

# WORLD HEALTH & POPULATION

[www.worldhealthandpopulation.com](http://www.worldhealthandpopulation.com)

VOLUME 15 • NUMBER 1 • 2014

Urbanization and Health in Developing Countries: A Systematic Review

Sustainability of Cancer Registration in the Kilimanjaro Region of Tanzania –  
A Qualitative Assessment

Comparative Analysis and Evaluation of the Effectiveness of Demographic Policies in  
EU Countries (2009-2010)

Awareness of Anti-Malarial Policy and Use of Artemisinin-Based Combination Therapy  
for Malaria Treatment in Communities of Two Selected Local Government Areas  
of Ogun State, Nigeria





**FROM THE EDITOR-IN-CHIEF** John Paul

3

**FROM THE PUBLISHER** Anton Hart

5

**ORIGINAL RESEARCH**



6

**Urbanization and Health in Developing Countries: A Systematic Review**

Sophie Eckert and Stefan Kohler



20

**Sustainability of Cancer Registration in the Kilimanjaro Region of Tanzania –  
A Qualitative Assessment**

Leah L. Zullig, Sky B. Vanderburg, Charles Muiruri, Bryan J. Weiner and John Bartlett



30

**Comparative Analysis and Evaluation of the Effectiveness of Demographic Policies in EU Countries  
(2009-2010)**

George Pierrakos, Dionyssi Balourdos, Sotiris Soulis, Markos Sarris, John Pateras,  
Panagiotis Skolarikos and Athanasios Farfaras



44

**Awareness of Anti-Malarial Policy and Use of Artemisinin-Based Combination Therapy for Malaria  
Treatment in Communities of Two Selected Local Government Areas of Ogun State, Nigeria**

Adeniyi K. Adeneye, Ayodele S. Jegede, Margaret A. Mafe and Ezeunwa E. Nwokocha



# WORLD HEALTH & POPULATION

Founded and edited by members of the Department of Health Policy and Administration,  
School of Public Health, University of North Carolina at Chapel Hill.

## HOW TO REACH THE EDITORS AND PUBLISHER

Telephone: 416-864-9667 Fax: 416-368-4443

## ADDRESSES

All mail should go to: Longwoods Publishing Corporation,  
260 Adelaide Street East, No. 8, Toronto, Ontario M5A  
1N1, Canada.

For deliveries to our studio: 54 Berkeley St., Suite 305,  
Toronto, Ontario M5A 2W4, Canada

## SUBSCRIPTIONS

Individual subscription rates for one year are [C] \$63 for  
online only. Institutional subscription rates are [C] \$265  
for online only.

For subscriptions contact Barbara Marshall at telephone  
416-864-9667, ext. 100 or by e-mail at [bmarshall@longwoods.com](mailto:bmarshall@longwoods.com).

Subscriptions must be paid in advance. An additional  
HST/GST is payable on all Canadian transactions.  
Rates outside of Canada are in US dollars. Our HST/GST  
number is R138513668.

## SUBSCRIBE ONLINE

Go to [www.worldhealthandpopulation.com](http://www.worldhealthandpopulation.com) and click on  
"Subscribe."

## FREE ONLINE ACCESS FOR DEVELOPING COUNTRIES

The online version of the journal *World Health & Population*  
is available for free to individuals and organizations from  
developing nations whose mission involves education  
and / or health. For more information and to see if your  
country is eligible go to [http://www.longwoods.com/  
pages/developing-countries](http://www.longwoods.com/pages/developing-countries).

## EDITORIAL

To submit material or talk to our editors please contact  
Ania Bogacka at 416-864-9667, ext. 108 or by e-mail  
at [abogacka@longwoods.com](mailto:abogacka@longwoods.com). Author guidelines are  
available online at [http://www.longwoods.com/pages/  
wh-for-authors](http://www.longwoods.com/pages/wh-for-authors).

## ADVERTISING

For advertising rates and inquiries, please contact  
Matthew Hart at 416-864-9667, ext. 113 or by e-mail at  
[mhart@longwoods.com](mailto:mhart@longwoods.com).

## PUBLISHING

To discuss supplements or other publishing issues  
contact Rebecca Hart at 416-864-9667, ext. 114 or by  
e-mail at [rhart@longwoods.com](mailto:rhart@longwoods.com).

World Health & Population is published four times per year by  
Longwoods Publishing Corp., 260 Adelaide St. East, No. 8, Toronto,  
ON M5A 1N1, Canada. Information contained in this publication has  
been compiled from sources believed to be reliable. While every  
effort has been made to ensure accuracy and completeness, these  
are not guaranteed. The views and opinions expressed are those of  
the individual contributors and do not necessarily represent an official  
opinion of World Health & Population or Longwoods Publishing  
Corporation. Readers are urged to consult their professional  
advisers prior to acting on the basis of material in this journal.

World Health & Population is indexed in the following:  
CAB Abstracts, Global Health, MEDLINE/Pubmed, Ulrich's (CSA),  
IndexCopernicus and Scopus, ProQuest, Ebsco Discovery Service  
and is a partner of HINARI.

## EDITOR IN CHIEF

**John E. Paul**, PhD  
University of North Carolina at Chapel Hill

## ASSOCIATE EDITORS

**Amir A. Khaliq**, PhD, MBBS, MSHS, MSc.  
Associate Professor, Department of Health  
Administration  
& Policy, Health Sciences Center, College of Public  
Health, University of Oklahoma

**Michel Landry**, BScPT, PhD  
Chief, Doctor of Physical Therapy Division,  
Dept. of Community and Family Medicine, Duke  
University

**Lutchmie Narine**, PhD  
Associate Professor, Department of Public Health, Food  
Studies and Nutrition, Syracuse University

## EDITORIAL ADVISORY BOARD

**Peggy Leatt**, PhD (Chair Editorial Advisory Board)  
Professor and Chair, Department of Health Policy  
and Administration Associate Dean for Academic Affairs,  
School of Public Health, University of North Carolina at  
Chapel Hill, Chapel Hill, NC

**Sagar C. Jain**, PhD  
Founding Editor-in-Chief, Journal of Health and  
Population in Developing Countries, Professor Emeritus,  
Department of Health Policy and Administration, School  
of Public Health, University of North Carolina at Chapel  
Hill, Chapel Hill, NC

**Karen B. Allen**, MA, MSc, PhD  
Regional Programme Planning Officer, UNICEF Eastern  
and Southern Africa Regional Office (ESARO), Nairobi,  
Kenya

**François Béland**, PhD  
Professeur titulaire, Faculté de Médecine, Université de  
Montréal, Montreal, QC

**Margaret Bentley**, PhD  
Associate Dean for Global Health, School of Public  
Health, University of North Carolina at Chapel Hill,  
Chapel Hill, NC

**Adalsteinn Brown**, DPhil  
Chair, Department of Public Health Policy, Dalla Lana  
School of Public Health, University of Toronto, Toronto,  
ON

**Francois Champagne**, PhD  
Professeur titulaire, Administration de la santé et GRIS,  
Université de Montréal, Montreal, QC

**Wen Chen**, PhD, MD  
Professor of Health Economics, Associate Dean, School  
of Public Health, Fudan University, Shanghai, China

**Arun Chockalingam**, MS, PhD, FACC  
Director, Office of Global Health, National Heart Lung  
and Blood Institute, National Institutes of Health,  
Bethesda, MD

**Jean-Louis Denis**, PhD  
Professeur titulaire, Faculté de Médecine, Université de  
Montréal, Montreal, QC

**William H. Dow**, PhD  
Associate Professor of Health Economics, University of  
California, Berkeley, School of Public Health, Berkeley, CA

**Bruce J. Fried**, PhD  
Associate Professor and Chair, Global Health Committee,  
Department of Health Policy and Administration,  
University of North Carolina at Chapel Hill, Chapel Hill,  
NC

**Daniel L. Goetz**, MS  
Senior Public Administration Specialist, International  
Development Group, RTI International, Research Triangle  
Park, NC

## Dean M. Harris, JD

Clinical Associate Professor, Department of Health Policy  
and Administration, University of North Carolina at  
Chapel Hill, Chapel Hill, NC

**Amir A. Khaliq**, PhD, MBBS, MSHS, MSc.  
Associate Professor, Department of Health  
Administration & Policy, Health Sciences Center,  
College of Public Health, University of Oklahoma

**Ambika Krishnakumar**, PhD  
Associate Professor, College of Human Services and  
Health Professions, Syracuse University, Syracuse, NY

**Sandra G. Leggat**, PhD  
School of Public Health, La Trobe University, Bundoora,  
Victoria, Australia

**Lutchmie Narine**, PhD  
Associate Professor, Department of Public Health,  
Food Studies and Nutrition, Syracuse University

**Bernardo Ramirez**, MD  
Vice President, INTECH, Celebration, FL

**Amal C. Sjaaf**, MD, DrPH  
Professor, Department of Health Policy and  
Administration, School of Public Health,  
University of Indonesia,  
Jakarta, Indonesia

**Abdul Sattar Yoosuf**, DrPH  
Director, Sustainable Development and Healthy  
Environments, World Health Organization, South East  
Asian Regional Office (SEARO), New Delhi, India

**David Zakus**, BSc, MES, MSc, PhD  
Director, Centre for International Health, Faculty of  
Medicine, University of Toronto President, Global Health  
Education Consortium, Toronto, ON

## EDITORIAL DIRECTOR

**Dianne Foster-Kent**  
E-mail: [dkent@longwoods.com](mailto:dkent@longwoods.com)

## MANAGING EDITOR

**Ania Bogacka**  
E-mail: [abogacka@longwoods.com](mailto:abogacka@longwoods.com)

## COPY EDITOR

**Gerry Jenkison**

## PUBLISHER

**W. Anton Hart**  
E-mail: [ahart@longwoods.com](mailto:ahart@longwoods.com)

## ASSOCIATE PUBLISHERS

**Rebecca Hart**  
E-mail: [rhart@longwoods.com](mailto:rhart@longwoods.com)

**Susan Hale**  
E-mail: [shale@longwoods.com](mailto:shale@longwoods.com)

**Matthew Hart**  
E-mail: [mhart@longwoods.com](mailto:mhart@longwoods.com)

## ASSOCIATE PUBLISHER/ADMINISTRATION

**Barbara Marshall**  
E-mail: [bmarshall@longwoods.com](mailto:bmarshall@longwoods.com)

## DESIGN AND PRODUCTION

**Benedict Harris**  
E-mail: [bharris@longwoods.com](mailto:bharris@longwoods.com)

No liability for this journal's content shall be incurred  
by Longwoods Publishing Corporation, the editors,  
the editorial advisory board or any contributors.  
ISSN No. 1718-3340  
eISSN No. 1929-6541

Publications Mail Agreement No. 40069375

© January 2014

## From the Editor-in-Chief

**T**his issue of *World Health & Population* has four original papers that should be of interest to our readers – two reviews using secondary data and two articles based on research-specific survey data collection. The papers have all been published online by *WHP* during the last quarter and are selected here as representative of recent outstanding contributions to the journal.

The first paper in this issue is by Sophie Eckert and Stefan Kohler, presenting a systematic review of urbanization and health in developing countries. This is an incredibly important topic, being addressed widely, and in particular in this journal through a series of past submissions on the impact on health of rural–urban migration in China<sup>1</sup>. Eckhart and Kohler analyzed data from 11 sentinel studies over the last 10 years and saw numerous counterbalancing effects on health from the rural–urban exodus; for example, among children, a lower risk of undernutrition but a higher risk of overweight. Further, risk factors for chronic disease were generally more prevalent in urban than in rural areas. Given that future population growth in developing countries will take place in predominately urban settings, and the particular challenges of chronic diseases, it is important that planners address the necessary policy shift from the traditional developing country focus on acute diseases to the area of increasingly prevalent chronic diseases.

“Sustainability of Cancer Registration in the Kilimanjaro Region of Tanzania” by Leah Zullig et al. is a qualitative assessment of an initiative from the Duke Global Health Institute and the Kilimanjaro Christian Medical Centre (KCMC). Disease registries are critical for long-term understanding of disease process and the development and dissemination of best practices and clinical guidelines. Registries for chronic diseases in low- and middle-income countries are a relatively new and promising development, but they pose significant challenges not only in establishing but also in institutionalizing (“sustaining”) them over the long haul. Zullig and colleagues conducted qualitative semi-structured interviews with clinicians and administrators at KCMC to assess the implementation of cancer registries in the context of an organizational change model. They identify a series of steps that need to be considered in maintaining any change effort of this magnitude.

In our third paper, George Pierrakos et al. perform a comparative analysis of demographic trends and policy implications in member countries of the European Union (EU). Through regression analysis of OECD and EU data, the authors identify critical factors impacting population policies. The EU is being demographically transformed by critical factors of (1) increasing life expectancy, (2) immigration, and (3) total fertility rates well below replacement levels. Population policy needs to address these issues from a holistic stance, while the potential demographic impact of other, seemingly unrelated policies, also needs to be evaluated.

Awareness and use of advanced therapy for malaria in two areas of Nigeria is the subject of the final paper in this issue. Adeniyi Adeneye, Ayodele Jegede and colleagues conducted in-person surveys of over 500 pregnant women and mothers of small children to assess their knowledge and use of the current recommended treatment for malaria in sub-Saharan Africa, artemisinin-based combination therapy (ACT). Interestingly, it is the affected population, not healthcare providers, that make the decision regarding choice of malaria treatment in most sub-Saharan countries, so the perception and priorities of the “end consumer” are critically important. ACT is clearly the treatment of choice for malaria in these settings (resistance or lack of efficacy rule out the others); however, awareness and cost are barriers. The Roll Back Malaria partnership is striving to overcome these barriers through education and improving drug availability and affordability.

In conclusion, we hope that you find the papers in this issue interesting and worthwhile, and that you will also consult others recently released online at [www.worldhealthandpopulation.com](http://www.worldhealthandpopulation.com). WHP is committed to a mission of providing a forum for researchers and policy makers worldwide to publish and disseminate health- and population-related research, and to encourage applied research and policy analysis from diverse global and resource-constrained settings. The editors and publishers of WHP look forward to continued enthusiastic submission of manuscripts for consideration, peer review and publication. Please feel free to contact us with comments or suggestions you might have on the papers, or about the journal and our mission.

This is my last “From the Editor” column for WHP, as I am stepping down after eight and a half years as Editor-in-Chief. My successor is Dr. Judith Shamian, RN, PhD and President of the International Council of Nurses. Dr. Shamian will bring new prestige, ideas and leadership to raise WHP to the next level, and I very much look forward to watching the progress. I would also like to take this opportunity to recognize and thank my long-term colleagues and co-editors, Amir Khaliq, Mike Landry and Lutchmie Narine, as well as the chair of the WHP Editorial Advisory Board, Peggy Leatt, and all the members of the WHP EAB. At Longwoods, Ania Bogacka, my expert and patient Managing Editor, provided critical guidance and support. Recognition should also go to the Longwoods Editorial Director, Dianne Foster Kent, and the Publisher, Anton Hart. This journal would not happen without the competent and dedicated involvement of all these (and many more!) individuals. Thank you.

As my final comment, I would like to acknowledge the founder of the predecessor journal to WHP, Dr. Sagar C. Jain, Professor Emeritus at the University of North Carolina at Chapel Hill. Dr. Jain initiated the *Journal of Health and Population in Developing Countries* in 1998. *World Health & Population* followed in 2005 and would not exist today, and certainly would not have thrived, without his foundational work. Dr. Jain has been my professor, mentor and a great supporter throughout my career, and I am very appreciative. Thank you Dr. Jain.

**John E. Paul, PhD MSPH**  
Editor-in-Chief,  
World Health & Population  
[paulj@email.unc.edu](mailto:paulj@email.unc.edu)

1. See, for example, Li, X., B. Stanton, X. Fang and D. Lin. 2006. “Social Stigma and Mental Health among Rural-to-Urban Migrants in China: A Conceptual Framework and Future Research Needs.” *World Health & Population* 8(3): 14–31. Retrieved February 1, 2014. <<http://www.longwoods.com/content/18282>>.

## Note from the Publisher

### In Appreciation and Anticipation

Welcoming our new editor-in-chief, Dr. Judith Shamian, also gives us an opportunity to reflect on the past and pay tribute to the people who made *World Health & Population* a viable and vital publication.

Our predecessor publication, the *Journal of Health and Population in Developing Countries*, was established in 1998 by Dr. Sagar C. Jain, Professor Emeritus at the University of North Carolina at Chapel Hill (UNC). By 2005 Dr. Jain had retired, and Longwoods was given the opportunity to continue the publication. Fortunately, UNC's Dr. John E. Paul took up the editorial challenge, and nine years later WHP is still a vibrant journal. I thank John for bringing us a strong commitment and a valuable network of authors and editors. Niche journals are typically the work of few, serve a narrow and essential market, and do so without the benefit of many administrative resources. You and your associates have been remarkable in providing important ideas, authors, policies, practices and reviews covering health and healthcare in developing countries. Thank you. We will honour your footprint with a new editor-in-chief and so continue this reviewed and indexed publication in its important role of serving developing countries – everywhere.

Under Dr. Judith Shamian's guidance, *WHP* will be well served. She has a global reputation as both a thinker and leader. She has been the president of the International Council of Nurses since May 2013 and will continue in this role until 2017.

Dr. Shamian is the former president and CEO of the Victorian Order of Nurses and past president of the Canadian Nurses Association. She is a professor at the Lawrence S. Bloomberg Faculty of Nursing at the University of Toronto, a co-investigator with the Nursing Health Services Research Unit, and was executive director of the Canadian government's Office of Nursing Policy for five years. In addition to her extensive international work, she was vice president of Nursing at Mount Sinai Hospital in Toronto and has held various academic positions since 1989.

Dr. Shamian has published and spoken extensively and globally on a wide range of topics. Government departments and agencies and academic bodies, including the World Health Organization (WHO), call on her to speak and consult on many issues related to nursing, health human resources, leadership and healthcare policy.

She was recently elected president of the International Council of Nurses. Her commitment is a focus on healthcare solutions, optimizing the use of evidence and expertise to convince governments and others to improve healthcare policy.

Dr. Shamian has worked in Botswana on an International Development Research Centre-funded research project. The University of Botswana now has numerous PhD-prepared faculty members and offers graduate education. She also established the first WHO Collaborating Centre for Leadership Development in a hospital environment.

She has been a consultant on projects in Israel, China, Barbados, the British Virgin Islands, Poland, Hungary and the United States. She has contributed to many expert panels, including several for the WHO.

### Education and Awards

Dr. Shamian obtained her PhD from Case Western Reserve, Cleveland, Ohio; her Master's in Public Health from New York University, and her Baccalaureate in Community Nursing from Concordia University in Montreal. She was awarded the Ross Award for Nursing Leadership in 1995, the Golden Jubilee Medal in 2002 by the Governor General of Canada, and the Award of Merit by the CNA and the Canadian Federation of Nurses Unions in 2004. She is the recipient of two honorary doctorate degrees, one from the University of Lethbridge, Alberta, in 2005 and one

from Ryerson University, Toronto, in 2006. She has been acknowledged as one of Canada's most powerful women by the national Women's Executive Network. For more on Dr. Shamian I recommend you visit [http://en.wikipedia.org/wiki/Judith\\_Shamian](http://en.wikipedia.org/wiki/Judith_Shamian).

We welcome Judith and look forward to a vigorous, constructive and important contribution to WHP. I know that the journal will be well served.

**W. Anton Hart**

Publisher,  
Longwoods Publishing Corporation  
ahart@longwoods.com

## Thank you to our reviewers:

---

**Aasif Khakoo**

**Ahmad Al-Nawafleh**

**Alok Ranjan Chaurasia**

**Andrew Holt**

**Anna E. Bauer**

**Chaojie (George) Liu**

**Chigozie Jesse Uneke**

**Chingle Moses**

**Daniel Kim**

**David Hay**

**Dima Bader**

**Emma Mitchell**

**Farah Farahati**

**Gobianand Kuppannan**

**Holly Korda**

**Isaac Dialsingh**

**Jack Williams**

**Joy Fraser**

**Liz Peloso**

**Lynn Cockburn**

**Mary Ditton**

**Michael J. Park**

**Olaoluwa Akinwale**

**Rafiqul Chowdhury**

**Rishma Walji**

**Rodela Khan**

**Santosh Kumar Mishra**

**Sarah Kibaalya**

**Shazia Jamshed**

**Shuangge Ma**

**Victor Morge**

**Wichian Sittiprapaporn**

**Zakir Husain**

Longwoods.com



# Urbanization and Health in Developing Countries: A Systematic Review

---



Sophie Eckert  
Institute for Social Medicine, Epidemiology and Health Economics,  
Charité University Medical Center, Berlin, Germany

Stefan Kohler, PhD  
Institute for Social Medicine, Epidemiology and Health Economics,  
Charité University Medical Center, Berlin, Germany



Correspondence may be directed to:  
Stefan Kohler, Institute for Social Medicine, Epidemiology and Health Economics,  
Charité University Medical Center, Luisenstraße 57, 10117 Berlin, Germany,  
e-mail: Stefan.Kohler@charite.de.



## Abstract

**Background:** Future population growth will take place predominantly in cities of the developing world. The impact of urbanization on health is discussed controversially. We review recent research on urban-rural and intra-urban health differences in developing countries and investigate whether a health advantage was found for urban areas.

**Methods:** We systematically searched the databases JSTOR, PubMed, ScienceDirect and SSRN for studies that compare health status in urban and rural areas. The studies had to examine selected World Health Organization health indicators.

**Results:** Eleven studies of the association between urbanization and the selected health indicators in developing countries met our selection criteria. Urbanization was associated with a lower risk of undernutrition but a higher risk of overweight in children. A lower total fertility rate and lower odds of giving birth were found for urban areas. The association between urbanization and life expectancy was positive but insignificant. Common risk factors for chronic diseases were more prevalent in urban areas. Urban-rural differences in mortality from communicable diseases depended on the disease studied.

**Conclusion:** Several health outcomes were correlated with urbanization in developing countries. Urbanization may improve some health problems developing countries face and worsen others. Therefore, urbanization itself should not be embraced as a solution to health problems but should be accompanied by an informed and reactive health policy.

## Introduction

More than half of the world's population inhabits urban areas (Dye 2008). The United Nations (UN) projects that the urban population will further increase from 3.3 billion to 4.9 billion worldwide by 2030 (UN 2007). Virtually all further population growth will take place in cities of the developing world, in which the rate of urbanization is faster than in developed countries (Alirol et al. 2011; Godfrey and Julien 2005).

