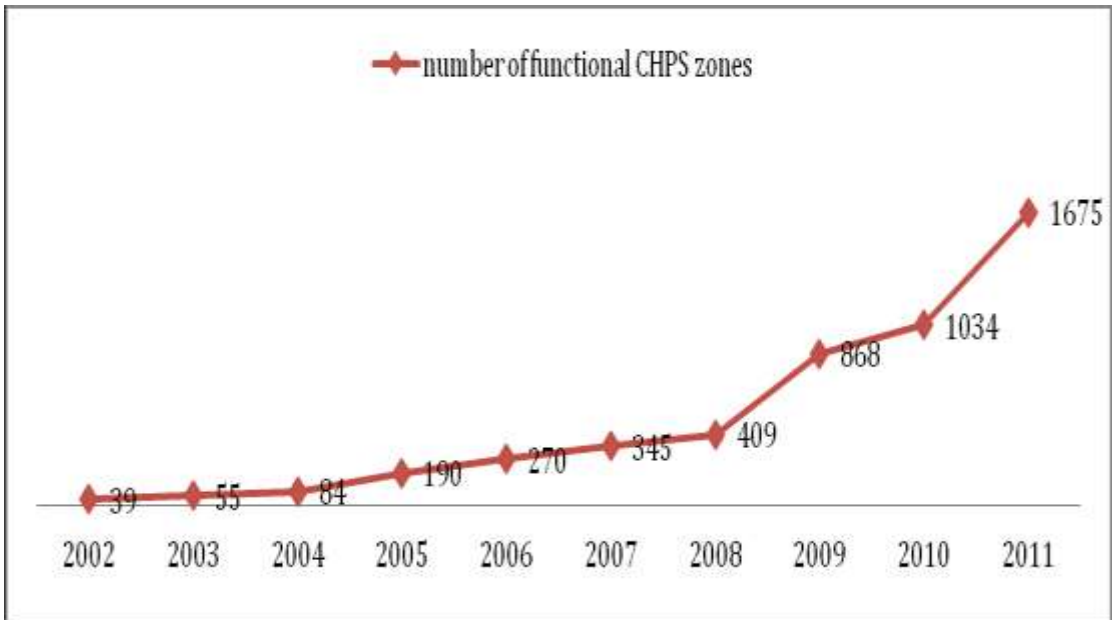
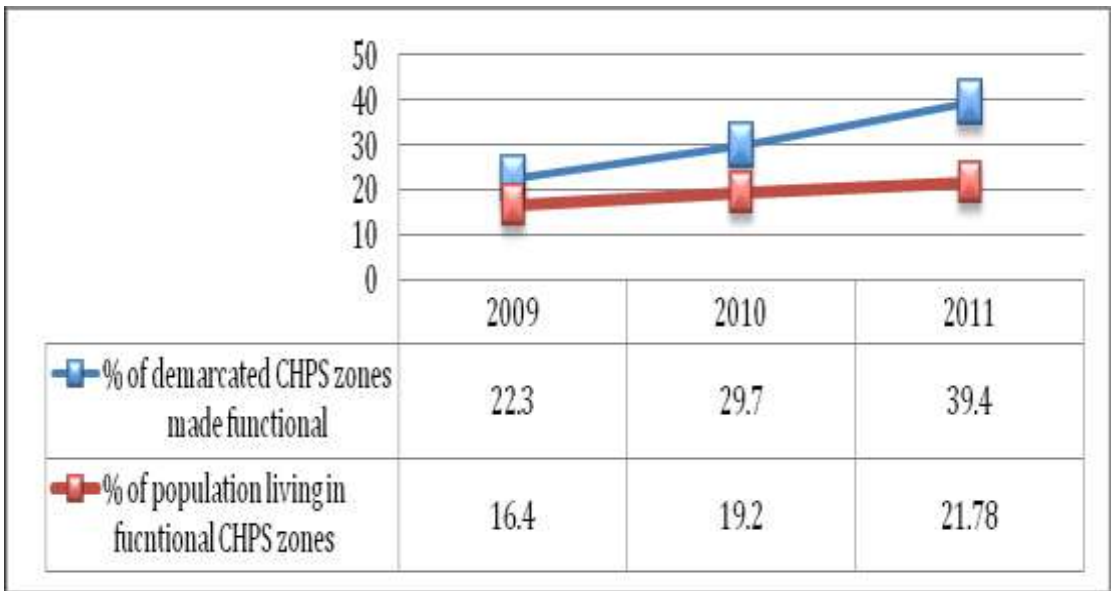