Some argue that urbanization worsens the health status of the populations affected. If urbanization is unplanned and rapid, it is prone to producing informal settlements with insufficient housing, poor sanitary conditions and crowding, all of which can accelerate the spread of diseases (Godfrey and Julien 2005; Moore et al. 2003). Changes in the physical and social environment brought about by urbanization may increase the rate of mental disorders (Bhugra and Mastrogianni 2004; Penkalla and Kohler, forthcoming). Lifestyle changes may lead to an increase in accidents, violence-related disabilities and non-communicable diseases (NCDs) as causes of death (Bygbjerg 2012; Montgomery et al. 2003). The rapid upsurge in NCDs and NCD risk factors while low- and middle-income countries continue to deal with the problems of infectious disease and undernutrition causes a double burden of disease, which has been associated with urbanization (Marshall 2004; World Health Organization [WHO] 2013). With respect to the growing NCD burden, urbanization, economic growth, market integration, and foreign direct investment together have been described to correlate roughly three times stronger with long-term changes in the mortality rates of heart disease and chronic NCDs than population aging, particularly in low-income countries (Bygbjerg 2012; Stuckler 2008).

Others argue that infrastructure improvements such as better access to health services, education, sanitation and safe water supply through urbanization improve health (McDade and Adair 2001). Increased urbanization has been associated with greater malaria transmission reductions across countries and continents (Tatem et al. 2013). Access to information and communications technology, which is not yet widespread but fast-growing in developing countries, may increasingly influence disease prevention and health promotion opportunities in developing countries (Kohler 2013). However, the prior required increase in access to information and communications technology through urbanization in the developing world is already subject to debate (Chinn and Fairlie 2006, 2010).

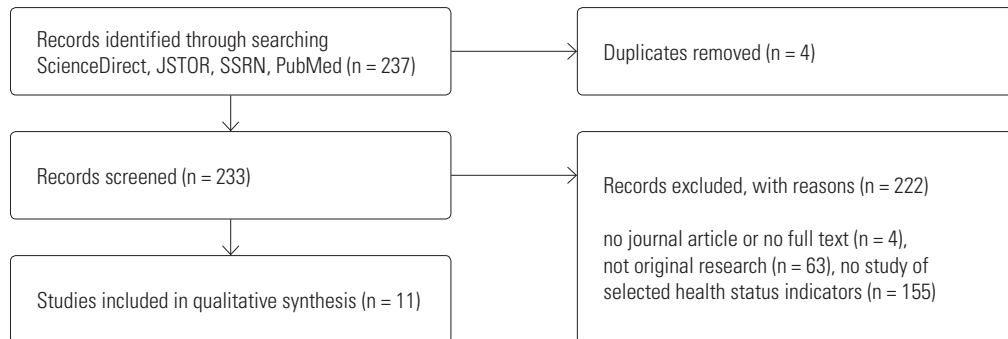
This article reviews recent research on urban-rural and intra-urban health differences in developing countries as measured by some common health indicators.

## Methods

### Search Strategy

The databases JSTOR, PubMed, ScienceDirect and SSRN were searched from January 1, 2005 to October 23, 2012. The abstract, title or keywords had to include the terms urbanization, health and developing countries. Within PubMed, the MeSH-term urbanization was also searched in combination with the keywords child mortality, life expectancy, fertility, reproductive health, chronic disease and communicable disease (Figure 1).

Figure 1. Flow diagram of study selection



### Selection Criteria

We included studies in our review if they examined WHO health indicators of the leading causes of death or the general health status, and were original research, published in English as a journal article and available as full text. The 15 health indicators we selected cover five areas of health: general health (life expectancy, mortality rate); child health (under-five mortality, malnutrition); reproductive health (attended births, access to contraception, maternal mortality); prevalence of NCDs (hypertension, diabetes, obesity); and prevalence of communicable diseases (tuberculosis, HIV/AIDS, malaria, diarrhea, lower respiratory infections).

Studies were excluded if they investigated aspects of urbanization other than its influence on health, or health indicators different from the ones enumerated.

### Data Extraction

We extracted data on the aims, country and population of the study, sample size, data source and time period studied, as well as health indicators. The health data we retrieved were deaths due to malaria, deaths due to diarrhea, occurrence of hypertension, diabetes and obesity, under-five mortality, childhood stunting, short stature, undernutrition and overnutrition, as well as fertility rates, the odds of giving birth within a year and life expectancy.

### Results

A total of 11 studies met our inclusion criteria (Table 1). Two studies targeted several countries, while nine each focused on a single country.

### Communicable Diseases

One study assessed the prevalence of communicable diseases in relation to an urbanizing environment. Fobil et al. (2011) investigated mortalities from infectious diseases in spatially different neighbourhoods of a rapidly urbanizing city in Ghana. Data on neighbourhood environment quality were extracted from the census database of 2000. Data on the causes of death between 1998 and 2002 were obtained from the Vital Registration System in Ghana. A total of 1,292 deaths due to malaria and 1,001 deaths due to diarrhea were considered. Based on a principal component analysis of 65 environmental variables, the urban environment was classified as extremely, moderately or least deteriorated, representing worst, somewhat worse and good environmental conditions, respectively. Relative mortalities were evaluated using the least deteriorated zone as a reference. Malaria mortality frequently varied significantly with the urban environment for four assessed subcomponents of environmental quality; namely per capita waste generation, water supply and sanitation, hygiene facilities and housing conditions ( $p \leq .061$ ). Diarrhea mortality varied significantly with the urban environment for two of its four assessed subcomponents ( $p \leq .036$ ). The authors interpreted these findings as evidence for differences in malaria mortality across differing urban environment conditions.

Table 1. Study characteristics

Study	Country	Health indicator	Urbanization aspect	Study population	Study type	Data source	Study period	Sample size
Allender et al. 2011	Sri Lanka	Chronic disease risk factors	Urban environment scale	Adults >18 years	Cross-sectional	Sri Lankan Diabetes and Cardio-vascular Study	2007–2008	4,485
Antai and Moradi 2010	Nigeria	Under-five mortality	Urban socio-economic disadvantage	Children <5 years	Cross-sectional	Demographic and Health Survey	2003	2,118
Bergh and Nilsson 2010	92 countries	Life expectancy at birth	Globalization in 92 countries	Population	Longitudinal	Panel data set	1970–2005	282–608
Firestone et al. 2011	Kanchanaburi, Thailand	Children's nutritional status	Urban and rural communities	Children 2–10 years	Cross-sectional	Kanchanaburi Demographic Surveillance System	2004	4,610
Fobil et al. 2011	Accra, Ghana	Malaria or diarrhea mortality	Disparities in different neighbourhoods of Accra	Population	Cross-sectional	Ghanaian Vital Registry System	1998–2002	1,001–1,292
Niakara et al. 2007	Ouagadougou, Burkina Faso	Hypertension risk	Exposure to rapid urbanization	Adults >35 years	Cross-sectional	Field research	2004	2,044
Sobngwi et al. 2004	Cameroon	Stroke and myocardial infarct risk factors	Lifetime exposure to urban environment	Adults >25 years	Cross-sectional	Field research	NA	1,726
Van de Poel et al. 2007	47 developing countries	Children's health	Urban–rural differentials	Children <5 years	Cross-sectional	Demographic and Health Survey	1994–2005	579–30,594
Van de Poel et al. 2009	Eight provinces in eastern China	Overweight and hypertension	Degree of urbanicity	Adults	Longitudinal	China Nutrition and Health Surveys	1991–2004	6,197 – 6,484
Vorster et al. 2007	North West Province of South Africa	Coronary heart disease risk factors	Socio-economic status during urbanization	Healthy adults >15 years	Cross-sectional	Field research	1996–1998	1,854
White et al. 2008	Coastal Ghana	Fertility	Urbanization from 1997 to 2001	Women 15–49 years	Cross-sectional	Population and Environment Survey	2002	1,436

### Non-communicable Diseases

Coronary heart disease (CHD) stands out among the NCDs due to its high mortality rate (UN 2007). Five studies evaluated the association between urbanization and the CHD risk factors hypertension, obesity and diabetes (Tables 2a–c).

Table 2a. Hypertension

Study	Subgroup	N	Prevalence of hypertension (%)		OR and model			
			Men	Women	1		2	
					Men	Women	Men	Women
Allender et al. 2011 <sup>a</sup>	Low urbanicity	1590	63.2	56.3	1	1	1	1
	Medium urbanicity	1561	70.8	60.3	1.41 (1.11–1.79)	1.18 (0.99–1.41)	1.30 (1.02–1.66)	1.06 (0.88–1.29)
	High urbanicity	1334	67.1	57.9	1.19 (0.93–1.52)	1.07 (0.88–1.29)	1.05 (0.80–1.36)	0.99 (0.81–1.22)
Niakara et al. 2007 <sup>b</sup>	Parceled-out areas	NA	42.8		1			
	Non-parceled-out areas		37.2		1.15 (0.99–1.34)			
Sobngwi et al. 2004 <sup>c</sup>	No EU	NA			1	1		
	Residence urban				2.46 (1.63–3.7)	1.64 (1.09–2.47)		
					<b>MN systolic</b>		<b>MN diastolic</b>	
	Rural dwellers ≤2 years EU	851	27.0	18.7	126 (21)	120 (21)	81 (15)	77 (13)
	Rural dwellers >2 years EU	234			123 (20)	117 (17)	81 (13)	77 (11)
	Urban dwellers ≤2 years EU	29	42.1	25.1	130 (17)	149 (28)	81 (7)	89 (14)
Urban dwellers >2 years EU	612	136 (23)			125 (19)	87 (13)	80 (13)	
Van de Poel et al. 2009 <sup>d</sup>					<b>Coefficient</b>	<b>Proportionate contribution</b>		
	Top third 2004	NA			0.066	0.714		
	Top third 1991				0.026	0.198		
Vorster et al. 2007 <sup>e</sup>					<b>MN systolic</b>		<b>MN diastolic</b>	
	Deep rural	432			125 (122–127) <sup>zy</sup>	126 (123–128) <sup>zyxs</sup>	75 (74–77) <sup>zy</sup>	77.1 (75–78) <sup>zyx</sup>
	Farm workers	239			125 (121–127) <sup>xw</sup>	128 (124–131) <sup>wvu</sup>	76 (73–78) <sup>y</sup>	77 (75–79) <sup>w</sup>
	Squatter camps	272			131 (128–134) <sup>zvw</sup>	130 (127–133) <sup>zwt</sup>	80 (76–82) <sup>zx</sup>	81 (79–83) <sup>zy</sup>
	Urban	472			128 (126–131) <sup>ywu</sup>	130 (127–133) <sup>yvtr</sup>	77 (76–79)	81 (79–82) <sup>yu</sup>
Upper urban	146			122 (117–126) <sup>yu</sup>	117 (112–121) <sup>xutr</sup>	79 (76–82) <sup>y</sup>	73 (70–75) <sup>xwvu</sup>	

Note: SD or 95% CI in parentheses.

CI = confidence interval, EU = exposure to urban environment, MN = mean, NA = not available, OR = odds ratio, and SD = standard deviation.

<sup>a</sup> Hypertension is defined as blood pressure >120 mmHg systolic or >80 mmHg diastolic. Model 1 is without adjustment. Model 2 adjusted for age and income.

<sup>b</sup> Hypertension is defined as blood pressure ≥140 mmHG systolic or ≥90 mmHG diastolic for at least one arm, or use of hypertensive treatment. Prevalence is adjusted for age and gender.

<sup>c</sup> Hypertension is defined as blood pressure ≥140 mmHG systolic or ≥90 mmHG diastolic. Model adjusted for age. Lifetime EU, socioprofessional category, alcohol intake, smoking status, and physical activity were not independently associated with hypertension. Age-adjusted four group comparison indicates difference of means for men ( $p < .00$ ) and for women ( $p < .00$ ). Age- and gender-adjusted four group comparison indicates difference of means for men and women jointly ( $p < .00$ ).

<sup>d</sup> Hypertension is defined as mean blood pressure ≥140 mmHG systolic or ≥90 mmHG diastolic after three measurements, or use of hypertensive treatment. Coefficient is from a linear probability model. Proportionate contribution is the contribution of the covariate to urbanicity-related inequality in hypertension relative to the concentration index for the respective risk factor. The prevalence of hypertension is 12%, 14%, 16%, 21% and 25%, respectively, in the least to most urban quintiles of an urbanicity index. Top third is significantly associated with urbanicity-related inequalities in hypertension in 2004 ( $p \leq .1$ ) and 1991 ( $p \leq .01$ ).

<sup>e</sup> Means for each sex with the same symbol differ significantly ( $p \leq .05$ ).

Table 2b. Overweight

Study	Subgroup	N	Prevalence of overweight (%)		OR and model			
			Men	Women	1		2	
					Men	Women	Men	Women
Allender et al. 2011 <sup>a</sup>	Low urbanicity	1590	19.6	30.7	1	1	1	1
	Medium urbanicity	1561	27.7	35.7	1.56 (1.2–2.04)	1.25 (1.04–1.52)	1.42 (1.08–1.86)	1.12 (0.92–1.37)
	High urbanicity	1334	37.5	56.4	2.45 (1.88–3.2)	2.92 (2.41–3.55)	1.80 (1.41–2.48)	2.47 (2.02–3.01)
Niakara et al. 2007 <sup>b</sup>	Parceled-out areas	1072	39.6		NA			
	Non-parceled-out areas	972	25.7					
Sobngwi et al. 2004 <sup>c</sup>	No EU	NA	9	17	1	1		
	EU ≤10 years		9	32	0.81 (0.36–1.84)	NS		
	EU >10 years		40	60	2.33 (1.00–4.99)			
	Residence urban				2.30 (1.09–4.87)	5.56 (3.6–8.61)		
					<b>Mean BMI</b>			
	Rural dwellers ≤2 years EU	851			21.3 (2.8)	22.0 (3.6)		
	Rural dwellers >2 years EU	234			21.6 (3.0)	23.6 (3.9)		
	Urban dwellers ≤2 years EU	29			21.1 (2.2)	25.8 (5.5)		
Urban dwellers >2 years EU	612			24.7 (4.1)	27.0 (5.2)			
Van de Poel et al. 2009 <sup>d</sup>					<b>Coefficient</b>	<b>Proportionate contribution</b>		
	Top third 2004	NA	0.049		0.495			
	Top third 1991		0.079		0.489			
Vorster et al. 2007 <sup>e</sup>					<b>MN BMI</b>			
	Deep rural	432			20.9 (20.3–21.4) <sup>z</sup>	25.8 (24.9–26.6) <sup>f</sup>		
	Farm workers	239			20.5 (19.8–21.3) <sup>y</sup>	26.3 (25.1–27.4) <sup>y</sup>		
	Squatter camps	272			20.2 (19.6–20.9) <sup>xw</sup>	26.5 (25.4–27.5) <sup>x</sup>		
	Urban	472			21.3 (20.6–21.8) <sup>cw</sup>	28.2 (27.4–29.0) <sup>px</sup>		
	Upper urban	146			22.7 (21.8–23.7) <sup>ywvw</sup>	27.3 (25.9–28.7)		

Note: SD or 95% CI in parentheses.

BMI = body mass index, CI = confidence interval, EU = exposure to urban environment, MN = mean, NA = not available, OR = odds ratio, and SD = standard deviation.

<sup>a</sup> Overweight is defined as BMI >23 kg/m<sup>2</sup>. Model 1 is without adjustment. Model 2 adjusted for age and income. The female ORs 1.25, 1.12 and 2.47 were extracted from the study assuming they were mistakenly listed as the ORs for low physical activity in the original tabulation. The original article interpreted on of these values as an OR for increased BMI.

<sup>b</sup> Overweight is defined as BMI >25kg/m<sup>2</sup>. Unadjusted prevalence differs between areas ( $p < .00$ ).

<sup>c</sup> Overweight is defined as BMI ≥25kg/m<sup>2</sup>. Prevalence data is extracted from a figure in the original article and may be imprecise. OR model adjusted for age and physical activity. Socioprofessional category, alcohol intake, and smoking status were not independently associated with overweight. Age-adjusted four group comparison indicates difference of means for men ( $p = .04$ ) and women ( $p = .06$ ). Age- and gender-adjusted four group comparison indicates difference of means for men and women jointly ( $p = .00$ ).

<sup>d</sup> Overweight is defined as BMI >25kg/m<sup>2</sup>. Coefficient is from a linear probability model. Proportionate contribution is the contribution of the covariate to urbanicity-related inequality in overweight relative to the concentration index for the respective risk factor. The prevalence of overweight is 10%, 12%, 17%, 25% and 26%, respectively, in the least to most urban quintiles of an urbanicity index. Top third is significantly associated with urbanicity-related inequalities in overweight in 2004 ( $p \leq .01$ ) and 1991 ( $p \leq .01$ ).

<sup>e</sup> Means for each sex with the same symbol differ significantly ( $p \leq .05$ ).

Table 2c. Diabetes and fasting serum glucose levels

Study	Subgroup	N	Prevalence of diabetes (%)		OR and model				
			Men	Women	1		2		
					Men	Women	Men	Women	
Allender et al. 2011 <sup>a</sup>	Low urbanicity	1590	7.4	8.8	1	1	1	1	
	Medium urbanicity	1561	10.8	12.1	1.51 (1.02–2.23)	1.43 (1.06–1.92)	1.30 (0.86–1.98)	1.27 (0.93–1.74)	
	High urbanicity	1334	16.3	16.7	2.44 (1.66–3.57)	2.1 (1.58–2.80)	2.05 (1.35–3.11)	2.14 (1.58–2.91)	
Sobngwi et al. 2004 <sup>b</sup>	No EU	NA	10	8	NS	1			
	EU ≤10 years		13	9		1.40 (0.68–2.87)			
	EU >10 years		17	16		2.73 (1.69–4.39)			
						<b>MN fasting glucose level</b>			
	Rural dwellers ≤2 years EU	851	12.0	7.7	4.7 (1.0)	4.6 (0.7)			
	Rural dwellers >2 years EU	234			4.9 (1.9)	4.7 (1.1)			
	Urban dwellers ≤2 years EU	29	15.1	15.6	6.8 (6.0)	5.0 (0.7)			
Urban dwellers >2 years EU	612	5.1 (1.8)			5.0 (0.9)				
Vorster et al. 2007 <sup>d</sup>	Deep rural	432			5.0 (4.8–5.1) <sup>z</sup>	4.9 (4.7–5.1) <sup>z</sup>			
	Farm workers	239			4.7 (4.5–5.0) <sup>y</sup>	4.7 (4.5–5.0) <sup>y</sup>			
	Squatter camps	272			4.9 (4.7–5.1) <sup>x</sup>	5.1 (4.9–5.4) <sup>x</sup>			
	Urban	472			4.9 (4.7–5.1) <sup>w</sup>	4.7 (4.5–4.9) <sup>w</sup>			
	Upper urban	146			4.2 (3.8–4.5) <sup>zxxx</sup>	4.1 (3.8–4.5) <sup>zxxx</sup>			

Note: SD or 95% CI in parentheses.

CI = confidence interval, EU = exposure to urban environment, MN = mean, NA = not available, OR = odds ratio, OGGT = oral glucose tolerance test, and SD = standard deviation.

<sup>a</sup> Diabetes is defined as fasting plasma glucose ≥7.0 mmol/l or 2h post-OGTT ≥11.1 mmol/l. Model 1 is without adjustment. Model 2 adjusted for age and income.

<sup>b</sup> Diabetes or impaired fasting glycaemia, i.e., fasting blood glucose ≥5.6 mmol/l, or use of hypoglycemic treatment. Prevalence data is extracted from a figure in the original article and may be imprecise. Model adjusted for age. Urban residence, socioprofessional category, alcohol intake, smoking status, and physical activity were not independently associated with impaired fasting glycaemia or diabetes. Age-adjusted four group comparison indicates difference of means ( $p = .01$ ) and women ( $p = .01$ ). Age- and gender-adjusted four group comparison indicates difference of means for men and women jointly ( $p = .00$ )

<sup>c</sup> Study measured fasting glucose in the serum. Means for each sex with the same symbol differ significantly ( $p \leq .05$ ).

Vorster et al. (2007) looked at newly assembled data from the Transition and Health during Urbanization of South Africans (THUSA) study. The study was conducted from 1996 to 1998 to examine the influence of urbanization on CHD risk factors of 1,854 apparently healthy adults in South Africa. Subjects were arranged into five levels of urbanization based on their place of residence and occupation. The five levels were deep rural, farm workers, informal settlements, urban and upper urban. Risk factors were evaluated through using questionnaires, measuring blood pressure, calculating body mass index (BMI) and analyzing blood. Mean risk factors of men and women were calculated separately. There were three main observations comparing blood pressure: Firstly, in both men and women there were no significant differences in the means of systolic and diastolic blood pressure among deep rural dwellers and farm workers. Secondly, informal settlement dwellers had the highest means of all groups in both systolic and diastolic blood pressure ( $p \leq .05$ ). Mean blood pressure in men was significantly lower for deep rural dwellers and farm workers. These means in women were significantly lower in upper urban dwellers and the deep rural group. Thirdly, upper urban men and women had the lowest systolic blood pressure, a finding that differed significantly from the means of all other groups, except for male rural dwellers and farm workers

( $p \leq .05$ ). Women of the upper urban group also had the lowest mean diastolic blood pressure compared with all other groups ( $p \leq .05$ ). Mean diastolic blood pressure of upper urban men was significantly higher than that of deep rural men ( $p \leq .05$ ), but it did not differ significantly compared with all other groups. The highest mean BMI was found among urban women and upper urban men and differed significantly from all other groups ( $p \leq .05$ ). The authors pointed out that, on average, urban groups were younger than rural groups. Therefore, they suggested that a higher mean BMI among urban groups was unlikely to be connected with increased risk due to age. Mean fasting serum glucose levels in both men and women were significantly lower among upper urban dwellers compared with all other levels of urbanization ( $p \leq .05$ ). No significant difference of mean serum glucose levels was observed within the other groups.

Sobngwi et al. (2004) examined the relationship between exposure to an urban environment (EU) and the prevalence of CHD risk factors. The factors studied were overweight, elevated fasting blood glucose and hypertension, as well as lifestyle aspects, such as sparse physical activity, smoking and alcohol intake. The EU was measured in total number of years or percentage of lifetime spent in urban areas. Cities with more than 100,000 inhabitants were classified as urban. The study sample included 1,726 randomly selected adults older than 25 years who were recruited from a rural and an urban area in Cameroon. The sample was divided into four subgroups: rural and urban dwellers with either less or more than two years of EU. The authors observed a higher prevalence of hypertension and diabetes in urban men and women. A longer lifetime EU was associated with significantly higher BMI and fasting blood glucose levels ( $p \leq .00$ ). Residing in an urban area was associated with higher odds of hypertension and higher odds of a BMI  $>25$  kg/m<sup>2</sup>. Urban men were 2.46 (95% CI: 1.63–3.7) and urban women were 1.64 (95% CI: 1.09–2.47) times as likely to suffer from hypertension. Urban men had 2.3 (95% CI: 1.09–4.87) times the risk and urban women had 5.56 (95% CI: 3.6–8.61) times the risk to have a BMI  $>25$  kg/m<sup>2</sup>.

Allender et al. (2011) investigated the relationship between urbanization and chronic diseases based on data from the cross-sectional Sri Lanka Diabetes and Cardiovascular Study (SLDCS) conducted from 2007 to 2008. The study population consisted of 4,485 subjects older than 18 years who were randomly recruited from seven out of nine provinces in Sri Lanka. The authors developed a multi-component scale that included population size and density, physical environment and infrastructure characteristics, as well as other items associated with an urban environment. The tertiles of the scale were used to divide the sample into three categories of urbanicity. The highest prevalence of overweight and diabetes mellitus were each among male subjects in the high urban category. The prevalence of hypertension was highest in the medium urbanicity group. In comparison with the low urbanicity category, men in the medium and high urbanicity categories had significantly higher odds of a BMI  $>23$  kg/m<sup>2</sup> (OR = 1.80, 95% CI: 1.41–2.48) and diabetes mellitus (OR = 2.05, 95% CI: 1.35–3.11), after adjusting for age and income differences. The highest prevalence of overweight and highest prevalence of diabetes mellitus for women also occurred in the high urbanicity category. By contrast, hypertension was most prevalent among women in the medium urbanicity category. After controlling for age and income differences, the women in the high and medium urbanicity categories had more than doubled their odds of a BMI  $>23$  kg/m<sup>2</sup> (OR = 2.47, 95% CI: 2.02–3.01) and diabetes mellitus (OR = 2.14, 95% CI: 1.58–2.91) compared to women in the low urbanicity category.

Niakara et al. (2007) examined the association between intra-urban disparities and the frequency of hypertension during rapid urbanization in Ouagadougou, Burkina Faso. A total of 2,087 inhabitants over 35 years old were sampled in a cross-sectional study in 2004. According to their type of housing, subjects were arranged in the subgroups of parcelled-out area and non-parcelled-out area. In parcelled-out areas, local authorities provided sanitation, electricity, infrastructure and access to public services, while non-parcelled-out areas were characterized by uncontrolled growth. Controlling for age and gender, the prevalence of hypertension was 42.8% in parcelled-out and 37.2% in non-parcelled-out areas, but the difference was not significant (OR = 1.15, 95% CI: 0.99–1.34). Risk factors for hypertension differed significantly between the subgroups ( $p \leq .001$ ). In non-parcelled-out areas, 25.7% of the sample had a BMI  $>25$  kg/m<sup>2</sup>, compared to 39.6% in parcelled-out areas ( $p \leq .001$ ).

Van de Poel et al. (2009) examined changes in the prevalence of overweight and of hypertension in China from 1991 to 2004 and their association with the degree of urbanicity. Data were extracted from the longitudinal China Health and Nutrition Survey (CHNS). The authors evaluated eight provinces with a sample size of 6,484 subjects in 1991 and 6,197 subjects in 2004. They created an index of urbanicity using factor analysis with a set of community-level characteristics. Testing for robustness, they considered the index a reliable indicator of the degree of urbanicity. In 1991 and in 2004, the prevalence of BMI >25 kg/m<sup>2</sup> and hypertension were each higher in the top third most urbanized communities ( $p \leq .1$ ). Urban environment characteristics accounted for 50% of the disparity in increased weight. While in 1991 these characteristics accounted for 20% of the urbanicity-related differences in hypertension, in 2004 they accounted for 62%. The rural-urban differences in the prevalence of overweight and in the prevalence of hypertension became smaller over time.

### Child Health

Three studies of child health assessed under-five mortality and nutritional status (Table 3).

Table 3. Child health indicators

Study	Subgroup	Health indicator	N	Prevalence (%)	OR and model		
					UADI	Child level	Mother level
Antai and Moradi 2010 <sup>a</sup>	Class I	Under-five mortality	338	6	1	1	1
	Class II		856	7	1.32 (1.19–1.54)	1.32 (0.19–1.55)	1.72 (0.91–3.29)
	Class III		490	13	1.39 (1.26–1.56)	1.38 (0.26–1.56)	1.78 (1.17–2.70)
	Class IV		43	8	1.76 (0.52–1.81)	1.76 (0.52–2.11)	2.03 (1.04–3.97)
	Class V		391	17	1.51 (0.65–1.72)	1.49 (0.14–1.65)	2.14 (1.11–4.12)
Firestone et al. 2011 <sup>b</sup>					<b>1</b>	<b>2</b>	<b>3</b>
	Rural	Short stature	NA	19.85	1	1	Not significant
	Urban				0.63 (0.42–0.94)	0.92 (0.59–1.43)	
	Rural	Underweight		27.79	1	1	Not significant
	Urban				0.64 (0.50–0.82)	0.74 (0.55–1.00)	
	Rural	Obesity		8.26	1	1	1
Urban				2.66 (1.91–3.72)	1.73 (1.21–2.48)	1.03 (0.59–1.80)	
Van de Poel et al. 2007 <sup>c</sup>					<b>RR range</b>		
	Urban	Under-five stunting	47	0.09–0.47 (0.28)	1		
	Rural				1.00–2.60 (1.40)		
	Urban	Under-five mortality		0.04–0.20 (0.10)	1		
Rural				0.72–1.80 (1.36)			

Note: Median or 95% CI in parentheses.

CI = confidence interval, UADI = urban area disadvantage index, NA = not available, OR = odds ratio, and RR = relative risk.

<sup>a</sup> Class I is assigned to the least disadvantaged, Class V to the most disadvantaged urban areas. Models accounted for community and mother-level random effects. Prevalence data is extracted from a figure in the original article and may be imprecise. The UADI model is without adjustment. The child-level model adjusted for child's sex, birth order and birth interval. The mother-level model adjusted in addition for mother's marital status, age, education, occupation, and a wealth index.

<sup>b</sup> Short stature (<2 SD height-for-age), underweight (<5th percentile BMI-for-age), obese (≥95th percentile BMI-for-age). Model 1 is without adjustment. Model 2 adjusted for household wealth, maternal education, household head occupation, child gender and age, maternal height or BMI, household size and ethnicity. Model 3 adjusted in addition for the community level variables wealth concentration, TV coverage and improved sanitation coverage that were found previously to be significant.

<sup>c</sup> Estimates of under-five stunting are statistically significant in 43 of 47 countries ( $p \leq .1$ ); estimates of the under-five mortality are statistically significant in 32 of 47 countries ( $p \leq .1$ )

Van de Poel et al. (2007) compared the under-five mortality and under-five stunting in urban and rural areas. A children's height was defined as stunted if it fell two or more standard deviations below the median height of healthy counterparts. Data on child health were extracted from Demographic and Health Surveys (DHS) conducted between 1994 and 2005 in 47 developing countries. The authors used Poisson regression to estimate rural-urban relative risks. The median rural-urban relative risk ratio of all countries examined was 1.36 (0.72–1.80) for under-five mortality and 1.4 (1.00–2.60) for under-five stunting. There were significant rural-urban differences in under-five mortality and in stunting in 32 and 43 countries, respectively ( $p \leq .1$ ). The relative rural-urban risk of stunting and under-five mortality fell on average by 53% and 59% after adjusting for household wealth. Further adjusting for sociodemographic differences reduced the risk ratios by another 22% and 25%. Rural-urban disparities in stunting remained significant in 18 countries after controlling for household wealth and other covariates; the median risk ratio of stunting was reduced from 1.40 to 1.09. The median risk ratio of under-five mortality was reduced from 1.36 to 1.07 after controlling for all covariates the study measured, and the rural-urban under-five mortality disparities remained significant in 17 countries.

Firestone et al. (2011) examined short stature, undernutrition and the prevalence of obesity in 4,610 children living in Kanchanaburi, Thailand. Data were extracted from the Kanchanaburi Demographic Surveillance System (KDSS) in 2004. The authors described an urban advantage in the unadjusted odds of short stature (OR = 0.63, 95% CI: 0.42–0.94) and underweight (OR = 0.64, 95% CI: 0.50–0.82). After adjusting for household level differences in the education, height and BMI of the mother, household size and wealth, occupation of the household head, child's age and ethnicity, the urban area advantage in the odds of short stature and underweight was diminished and no longer significant. Household wealth was significantly and negatively associated with the odds of short stature and underweight. The authors concluded that household poverty accounted for child under-nutrition in this sample rather than community characteristics. After controlling for household level covariates, residence in urban areas was associated with greater odds of obesity (OR = 1.73, 95% CI: 1.21–2.48). Community wealth concentration, TV coverage and improved sanitation coverage could explain this rural-urban difference in obesity (OR = 1.03, 95% CI: 0.59–1.80).

Antai and Moradi (2010) measured the association between under-five mortality and a poor living standard in urban areas of Nigeria. They aimed to assess the influence of rapid urbanization on child health. Urban population pattern data were taken from the United Nations Department of Economics and Social Affairs. Population characteristics and child deaths were taken from the Demographic and Health Survey (DHS) in 2003. The study included 2,118 subjects. Urban areas were classified into five groups, using an urban area disadvantage index that was based on indicators of socio-economic disadvantage. Class I represented the least disadvantaged areas, whereas Class V stood for the most disadvantaged. Odds ratios were estimated in comparison with Class I. Covariates included were individual-level factors such as birth order, sex of child, occupation, education, age and marital status of mother, and a wealth index. The authors found significantly higher under-five mortality in the three most disadvantaged urban areas. Children in the most disadvantaged urban area faced more than twice the risk of dying below the age of five than did children in the least disadvantaged urban area (OR = 2.14, 95% CI: 1.11–4.12).

## Fertility

White et al. (2008) evaluated the association between urbanization and fertility rates, conducting an event-history analysis of 1,436 women based on the 2002 Ghana Population and Environment Survey. Adjusting for age, the study reported, on average, a 24% lower odds of giving birth in any given year for women with urban residence (OR = 0.76,  $p \leq .00$ ). The effect size and its significance varied by the number of times a women had given birth. For all women and nulliparae, the negative association between urbanization and fertility could not be attributed to differences in age, education, the union or employment status of the mother. Net of these personal traits, urban women exhibited fertility odds that were, on average, 11% lower than those of rural women ( $p < .05$ ).

### Life Expectancy

Bergh and Nilsson (2010) investigated the relationship between life expectancy and globalization within a sample of 92 countries. Urbanization was examined as a covariate. The study found that globalization, urbanization, nutrition, education, public health measures and income were all positively related to life expectancy if significant ( $p \leq .1$ ). This result was reproduced for a subsample of less developed countries. Urbanization was positively but not significantly associated with life expectancy.

### Discussion

Our aim was to give an overview of studies that investigated health in relation to aspects of urbanization across developing countries. We approached this broad research question by deciding on WHO health indicators to report on in our review. These were either connected to the 10 leading causes of death in developing countries or reflected a population's health status in general.

### Summary of Main Results

#### Communicable and Non-communicable Disease

Malaria mortality appeared more strongly associated with urban environment characteristics than infectious diarrhea. An urban area disadvantage was observed for extremely deteriorated neighbourhoods. No clear pattern in the variation of the mortality risks due to environmental differences was found. Neither an overall effect of urbanization on the mortality from these diseases nor the influence of urbanization over time was assessed (Fobil et al. 2011).

The findings on NCDs varied across the studies examined. Studies either reported the values of blood pressure, BMI and fasting glucose levels, or their prevalence as CHD risk factors defined by cut-off values. Hypertension, overweight and diabetes were more prevalent under higher urbanization levels (Allender et al. 2011; Niakara et al. 2007; Sobngwi et al. 2004; Van de Poel et al. 2009). Both urban residence and lifetime exposure to urban environment were associated with greater odds of hypertension, diabetes and overweight (Sobngwi et al. 2004). The highest odds for hypertension were observed in the medium urbanicity group, whereas the highest odds of diabetes and overweight were found in the high urbanicity group (Allender et al. 2011). In another study, BMI but neither blood pressure nor fasting glucose increased, on average, with rising urbanization levels (Vorster et al. 2007). Several authors suggested that lifestyle changes occurring with urbanization, such as reduced physical activity or increased fat or protein intake, explain in part the urban concentration of NCD risk factors.

#### Child Health

Studies on child health reported lower under-five mortality and undernutrition for urban areas than for rural areas (Firestone et al. 2011; Van de Poel et al. 2007). Socioeconomic disadvantages on the household and community level were associated with under-five mortality and accounted for most of the rural-urban disparities in child health (Antai and Moradi 2010; Van de Poel et al. 2007). A higher prevalence of overweight in urban areas accompanied the positive effect of urban residence on undernutrition (Firestone et al. 2011).

#### Fertility and Life Expectancy

In developing countries, perinatal conditions have been considered to be among the leading contributors to the total burden of disease (Murray and Lopez 1997). In combination with other parameters, fertility rate is an important indicator for reproductive health and development. Urban residence was associated with lower fertility rates in Ghana (White et al. 2008).

Life expectancy is the most widely used indicator to measure a population's health status (OECD 2013). It takes into account length of life but not quality of life. Urbanization was not significantly associated with a higher life expectancy. In the same study, aspects that can be associated with urbanization, such as nutritional intake and the number of physicians, correlated positively with life expectancy (Bergh and Nilsson 2010).

### Quality of Evidence

Nine studies reviewed were based on cross-sectional data, and two on longitudinal data. All controlled for some individual characteristics and some also for community-level or infrastructure characteristics. Suggestive associations between urbanization and health were described, but the evidence level for causal inference on the impact of urbanization on health is low.

### Limitations and Ways Forward

The comparability of the studies reviewed and their findings is limited. The studies examined different countries, populations and time periods using different methods and study designs. The definitions of urbanization and diseases varied and rural-urban or intra-urban comparisons were investigated. Controlled trials were not among the results of our database search but are conceivable in future research within planned urbanization projects.

Additionally, weak health information systems may not be able to provide reliable disaggregated health statistics on a rural-urban or intra-urban basis, but aggregated data can mask rural-urban or intra-urban health differences if health determinants vary within the unit of data collection (Moore et al. 2003; WHO 2010). Collecting accessible and relevant data has consequently been considered necessary to better describe and quantify the relationships between health outcomes and the urban environment (Antai and Moradi 2010; Khan et al. 2013).

### Conclusion

#### Implications for Research

Several health outcomes correlate with urbanization processes in developing countries. Urbanization has been associated with better and worse health status. Prospective research studies and continuing collection of reliable data are needed to assess the causal relationship between urbanization and health with more confidence. To improve our understanding of the different pathways through which urbanization affects health, the relationships between specific and general indicators of both need to be studied. In addition, future research should aim at assessing the overall impact of urbanization on the disease burden of developing countries to guide health policy and public health practitioners.

#### Implications for Practice

Measures that improve health in urban areas might be distinctively different from those in rural areas (Van de Poel et al. 2007). Urbanization can be expected to shift the disease pattern. Despite likely health improvements, urbanization also imposes new health problems on developing countries. Therefore, their progressing urbanization should be accompanied by an informed health policy that is able to anticipate and screen for health changes associated with urbanization.

### Author Contributions

SE and SK jointly conceived the study. SE designed the study with advice from SK and acquired the data. SE drafted and SK revised the manuscript. Both authors analyzed and interpreted data.

### References

- Alirol, E., L. Getaz, B. Stoll, F. Chappuis and L. Loutan. 2011. "Urbanisation and Infectious Diseases in a Globalised World." *The Lancet Infectious Diseases* 11(2): 131–41. doi:10.1016/S1473-3099(10)70223-1.
- Allender, S., K. Wickramasinghe, M. Goldacre, D. Matthews and P. Katulanda. 2011. "Quantifying Urbanization as a Risk Factor for Noncommunicable Disease." *Journal of Urban Health: Bulletin of the New York Academy of Medicine* 88(5): 906–18. doi:10.1007/s11524-011-9586-1.
- Antai, D. and T. Moradi. 2010. "Urban Area Disadvantage and under-5 Mortality in Nigeria: The Effect of Rapid Urbanization." *Environmental Health Perspectives* 118(6): 877–83. doi:10.1289/ehp.0901306.
- Bergh, A. and T. Nilsson. 2010. "Good for Living? On the Relationship between Globalization and Life Expectancy." *World Development* 38(9): 1191–1203. doi:10.1016/j.worlddev.2010.02.020.
- Bhugra, D. and A. Mastrogianni. 2004. "Globalisation and Mental Disorders. Overview with Relation to Depression." *The British Journal of Psychiatry* 184(1): 10–20. doi: 10.1192/bjp.184.1.10

- Bygbjerg, I.C. 2012. "Double Burden of Noncommunicable and Infectious Diseases in Developing Countries." *Science* (New York, N.Y.) 337(6101): 1499–501. doi:10.1126/science.1223466.
- Chinn, M.D. and R.W. Fairlie. 2006. "The Determinants of the Global Digital Divide: A Cross-Country Analysis of Computer and Internet Penetration." *Oxford Economic Papers* 59(1): 16–44. doi:10.1093/oepl024.
- Chinn, M.D. and R.W. Fairlie. 2010. "ICT Use in the Developing World: An Analysis of Differences in Computer and Internet Penetration." *Review of International Economics* 18(1): 153–167. doi:10.1111/j.1467-9396.2009.00861.x.
- Dye, C. 2008. "Health and Urban Living." *Science* (New York, N.Y.) 319(5864): 766–9. doi:10.1126/science.1150198.
- Firestone, R., S. Punpuing, K.E. Peterson, D. Acevedo-Garcia and S.L. Gortmaker. 2011. "Child Overweight and Undernutrition in Thailand: Is There an Urban Effect?" *Social Science and Medicine* (1982) 72(9): 1420–1428. doi:10.1016/j.socscimed.2011.03.003.
- Fobil, J.N., A. Kraemer, C.G. Meyer and J. May. 2011. "Neighborhood Urban Environmental Quality Conditions Are Likely to Drive Malaria and Diarrhea Mortality in Accra, Ghana." *Journal of Environmental and Public Health*. Epub 21 Jun 2011. doi:10.1155/2011/484010.
- Godfrey, R. and M. Julien. 2005. "Urbanisation and Health." *Clinical Medicine* 5(2): 137–41. doi:10.7861/clinmedicine.5-2-137.
- Harpham, T. 2009. "Urban Health in Developing Countries: What Do We Know and Where Do We Go?" *Health and Place* 15(1): 107–16. doi:10.1016/j.healthplace.2008.03.004.
- Khan, F.S., I. Lotia-Farrukh, A.J. Khan, S.T. Siddiqui, S.Z. Sajun, A.A. Malik et al. 2013. "The Burden of Non-communicable Disease in Transition Communities in an Asian Megacity: Baseline Findings from a Cohort Study in Karachi, Pakistan." *PloS One* 8(2): e56008. doi:10.1371/journal.pone.0056008.
- Kohler, S. 2013. "Can Internet Access Growth Help Reduce the Global Burden of Noncommunicable Diseases?" *Online Journal of Public Health Informatics* 5(2): 221. doi:10.5210/ojphi.v5i2.4667.
- Marshall, S.J. 2004. "Developing Countries Face Double Burden of Disease." *Bulletin of the World Health Organization* 82(7): 556.
- McDade, T.W. and L.S. Adair. 2001. "Defining the 'Urban' in Urbanization and Health: A Factor Analysis Approach." *Social Science and Medicine* 53(1): 55–70. doi:10.1016/S0277-9536(00)00313-0.
- Montgomery, M.R., R. Stren, B. Cohen and H.E. Reed, eds. 2003. "Cities Transformed: Demographic Change and Its Implications in the Developing World." Washington, DC: National Academies Press.
- Moore, M., P. Gould and B.S. Keary. 2003. "Global Urbanization and Impact on Health." *International Journal of Hygiene and Environmental Health* 206(4–5): 269–78. doi:10.1078/1438-4639-00223.
- Murray, C.J. and A.D. Lopez. 1997. "Global Mortality, Disability, and the Contribution of Risk Factors: Global Burden of Disease Study." *Lancet* 349(9063): 1436–42. doi:10.1016/S0140-6736(96)07495-8.
- Niakara, A., J. Fournet, J. Gary, M. Harang, L.V.A. Nébié and G. Salem. 2007. "Hypertension, Urbanization, Social and Spatial Disparities: A Cross-sectional Population-Based Survey in a West African Urban Environment (Ouagadougou, Burkina Faso)." *Transactions of the Royal Society of Tropical Medicine and Hygiene* 101(11): 1136–42. doi:10.1016/j.trstmh.2007.07.002.
- OECD. 2013. *Better Life Index: Health*. Retrieved February 10, 2014. <<http://www.oecdbetterlifeindex.org/topics/health/>>.
- Penkalla, A.M. and S. Kohler. "Urbanicity and Mental Health in Europe: A Systematic Review." *European Journal of Mental Health* forthcoming.
- Sobngwi, E., J.-C. Mbanya, N.C. Unwin, R. Porcher, A.-P. Kengne, L. Fezeu et al. 2004. "Exposure over the Life Course to an Urban Environment and Its Relation with Obesity, Diabetes, and Hypertension in Rural and Urban Cameroon." *International Journal of Epidemiology* 33(4): 769–76. doi:10.1093/ije/dyh044.
- Tatem, A.J., P.W. Gething, D.L. Smith and S.I. Hay. 2013. "Urbanization and the Global Malaria Recession." *Malaria Journal* 12(1): 133. doi:10.1186/1475-2875-12-133.
- United Nations. 2007. *State of World Population 2007: Unleashing the Potential of Urban Growth* (p. 108). New York: United Nations Population Fund. Retrieved February 10, 2014. <<https://www.unfpa.org/public/publications/pid/408>>.
- Van de Poel, E., O. O'Donnell and E. Van Doorslaer. 2007. "Are Urban Children Really Healthier? Evidence from 47 Developing Countries." *Social Science and Medicine* 65(10): 1986–2003. doi:10.1016/j.socscimed.2007.06.032.
- Van de Poel, E., O. O'Donnell and E. Van Doorslaer. 2009. "Urbanization and the Spread of Diseases of Affluence in China." *Economics and Human Biology* 7(2): 200–16. doi:10.1016/j.ehb.2009.05.004.
- Vorster, H.H., A. Kruger, C.S. Venter, B.M. Margetts and U.E. Macintyre. 2007. "Cardiovascular Disease Risk Factors and Socio-economic Position of Africans in Transition: The THUSA Study." *Cardiovascular Journal of Africa* 18(5): 282–9.