Fig 1: National Implementation of functional CHPS zones



	2009	2010	2011
% of demarcated CHPS zones made functional	22.3	29.7	39.4
% of population living in fucntional CHPS zones	16.4	19.2	21.78

Fig 2: Percentage of functional CHPS zones

Annex 8: Statistical Tables from MICS for Ghana

Table 1: Socio-demographic Characteristics of Households

Household Characteristics	Number	Percent	Total N=
Place of Residence			
Urban:	1030	29.1	3545
Rural:	2515	70.9	
Ethnicity			
Akan:	1347	38.1	3536
Ga/Dangme:	200	5.7	
Ewe:	398	11.3	
Mole-Dagbani:	1142	32.3	
Gender			
Male:	1822	51.4	3545
Female:	1723	48.6	
Religion			
Catholic	488	13.8	3545
Protestant	409	11.5	
Pentecostal/ Charismatic	947	26.7	
Muslim	809	22.8	
Traditional	460	13.0	
Spiritualist	142	4.0	
Other/No Religion	290	8.2	
Education:			
Primary	688	37.6	1829
Middle/JHS	915	50.0	
Secondary/SHS	138	7.5	
Vocational	38	2.1	
Post SHS	19	1.0	
Tertiary	30	1.6	
Wealth Quintile:			
Poorest:	1035	29.8	3468
Second:	922	26.6	
Middle	575	16.5	
Fourth	503	14.5	
Richest	433	12.50	

Table 2: Socio-economic disparities in adolescent pregnancy and unmet need for contraception in Ghana

Adolescent Pregnancy				**Unmet need for Contraception**			
Variable	Number	Percentage (%)	Total N=	Variable	Number	Percentage (%)	Total N=
Currently Pregnant				**Currently Using method to avoid pregnancy**			
Yes:	31	2.6	1199	Yes:	756	13.7	5,501
No:	1168	97.4		No:	4745	86.3	
Place				**Place**			
Urban:	9	1.7	529	Urban:	356	15.7	2263
Rural:	22	96.7	670	Rural:	400	12.4	3238
P<0.087				**P<0.000**			
Ethnicity				**Ethnicity**			
Akan:	13	2.45	531	Akan:	376	16.0	2392
Ga/Dangme:	2	2.25	89	Ga/Dangme:	73	18.6	392
Ewe:	5	3.0	169	Ewe:	84	12.7	661
Mole-Dagbani:	9	3.5	257	Mole-Dagbani:	136	10.9	1244
P<0.855				Grusi/Gruma	29	11.8	246
				Other ethnicity	57	10.6	536
Religion				**Religion**			
Catholic	5	2.4	206	Catholic	128	14.4	891
Protestant	3	1.4	218	Protestant	127	14.5	876
Pentecostal/Charismatic	10	3.6	282	Pentecostal/Charismatic	237	16.9	1402
Muslim	7	3.5	201	Seventh Day Adventist	38	29.5	129
Traditional	3	2.3	133	(SDA)	106	9.9	1067
Spiritualist	2	4.2	48	Muslim	57	9.4	608
P<0.891				Traditional	29	9.8	195
				Spiritualist	34	10.2	333
				No/Other religion			
				P<0.000			

Education:				**Education:**			
Primary	12	3.8	317	Primary	134	12.9	1036
Middle	10	1.9	522	Middle	317	17.4	1823
Secondary/SHS	0	0.0	202	Secondary/SHS	78	15.2	512
Post-Secondary	0	0.0	1	Vocational	30	22.9	131
Vocational	1	9.1	11	Post-Secondary	7	11.3	62
Tertiary	0	0.0	3	Tertiary	11	13.1	84
P<0.051				**P<0.010**			
Wealth Quintile:				**Wealth Quintile:**			
Poorest:	9	3.4	263	Poorest:	99	7.9	1251
Second:	10	4.6	219	Second:	144	12.9	1117
Middle	7	3.3	214	Middle	127	13.6	931
Fourth	5	2.3	216	Fourth	182	17.7	1027
Richest	0	0.0	287	Richest	204	17.4	1175
P<0.016				**P<0.000**			