White, M.J., S. Muhidin, C. Andrzejewski, E. Tagoe, R. Knight and H. Reed. 2008. "Urbanization and Fertility: An Event-History Analysis of Coastal Ghana." *Demography* 45(4): 803–16. doi: 10.1353/dem.0.0035

World Health Organization. 2010. "Hidden Cities: Unmasking and Overcoming Health Inequities in Urban Settings." Geneva: World Health Organization. Retrieved February 10, 2014. <[http://www.who.int/kobe\\_centre/publications/hidden\\_cities2010/en/](http://www.who.int/kobe_centre/publications/hidden_cities2010/en/)>.

World Health Organization. 2013. Obesity and Overweight. WHO Fact Sheet No. 311. Retrieved February 10, 2014. <<http://www.who.int/mediacentre/factsheets/fs311/en/>>.



# Sustainability of Cancer Registration in the Kilimanjaro Region of Tanzania – A Qualitative Assessment

---



Leah L. Zullig, PhD, MPH  
 Department of Health Policy and Management, Gillings School of Global Public Health,  
 University of North Carolina at Chapel Hill; Chapel Hill, NC;  
 Health Services Research and Development, Durham Veterans Affairs Medical Center;  
 Durham, NC

Sky B. Vanderburg, BS  
 Duke Global Health Institute, Duke University; Durham, NC

Charles Muiruri, MPH  
 Department of Health Policy and Management, Gillings School of Global Public Health,  
 University of North Carolina at Chapel Hill; Chapel Hill, NC;  
 Duke Global Health Institute, Duke University; Durham, NC, USA

Amy Abernethy, MD  
 Duke Cancer Institute, Duke University; Durham, NC, USA

Bryan J. Weiner, PhD, MA  
 Department of Health Policy and Management, Gillings School of Global Public Health,  
 University of North Carolina at Chapel Hill; Chapel Hill, NC

John Bartlett, MD\*  
 Duke Global Health Institute, Duke University; Durham, NC



Correspondence may be directed to:  
 Leah Zullig,  
 Health Services Research & Development (152); 411 West Chapel Hill Street, Suite 600;  
 Durham, NC 27701, USA,  
 Tel: 919-286-0411 x 7586;  
 E-mail: zullig@email.unc.edu.

---

\* On behalf of the authors



## Abstract

The projected cancer burden in Africa demands a comprehensive surveillance strategy. Kilimanjaro Christian Medical Centre (KCMC) is developing a population-based cancer registry, and understanding stakeholders' perceptions of factors impacting cancer registration sustainability is critical to its long-term success. We conducted 11 semi-structured qualitative interviews with clinicians and administrators. Interviews were double-coded and evaluated for predetermined and emerging themes.

Nearly half (45%) of participants discussed change commitment, stating that the cancer registry would benefit KCMC and that they were committed to it. However, change efficacy was low – participants were not confident in their shared ability to sustain the registry. Most participants (73%) discussed the importance of resource availability and administration support. Several themes emerged across interviews: (i) lack of cancer registry awareness, (ii) ambiguity about its purpose, (iii) the importance of training, (iv) the importance of outcome data, and (v) the importance of international partners. These findings may facilitate cancer registry development and sustainability in similar settings.

---

## Introduction

### Cancer Registration in Africa

In 2008 cancer registries in Africa represented only 11% of a population bearing over 571,000 new cancer cases (Ferlay et al. 2010; Parkin 2006). Institutions seeking to establish or sustain cancer surveillance systems on the continent have faced challenges (Rastogi et al. 2004; Zullig et al. 2013), yet many of these programs move forward without assessing organizational needs. Formal evaluation is critical to laying groundwork for sustainability. Understanding local perceptions of barriers and readiness to surmount them is an important foundation for developing a cancer registry that can effectively serve its population.

### *Formal evaluation is critical to laying groundwork for sustainability.*

We had previously conducted a quantitative needs assessment examining organizational readiness to implement a cancer registry at a tertiary medical centre in the Kilimanjaro region of Tanzania (Zullig et al. 2013). Respondents were generally confident and committed to registry development. However, approximately one-third of respondents reported that there were no funds to maintain the registry. In light of this initial disconnect between high organizational confidence and commitment versus limited financial resources, we posit that understanding additional contextual factors impacting long-term sustainability of cancer registration activities is of critical importance.

The objective of the current study was to develop a comprehensive understanding of perceived factors associated with sustainability of cancer registration activities through key stakeholder interviews. To our knowledge, this is the first effort to engage administrative and clinical stakeholders in a low- or middle-income country (LMIC) in a formal, qualitative assessment of sustainability of cancer registration activities.

## Methods

### Weiner's Theory of Organizational Readiness to Change

Weiner's theory of organizational readiness to change provided the conceptual model (Weiner 2009). The key tenet is that organizational readiness is a multi-level, multi-faceted construct comprised of both organizational members' shared resolve to implement a change and their belief

in the collective capacity to make a change. The former construct is termed *change commitment* and the latter is *change efficacy* (Weiner 2009; Weiner et al. 2008). We apply principles of the theory in the context of sustainability.

*...understanding additional contextual factors impacting long-term sustainability of cancer registration activities is of critical importance.*

### **Participant Recruitment and Questionnaire Design**

Recruitment and interviews were conducted in March 2013. To identify participants, we acquired a list of administrative department heads and clinical stakeholders. As a secondary recruitment method, we attended a clinical conference to identify possible participants. We selected stakeholders based on their anticipated interaction with the cancer registry and to achieve a diverse sample with regard to professional roles (e.g., clinical, administrative) and physician specialty. We estimated a target of ten interviews, based on feasibility due to time and budget constraints, while balancing the need to achieve saturation.

We prepared an interview guide that consisted of ten open-ended questions. Questions were designed to delve further into our previous findings from the quantitative needs assessment based on Weiner's theory of organizational readiness to change (Weiner 2009; Zullig et al. 2013). The semi-structured interview guide was designed with findings from our previous work guiding our hypotheses but with attentiveness to ensure that participants were able to express their own opinions and perceptions. We began with general questions and progressed to more explicit, context-specific ones. Questions were designed to address the perceived need for the cancer registry, resource availability, sustainability of cancer registry implementation and perceived professional roles associated with the registry.

In accordance with the participant's preference, interviews were conducted either in person or via voice over Internet protocol (VOIP). The location of the in-person interviews was left to the participant's discretion but was typically his or her office. Participants were given the option of completing the interview in either Swahili or English; all chose English. Verbal informed consent was obtained at the time of interview. Duke University Health System's Institutional Review Board reviewed and exempted this study. Ethical clearance was obtained from the Research Ethics Committee at the Kilimanjaro Christian Medical Centre (KCMC) and Kilimanjaro Christian Medical University College. All interviews were digitally audio-recorded, transcribed in smooth verbatim style and crosschecked for accuracy.

### **Data Analysis**

Interview texts were analyzed in accordance with standard social science qualitative methodology (Rubin and Rubin 2005). A list of five initial codes was created based on our theoretical framework (Weiner 2009) and previous experience (Zullig et al. 2013). These initial codes included change commitment, change efficacy, resource availability, communication and leadership support. Additional codes emerged as the interviewers reviewed transcripts. Two interviewers (LLZ and SV) coded the interview transcripts separately and subsequently jointly reviewed the texts. After consensus was achieved, a larger group of the research team (LLZ, SV, SYZ, CM) reviewed the study material to ensure data analysis integrity and that codes had been interpreted within the cultural context. The research team then organized codes under thematic headings and identified key representative quotes (Rubin and Rubin 2005; Ryan and Bernard 2003). Our primary aim was to understand stakeholders' perceptions of factors impacting sustainability of

cancer registry activities at the KCMC and how these views might inform ongoing registry development and training.

## Results

### Participant Characteristics

Each of the clinical and administrative stakeholders we approached agreed to be interviewed, suggesting a high level of organizational motivation and interest in sustaining the cancer registry. We interviewed 11 participants, with an approximately even balance of administrators and clinical-only staff (55% administrators; 45% clinical-only). Participants were diverse in specialty and gender, and the majority were trained as physicians (82%; Table 1). Eighty-two percent of interviews were conducted in person.

Table 1. Semi-structured interview respondent characteristics (N = 11)

Characteristics	N (%)
<b>Sex</b>	
Male	7 (63.6)
Female	4 (36.4)
<b>Highest degree earned</b>	
MD	9 (81.8)
PhD	1 (9.1)
Secondary school	1 (9.1)
<b>Physician specialty or department</b>	
Community medicine	2 (18.2)
Internal medicine	2 (18.2)
Medical records	1 (9.1)
Obstetrics and gynecology	1 (9.1)
Parasitology	1 (9.1)
Pathology	2 (18.2)
Pediatrics	1 (9.1)
Surgery	1 (9.1)
<b>Professional role</b>	
Department head	5 (45.4)
Interim department head	1 (9.1)
Clinician only/faculty	5 (45.4)
<b>Interview setting</b>	
In person	9 (81.8)
Via VOIP	2 (18.2)
	<b>Mean (SD)</b>
<b>Interview length (minutes)</b>	<b>25.2 (12.5)</b>

VOIP = voice over Internet protocol.

Codes based on the theoretical framework are discussed in detail below. Key quotes describing each code are highlighted in Table 2. Emerging themes and iconic quotes are presented in Table 3.

Table 2. Predetermined, theoretically driven themes

Theme	Example quote
Change commitment	<ul style="list-style-type: none"> <li>I think it's the responsibility of everybody to understand what the cancer registry is. Also, at the end of the day when you say everybody is responsible, that means working... and not coming up where people say, "It's not me, it's not me, it's not me."</li> <li>KCMC should be responsible for the cancer registry and should take [ownership] and see... that the registry is sustained in various ways, and make sure that there are some benefits to the hospital [that] come out of its existence.</li> </ul>
Change efficacy	<ul style="list-style-type: none"> <li>The culture of creating... and maintaining records is very loose.</li> <li>People don't think that they can gain much by training in oncology, because first of all the medicines are very expensive, [and] the technology... is also very expensive, and they think they cannot make any money from it rather than diagnosing it.</li> </ul>
Resource availability	<ul style="list-style-type: none"> <li>I cannot just say that we have funds in a certain way that we can support. We are quite poor, and we aren't able to do that, but if there is anything that a cancer registry is planning to do... [for] cancer patients, then the door is open and we are ready to help.</li> <li>It doesn't need a lot of money, and what they eventually learn from the cancer registry, the cancer registry itself can be an income-generating tool.</li> </ul>
Communication	<ul style="list-style-type: none"> <li>...very two-way traffic kinds of relationships with the departments...</li> <li>So essentially everyone, and especially because cancer patients are distributed to everybody at KCMC, ...there's no way we can underestimate or undermine any department, any unit.</li> </ul>
Leadership support	<ul style="list-style-type: none"> <li>Implementation sometimes could be slow because the management has not stated anything openly regarding the cancer registry.</li> <li>...if we have these people committed, the leadership is committed [to] the cancer registry, this is actually going to be [the] number one investment we probably have to do.</li> <li>...the keys to improve a place is first to make the key people, meaning the people who are the leaders of that particular place, ...know and understand better about that particular aspect of [the] issue which you are planning to implement. If you can't make them understand it better, they are the first people to make that particular aspect of [the] issue stagnant.</li> </ul>

KCMC = Kilimanjaro Christian Medical Centre.

Table 3. Emerging themes

Theme	Example quote
Current lack of awareness	<ul style="list-style-type: none"> <li>I don't know what's the competence of the cancer registry, what information is in the cancer registry, what is needed to be collected from the patients. I have not been involved with any registry. But I am keen about this situation because we as a nation, if you don't have a cancer register, how do you talk about cancer in this country? We'll just be like blind.</li> </ul>
Purpose of registry	<ul style="list-style-type: none"> <li>[The] cancer registry is definitely both a clinical and research tool. And the reason that people think it's more [of] a research tool is because, of course, it has only existed for a very brief time, and probably by that time the community here was not really told what the importance of [the] cancer registry [was].</li> <li>[To share] the common causes [of cancer] that we are coming across... and to have our figures updated as we go along in managing the patients... It will also help us... knowing [not only] the [cancer] type, but [also] the magnitude... of patients that we are treating in our individual departments. Looking at the challenges we are facing in treating the patients and also unifying the information that we'd like to extract from these patients. ...At the moment each department works on its own.</li> </ul>
Staff training	<ul style="list-style-type: none"> <li>I think the first thing, if you want to make it sustainable, is that... you need to train; training is very important... And after training, then you probably need to appoint people who will work on that permanently.</li> <li>There must be specific people who are informed and knowledgeable, be those nurses or whatever, who are responsible and accountable to that registry. And their responsibilities must be well defined.</li> </ul>
Patient outcomes	<ul style="list-style-type: none"> <li>Of course a number of patients who report to our department with cancer, they present in advanced states... Sometimes they don't come back because they're coming from far [away], but we don't have the means of knowing what has happened [to them]. Maybe through a cancer registry we might get the contact [with] where these patients are and if there is anything that would let us know the [ir] progress.</li> <li>What we are collecting has to be linked with outcomes, and we really have to know the outcomes, [including] mortality outcomes.</li> </ul>

KCMC = Kilimanjaro Christian Medical Centre.

### Change Commitment

Five participants (45%) provided discussion of the hospital's commitment to changing practice to implement sustainable registry practices. Participants stressed the importance of each department committing its respective expertise to support change (e.g., the pathology department providing clear confirmation of cancer diagnosis, medical records supporting record keeping). There was a common sentiment that implementing and sustaining the registry would serve to benefit the organization in the long run. One participant summarized the organization's holistic commitment to change in this way:

KCMC should be responsible for the cancer registry and should take [ownership] and see... that the registry is sustained in various ways, and make sure that there are some benefits to the hospital [that] come out of its existence.

Another participant indicated that there were many members in the organization who support the cancer registry and that there is a need to systematically "identify those people properly [with regard to] who can go an extra mile" with the goal of sustaining registration.

### Change Efficacy

Weiner defines change efficacy as "shared belief in their collective capability" to make a change (Weiner 2009). Five participants (45%) assessed institutional or national capacity for cancer registration, all voicing doubt with the following examples: inaccurate or lost patient files, lack of a national patient identification, and scarce interest in oncology among physician trainees. Individual concerns went beyond a shortage of trained personnel or materials to express that "the culture of creating ... and maintaining records is very loose." This "culture" also suffers from a stark distinction between research and clinical care, where research efforts are often seen as extraneous to the purpose of medical record keeping.

### Resource Availability

The majority of participants ( $n = 8$ , 73%) discussed resource availability. This discussion generally revolved around the availability of funds, staffing and information technology infrastructure. With regard to financial resource availability, several participants indicated that funds were unavailable, but that they were committed to the registry despite this: "We are quite poor, and we aren't able to do that, but if there is anything that a cancer registry is planning to do... [for] cancer patients, then the door is open and we are ready to help." Several participants provided possible solutions for overcoming this implementation barrier. Two suggested partnering with the Tanzanian government or non-governmental organizations as a strategy to bolster resource availability. Another noted that while initially a cancer registry requires a small outpouring of funds it could eventually create revenue: "It doesn't need a lot of money, and what they eventually learn from the cancer registry, the cancer registry itself can be an income-generating tool."

Availability of staffing was another common theme. Participants generally felt that there were too few staff, that staff were overburdened with existing work commitments, and that they were inadequately trained for cancer registration. According to one participant, "We need the staff. We need people that are trained. We need the infrastructure to do it too. We need...committed doctors in the specific units...."

Technology infrastructure was also mentioned frequently. One participant summarized technological needs by saying the organization "need[s] computers and even software, like a database." While there is a technological foundation at KCMC, participants generally viewed their organization's technological infrastructure as in its infancy. Hospital medical records are currently paper-based. Participants expressed frustration with current record-keeping practices and suggested that the cancer registry operate independently: "You should bypass a system which is not working

because working with [new] systems because trying to make [this] work, it doesn't work." Several participants indicated that they desired a transition toward electronic medical records and thought the cancer registry would both benefit from electronic records and, perhaps, promote adoption of an electronic record system.

### Communication

Communication was discussed in a myriad of ways: with administration, between clinical departments and with patients. Ten out of 11 participants mentioned an aspect of communication. Participants indicated that they desired communication with and from administration: "open discussion and a lot will come out from there." Moreover, they indicated that communication was critical to foster inter-departmental collaboration: "very two-way-traffic kinds of relationships with the departments." One participant indicated that organization-wide communication is important between "... essentially everyone, and especially because cancer patients are distributed to everybody at KCMC,...there's no way we can underestimate or undermine any department, any unit."

### Leadership Support

Eight participants (73%) discussed the importance of support from hospital administration and key leaders in sustaining the cancer registry. Several participants indicated that a signal from organizational leadership was the primary factor influencing registry sustainability. One participant said:

The first thing to me is administration. I'll say this again and again, because the system that we have at KCMC is hierarchical, all the way through [to] the bottom. And once you have the head of the hospital, the head of departments and all other people at KCMC committed and interested in the cancer registry, there is so much chance that the cancer registry will [succeed].

But at the end of it all, the buck stops at the office of the executive director.

Additional quotations highlighting the importance of leadership support are listed in Table 2.

### Emerging Themes

Emerging themes included: (i) a general lack of awareness about the cancer registry, (ii) ambiguity about the purpose of the cancer registry, (iii) the critical nature of training staff (both to increase awareness and ensure best practices for registration), (iv) the importance of including patient outcome data, and (v) connecting with international partners. Lack of awareness about the registry was evident across all interviews, both with regard to what participants did and did not say. Nearly 82% indicated they had no personal experience with a registry. Speaking of gaining organizational commitment, one participant said, "Maybe they [do not know] exactly what importance ... the cancer registry [will] bring to KCMC and Tanzania, [such] as pride."

There was confusion about the purpose of the registry. Some participants viewed it as a short-term research project potentially fuelling long-term instability, while others viewed it as a joint clinical–research venture, and still others were completely uncertain of its purpose. One participant summarized this issue as follows:

[The] cancer registry is definitely both a clinical and research tool. And the reason that people think it's more [of] a research tool is because, of course, it has only existed for a very brief time, and probably by that time the community here was not really told what the importance of [the] cancer registry [was].

Several participants indicated that they perceived the registry as having a potentially positive impact on improving patient care. There was a strong emphasis on using registry data for clinical purposes such as internal reporting and disease tracking:

I want to see [the] cancer registry coming up with kinds of deliverables, deliverables that everyone else will be able to see and say “this is something very important.” I mean, this is something unique to support, because in a way it’s also supporting us.

Distinct from the theory-driven theme of staffing resource availability was the emerging theme of the importance of providing training to staff in various aspects of the registry. Nearly all ( $n = 10$ , 91%) participants discussed this during their interview. Participants offered staff training as a solution to overcome lack of awareness:

I think the first thing, if you want to make it sustainable, is that...you need to train; training is very important...And after training, then you probably need to appoint people who will work on that permanently.

Collecting patient outcome data is not standard practice for many cancer registries. However, participants identified this as a high priority. They recognized several barriers to longitudinal patient tracking, including lack of a unique personal identification number, lack of a system for defining residential addresses, and patients having insufficient personal financial and/or transportation resources to present at the hospital for care, which makes including them in the registry challenging. Most participants reported that patient outcome data was a critical component of the registry to inform clinical care. Because of the aforementioned barriers, at least three participants suggested that it would be important to have registry staff collect data in the community. One participant described this as follows:

That patient may not have enough money to come to KCMC, so that patient will tell the doctor, only give me medication, to give me medicine, and they’re going home.... We will go to the field, go to the health centre and identify also cancer patient[s].

Creating international partnerships was previously identified as a mechanism to overcome lack of financial resources. A related theme emerged regarding the perceived interconnectedness of the organization within a broader context of international cancer care. For example, when discussing the role of the pathology department, one participant said it was important to, “make sure that we have a diagnosis that is standard, you know, because that will help to harmonize even with ... other countries.” This eye toward bridging along international lines also resonated in the following quote:

The very last thing would be, I think, international cooperation is really important, the way we have seen it from everywhere, and we know that in today’s world nothing can just exist on an un-united basis. Probably you need to connect with people; you connect with others that are doing the same thing.

## Discussion

Interviews with key clinical and administrative stakeholders were consistent with findings from a previous, quantitative study (Zullig et al. 2013). In general, participants were committed to supporting the cancer registry but identified a lack of resource availability, particularly with regard to financial resources, staffing and information technology. Similarly, several participants expressed negative change efficacy. These are elements of readiness to change – a key component of sustainability. Anticipated sustainability may affect people’s readiness to change and, ultimately, their

willingness to initiate change, the amount of effort that they are willing to expend and their persistence when confronted with obstacles. Negative change efficacy may reflect that participants collectively did not perceive their organization had the ability to sustain the cancer registry. However, participants presented thoughtful suggestions for overcoming these limitations, recommending a tangible and authentic commitment to change. These possible solutions may be translatable to the development of cancer registries in other LMICs:

- Involve key leaders during the initial planning stage and secure buy-in early.
- Train staff early and provide continuing education opportunities to demonstrate organizational commitment, facilitate communication and ensure a well-qualified team.
- Assign a visible leadership role to a single person who can take responsibility for the registry while holding other team members accountable.
- The registry must be designed and promoted to inform research questions and support patient care.
- Collaborative partnerships are critical both within the organization (e.g., between clinical departments) and externally (e.g., with international partners and other institutions) in order to safeguard daily operations and for benchmarking, shared learning and support.

In summary, KCMC and institutions like it in other LMICs face many challenges to implementing and sustaining cancer registration programs. However, when organization members share a vision for their institution, that vision may strengthen their collective ability to overcome resource limitations. One participant shared his vision for the cancer registry at KCMC. We assert that this vision and commitment to excellence is critical to the success of cancer registration in LMICs:

...[I view] KCMC as an icon [of] education, so other people from other hospitals could come and see what KCMC is doing, and such a registry can...be established somewhere else. KCMC [could] be a centre of excellence maybe – that's what I could maybe suggest as a dream to me, as a dream to see where KCMC [is] headed... the experience which would be gained from the cancer registry [can help] develop the management of the cancer patient [at] KCMC.

### Acknowledgements

Other authors of this paper include: **Olola Oneko**, MD, Kilimanjaro Christian Medical Centre; Moshi, Tanzania; **Esther Lisasi**, MD, Kilimanjaro Christian Medical Centre; Moshi, Tanzania; **Michael Oresto Munishi**, MPH, Kilimanjaro Christian Medical Centre; Moshi, Tanzania, and **S. Yousef Zafar**, MD, MS, Duke Global Health Institute, Duke University; Durham, NC; Duke Cancer Institute, Duke University; Durham, NC, USA.

### Funding

Dr. Zullig was funded by the National Cancer Institute (5R25CA116339). Dr. Zafar is supported by the American Cancer Society Mentored Research Scholar Grant, the Duke Cancer Institute Cancer Control Research Pilot Studies Award, and the Duke Clinical Research Institute Comparative Effectiveness KM1. Dr. Bartlett is supported by HRSA grant T84HS21123 and NIH grants P30AI064518, D43CA153722, U01AI069484 and D43TW06732. This project was also supported by the HIV Associated Malignancies Training and Research Program (D43 CA153722) and Medical Education Partnership Initiative (T84HA21123).

### References

- Ferlay, J., H.R. Shin, F. Bray, D. Forman, C. Mathers and D.M. Parkin. 2010. "Estimates of Worldwide Burden of Cancer in 2008: GLOBOCAN 2008." *International Journal of Cancer* 127(12): 2893–917.
- Parkin, D.M. 2006. "The Evolution of the Population-Based Cancer Registry." *Nature Reviews Cancer* 6(8): 603–12.

- Rastogi, T., A. Hildesheim and R. Sinha. 2004. "Opportunities for Cancer Epidemiology in Developing Countries." *Nature Reviews Cancer* 4(11): 909–17.
- Rubin, H.J. and I.S. Rubin. 2005. *The Art of Hearing Data* (Second Edition). Thousand Oaks, CA: Sage Publications, Inc.
- Ryan, G.W. and H.R. Bernard. 2003. "Techniques to Identify Themes." *Field Methods* 15(1): 85–109.
- Weiner, B.J. 2009. "A Theory of Organizational Readiness for Change." *Implementation Science* 19(4): 67.
- Weiner, B.J., H. Amick and S.Y. Lee. 2008. "Conceptualization and Measurement of Organizational Readiness for Change: A Review of the Literature in Health Services Research and Other Fields." *Medical Care Research and Review* 65(4): 379–436.
- Zullig, L.L., C. Muiruri, A. Abernethy, B.J. Weiner, J.A. Bartlett, O. Oneko and S.Y. Zafar. 2013. "Cancer Registration Needs Assessment at a Tertiary Medical Center in Kilimanjaro, Tanzania." *World Health & Population* 14(2): 12–23.



# Comparative Analysis and Evaluation of the Effectiveness of Demographic Policies in EU Countries (2009-2010)

---



George Pierrakos, PhD, Associate Professor of Department of Health Care and Social Units Administration, Faculty of Management and Economics, Technological Educational Institute (TEI) of Athens, Athens, Greece

Dionyssis Balourdos, Member of the Institute for Social Policy, National Centre for Social Research, Athens, Greece

Sotiris Soulis, PhD, Professor of Department of Health Care and Social Units Administration, Faculty of Management and Economics, Technological Educational Institute (TEI) of Athens, Athens, Greece

Markos Sarris, PhD, Professor of Department of Health Care and Social Units Administration, Faculty of Management and Economics, Technological Educational Institute (TEI) of Athens, Athens, Greece

John Pateras, Lecturer of Department of Department of Health Care and Social Units Administration, Faculty of Management and Economics, Technological Educational Institute (TEI) of Athens, Athens, Greece

Panagiotis Skolarikos, MD, Director of Department of Obstetrics and Gynecology, Helena Venizelou Hospital, Athens, Greece

Athanasios Farfaras, M.Sc., MD, PhD, Department of Obstetrics and Gynecology, Helena Venizelou Hospital, Athens, Greece



Correspondence may be directed to:

Athanasios Farfaras,

Agias Barbaras 32 Palaio Faliro DC:

17563 Athens, Greece,

Tel: 0030-210-9827429;

E-mail: farfaras@gmail.com.



## Abstract

**Purpose:** This article contains a comparative analysis and evaluation of the effectiveness of population policies in European Union (EU) countries, using multivariate analysis.

**Data and Methods:** To study these differences, it is primarily necessary to have the relevant data. The most recent database available was developed by the OECD in 2007 and currently covers OECD countries and most EU Member States. We used multivariate analysis to categorize the indicators into the following groups: (a) economic indicators, (b) indicators reconciling work and family life, and (c) demographic indicators.

**Results:** The results of measuring the degree of coherence of factors reveal that the four most important factors influencing the effectiveness of population policy are (i) the average maternal age at first childbirth, (ii) social protection expenditure, (iii) GDP, and (iv) public spending for benefits. Based on the data from the evaluation of the correlation matrix of variables and data, the classification of countries, according to the values of the coefficients of analysis, appears as follows: the Nordic countries (together with France and the United Kingdom), the Southern European countries and the Northern countries: Estonia, Latvia, Lithuania (by a very slight margin Romania), and Bulgaria, Poland, Slovakia (and, marginally, Malta).

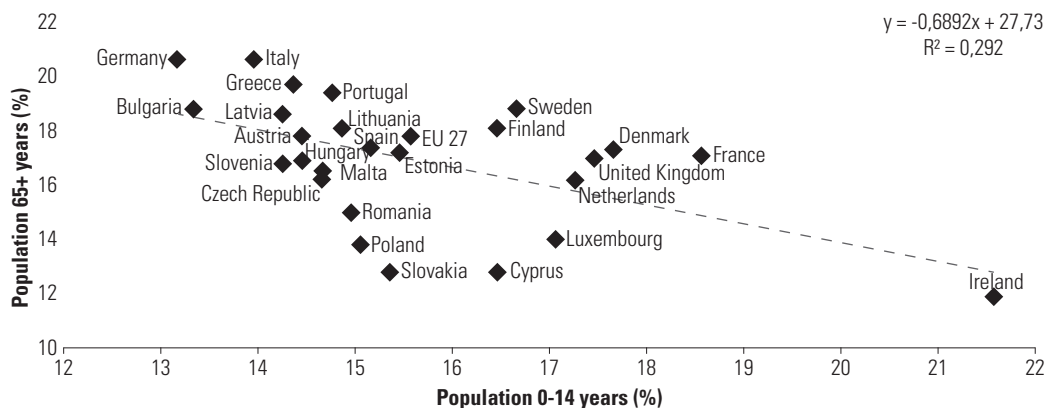
**Conclusions:** The key comparative findings from benchmarking best practices in the context of the European experience are the following: The EU is being demographically transformed as a direct result of an increase in average life expectancy and immigration and a decrease in fertility. Demographic factors are influenced by specific features, in contrast with economic factors which seem to be less stable.

## Introduction

Over the last few decades, the European Union (EU)'s demographic structure has changed dramatically. Population growth has slowed considerably and aging has accelerated. Three major trends characterize this population pattern. First, as the baby-boom generation approaches retirement age, the share of older people is rising significantly; second, fertility rates have remained low – below replacement level for several decades; and thirdly, EU populations are experiencing greater longevity and healthier lives.

A continuous increase in the elderly population (usually those aged 65 years and over) and a simultaneous decrease in the young population (usually those aged 0–14 years) characterize the process of population aging. This has an impact on almost all European countries, but those most strongly affected are Germany, Italy, Greece, Portugal and some Eastern European countries, including Bulgaria (Figure 1).

Figure 1. Population 65 years and over and population 0–14 years, EU-27 Member States, 2012



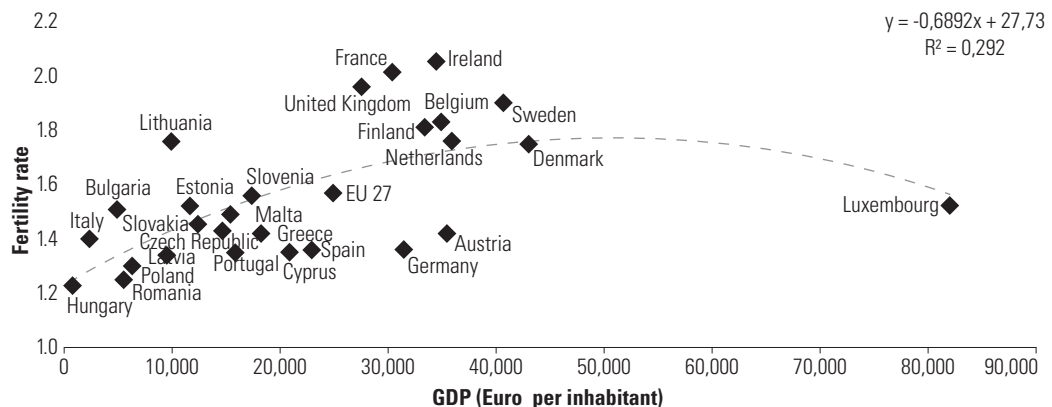
The fertility rate in EU countries has been declining since 1965 and was at its lowest at the beginning of the present century. Since then, there has been a slight increase; there are indications though that the fertility rate has begun to fall again during the current economic recession. It is estimated that in the following decades the fertility rate in the EU-27 will be no more than 1.6 per woman in the population and therefore well below the rate of 2.1 necessary to replace each generation (European Commission 2012).

As stated in a report from the Council of the European Union (2011: 3),

Lowest-low fertility – below 1.3 children per woman – has ended in all Member States and the most recent figure for EU-27 was 1.6 and could rise to over 1.7 if adjustments for the postponement of births (the so-called tempo effect) are taken into account. This small adjustment does not make up for the shortfall in relation to the replacement ratio of 2.1, but it could contribute to a slower rate of population decline in the medium/longer term, in conjunction with a possible further increase in fertility as EU Member States become wealthier. There are significant differences in fertility trends among Member States, and in 2009 the birth rate was still below 1.5 in 12 of them.

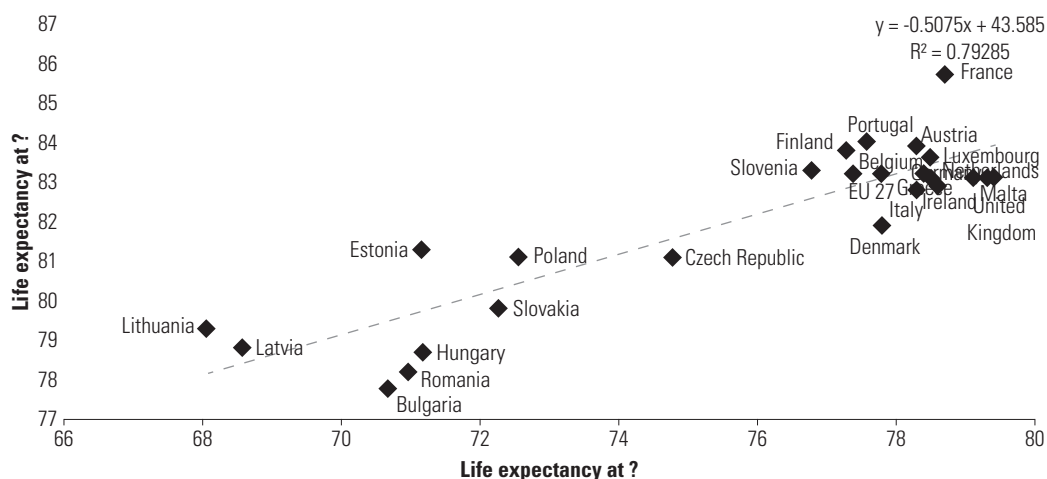
The demographic–economic paradox, that is, the inverse correlation between GDP per capita and fertility, is found in a number of EU countries. In Figure 2 we see that the higher the GDP per capita of a country, the fewer children are born. This is actually the case for Luxembourg, Germany and Austria. However, the relation is far from linear, as in other countries with similar GDP levels (Luxembourg is an outlier as far as GDP is concerned). Fertility is significantly higher in Sweden (1.90 children per woman), Finland (1.83 children per woman) and Belgium (1.81 children per woman). The modest change in fertility results from somewhat new family building patterns: countries with fewer marriages, more cohabitation, more divorces and an older average age of women at childbirth tend to have higher fertility rates. Fertility is just below replacement level in Ireland (2.05 children per woman), France (2.01 children per woman) and the United Kingdom (UK; 1.96 children per woman). Furthermore, almost all Eastern and Southern European countries have among the lowest fertility rates – also a paradox, as among them there are countries hardly affected by the financial crisis.

Figure 2. Fertility rate and Euros per inhabitant, EU-27 Member States, 2011



Life expectancy at birth in the EU-27 averaged 80.3 years in 2011, reaching 83.2 years for women and 77.4 years for men. Improvements in living standards and the establishment and improvement in health systems across Europe have led to a continuous increase in life expectancy at birth (see Figure 3).

Figure 3. Life expectancy at birth, EU-27 Member States, males and females, 2011



Significant differences in life expectancy at birth are nevertheless observed among EU Member States. European men on average enjoy the longest life span in Italy (80.1 years), Sweden (79.9 years), Spain (79.9 years), Netherlands (79.4 years) and the UK (79.1) (2011 data for the majority of countries). In Central Europe, life expectancy is lagging behind the EU-27 average by 4 to 12 years. A woman born in 2011 is expected to live between 77.8 years (Bulgaria) and 85.4 years (Spain), a range of 7.9 years. Some new EU Member States, however, in particular the Czech Republic, Slovakia and Slovenia, are clearly catching up. Since infant and child mortality have now reached very low levels, this essentially translates into a gain in life expectancy above the age of 50.

Migration is also a significant key driver of population growth in EU Member States. In recent years, the increase in the population of the EU-27 has mainly been due to high net migration rates (Table 1). As stated in the report from the Council of the European Union (2011), immigration is not only increasing the total population, but is also bringing in a much younger population. Countries with positive migration, that is, receiving countries, include those in Northern and Western, as well as, quite recently, Southern Europe (Spain, Portugal, Italy and Greece). Countries of Eastern and South-eastern Europe, as sending countries, have a negative migration balance.

Table 1. EU-27 Member States by contribution of natural change and net migration to population growth/decline, 2009

<b>Growth, due to</b>	
Only natural change	IE, PL
Mostly natural change	CY, ES, FR, NL, SK, UK
Mostly net migration	BE, CZ, DK, EL, LU, SI, FI, SE
Only net migration	IT, AT, PT
<b>Decline, due to</b>	
Only natural change	HU, EE
Mostly natural change	BG, DE, LV, RO
Mostly net migration	LT
Only net migration	MT

Source: European Commission, Eurostat 2011, p.60.

AT = Austria; BE = Belgium; BG = Bulgaria; CY = Cyprus; CZ = Czech Republic; DE = Germany; DK = Denmark; EE = Estonia; EL = Greece; ES = Spain; FI = Finland; FR = France; HU = Hungary; IE = Ireland; IT = Italy; LT = Lithuania; LU = Luxembourg; LV = Latvia; MT = Malta; NL = Netherlands, the; PL = Poland; PT = Portugal; RO = Romania; SE = Sweden; SI = Iceland; SK = Slovakia; UK = United Kingdom.

The impact of family policies on these trends is difficult to isolate and assess. The European Commission (2006) has identified five key policy areas where actions would be needed in order to meet the demographic challenge. These policy areas are (i) promoting demographic renewal in Europe through better support for families; (ii) promoting employment by, among other strategies, promoting active aging; (3) introducing reforms to increase productivity and economic performance; (4) attracting and integrating migrants in Europe; and (5) promoting sustainable public finances.

We restrict our analysis to family policies that may have an impact on fertility. The central questions examined in this paper are: To what extent can the differences in fertility levels among European countries be explained with existing family policies? Is there evidence that better policies can help parents cope with the constraints of a modern society? Are there significant differences between the Northern European countries and the so-called South European cluster?

The first part of the paper is devoted to a discussion of the theoretical determinants of family policy and fertility, in order to improve our understanding of the relationship between vital demographic trends and policy responses. The second part describes an evaluation framework for different policies and assesses the role of several national factors. Then, data from the OECD data base are used and factor analysis is applied for a comparative analysis between different countries in the EU context. The article concludes with a discussion of future avenues of research.

## **Theoretical Framework**

### **Fertility and Childbearing**

Fertility has been investigated since the first post-war decades, because of the contribution of economics and, later, of sociology and psychology (Becker 1988). In the context of the socio-economic approach, children are considered “capital goods,” expected to yield future benefits by supporting their parents either financially (in developing countries) or emotionally (in developed countries).

In that sense, children assume special importance and usefulness in the micro-socio-economic function of the household. The number of “children – capital goods” depends on a wide range of economic, social, psychological and cultural factors – variables affecting parents’ decisions regarding the desired and the actual family size. Parents’ decisions about the family size they desire and the one they can actually have further depend on the expected future benefit–utility they may derive, seeking the best possible balance between cost and quality of the “children – capital goods” (Robinson and Bianchi 1997).

Modern economic theory on the household is based on the premise that a family can be seen as a small financial entity that produces and consumes basic and durable goods. Based on the assumption that children constitute commodities, the cost of children refers to the input of resources required for their upbringing, while benefits relate to the outputs and outcomes arising from the children themselves at a later time during their development. In this sense, the benefits of children are more long-term than short-term.

Obtaining features that resemble those of “durable goods,” children are determined, in terms of number, by their “price” or cost in relation to the disposable income of the family. The cost is divided into two components: the direct cost (cost of education, healthcare, clothing, etc.) and the indirect or opportunity cost, which traditionally has burdened the spouse–mother (child care, upbringing and non-participation in the labour market). If the spouse–mother has high potential to earn a salary, higher “relative prices” or higher opportunity costs emerge, respectively, provided that social norms and social values are excluded from the analytical mechanism, as they remain unaltered for long periods of time. This cost “is saved” by the couple by designing a strategy that limits the number of children (Willis 1987).

In this context, it is argued (Earsterlin 1978) that parents postpone childbearing until convinced they can afford to assume their responsibilities and financial burdens. Since fertility is an irreversible fact, depending on the economic conditions (phases of the economic cycle) of the family, an

informal competition between fertility and “lost consumer” opportunities of childbearing seems to exist. Furthermore, it is stated (Oppenheimer 1988) that premarital cohabitation causes parents to delay their formal marriage as well as their decision to have children, until they feel more confident about their own career path.

Esping-Anderson states that due to the maturation of the welfare state, the current standard form of the nuclear family, which becomes institutionally and socially legitimate through marriage and marital fertility after undergoing a state of destabilization and crisis (“de-familization” is the term used) (Esping-Anderson 1999, Bambra 2007), enters into another state dominated by dispute and diversity. Countries in which the incentives and opportunities for women’s professional integration are numerous, that is, where the cost of “non-working” is high, confront an inevitable family crisis. If the services of the welfare state are inadequate, fertility is severely affected. Through Esping-Anderson’s approach, it becomes evident why in many Northern European countries fertility tends to stabilize, given that the importance of opportunity cost is being downgraded. In contrast, Southern European countries and Germany have reached a record in birth rate decline, since the opportunity cost is extremely high. In general, fertility seems to be chosen according to rational criteria and reflects diverse, flexible, multi-figured or single-figured families – households.

### **Basic Socio-economic Determinants of Fertility**

A family must take into account the cost–benefit ratio of its members by focusing on minimizing the costs and maximizing the benefits in order to plan its range of family size and obtain the desired number of offspring. Therefore, the size of this micro-socio-economic unit depends on investing in the perceived quality of the offspring, disposable family income, the current price of the services required for the offsprings’ upbringing, and the maximization of benefit, which, either in the form of children’s future employment and income or in the form of parents’ and children’s psycho-emotional security and satisfaction, constitutes a key incentive of fertility.

This way, the family expects and strives to maximize its long-term benefits. The available economic resources seem at first to be one of the key elements taken into account when planning the size of the family, because their sufficiency allows the purchase of accompanying services and products for the qualitative development of children. Thus, the association of income and fertility is positive, while the increase in prices of goods and services has a negative impact. Certainly, the positive association of income and fertility is not always confirmed, as it has been noted that income growth per se does not necessarily lead to the increase of fertility.

Additional factors, such as parents’ education, as well as their social and cultural capital, seem to exert considerable influence over their decision about the size of family they wish to obtain (Macura et al. 2007). These factors may have a negative effect on fertility, because they increase the requirements for a better quality of life for children and family life (Van Groezen 2003). Better quality of life for children requires adequate resources, tangible and intangible (high income, high educational level, social perceptions of gender roles, satisfaction with management of working and leisure time and many other factors), which have been identified as leading to a negative association between income and fertility (Robinson 1997; Cigno et al. 2004). Presented below are some key indicative determinants, which, along with many others, compose and structure the multi-factorial and multi-dimensional scope of fertility.

#### **Income**

Fertility generally depends on the increase in family income (increase of women’s salary), which decreases when the cost of children’s upbringing rises. Nevertheless, the size of family may be positively or negatively correlated with income, particularly when their relation is examined in connection with the educational level of parents and especially with that of the mother.

#### **Women’s Employment**

Women’s employment constitutes a key determinant of childbearing. In developed countries, the correlation between fertility and women’s employment may be positive, on the condition that

income earnings and childcare services are available. However, recent studies show that the relation between fertility and female employment is not always distinct, especially when changes in fertility can be explained only by changes in women's salary (Andersson 2000; Kravdal and Rindfuss 2008).

### **Cost and Quality of Childcare**

The cost of the child's upbringing and development depends on the number of offspring (family size) and the quality of child care (level of education and literacy, health, nutrition, clothing, leisure activities, entertainment, etc.). The association between cost of children and fertility is expected to be negative: high cost of children corresponds to reduced births. Family support through quality childcare services, benefits and welfare at work reduces the cost of children and may constitute a positive determinant of family size. Nevertheless, key determinants that can affect the cost of children either positively or negatively are the following: women's employment opportunities, the wage differential between men and women, the perception of women/men and the general population on gender roles, and women's concern for their work (professional career).