Table 3: Disparities in antenatal and postnatal care coverage and skilled birth attendance in Ghana

Antenatal Care Coverage				**Skilled Attendant at Birth**				**Postnatal Care**					
Variable	Number	Percentage (%)	Total N=	**Variable**	Number	Percentage (%)	Total N=	**Variable**	Home		Public/Private Care		Total N=
									Number	Percentage (%)	Number	Percentage (%)	
Antenatal Care				**Skilled Attendant**									1456
Yes:	1364	94	1450	Yes:	N/A	N/A	N/A						
No:	86	6		No:					821	56.4	635	43.6	
Place				**Place**				**Place of Residence**					
Urban:	390	94.7	412	Urban:	311	82.3	378	Urban:	97	23.4	317	76.6	414
Rural:	892	85.9	1038	Professional	317	40.8	777	Rural:	724	69.5	318	30.5	1042
P<0.000				Rural:				**P<0.000**					
				P<0.000									

Ethnicity				**Ethnicity**				**Ethnicity**					
Akan	424	91.2	465	Akan	238	72.6	328	Akan	257	47.5	284	52.5	541
Guan	67	95.7	70	Guan	35	56.5	62	Ga/Dangme:	30	38.0	49	62.0	79
Ga/Dangme:	71	89.9	79	Ga/Dangme:	46	66.7	69	Ewe:	84	51.9	78	48.1	162
Ewe:	146	89.6	163	Ewe:	81	56.6	143	Mole-Dagbani:	274	67.3	133	32.7	407
Mole-Dagbani:	358	88.2	406	Mole-Dagbani:	136	41.6	327	Grusi	46	59.0	32	41.0	78
Grusi	28	87	32	Grusi/Gruma	31	45.6	68	Other ethnicity	129	70.5	54	29.5	183
Other ethnicity	154	84.6	182	Other ethnicity	56	36.8	152	**P<0.000**					
P<0.000				**P<0.000**									
Occupation				**Occupation**				**Gender**					
Professional	1282	88.4	1450	Professional	628	54.4		Male	N/A	N/A	N/A	N/A	N/A
Semi-Prof	78	5.4		Semi-Prof	162	14.0		Female					
Unqualified-Prof	4	0.3		Unqualified	328	28.4	1155	**P<0.000**					
No ANC	86	5.9		Prof	37	3.2							
				No ANC									
				P<0.000									
Religion				**Religion**				**Religion**					
Catholic	194	99.0	196	Catholic	86	58.9	146	Catholic	102	52.3	93	47.7	195
Protestant	164	96.5	170	Protestant	92	69.2	133	Protestant	76	43.9	97	56.1	173
Pentecostal	342	94	364	Pentecostal	210	69.8	301	Pente/	158	43.3	207	56.7	365
Moslem	349	98.3	355	Muslim	152	53	284	Charisma	211	58.9	147	41.1	358
Traditional	143	83	185	Traditional	36	22.8	158	Muslim	148	80.4	36	19.6	184
Spiritualist	56	94.9	59	Spiritualist	16	47.1	34	Traditional	45	75.0	15	25.0	60
No religion	86	82.4	115	No religion	31	34.1	91	Spiritualist	80	69.6	35	30.4	115
P<0.000				**P<0.000**				No religion	1	16.7	5	83.3	6
								Other religion					
								P<0.000					
Education:				**Education:**				**Education:**					
Primary	266	93.6	284	Primary	123	58.3	211	Primary	162	56.4	125	43.6	287
Middle	400	98.8	405	Middle	238	75.3	316	Middle	160	39.3	247	60.7	407
Secondary/SHS	58	96.7	60	Secondary/SHS	53	94.6	56	Secondary	11	18.3	49	81.7	60
Vocational	15	100	15	Vocational	13	92.9	14	Vocational	2	13.3	13	86.7	15
Post-sect	2	100	2	Post-sect	2	100	2	Post-Sec	0	0.0	2	100.0	2
Tertiary	12	100	12	Tertiary	10	90.91	11	Tertiary	1	8.3	11	91.7	12
P<0.261				**P<0.261**				**P<0.000**					
Wealth				**Wealth**				**Wealth**					
Quintile:	386	89.5	430	**Quintile:**				**Quintile:**			100	23.2	431
Poorest:	364	93.3	390	Poorest:	386	89.5	430	Poorest:	331	76.8	111	28.3	392
Second:	226	96.6	234	Second:	364	93.3	390	Second:	281	71.7	108	45.8	236
Middle	223	97.4	229	Middle	226	96.6	234	Middle	128	54.2	167	72.6	230
Fourth	165	98.8	167	Fourth	223	97.4	229	Fourth	63	27.4	149	89.2	167
Richest				Richest	165	98.8	167	Richest	18	10.8			
P<0.000				**P<0.000**				**P<0.000**					