### **Opportunity Cost of Mother**

The opportunity cost refers to the income that the mother (Gauthier 2007) is deprived of because she gives up her job or reduces her working hours to bring up her children (McDonald 2000). The opportunity cost of the mother is calculated on the basis of her salary, her working time and the time of absence from work. If the mother is unemployed, it is calculated according to her educational level, which is considered a parameter of her potential salary (Craig 2006). The ratio between the opportunity cost of the mother and the number of children is estimated to be negative: the larger the opportunity cost, the smaller the family size.

### **Maternal Age and Birth Interval**

The age of mother at first childbirth has an impact on family size, which in addition depends on the value parents ascribe to children as "durable goods", the structure of the labour market and changes in the opportunity cost of the mother.

Furthermore, age at marriage and age of parents at first childbirth affect birth interval, since it has been noted that a large time gap between births is positively correlated with high educational level, high income, and mother's high-flying career.

Birth interval is also affected by women's employment, given that (a) short intervals between births facilitate the return to employment, and (b) large intervals between births favour work experience. Thus, the relationship between birth interval and women's employment can work in both directions, either positively or negatively.

### **Desired and Actual Number of Children**

Family size also depends on the desired versus actual number of children a family is planning to have. The relationship between the desired and actual number of children is affected by factors such as income, maternal age, duration of marriage, number of existing children, housing conditions, and incentives from family policies (benefits, tax exemptions, working facilities, etc.) (Symeonidou et al. 2000).

### **Time Management**

The distribution of human time is an important factor affecting fertility. The allocation of time between labour, housework and rest or leisure (free time), according to the theory of the allocation of human time, affects fertility and is directly linked to women's employment (Bratti 2003; Del Boca et al. 2005).

### Social Roles of Men and Women

Attitudes and perceptions of social roles of men and women regarding the mother–wife–worker constitute a key factor positively or negatively affecting the size of the family. If these roles are understood and exercised on a basis of conflictual behaviour within a competitive ideological–cultural framework of values and principles between both parents, then they have a negative effect on fertility. In this case, family size is limited for the sake of career opportunities and the pursuit of a higher salary/income, resulting in female employment affecting fertility in a negative way.

On the other hand, if these roles are perceived by both parents on a basis of consensual behaviour (mutual acceptance of mother and father, working parents, spousal roles), female employment may have a positive effect on fertility due to the equal allocation of housework (e.g., child care), thus achieving a reconciliation and harmonization between professional and family life.

To sum up, relevant studies on fertility highlight the importance and special significance of certain determinants, such as the opportunity cost of mother, social roles of men and women, reconciliation and harmonization of family and professional life, and value ascribed by the working mother to her professional career.

Through women's employment, the aforementioned determinants may have a positive effect on fertility and hence on the size of the family (Symeonidou 2002).

Thus the main determinants affecting fertility are not only economic factors, such as family income, female employment, the cost of children and the alternative or occasional cost of mother, but also socio-cultural factors, such as the desired and actual number of children, mother's age, time management between professional and family life, and attitudes and perceptions of the social roles of men and women.

### Fertility and Family Policy

Fertility policy is perceived as the framework of family protection policies, which are addressed to couples and single-parent families (Gauthier 2002). The implementation of these policies is achieved through a series of direct measures, such as benefits or allowances, tax discount, maternity benefits, in-kind benefits, parental leave, and child care benefits.

In some cases, family policy is also related to a wider range of accompanying measures that refer to employment, education, health, culture, immigration, media, leisure and so forth, and have an overall impact on family welfare (Sleeboos 2003).

However, the approach of the aforementioned broader framework of direct and indirect family policy measures is not always achieved. Studies indicate that the basic family policy is closely related to fertility and includes measures such as (i) parental absence (maternity protection, parental leave), (ii) child care services, and (iii) family benefits (Neyer 2003).

The first category comprises the institutional measures for the working mother, such as leave of absence from the workplace to meet basic needs of the children. The second category comprises measures related to the provision of crèche and child care services, which include reception and accommodation areas for preschool-age children. The third category refers to family benefits and aims at increasing the family income in order to reduce the cost of child care. The amount of family benefits usually depends on the number of children and the type of household. Tax relief and allowances related to the number of children, or certain other benefits provided for the improvement of the housing conditions of households and so forth, are also considered family benefits.

### Evaluation of Different Policies

#### Methodological Framework

Family policies vary considerably from one country to another. Some countries have traditionally been designing and implementing policies to influence fertility, while some focus on protecting families and children. Other countries have only recently implemented family policies and therefore have a differentiated set of measures for child and family welfare. They also have different goals and different priorities, such as support of birth rate increase, support for work,

reconciliation with family life, decrease of income inequality, reduction of family and child poverty, child education, gender equality or development of child care services.

According to Lohmann et al. (2009), theoretical analysis of family policy programs for the most part supports the general division of countries into universalist (social democrat), residual (liberal economic) and social insurance (conservative) welfare regimes as originally formulated and further developed by Esping-Andersen (1997). These groupings often correspond to regional country clusters.

The first welfare regime is known for its universal state support for families, high commitment to gender equality in work and care, and strong support for working parents. The Nordic countries are examples of this. The social insurance regime is characterized by a medium level of support for families, mainly in the form of cash benefits related to working status. This regime tends to support a traditional male breadwinner model, where the man works full-time and the woman works occasionally and is mostly responsible for the domestic area. Countries belonging to this model include Germany, France and the Netherlands. In the residual welfare regime, there is low support for families, and policies are targeted mainly at vulnerable groups. In this regime, we find among other countries the UK. There may also be a fourth model comprising the Southern European countries (Greece, Italy, Portugal and Spain). This model is characterized by fragmentation along occupational lines, a low degree of state penetration of the welfare sphere and a highly collusive mix between public and non-public actors and institutions.

To study whether there are significant differences concerning family policies aimed at affecting fertility among EU countries, we used relevant data developed by the OECD. This dataset currently covers all OECD countries. It is a relatively new database; the first indicators went online in December 2006. It contains socio-demographic contextual data as well as indicators on support programs, allowing comparisons of different configurations of family policies, their context and their outcomes (Thévenon 2008).

More precisely, the aim of the database is to provide cross-national data regarding the situation of families and children. The OECD family database has four broad categories: (i) indicators on the structure of families, (ii) indicators on family formation (e.g., fertility trends), (iii) the “labour market situation of families,” for example, how the presence of children in households may affect the parental labour market, and (iv) measures that exist to support families and children.

The methodology for OECD family data collection, which builds on past and ongoing OECD work, is based on specifically developed questionnaires taken from different OECD sources. The OECD family database is not linked to any specific point in time, thus updating it is an ongoing process (Adema et al. 2009).

In particular, the available indicators make it possible to compare policies on parental leave, child care and education facilities, and financial support. This information is supplemented by data on the structure of families, fertility indicators and the impact of having children on employment and on child welfare. Family policies can thus be compared in relation to the context in which they are implemented (Thévenon 2008).

### Factor Analysis

The technique of factor analysis is based on the interrelationship of variables. Different methods are used to extract the factors. One of the best known and most established methods is the analysis of key factors or, stated differently, analysis of common factors. The inputs in a factor analysis are the coefficients of correlation between the selected variables. We usually choose different models to reach the appropriate number of factors for the final system. A factor analysis of the OECD data makes it possible to identify the main similarities and differences in family policies among European countries (Thévenon 2008). The variables included in the analysis are all described in Table 2.

Table 2. Selected indicators for the comparison of family policies

(a) Economic indicators	(a) Social protection expenditure (% GDP), 2007, (b) Public expenditure (2005) for family allowances, services and tax relief (total) as % of GDP, (c) GDP (Euro per capita), (d) Real GDP per capita growth rate, 2007
(b) Indicators reconciling work and family life	Employment rate of women, 2007; unemployment rate of women, 2007; long-term unemployment rate of women, 2007; % of women as % of the total number of students in tertiary education
(c) Demographic indicators	Marriage rates in 1000 residents, 2006; divorce rates in 1000 residents, 2006; average age of mother at first birth, fertility, 2007; rough infant mortality rate

## Results

The main similarities and differences in fertility, female employment and family policies among European countries are likely to be identified through factor analysis of the OECD data. All variables included in the analysis are described in Table 3.

Table 3. Definition of variables and their correlation with factors (Rotated Component Matrix)<sup>a</sup>

	Component <sup>b</sup>	
	1	2
<b>Economic indicators</b>		
Social protection expenditure (% GDP), 2007	0.903	-0.062
GDP (Euro per capita)	0.74	0.352
Public expenditure (2005) for family allowances, services and tax relief (total) as % of GDP	0.674	0.122
Growth rate real per capita GDP, 2007	-0.839	0.067
<b>Indicators reconciling work and family life</b>		
Employment rate of women, 2007	0.252	0.76
Long-term unemployment rate of women, 2007	-0.152	-0.864
Unemployment rate of women, 2007	0.073	-0.879
Students (ISCED 5-6) by sex aged 20–24 as % of corresponding age population, females	-0.263	-0.126
<b>Demographic indicators</b>		
Fertility, 2007	0.556	0.567
Gross infant mortality rate	-0.805	-0.052
Marriage rates in 1000 residents, 2006	-0.502	0.381
Divorce rates in 1000 residents, 2006	-0.09	0.461
Average age of mother at first birth, fertility, 2007	0.872	-0.064

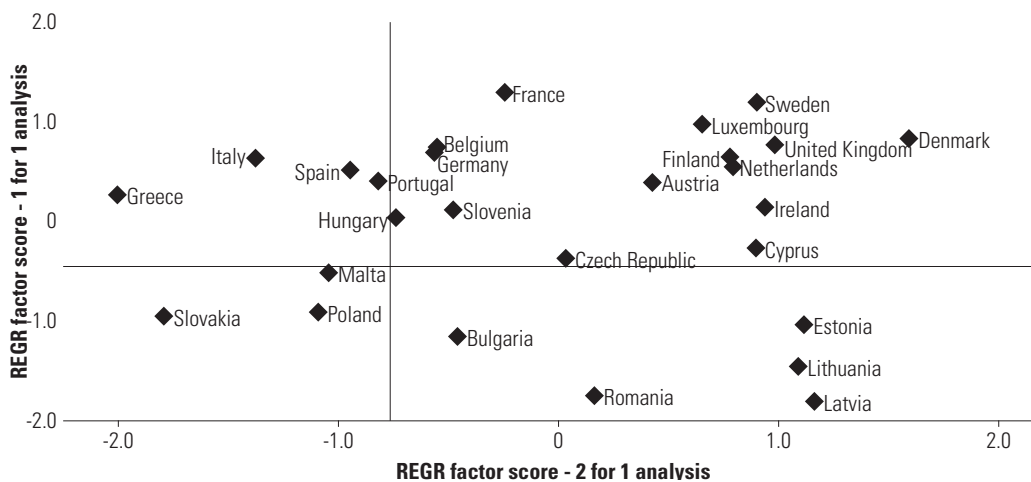
Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

<sup>a</sup> Rotation converged in 3 iterations.

<sup>b</sup> The variables loaded to each factor are underlined.

The results of measuring the degree of coherence of the factors show that the first factor is strongly affected by economic–demographic indicators: social protection expenditure (% of GDP); GDP (Euro per capita); public expenditure for family allowances, services and tax relief (as % of GDP); average age of mother at first birth and infant mortality. We also see that women's employment rate, unemployment rate and long-term unemployment rate; fertility, and divorce rates are substantially loaded on factor (component) 2.

Figure 4. EU-27 Member States ranked according to their fertility, family policies, female employment and other socio-economic characteristics



REGR = Regression

Based on data from the assessment of the rotated component matrix and on data in Figure 4, the classification of countries according to the rates of the coefficients of factor analysis is evident. The horizontal axis shows the classification of the countries with respect to variables included in factor 1, while the vertical axis shows the respective classification with respect to the variables included in factor 2.

1. Four distinct groups of countries represent the first focus of analysis in the upper right edge of the diagram. Those are the Nordic countries (along with countries such as France and the UK), while Luxembourg, Austria and the Netherlands are in close proximity
2. The Southern European countries (upper left): Greece, Spain, Portugal, Italy

The acceding EU countries are divided into two separate groups, consistent with their geographical segmentation. Accordingly:

3. The Northern countries: Estonia, Latvia, Lithuania, Romania, Bulgaria in the bottom right part of the diagram
4. Poland and Slovakia (along with Malta, marginally) in the bottom left.

This variation can be attributed mainly to the size of fertility, female employment and education, as well as the size of social protection expenditure and the differences in child care systems for working parents. Female employment is consistent with higher fertility in the Nordic countries, which have a lower unemployment rate among women and satisfactory GDP growth rates. Their neighbouring countries or more distant neighbours (Latvia, Estonia, Lithuania), who do not have similar characteristics, have, for instance, lower fertility and family-child protection.

In the opposite part of the diagram are the Southern European countries (Greece, Italy, Spain and Portugal), with generally less support for work and family reconciliation, weak family policies and considerably lower fertility and female employment (such as Poland, Bulgaria and Slovakia in the bottom left of the diagram). Poverty rates are higher than the respective ones in the Nordic countries, and these countries are characterized by a family policy deficit. The benefits are relatively low, while the parental leave may be relatively long but counterbalanced unsatisfactorily by the salary.

Compared to other Eastern European countries (e.g., the Czech Republic, Poland and Slovakia), Hungary provides more comprehensive support to parents through a balanced combination of policies; for instance, the compensation payment for parental leave is twice as much as in Poland and the Czech Republic. Furthermore, public expenditures on child care services and coverage of

expenses for preschool children are also higher (87% of children) than in Poland (36%), while families are also supported through relatively generous benefits corresponding to 2% of GDP, compared to only 1% in Poland. Perhaps it is for these reasons that Hungary is somewhere in the middle, close to the intersection of the two axes of the diagram and a long distance from other Eastern European countries, for example, Romania.

## Conclusions

Family and child policies cover a wide range of services related to actions and measures to support and strengthen the family and ensure the welfare of the child. Fertility is partially affected by these policies and is mainly dependent on the generosity of the system and on other factors such as the degree of reconciling work and family life. Below are the key findings of the comparative research of good practices in the framework of the European experience:

The EU is transforming demographically, as the average lifespan increases, fertility declines and immigration rises. In terms of funding, social welfare appears as the most neglected pillar of social protection, at least in Southern Europe. Nevertheless, it represents an aspect of the social state reflecting the state's commitment to intervene in order to support the most vulnerable groups of the population. These forms of intervention present significant particularities compared to the other social protection mechanisms, since they are not intended to cover standard future risks such as social security systems, nor do they focus on addressing a clearly defined field of problems such as health systems. However, they are encouraged to approach heterogeneous, unpredictable and current situations and needs with a high degree of differentiation and generally personalized features. This aspect of the social welfare state reveals the full importance of the principle of social solidarity and collective responsibility.

In order to enhance and support fertility, the family policy has set a number of multi-dimensional targets with a special emphasis on child protection, promoting the reconciliation of professional and family life, enhancing large families and single-parent families, and supporting families at risk of poverty

Therefore, by creating the appropriate conditions and incentives for couples, the family policy aims primarily at enhancing fertility and, at the same time, improving child development and the quality of child care.

## References

- Adema W., M. Huerta, A. Panzera, O. Thévenon and M. Pearson. 2009. "The OECD Family Database: Developing a Cross-National Tool for Assessing Family Policies and Outcomes." *Child Indicators Research* 2: 437–60.
- Andersson, G. 2000. "The Impact of Labour-Force Participation on Childbearing Behaviour: Pro-cyclical Fertility in Sweden during the 1980s and the 1990s." *European Journal of Population* 16(4): 293–33.
- Bambra, C. 2007. "Defamilisation and Welfare State Regimes: A Cluster Analysis." *International Journal of Social Welfare* 16: 1–13.
- Becker, G. 1998. "Family Economics and Macro Behaviour." *The American Economic Review (A.E.R.)* 18(1) 1–13.
- Bratti, M. 2003. "Labour Force Participation and Marital Fertility of Italian Women: The Role of Education." *Journal of Population Economics* 16(3): 525–54.
- Cigno, A., A. Luporini and A. Pettini. 2004. "Hidden Information Problems in the Design of Family Allowances." *Journal of Population Economics* 17(4): 645–55.
- Council of the European Union. 2011. *Demography: Changing Face of Europe*. Background note from the Presidency. Luxembourg: EPSCO June, 2011
- Craig, L., 2006. "Children and the Revolution. A Time-Diary Analysis of the Impact of Motherhood on Daily Workload." *Journal of Sociology* 42(2): 125–43.
- Del Boca, D., S. Pasqua and C. Pronzato. 2005. "Employment and Fertility in Italy, France and the UK." *Labour* (19): 51–77.
- Earsterlin, R. "The Economics and Sociology of Fertility: A Synthesis." In C. Tilly, ed, *Historical Studies of Changing Fertility* pp. 57–133. Princeton University Press, 1978.

- Esping-Andersen, G. *Welfare States at the End of the Century. OECD, Family, Market and Community*. Paris: OECD. 1997
- Esping-Andersen, G. 1999, *Social Foundations of Postindustrial Economies*, Oxford: Oxford University Press.
- European Commission 2006. Commission Communication of 12 October 2006 “The demographic future of Europe – From challenge to opportunity” [COM(2006) 571 final – Not published in the Official Journal]
- European Commission. 2012. *Demography, Active Ageing and Pensions. Social Europe Guide, Volume 3*. Luxembourg: Publications Office of the European Union.
- European Commission. 2012. Directorate-General for Employment, Social Affairs and Inclusion 2012. *Social Europe Guide, Volume 3*. Luxembourg: Publications Office of the European Union
- European Commission, Eurostat. 2011. “Demography Report 2010. Older, More Numerous and Diverse Europeans.” Eurostat, the Statistical Office of the European Union, Unit F.1.
- Gauthier, A.H. 2002. “Family Policies in Industrialized Countries: Is There Convergence?” *Population* 57(2): 447–74.
- Gauthier, A.H. 2007. “The Impact of Family Policies on Fertility in Industrialized Countries: A Review of the Literature.” *Population Research and Policy Review* 26: 323–46.
- Kravdal, Ø. and R.R. Rindfuss. 2008. “Changing Relationships between Education and Fertility: A Study of Women and Men Born 1940 to 1964.” *American Sociological Review* 73(5): 854–87.
- Lohmann, H., F.H. Peter, T. Rostgaard and C.K. Spiess. 2009. *Towards a Framework for Assessing Family Policies in the EU Final Report*. DIW Berlin and SFI Copenhagen, April 2009.
- Macura, M., Y. Mochizuki-Sternber and J. Lara Garcia. 2007. “Eastern and Western Europe’s Fertility and Partnership Patterns: Selected Developments from 1987 to 1999.” In M. Macura and G. Beets, eds, *Dynamics of Fertility and Partnership in Europe: Insights and Lessons from Comparative Research*, Vol 1 pp. 27–55. New York and Geneva: United Nations.
- McDonald, P. 2000. “Gender Equity, Social Institutions and the Future of Fertility.” *Journal of Population Research* 17(1): 1–16
- Neyer, G. 2003. “Family Policies and Low Fertility in Western Europe.” *Journal of Population and Social Security (Population)* 1 (Suppl.): 46–93.
- Oppenheimer, V.K. 1988. “A Theory of Marriage Timing.” *American Journal of Sociology* 94(3): 563–91.
- Robinson, W.C. 1997. “The Economic Theory of Fertility over Three Decades.” *Population Studies* 51(1): 63–74.
- Robinson, J.P. and S. Bianchi. 1997. “The Children’s Hours.” *American Demographics* 20: 22–24.
- Sleeboos, J. 2003. *Low Fertility Rates in OECD Countries: Facts and Policy Responses*. OECD Social, Employment and Migration Working Papers, 15. Paris: OECD.
- Symeonidou, H., M. Cavouriaris, E. Kandilorou, M. Magdalinos, G. Mitsopoulos, J. Tsahalides and K. Vezyrgianni. 2000. *Expected and Actual Family Size. Life-Cycle Events: A Follow-up Survey 1983–1997*. Athens: National Centre for Social Research. (in Greek)
- Symeonidou, H. 2002. *Fertility and Family Surveys in Countries of the ECE Region. Standard Country Report – Greece*. New York and Geneva: United Nations.
- Thévenon, O. 2008. *Vienna Yearbook of Population Research*. Vienna: Vienna Institute of Demography (VID) of the Austrian Academy of Sciences in Vienna.
- Thévenon, O. 2008a. *Family Policies in OECD Countries: Contrasted Models. Population and Societies*, 448, Paris
- Van Groezen, B., T. Leers and L. Meijdam. 2003. “Social Security and Endogenous Fertility: Pensions and Child Allowances as Siamese Twins.” *Journal of Public Economics* 87(2): 233–51.
- Willis, R. 1987. “The Family. What Have We Learned from the Economics of the Family.” *American Economic Review* 77: 68–81.

Healthcare  
Quarterly

Healthcare  
Quarterly

Healthcare  
Quarterly

Healthcare  
Quarterly

Healthcare  
Quarterly

Healthcare  
Quarterly

Advancing Access.

Healthcare  
Quarterly

Healthcare  
Quarterly

Healthcare  
Quarterly

Healthcare  
Quarterly

Healthcare  
Quarterly

Healthcare  
Quarterly

CREATING THE RIGHT

# Healthcare Quarterly

*Healthcare Quarterly* recognizes, nurtures and champions excellence in the Canadian healthcare system. Its objective is to document and disseminate leading practices in health service delivery and policy development.

*Healthcare Quarterly* helps Canadian health system managers anticipate and respond to changing environments, demands and mandates.