Table 4: Social inequalities in child survival in Ghana

Under-5 Children Stunted						**Exclusive Breastfeeding for 6 Months**					
Variable	Height-for-age >-2		Height-for-age <-2		Total N=	**Variable**	0		1		Total N=
	Number	Percentage (%)	Number	Percentage (%)			Number	Percentage (%)	Number	Percentage (%)	
	2671	77.0	797	23.0	3468		166	43.2	218	56.8	384
Place of Residence						**Place**					
Urban:	877	86.7	135	13.3	1012	Urban:	48	39.3	74	60.7	122
Rural:	1794	73.1	662	26.9	2456	Rural:	118	45.0	144	55.0	262
P<0.000						**P<0.294**					
Ethnicity						**Ethnicity**					
Akan	1051	77.6	303	22.4	1354	Akan:	77	55.0	63	45.0	140
Ga/Dangme:	166	85.1	29	14.9	195	Ga/Dangme:	10	45.5	12	54.5	22
Ewe:	327	85.2	57	14.8	384	Ewe:	20	41.7	28	58.3	48
Mole-Dagbani:	699	73.1	257	26.9	956	Mole-Dagbani:	26	27.7	68	72.3	94
Grusi	126	77.3	37	22.7	163	Other ethnicity:	166	43.2	218	56.8	384
Other ethnicity	295	72.5	112	27.5	407	**P<0.001**					
P<0.000											
Gender						**Gender**					
Male	1354	76.0	427	24	1781	Male	90	45.7	107	54.3	197
Female	1317	78.0	370	22	1687	Female	76	40.6	111	59.4	187
P<0.000						**P<0.319**					
Religion						**Religion**					
Catholic	368	77.3	108	22.7	476	Catholic	24	42.9	32	57.1	56
Protestant	327	81.1	76	18.9	403	Protestant	24	53.3	21	46.7	45
Pentecost/Charisma	747	80.4	182	19.6	929	Pentecost/Charisma	49	44.1	62	55.9	111
Muslim	607	76.7	184	23.3	791	Muslim	30	32.6	62	67.4	92
Traditional	303	67.3	147	32.7	450	Traditional	16	48.5	17	51.5	33
Spiritualist	101	72.7	38	27.3	139	Spiritualist	7	50.0	7	50.0	14
No religion	209	77.4	61	22.6	270	No religion	15	46.9	17	53.1	32
Other religion	9	90.0	1	10.0	10	Other religion	1	100.0	0	0	1
P<0.000						**P<0.317**					

Education:						**Education:**					
Preschool	4	80.0	1	20.0	5	Preschool	0	0.0	1	100.0	1
Primary	534	79.5	138	20.5	672	Primary	31	43.1	41	56.9	72
Middle	734	81.4	168	18.6	902	Middle	58	47.9	63	52.1	121
Secondary/SHS	117	87.3	17	12.7	134	Secondary/SHS	10	58.8	7	41.2	17
Vocational	36	94.7	2	5.3	38	Vocational	3	60.0	2	40.0	5
Post-Sec	16	94.1	1	5.9	17	Tertiary	2	50.0	2	50.0	4
Tertiary	27	96.4	1	3.6	28	**P<0.749**					
P<0.000											
Wealth Quintile:						**Wealth Quintile:**					
Poorest:	735	71.0	300	29.0	1035	Poorest:					
Second:	658	71.4	264	28.6	922	Second:	38	39.2	59	60.8	97
Middle	450	78.3	125	21.7	575	Middle	57	47.9	62	52.1	119
Fourth	426	84.7	77	15.3	503	Fourth	22	40.7	32	59.3	54
Richest	402	92.8	31	7.2	433	Richest	31	47.7	34	52.3	65
P<0.000						**P<0.523**	18	36.7	31	63.3	49