HealthcareQuarterly.com



# Awareness of Antimalarial Policy and Use of Artemisinin-Based Combination Therapy for Malaria Treatment in Communities of Two Selected Local Government Areas of Ogun State, Nigeria

---



Adeniyi K. Adeneye, MPhil  
Public Health Division, Nigerian Institute of Medical Research, Lagos, Nigeria;  
Department of Sociology, Faculty of the Social Sciences, University of Ibadan, Ibadan, Nigeria

Ayodele S. Jegede, PhD  
Department of Sociology, Faculty of the Social Sciences,  
University of Ibadan, Ibadan, Nigeria

Margaret A. Mafe, PhD  
Public Health Division, Nigerian Institute of Medical Research, Lagos, Nigeria;  
Department of Sociology, Faculty of the Social Sciences, University of Ibadan, Ibadan, Nigeria

Ezebunwa E. Nwokocha, PhD  
Department of Sociology, Faculty of the Social Sciences,  
University of Ibadan, Ibadan, Nigeria



Correspondence may be directed to:  
Adeniyi K. Adeneye, Public Health Division, Nigerian Institute of Medical Research,  
6 Edmond Crescent, P.M.B 2013,  
Yaba, Lagos, Nigeria,  
Tel: +234-805-788-7698, +234-816-945-3782, E-mail: oakadeneye@yahoo.co.uk.



## Abstract

With limited data on the awareness of changes in the use of antimalaria drugs and availability and use of artemisinin-based combination therapy (ACT) in the context of the Roll Back Malaria (RBM) program, we conducted this descriptive cross-sectional study of 262 registered women attending antenatal clinics and 233 mothers of under-five children. We used a questionnaire to assess the awareness, availability and use of ACT in Ijebu North and Yewa North Local Government Areas (LGAs) of Ogun State. Malaria is holo-endemic in these areas, and the RBM program has been implemented for years prior to the 2010 RBM deadline. Data were also collected through focus group discussions, along with secondary data from hospital records. Hospital stock records showed inadequate and inconsistent supplies of ACT drugs in hospitals surveyed. Only 23.0% of respondents knew about ACT drugs. About 48% preferred analgesics over ACT drugs (0.6%) for malaria treatment. Lack of awareness was the major reason for non-use of ACT drugs (86.1%). Communities in Yewa North had more supplies of ACT drugs and knew more about ACT than those in Ijebu North. Adequate information on ACT needs to be made available and accessible under a public-private partnership if 2010 RBM targets (now past) and the 2015 Millennium Development Goal (ongoing) for malaria are to be realized in the study communities and Ogun State in general.

---

## Introduction

Malaria remains a major global public health and development challenge, particularly in Nigeria (Federal Ministry of Health 2010). It is currently estimated that 90% of global episodes of clinical malaria and 90% of global malaria mortality occur in sub-Saharan Africa. Most of the early treatments for fever and uncomplicated malaria occur through self-treatment at home with antimalarial drugs bought from patent medicine sellers, and treatment is rarely sought at health facilities (Goodman et al. 2007; Okeke et al. 2006). Several studies on treatment-seeking for fever and malaria in sub-Saharan Africa, particularly southern Nigeria, showed that patent medicine sellers remained the most common source of treatment for fever and malaria (Brieger et al. 2002; Goodman et al. 2007). This is because drug stock-outs are common in public facilities, and, also, patent medicine sellers are perceived as more friendly and approachable (Williams and Jones 2004).

*... 90% of global episodes of clinical malaria and 90% of global malaria mortality occur in sub-Saharan Africa.*

Among clients of patent medicine sellers, a high proportion seek care for fever or malaria, as well as other common complaints such as cold, headaches, stomach aches, diarrhea and sexually transmitted infections (Adome et al. 1996). Of those with fever or malaria, the small proportion who use formal health facilities are those with severe malaria. In some cases, too, traditional healers are sought (Lindblade et al. 2000; McCombie 1996; Molyneux et al. 2002). In a pilot study of the awareness, accessibility and use of the malaria control strategies within the context of the Roll Back Malaria (RBM) program among at-risk groups in Nigeria, only 16.2% of respondents (23.5% mothers of children under five years vs. 8.8% pregnant women) were aware of a change in policy on malaria treatment using antimalarials (Adeneye et al. 2007). Similarly, the 2010 Nigeria Malaria Indicator Survey showed that knowledge of artemisinin-based combination therapy (ACT) drug that can be used to treat malaria was low (12.0%) compared to aspirin or paracetamol (44.0%); chloroquine (37.0%); sulphadoxine-pyrimethamine (13.0%) and quinine (7.0%) (National Population Commission [Nigeria] et al. 2012). In recent years, considerable efforts have been made in training health providers in Nigeria on how to effectively diagnose and treat malaria with ACT,

particularly in febrile children (National Population Commission and MEASURE DHS ICF Macro 2009). Hence, education of health providers and communities about diagnosis and change in antimalarial treatment policy, particularly on the change from monotherapies such as chloroquine and sulphadoxine-pyrimethamine to ACTs and how to correctly dispense and use ACT are vital components of effective case management (Kokwaro 2009).

Malaria control efforts in sub-Saharan Africa have been affected by the development and spread of parasite resistance to commonly used first-line antimalarials, notably chloroquine and sulphadoxine-pyrimethamine, reported in almost all malaria-endemic countries in Africa, including Nigeria (Federal Ministry of Health 2010; WHO 2000; 2001). Consequently, the World Health Organization (WHO) has recommended the use of ACT (WHO 2001).

### *Malaria control efforts in sub-Saharan Africa have been affected by the development and spread of parasite resistance*

ACT is the current standard of care for the treatment of patients with uncomplicated falciparum malaria in Africa. The implementation of ACT is one of the key evidence-based and cost-effective malaria control measures initiated to enable malaria-endemic countries to achieve the goals set in the Abuja Declarations and Plans of Action by African Union heads of state and governments at the African Summit to Roll Back Malaria in April 2000 (Nabarro and Tayler 1998; TDR News 1999). One of the RBM goals was to ensure that least 60% and 80% of patients, by 2005 and 2010, respectively, had access to and used correct and affordable treatment within 24 hours of symptom onset, particularly for under-five children. The goal was to halve malaria morbidity and mortality worldwide by 2010 and to further reduce the burden by 50% by 2015 (Muheki et al. 2004; Nabarro and Tayler 1998; TDR News 1999). The RBM goal is also expected to contribute to the Millennium Development Goal (MDG) for malaria of halting and beginning to reverse the incidence of malaria and other major diseases by the target date of 2015 (Teklehaimanot et al. 2005).

The number of ACT treatment courses ordered and procured by national governments of endemic countries through the WHO for use in their public health sector increased from around half a million in 2001 to 31.3 million in 2005; 25.5 million of those were for countries in Africa, including Nigeria (Bosman and Mendis 2007). Since 2004, there has been a strong commitment in many of the countries, under the auspices of the National Malaria Control Program in Nigeria, to making ACTs available in the public sector. Unfortunately, efforts have suffered from problems of funding for purchases, from procurement bureaucracy and from gaps in supply chain management (Medicines for Malaria Venture 2008). Moreover, quality and affordable ACTs have not yet penetrated the profit-oriented private sector (Bosman and Mendis 2007).

Resolution 12.5 of the World Health Assembly, published May 23, 2007, urges member states to progressively discontinue the provision of oral artemisinin monotherapies and to promote use of ACTs in both the public and private health sectors. Member states are further urged to implement policies that prohibit the production, marketing, distribution and use of such monotherapies (Federal Ministry of Health 2010).

Studies have shown that ACT is much more effective than monotherapies, notably chloroquine and sulphadoxine-pyrimethamine, but is much more expensive (TDR 2006). ACTs are over ten times more expensive than the traditional drugs currently used in Africa as monotherapy. Thus, according to reports, combination therapy would be out of reach for the majority of the population in sub-Saharan Africa, especially when purchased out-of-pocket from private sector shops and pharmacies (Medicines for Malaria Venture 2008; WHO 2001). Reports have shown, however, that ACTs have reduced the number of malaria cases and deaths and are much more cost-effective than conventional antimalarial drugs (Muheki et al. 2004; TDR 2006). Yet despite the effectiveness of ACT in improving malaria health outcomes, difficulties in reordering and maintaining supplies (Kokwaro 2009) and affordability remain key barriers and subjects for policy debate, particularly in sub-Saharan Africa (Muheki et al. 2004). To address these barriers, the Affordable Medicines

Facility – malaria (AMFm) model was designed and is being managed by the Global Fund as an innovative financing mechanism to expand access to ACTs through the public, private and non-governmental organization (NGO) sectors. Financial support for the initiative comes from UNITAID (an international facility for the purchase of drugs against HIV/AIDS, Malaria and Tuberculosis), the United Kingdom Department for International Development (DFID) and other donors, while the RBM program continues its important partnership role with the AFMm. Following a successful pilot implementation of AMFm in eight countries – Cambodia, Ghana, Kenya, Madagascar, Niger, Nigeria, Tanzania (including Zanzibar) and Uganda – implementation of Phase 1 began in 2010 in several countries, including Nigeria (The Global Fund to Fight AIDS, Tuberculosis and Malaria 2013).

*ACTs have reduced the number of malaria cases and deaths and are much more cost-effective than conventional antimalarial drugs*

In Nigeria, as in other African countries, addressing the malaria burden is a major challenge and forms a major disease control component of the National Health Policy and Strategic Plan (Federal Ministry of Health 2009; National Population Commission and MEASURE DHS ICF Macro 2009). Since the introduction of the RBM program in Nigeria in 1999, malaria control in the country has been transformed. The Federal Ministry of Health's National Malaria Control Program designed and developed a five-year strategic plan for malaria control. It builds on the National Malaria Strategic Plan (NMSP) for malaria control developed by the National Malaria Control Program in partnership with the RBM partners, states' ministries of health and their local government areas (LGAs), and other stakeholders to enable national scale-up of key preventive and curative interventions. As a result of these initiatives, the RBM goals have been achieved by 2010 and the MDGs are expected to be achieved by 2015 (Federal Ministry of Health 2009). The major targets for malaria control in the country during the five-year period of the NMSP included reducing malaria-related mortality by 50% by the year 2010, and delivering prompt and appropriate treatment, according to the national treatment guidelines, to at least 80% of febrile patients by 2011, sustaining the level to 2013 (Federal Ministry of Health 2009). In line with the road map to achieve the 2010 RBM targets, about 128 million doses of ACT were projected for distribution to ensure comprehensive nationwide coverage for under-five children by 2010 (Federal Ministry of Health 2005a).

Taking a cue from the National Malaria Strategic Plan, the Ogun State government introduced a free malaria treatment program in 2008, using ACT for all febrile children under five years who presented at various public primary and secondary health facilities. The program's success depends on the public knowing about it, understanding its value, and using it. In view of the dearth of empirical data on the awareness, availability and use of ACT in the context of RBM program, the need to examine these became imperative. The study therefore assessed the success of the antimalarial policy and use of ACT for malaria treatment. In doing this, peoples' awareness and use of ACT, ability and willingness to pay, with emphasis on their perceived fair price for a course of the drug, were taken into cognizance in communities of two selected local government areas of Ogun State, Nigeria.

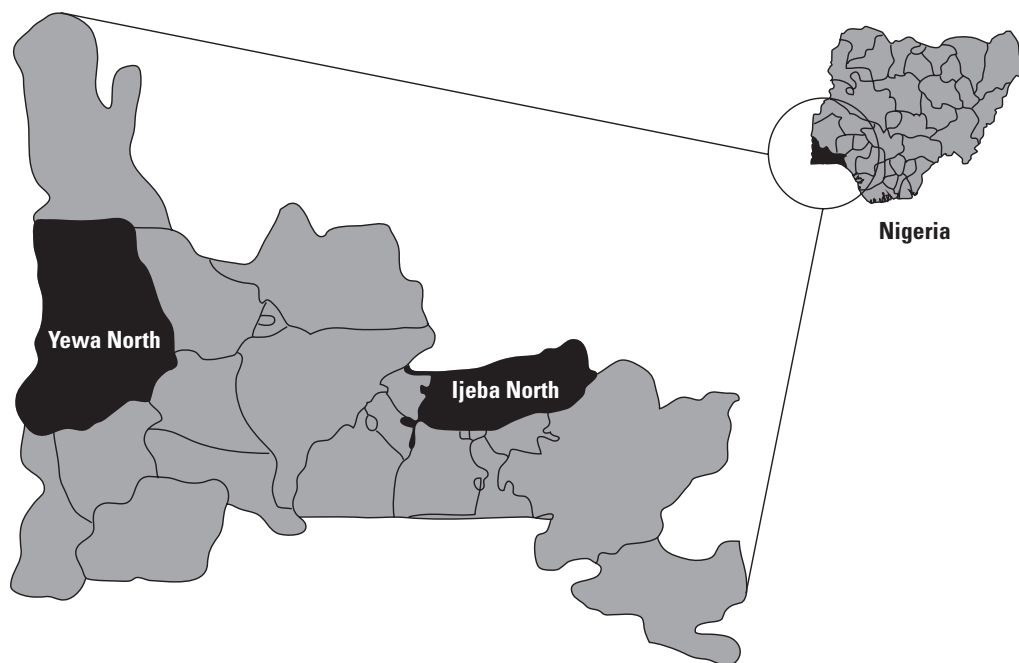
## Methods

### Study Area

The study was carried out in two randomly selected LGAs of Ogun State, which is located in the southwestern part of Nigeria, where malaria is holo-endemic and the RBM program is being implemented. The LGAs are Ijebu North and Yewa North, two of 20 in Ogun State. Ijebu North and Yewa North are 140 km northeast and 170 km north of Lagos, respectively, in the rain forest zone of southwest Nigeria. Two communities (Oru/Awa-Ilaporu and Mamu) in Ijebu North and

two (Igbogila and Ijoun) in Yewa North were randomly selected as the study units. Inhabitants of these LGAs are predominantly farmers and traders, and transmission of malaria is high during the rainy season between April and November (Ayanlade et al. 2010; Ekanem 1996; Omikunle 1999). The location of the study LGAs in Ogun State is shown in Figure 1.

Figure 1. Ogun State map showing the study local government areas



Basic social amenities such as roads, water, health facilities and educational institutions abound in the selected LGAs. Health facilities in Ijebu North include a general hospital, primary healthcare centres (PHCs), health clinics, health posts and private clinics. Yewa North also has a general hospital, PHCs, health clinics, health posts, private clinics and an alternative health clinic. Many patent medicine sellers abound in the two LGAs, with stocks of ACTs and antimalaria monotherapies (Information, Youth, Sports and Culture Division [INLG] 1997; Omikunle 1999; YNLG 2003).

### Study Design

This is a descriptive cross-sectional study on the awareness, availability and use of ACT in the context of the RBM program in Ijebu North and Yewa North LGAs of Ogun State. The major target populations for the study were pregnant women and mothers of under-five children. A total 233 mothers of children under five and 262 pregnant women attending antenatal clinics were interviewed during the household and clinic surveys, respectively, in the selected communities. The two questionnaires were similar, but the one administered to the pregnant women had an additional section on intermittent preventive treatment of malaria in pregnancy (IPTp).

Mothers of under-five children were selected for the household survey using a multi-stage sampling process with a combination of simple random and systematic sampling (Varkevisser et al. 2003). The first stage involved selecting two LGAs from the list of 20 in Ogun State, using the simple random sampling technique. Adopting the balloting approach, we wrote the LGA names on pieces of paper and grouped them into threes according to their geo-political zone, placed them in three containers to represent those zones, and shuffled them. One LGA was subsequently picked

from two of the three containers, randomly selected. The second stage involved selecting two communities in each of the two LGAs, using the balloting approach without replacement. The third stage involved randomly selecting enumeration areas (EAs), that is, one EA for each rural community and three EAs for each semi-urban community. In doing this, a list of all the EAs from the 2005 national census delineation exercise in the selected LGAs was obtained from the National Population Commission (NPC). Subsequently, a systematic sampling of 96 and 19 households from Oru/Awa-Ilaporu and Mamu in Ijebu North LGA and 109 and 9 households from Igbogila and Ijoun in Yewa North LGA were made. Then, a mother of an under-five child from each selected household was selected for interview. If a mother of an under-five child was not found in a selected household, the next household was selected.

For the clinic survey, the sampling frame for the selection of study units was the list of pregnant women registered for antenatal care at the selected health facilities. Women were randomly selected and interviewed on exit from the clinic. Their names were noted on each visit to the health facilities in order to avoid duplication of respondents. To ensure confidentiality, the list of names was subsequently destroyed.

### Data Collection Procedures

The study involved interviewer-administered semi-structured questionnaires for both clinic and household surveys. In addition, in-depth interviews were conducted with health providers in health facilities visited, and secondary data were collected through hospital records. In this regard, records from the service delivery point ledger and monthly summary form relating to ACT supplies and distribution of the brand, drug formulation and quantity of ACTs supplied monthly between 2006 and 2008 were checked at the health facilities. Similarly, the observation technique was adopted for noting the dispensation of ACTs. Data collection first involved a formative qualitative study of people's perceptions, beliefs and practices concerning malaria prevention and treatment through focus group discussions (FGDs) and in-depth interviews. It is important to emphasize that the questions in our survey related to the broad categories of perceptions, beliefs and practices from the formative study, because these served as the platform for the design and development of the questionnaire contents. Moreover, the effective management and control of malaria, particularly in pregnant women and children under five, is usually a function of several factors, such as those relating to knowledge, perception, attitude and treatment practices. Thus, it is assumed that a change in community and individual knowledge will lead to a change in behaviour. Cognitive variables such as attitudes and beliefs, as well as expectations of future events and outcomes, are major determinants of health-related behaviour, such as use of ACTs for malaria treatment (Chen and Land 1986; Munro et al. 2007; Rosenstock 1966).

The formative study was then followed by the use of questionnaires in household and clinic surveys. Prior to the actual survey, a pretest to ascertain the validity and reliability of the questionnaire and data collection procedures was carried out.

The main sections of the household and clinic survey questionnaires from which the focus of this paper was derived include those that probed respondents' background characteristics. They included age, religion, level of education, marital status and occupation. Others probed respondents' awareness and use of ACT and their ability and willingness to pay for ACTs, with emphasis on the perceived fair price they would pay for a course of treatment. Understanding willingness to pay is of particular importance in analyzing pricing policy for health products such as ACTs. In this context, data on willingness to pay is used to study the screening effect of prices, that is, whether those who buy ACTs at a particular price are more likely to use the product, as well as their direct causal effect: whether higher prices cause higher use through psychological effects (Cohen and Dupas 2010). Moreover, ACTs are only free for children under five at public health facilities; they are paid for at the other healthcare outlets such as patent medicine sellers and private hospitals, where a significant number of patients seek healthcare (Brieger et al. 2002; Goodman et al. 2007).

In addition, prerequisites for the success of the antimalaria drug policy on ACT use include getting the drug treatment to most people at the lowest possible cost, increased acceptance, willingness and ability to pay, and utilization of the drug as prompt, adequate and appropriate treatment of malaria.

### **Ethical Considerations**

Approvals for the main study on which this paper is based were obtained from the State Ministry of Health, LGAs and the community prior to the commencement of the study in the communities. Ethical approval for the research protocol for the larger study with assigned number UI/EC/11/0075 was obtained from the University of Ibadan/University College Hospital (UI/UCH) Ethics Committee. Informed consent of all research participants for the study was sought and obtained in written form using an informed consent form to signify their willingness to participate.

*Understanding willingness to pay is of particular importance in analyzing pricing policy for health products such as ACTs.*

### **Data Analysis**

Quantitative and qualitative data for each phase of the study were analyzed using EpiInfo 6.04a and the textual analysis program, Textbase Beta software, developed by Bo Summerlund and distributed by Qualitative Research Management of Desert Hot Springs, CA (Fielding and Lee 1998; Miles and Huberman 1994). Statistical analyses of the quantitative data were conducted using analysis of variance and chi-square tests at a 95% level of significance. Analysis of variance (ANOVA) was used in showing the relationship between measurements of the mean and the variance, or “random error,” of each subgroup in the study in order to provide information needed to determine if the difference between the two was significant. Chi-square, a non-parametric test of statistical significance for bivariate tabular analysis, was used to show whether or not two different samples (of people) were different enough in some characteristics or aspects of behaviour.

In analyzing the qualitative data, the tapes of participant responses from FGDs were first transcribed and typed. The electronic transcripts were then saved as ASCII text files and subsequently summarized, categorized, coded and sorted into text segments according to similarities and differences in individual opinions and views. A standard node tree of domains and concepts of interest was developed for coding the text, using the Textbase Beta software. The program allows files to be given variable assignments, and thus it was possible to sort and then compare patterns of opinions and views as discussed by the respondents.

## **Results**

### **Socio-demographic Characteristics of Respondents**

Of the 495 respondents surveyed, 262 (52.9%) were pregnant women and 233 (47.1%) were mothers of children less than five years old. Overall, 50.9% and 49.1% of respondents were from Yewa North and Ijebu North LGA, respectively. A larger number (68.5%) were Christians, and 97.6% were married. Most were artisans (38.4%) and traders (25.9%) and had some formal education. Of the 262 pregnant women interviewed, 40.1% were from private hospitals and 59.9% were from public hospitals. Respondent age ranged from 16 to 40 years, with a mean age of 28.8 years (27.9 years among pregnant women vs. 28.7 years among mothers of children under five) and a median of 30 years (30 years among pregnant women vs. 23 years among mothers of children under five). Respondents' socio-demographic characteristics are presented in Table 1.