DTP3 Vaccination						**Antibiotic Treatment for Pneumonia**					
Variable	No		IM16=3 IM15=1		Total N=	**Variable**	0		1		Total N=
	Number	Percentage (%)	Number	Percentage (%)			Number	Percentage (%)	Number	Percentage (%)	
	30	49.2	31	50.8	61		128	68.4	59	31.6	187
Place of Residence						**Place of Residence**					
Urban:	10	34.5	19	65.5	29	Urban:	26	72.2	10	27.8	36
Rural:	20	62.5	12	37.5	32	Rural:	102	67.6	49	32.4	151
P<0.029						**P<0.588**					
Ethnicity						**Ethnicity**					
Akan:	12	42.9	16	57.1	28	Akan:	31	62.0	19	38.0	50
Ga/Dangme:	1	20.0	4	80.0	5	Ga/Dangme:	12	92.3	1	7.7	13
Ewe:	5	71.4	2	28.6	7	Ewe:	20	76.9	6	23.1	26
Mole-Dagbani:	4	36.4	7	63.6	11	Mole-Dagbani:	43	75.4	14	24.6	57
Other ethnicity:	8	80.0	2	20.0	10	Other ethnicity:	22	55.0	18	45.0	40
P<0.036						**P<0.057**					

Gender						**Gender**					
Male	18	52.9	16	47.1	34	Male	62	67.4	30	32.6	92
Female	12	44.4	15	55.6	27	Female	66	69.5	29	30.5	95
P<0.510						**P<0.759**					
Religion						**Religion**					
Catholic	3	33.3	6	66.7	9	Catholic	16	66.7	8	33.3	24
Protestant	6	60.0	4	40.0	10	Protestant	10	62.5	6	37.5	16
Pentecostal/Charis	9	42.9	12	57.4	21	Pentecostal/Charis	32	68.1	15	31.9	47
matic	7	63.6	4	36.4	11	matic	32	76.2	10	23.8	42
Muslim	4	66.7	2	33.3	6	Muslim	15	55.6	12	44.4	27
Traditional	1	25.0	3	75.0	4	Traditional	8	80.0	2	20.0	10
Spiritualist						Spiritualist	15	71.4	6	28.6	21
P<0.726						No Religion					
						P<0.496					
Education:						**Education:**					
Preschool	0	0.0	1	100.0	1	Primary	26	57.8	19	42.2	45
Primary	4	28.6	10	71.4	14	Middle	29	69.1	13	30.9	42
Middle	10	50.0	10	50.0	20	Secondary/SHS	2	100.0	0	0.0	2
Secondary/SHS	1	33.3	2	66.7	3	Tertiary	1	50.0	1	50.0	2
P<0.508						**P<0.474**					
Wealth Quintile:						**Wealth Quintile:**					
Poorest:	7	77.8	2	22.2	9	Poorest:	48	67.6	23	32.4	71
Second:	8	57.1	6	42.9	14	Second:	42	72.4	16	27.6	58
Middle	4	28.6	10	71.4	14	Middle	21	65.6	11	34.4	32
Fourth	6	54.6	5	45.4	11	Fourth	9	60.0	6	40.0	15
Richest	5	38.5	8	61.5	13	Richest	8	72.7	3	27.3	11
P<0.171						**P<0.886**					

Table 5: Summary of Inequalities across different PROGRESS Categories

Population group	**Adolescent pregnancy** (%)	**Unmet need for contraception** (%)	**Antenatal Care Coverage** (%)	**Skilled attendant at birth** (%)	**Postnatal care for mothers and babies** (%)	**Children under five who are stunted** (%)	**Exclusive breastfeeding for 6 months** (%)	**DTP3 vaccine. (12 – 23 months of age)** (%)	**Antibiotic Treatment for Pneumonia** (%)
Place of residence								65.5	27.8
Rural	96.7	12.4	85.9 94.7	40.8	69.5	26.9	55.0	37.5	32.4
Urban	1.7	15.7		82.3	23.4	13.3	60.7		
Ethnicity									
Akan	2.45	16.0	91.2	72.6	47.5	22.4	45.0	57.1	38.0
Guan	-	-	95.7	56.5	-	14.9	-	-	-
Ga/Dangme	2.25	18.6	89.9	66.7	38.0	14.8	54.5	80.0	7.7
Ewe	3.0	12.7	89.6	56.6	51.9	26.9	58.3	28.6	23.1
Mole-Dagbani	3.5	10.9	88.2	41.6	67.3	22.7	72.3	63.6	24.6
Grusi/Gruma	-	11.8	87	45.6	59.0	27.5	56.8	20.0	45.0
Other ethnicity	-	10.6	84.6	36.8	70.5				
Occupation									
Professional			88.4	54.4					
Semi-Prof			5.4	14.0					
Unqualified-Prof			0.3	28.4					
No ANC			5.9	3.2					
Gender									
Male						24	54.3	47.1	32.6
Female						22	59.4	55.6	30.5
Maternal education level									
Primary	3.8	12.9	93.6	58.3	56.4	20.5	100.0	71.4	42.2
Middle	1.9	17.4	98.8	75.3	39.3	18.6	56.9	50.0	30.9
Secondary/SHS	0.0	15.2	96.7	94.6	18.3	12.7	52.1	66.7	0.0
Post-Secondary	0.0	22.9	100	92.9	13.3	5.3	41.2	-	-
Vocational	9.1	11.3	100	100	0.0	5.9	40.0	-	-
Tertiary	0.0	13.1	100	90.9	8.3	3.6	50.0	-	50.0
Religion									
Catholic	2.4	14.4	99.0	58.9	52.3	22.7	57.1	66.7	33.3
Protestant	1.4	14.5	96.5	69.2	43.9	18.9	46.7	40.0	37.5
Pentecostal/Charismatic	3.6	16.9	94	69.8	43.3	19.6	55.9	57.4	31.9
Seventh Day Adventist	-	29.5	-	-	58.9	23.3	67.4	-	23.8
Muslim	3.5	9.9	98.3	53	80.4	32.7	51.5	36.4	44.4
Traditional	2.3	9.4	83	22.8	75.0	27.3	50.0	33.3	20.0
Spiritualist	4.2	9.8	94.9	47.1	69.6	32.6	53.1	75.0	28.6
No/Other religion	-	10.2	82.4	34.1	16.7				
Socio-economic status									
Poorest:	9	9	386	89.5	76.8	29.0	60.8	22.2	32.4
Second:	10	10	364	93.3	71.7	28.6	52.1	42.9	27.6
Middle	7	7	226	96.6	54.2	21.7	59.3	71.4	34.4
Fourth	5	5	223	97.4	27.4	15.3	52.3	45.4	40.0
Richest	0	0	165	98.8	10.8	7.2	63.3	61.5	27.3

Table 6: MCH indicators: P-values and Odds Ratios

	Adolescent Pregnancy		Met Need for Contraception		Antenatal Care		Skilled Attendant at Birth		Postnatal Care		Under Five Stunting		Excusive Breastfeeding for Six Months		DTP3 Vaccination		Antibiotic for Pneumonia Treatment	
	OR	P-value	OR	P-value	OR	P-value	OR	P-value	OR	P-value	OR	P-value	OR	P-value	OR	P-value	OR	P-value
Place																		
Urban:	1.000		1.000		1.000		1.000		1.000		1.000		1.000		1.000		1.000	
Rural:	1.962	0.087	0.755	12.82	0.345	0.000	15.656	0.000	7.440		2.397		0.792	0.295	0.316	0.302	1.249	0.589
Ethnicity																		
Akan	1.000		1.000		1.000		1.000		1.000		1.000		1.000		1.000			
Guan	1.562	0.564	0.722	0.094	2.159	0.199	2.160	0.199	1.050	0.848	0.829	0.357	3.130	0.111		0.169	2.437	0.354
Ga/Dangme:	0.916	0.909	1.187	0.229	0.598	0.154	0.598	0.154	0.681	0.122	0.592	0.013	2.348	0.258	2.333	0.535	0.406	0.454
Ewe:	1.214	0.719	0.755	0.031	0.830	0.541	0.830	0.541	1.198	0.323	0.591	0.001	1.643	0.224	0.467	0.456	0.975	0.973
Mole-Dagbani:	1.489	0.388	0.637	0.000	0.721	0.144	0.721	0.144	2.291	0.000	1.247	0.029	3.522	0.045	0.000	0.149	1.393	0.716
Grusi/Gruma	1.138	0.903	0.828	0.457	0.345	0.016	0.345	0.016	1.186	0.645	1.171	0.565						
Other ethnicity	0.379	0.336	0.617	0.001	0.379	0.000	0.379	0.000	2.657	0.000	1.287	0.535	1.671	0.158	0.292	0.202	2.659	0.131
Gender																		
Male	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.000		1.000		1.000		1.000	
Female											0.891	0.153	1.228	0.99	1.406	0.513	0.908	0.760
Religion																		
Catholic	1.000		1.000		1.000		1.000		1.000		1.000		1.000				1.000	
Protestant	0.561	0.427	1.011	0.937	0.484	0.074	0.484	0.074	0.714	0.109	0.792	0.165	0.656	0.297			1.200	0.789
Pentecostal	1.478	0.480	1.228	0.087	0.575	0.144	0.575	0.144	0.740	0.099	0.822	0.164	0.982	0.958			0.714	0.556
Muslim	1.451	0.529	0.658	0.003	0.506	0.064	0.508	0.000	1.309	0.133	1.033	0.815	1.550	0.211			0.625	0.407
Traditional	0.928	0.919	0.617	0.004	0.183	0.000	0.183	0.064	3.748	0.000	1.653	0.000	0.797	0.608			1.600	0.422
Spiritualist	1.748	0.508	1.041	0.856	0.739	0.621	0.739	0.000	2.735	0.002	1.282	0.258	0.750	0.633			0.500	0.444
No religion	0.628	0.672	0.648	0.039	0.152	0.000	0.152	0.571	2.084	0.003	0.995	0.976	0.850	0.717			0.800	0.734
Other	0.000	0.753	1.277	0.703		0.571			0.182	0.086	0.379	0.342	0.000	0.258				
Education:																		
Pre-School											1.000							
Primary	1.000		1.000		1.000				1.000		1.034	0.976	0.000	0.390			1.000	
Middle	0.496	0.101	1.417	0.002	1.729	0.052	1.000	0.052	0.499	0.000	0.916	0.937	0.000	0.341	0.000	0.547	0.613	0.279
Secondary/SHS	0.000	0.005	1.209	0.216	2.161	0.208	1.729	0.207	0.173	0.000	0.581	0.634	0.000	0.264	0.000	0.340	0.000	0.239
Vocational	2.542	0.376	1.999	0.002		0.194	2.161	0.194	0.118	0.001	0.222	0.230	0.000	0.317	0.000	0.564		
Post-sect	0.000	0.843	0.857	0.707		0.634		0.634	0.000	0.109	0.250	0.346						
Tertiary	0.000	0.779	1.014	0.966		0.245		0.245	0.070	0.001	0.148	0.163	0.000	0.414			1.368	0.829
Other			0.000	0.505														
Wealth Quintile:																		
Poorest:																		
Second:	1.000		1.000	0.000	1.000		1.000		1.000		1.000		1.000		1.000		1.000	
Middle	1.350	0.521	1.722	0.000	1.033	0.866	1.033	0.866	0.765	0.094	0.983	0.864	0.701	0.199	2.625	0.321	0.795	0.556
Fourth	0.954	0.928	1.838	0.000	1.440	0.133	1.440	0.133	0.358	0.000	0.681	0.002	0.937	0.851	8.750	0.024	1.093	0.844
Richest	0.669	0.475	2.506	0.000	3.723	0.000	3.723	0.000	0.114	0.000	0.443	0.000	0.706	0.284	2.917	0.291	1.391	0.574
	0.000	0.002	2.445	0.000	15.497	0.000	15.497	0.000	0.036	0.000	0.189	0.000	1.109	0.775	5.600	0.752	0.783	0.736