Table 1. Socio-demographic characteristics of respondents

Socio-demographic characteristics	Pregnant women		Mothers of under-five children		Total	
	Number	%	Number	%	Number	%
<b>Local Government Area</b>						
Yewa North	133	50.8	129	49.2	119	51.1
Ijebu North	114	48.9	252	50.9	243	49.1
<b>Total</b>	<b>262</b>	<b>52.9</b>	<b>233</b>	<b>47.1</b>	<b>495</b>	<b>100.0</b>
<b>Communities</b>						
Igbogila	123	46.9	109	46.8	232	46.9
Ijoun	10	3.8	9	3.9	19	8.2
Oru/Awa-Ilaporu	108	41.2	96	41.2	204	41.2
Mamu	21	8.0	19	3.8	40	8.1
<b>Total</b>	<b>262</b>	<b>52.9</b>	<b>233</b>	<b>47.1</b>	<b>495</b>	<b>100.0</b>
<b>Religion</b>						
Christianity	193	73.7	146	62.7	339	68.5
Islam	69	26.3	83	35.6	152	30.7
Traditional	0	0.0	4	1.7	4	0.8
<b>Total</b>	<b>262</b>	<b>52.9</b>	<b>233</b>	<b>47.1</b>	<b>495</b>	<b>100.0</b>
<b>Marital status</b>						
Never married	3	1.1	6	2.6	9	1.8
Married	258	98.5	225	96.6	483	97.6
Divorced	1	0.4	1	0.4	2	0.4
Separated	0	0.0	1	0.4	1	0.2
<b>Total</b>	<b>262</b>	<b>52.9</b>	<b>233</b>	<b>47.1</b>	<b>495</b>	<b>100.0</b>
<b>Education</b>						
None	52	19.8	42	18.0	94	19.0
Primary	86	32.8	52	22.4	138	27.9
Secondary	103	39.3	111	47.6	214	43.2
Post-secondary	21	8.0	28	12.0	49	9.9
<b>Total</b>	<b>262</b>	<b>52.9</b>	<b>233</b>	<b>47.1</b>	<b>495</b>	<b>100.0</b>
<b>Occupation</b>						
Unemployed	1	0.4	1	0.4	2	0.4
Housewife	23	8.8	20	8.6	43	8.7
Farming	41	15.6	17	7.3	58	11.7
Artisan	76	29.0	114	48.9	190	38.4
Civil servant	19	7.3	25	10.9	44	8.9
Professional (e.g., banker)	8	3.1	12	5.2	20	4.0
Trading	86	32.8	42	18.0	120	25.9
Student	5	1.9	0	0.0	5	1.0
Other	3	1.1	0	0.0	3	0.6
No response	0	0.0	2	0.9	2	0.4
<b>Total</b>	<b>262</b>	<b>52.9</b>	<b>233</b>	<b>47.1</b>	<b>495</b>	<b>100.0</b>

### Respondents' Awareness of ACT

Table 2 summarizes respondents' awareness of the change in antimalaria drugs according to their status. Few (23.0%) respondents (20.2% pregnant women vs. 26.2% mothers of children under five) knew of the change in antimalarial use. The LGA and community of respondents' residence positively influenced their level of awareness of the change. More respondents in communities of Yewa North knew about it than those in Ijebu North, as presented in Table 3. Table 4 shows that respondents' level of education had a direct association with their awareness of the change ( $\chi^2 = 50.13$ ,  $df = 6$ ,  $p < .05$ ).

Table 2. Respondents' awareness of change in antimalaria drugs according to their status

Are you aware of changes in antimalaria drugs?	Mothers of under-five children		Pregnant women		Total	
	Number	%	Number	%	Number	%
Yes	61	26.2	53	20.2	114	23.0
No	172	73.8	205	78.2	377	76.2
Undecided	0	0.0	4	1.5	4	0.8
<b>Total</b>	<b>233</b>	<b>100.0</b>	<b>262</b>	<b>100.0</b>	<b>495</b>	<b>100.0</b>

Table 3. Respondents' awareness of change in antimalaria drugs by their LGA and community

	Are you aware of change in the use of antimalarials?							
	Yes		No		Undecided		Total	
	Number	%	Number	%	Number	%	Number	%
<b>Local government area</b>								
Yewa North	104	41.3	146	57.9	2	0.8	252	50.9
Ijebu North	10	4.1	231	95.1	2	0.8	243	49.1
<b>Total</b>	<b>114</b>	<b>3.0</b>	<b>377</b>	<b>76.2</b>	<b>4</b>	<b>0.8</b>	<b>495</b>	<b>100.0</b>
$\chi^2 = 114.28$ , $df = 6$ , $p < .05$								
<b>Communities</b>								
Igbogila	89	38.4	141	60.8	2	0.9	232	46.9
Ijoun	15	78.9	4	21.1	0	0.0	19	3.8
Oru/Awa-Ilaporu	8	3.9	194	95.1	2	1.0	204	41.2
Mamu	2	5.0	38	95.0	0	0.0	40	8.1
<b>Total</b>	<b>114</b>	<b>23.0</b>	<b>377</b>	<b>76.2</b>	<b>4</b>	<b>0.8</b>	<b>495</b>	<b>100.0</b>
$\chi^2 = 114.28$ , $df = 6$ , $p < .05$								

LGA = local government area.

Table 4. Respondents' awareness of change in antimalaria drugs according to level of education

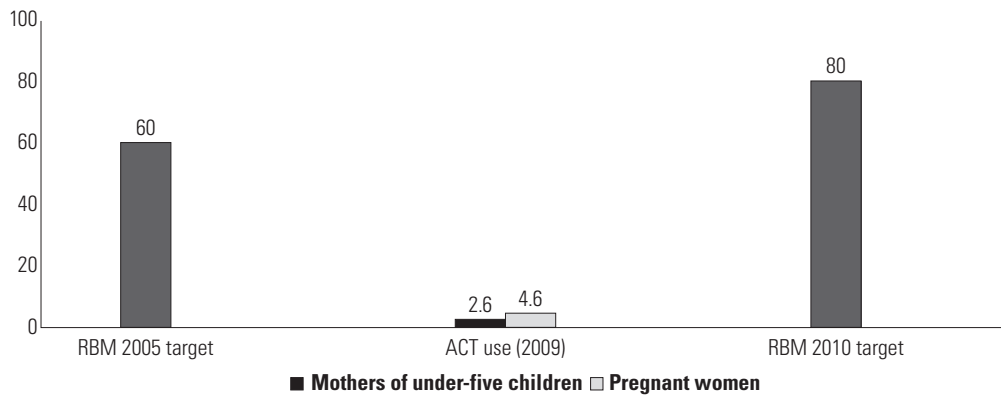
	Are you aware of change in the use of antimalarials?							
	Yes		No		Undecided		Total	
	Number	%	Number	%	Number	%	Number	%
<b>Education</b>								
None	16	17.0	76	80.9	2	2.1	94	19.0
Primary	26	18.8	112	81.2	0	0.0	138	27.9
Secondary	42	19.6	171	79.9	1	0.5	214	43.2
Post-secondary	30	61.2	18	36.7	1	2.0	49	9.9
<b>Total</b>	<b>114</b>	<b>23.0</b>	<b>377</b>	<b>76.2</b>	<b>4</b>	<b>0.8</b>	<b>495</b>	<b>100.0</b>
$\chi^2 = 114.28$ , $df = 6$ , $p < .05$								

Statistical tests using Chi-square further indicated that pregnant women registered for antenatal care at public hospitals (24.8%) knew more about the change than those attending private hospitals (13.3%) ( $\chi^2 = 6.84, df = 2, p < .05$ ). Multiple regression further reinforced LGA of residence (0.85) and facility type attended for antenatal care (0.31) as the two key factors that had joint effects on respondents' awareness of the change. Factors such as age, marital status, religion, education and occupation had no significant joint effect.

**Respondents' Use of ACT**

When respondents were asked whether they had ever taken ACTs, only a few (3.6%; 6.0% in Yewa North vs. 1.2% in Ijebu North) said they had taken the new combination drug. Figure 2 illustrates ACT use among respondents by status.

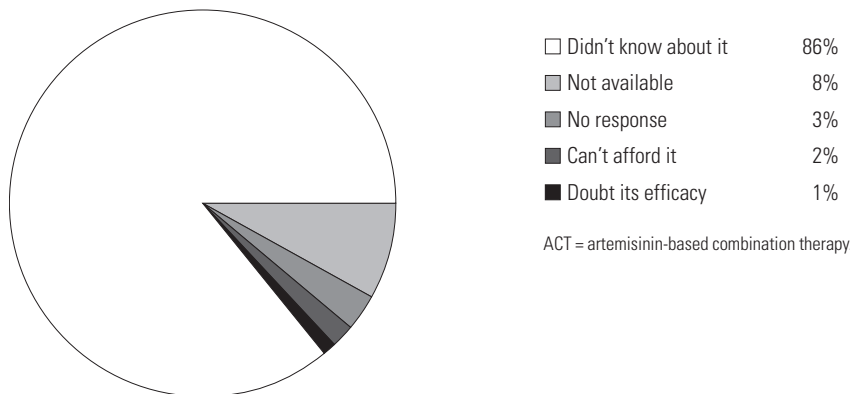
Figure 2. ACT use by respondents according to their status



ACT = artemisinin-based combination therapy; RBM = Roll Back Malaria program.

On the one hand, the reasons that informed the choice of ACT for malaria treatment among respondents were, “it is very effective/works faster” (83.3%) and “was prescribed at the hospital/pharmacy” (5.5%). However, 11.2% were undecided on their reason for choosing ACT. On the other hand, reasons given for non-use of ACT are illustrated in Figure 3. While most (85.5%) respondents had never taken ACTs, 10.5% could not recall or were unsure, and 0.4% did not respond. Their probability of having taken ACTs was positively associated with education ( $\chi^2 = 33.02, df = 9, p < .05$ ), ranging from 11.1% (no formal education) to 44.4% (post-secondary).

Figure 3. Reasons for non-use of ACT for malaria treatment by respondents



ACT = artemisinin-based combination therapy.

Among health providers interviewed, knowledge of malaria treatment using ACTs was high. The main barriers impeding access to ACTs identified by public health providers actively involved in implementing the RBM program included inconsistent and inadequate supplies and difficulty in getting to hard-to-reach areas because of the poor transportation system. In alleviating the impact of the supply problem, a health provider interviewed at the Igbogila PHC revealed that:

...we usually endeavour to notify the local government health department in Aiyetoro when we're almost exhausting our stock of ACTs, LLINs [long lasting insecticide nets] and IPTp drugs ahead of time so that they can find a way of replenishing our stock of the products.

Furthermore, on the issue of inadequacy and inconsistency of supplies, the State senior program manager interviewed pointed out that:

...we get LLINs and other control products such as ACTs and IPTp drugs from the Federal Ministry of Health (in Abuja), the State Government and donor agencies such as UNICEF, but it is usually not enough and [not] regular. For the ACTs, we have them in our public primary and secondary health facilities. The adults pay for the drugs. Only children under five years are provided free treatment with the ACTs.

### **Perceived Fair Price and Willingness to Pay for ACT among Respondents**

On the one hand, when respondents were asked how much they would be willing to pay if a course of ACT were sold at a hypothetical price of 500.00 Naira (N) (3.13 US dollars) in their communities, a larger proportion (82.6%; 73.0% Yewa North vs. 92.6% Ijebu North) was willing to pay the 500.00 Naira and 16.8% was unwilling. Very few (0.6%) were indifferent to paying for the drug. Willingness to pay was positively associated with education ( $\chi^2 = 58.66$ ,  $df = 6$ ,  $p < .05$ ). Further, ANOVA showed that older respondents with a mean age of 29.2 years were more willing to pay the hypothetical price compared to younger ones with a mean age of 27.2 years who were unwilling ( $p < .05$ ).

Reasons given by the 16.8% of unwilling respondents were: can't afford it (56.6%), no work/no money (33.7%), know nothing about the drug (8.4%) and prefer herbs (1.2%). When these respondents were asked what they would be willing to pay (WTP), their answers ranged from 100.00 to 300.00 Naira (0.63 to 1.88 US dollars). The mean WTP was 234.78 Naira (1.47 US dollars) (233.33 Naira; 1.46 US dollars in Yewa North vs. 266.67 Naira; 1.67 US dollars in Ijebu North), with a median of 250.00 Naira (1.56 US dollars).

### **Health Facility Records and Availability of ACT Supplies in Study Communities**

Only the public health facilities surveyed had stocks of ACTs for the age category of one to six years, while none of the private health facilities surveyed had ACTs in stock, as presented in Table 5. Information relating to ACTs in stock over a three-year period (2006–2008) at the health facilities surveyed following examination of records is displayed in Table 5.

*...none of the private health facilities surveyed had ACTs in stock*

Interviews with health workers at all health facilities visited during the survey showed that none had a copy of the National Policy on Malaria Diagnosis and Treatment document.

ACT drugs for age category one to six years were observed to be in stock and dispensed only in public health facilities, except at Ijoun PHC and Mamu health post. None of the private health facilities had any stock of ACT drugs.

Table 5. Population of under-five children juxtaposed with the stocks of ACTs at surveyed public and private health facilities in study communities, January 2006 – June 2008

Community/LGA	Expected population of children <5 years in the community	Available ACTs (Packs of Malmel®/Larimal® for age category 1–6 yrs only) at health facilities visited January 2006 – June 2008	
		Public	Private
<b>Ijebu North LGA</b>			
Oru/Awa-Ilaporu	2,982	97	0
Mamu	583	0	0
<b>Total</b>	<b>3,565</b>	<b>97</b>	<b>0</b>
<b>Yewa North LGA</b>			
Igbogila	3,384	150	0
Ijoun	272	210	0
<b>Total</b>	<b>3,656</b>	<b>360</b>	<b>0</b>
<b>Grand total</b>	<b>7,221</b>	<b>457</b>	<b>0</b>

ACT = artemisinin-based combination therapy; LGA = local government area.

## Discussion

Limitations should be pointed out prior to discussing the study's results. Non-response bias was a primary limitation, some of which may be attributed to the population's poor health education and low awareness of health issues. The second limitation of the study is the focus on two LGAs of Ogun State in one part of the country. A larger study with adequate sample size that is more representative of the geo-political zones of the country is needed to provide better and more generalizable findings. Nonetheless, these limitations do not undermine the validity of findings of this study. Given the widespread concerns about the limited evidence of decreases in malaria-related mortality and morbidity, the results may be useful as a baseline for malaria control improvement efforts on ACT provision for effective malaria treatment with the aim of now meeting the 2015 MDG for malaria in Ogun State in particular and in the country in general, following the past RBM deadline.

The poor awareness of ACTs among respondents perhaps explains the low use of the WHO-recommended combination drugs as first-line treatment in the study area. It is disappointing that very few respondents, particularly mothers of children under five, reported ever having used the new combination therapy, despite the free malaria treatment program being implemented in the State. This is perhaps an indicator of poor implementation of the WHO-recommended change in the use of antimalarials in the study LGAs, as emphasized in the National Policy on Malaria Diagnosis and Treatment document (Federal Ministry of Health 2005b; 2010). It is apparent that a predominant number of people in the study communities are not aware of or using ACT as the new drug recommended for effective treatment of malaria, and are still using declassified antimalarials, notably chloroquine, sulphadoxine-pyrimethamine and artemisinin monotherapies. This implies that the declassified antimalarials are still being distributed and marketed in the study communities, contrary to Resolution 12.5 of the World Health Assembly that advocated for the discontinuation of production, importation, distribution and marketing of such drugs, as emphasized in the National Policy on Malaria Diagnosis and Treatment document. Hence, the regulatory authorities such as the National Agency for Food and Drug Administration and Control (NAFDAC) need to intensify efforts to stop further local production, importation, distribution, and marketing of these declassified antimalarials. In addition, there is need for intensive public health education on ACTs through advocacy and information, education and

communication (IEC) activities by the Ministry of Health in collaboration with the Ministry of Information and Communications in communities across the State, emphasizing the change in antimalarial drug policy and the rationale and benefits of using the new drug, targeting in particular caregivers and households in communities of Ijebu North LGA. To achieve this, IEC materials such as leaflets and posters need be developed and distributed to complement mass media campaigns that will sensitize the public to ACTs in these communities. Health messages aimed at raising awareness of ACT and advocating for its use need to be developed using simple and clear language that people can easily comprehend and identify with. This is particularly important in communities where it is difficult to get health messages across to people who still believe in traditional approaches to healthcare and do not understand the basics of how infections occur through the biomedical framework emphasized by Erinoshio and Oke (1994).

It is disappointing that none of the health facilities visited during the study had a copy of the National Policy on Malaria Diagnosis and Treatment document, despite the fact that it was printed and provided to all states for distribution to all LGAs and health facilities across the country (Federal Ministry of Health 2010). The protocols outline basic information to guide healthcare providers on steps to take and drugs to use for effective implementation of malaria treatment using ACT as updated by the Federal Ministry of Health in the policy documents in 2005 and 2010 respectively. Disseminating the most recent document to healthcare providers, particularly in the study areas, is germane in preventing the incidence of malaria-related complications in pregnancy and impacting on the prescribing practices of healthcare providers. It will improve and harmonize malaria management practices at the health facility level in the study communities with those in other parts of the country.

In view of how long the RBM program has been implemented prior to the free malaria treatment program in Ogun State, the poor awareness of policy change in use of antimalarials and actual use of ACT reported by the respondents in Tables 2 and 3 and Figure 2 is far below, and nowhere near, the RBM target of 60% expected for 2005, not to mention the 80% target expected for 2010, as emphasized in TDR News (2000, 2002). The level of awareness of change in antimalarial use reported in the study is higher than the findings of Adeneye et al. (2007) in a pilot study to evaluate malaria control strategies in Ogun State. Similarly, it is higher than the findings of Ajayi et al. (2008) in which none of the respondents had either heard of or used ACT in a previous qualitative study of the feasibility and community perception on effectiveness of ACT use in the context of HMM in some communities of Oyo State, Nigeria.

Given that the Ministry of Health in the State is implementing a free malaria treatment program with ACT for all febrile children under five presenting at various public primary and secondary health facilities (Adeneye personal communication), the results presented in Table 5 showed the gross inadequacy of stocks of ACT supplied for dispensing in health facilities in the study communities compared to the large number of the expected target population of under-five children. The lack of availability of ACTs, for example, which was indicated by respondents as a reason for non-use of the drug in Figure 3, is corroborated with the data from hospital records presented in Table 5. It attests to the poor implementation of the policy change for using antimalarials emphasized in the National Policy on Malaria Diagnosis and Treatment document. Regular provision of essential drugs such as ACTs to health facilities in the rural areas just as those reported in this study needs be intensified as emphasized in the National Health Policy. We believe that the provision of these essential drugs will enormously contribute to improving the health status of the people.

The low use of ACTs reported in the study is perhaps connected to the ability and willingness of respondents to pay for ACTs in the study communities. These products were not readily available in the public hospitals, where they should not only have been available to adults but free for children. The actual price respondents were willing to pay for a treatment course of ACT suggests the need to ensure equitable affordability of the drugs in the study communities. This could be accomplished through price subsidy for drugs purchased from private sector operators such as patent medicine

sellers, given that the drugs are not available at public health facilities. The high cost of ACTs mentioned by many respondents as a contributing factor to their low use of the drugs could perhaps be attributed to the situation where 62.5% of the population in Ogun State (higher than the national average of 61.2%) live on less than 1.00 US dollar (160.00 Naira) a day, based on purchasing power parity (National Bureau of Statistics 2012).

The reality of the consequent economic burden of the hypothetical price many respondents said they were willing to pay may not have dawned on them at the time of the survey. In reality, they may eventually be unable to afford it. It is possible that when the drugs are actually available for purchase consequent to a malaria case, willingness may wane, with preference for a lower price. In contrast to the cheaper artemisinin monotherapies, and chloroquine- and sulphadoxine-pyrimethamine-based drugs that their prices ranged from 50.00 to 350 Naira (0.31 to 2.19 US dollars), with an average price of 130.00 Naira (0.81 US dollars), the retail market price of an adult treatment course of ACT ranged from 130.00 to 640.00 Naira (0.81 to 4.00 US dollars), with an average price of 340.00 Naira (2.13 US dollars). The retail market price of a course of ACT for children also ranged from 130.00 to 480.00 Naira (0.81 to 3.00 US dollars), with an average price of 256.67 Naira (1.60 US dollars) (Adeneye personal communication). The overwhelming health expenditure, with the majority of it being out-of-pocket expenditures, in spite of the endemic nature of poverty in the country reported by the National Bureau of Statistics (2012), perhaps explains the challenge of choice and preference for the cheaper declassified antimalarials for effective malaria treatment in the study communities, rather than the recommended ACT drugs. Despite ACT's proven efficacy to improve malaria health outcomes, its cost and affordability, particularly in the study communities, remain key areas for policy debate, as emphasized by Muheki et al. (2004). Hence, consumer behaviour patterns in ACT use relative to cheaper and ineffective antimalarials, as demonstrated in this study, need be taken into account when considering the treatment policy on malaria in Ogun State in particular and the in country at large.

It is evident from the study that private health facilities are not involved in implementing the RBM program in the study LGAs, considering the hospital records checked and observations made that none of the private health facilities we visited had ACT drugs to dispense to their clients presenting with malaria. It therefore becomes very important that private health facilities in the LGAs need to be part of the strategy to change malaria treatment guidelines using ACTs if there are to be meaningful improvements in accessing effective antimalarials drugs in the communities. These private health facilities need be involved in the implementation processes of the RBM program, particularly in respect of ACT supplies through the AMFm model being implemented in the country (The Global Fund to Fight AIDS, Tuberculosis and Malaria 2013). This is important if the full potential of the program is to be harnessed to achieve the Millennium Development Goal for malaria now that the RBM 2010 deadline has passed.

### Acknowledgements

We sincerely acknowledge and thank the Research Assistants, the health workers of health facilities visited during the study and people of the communities where the study was carried out for all their support and cooperation. We wish to express our profound gratitude to the Ogun State Malaria Control Program Manager, Mrs 'Toyin Oworu, and other staff of the Roll Back Malaria Unit, Ogun State Primary Health Development Board, Ministry of Health, Ibara, Abeokuta, for their cooperation. We also appreciate the assistance of Mr. Ebenezer and Mr. Femi Adeniyi at the time of data collection. In addition, we would like to thank participants in numerous scientific conferences for their thoughtful and constructive comments on the research.

### References

- Adeneye, A.K., A.S. Jegede, M.A. Mafe and E.E. Nwokocha. 2007. "A Pilot Study to Evaluate Malaria Control Strategies in Ogun State, Nigeria." *World Health and Population* 9(2): 83-94. Retrieved June 7, 2011. <<http://www.longwoods.com/content/19003>>.
- Adome, R.O., S.R. Whyte and A. Hardon. 1996. *Popular Pills: Community Drug Use in Uganda*. Amsterdam: Het Spinhuis.

- Ajayi, I.O., C.O. Falade, B.O. Olley, B. Yusuf, S. Gbotosho, T. Iyiola, O. Olaniyan, C. Happi, K. Munguti and F. Pagnoni. 2008. "A Qualitative Study of the Feasibility and Community Perception on the Effectiveness of Artemether-lumefantrine Use in the Context of Home Management of Malaria in South-West Nigeria." *BMC Health Services Research* 8: 119, doi:10.1186/1472-6963-8-119.
- Ayanlade, A., N.O. Adeoye and O. Babatimehin. 2010. *Climate Change/Variability and Malaria Transmission in Sub-Saharan Africa: A Case of Nigeria*. Climate Change and Security: An International Conference on the Occasion of the 250th Anniversary of the Royal Norwegian Society of Sciences and Letters, Trendheim, Norway, 21–24 June., 2010.
- Bosman, A. and K.N. Mendis. 2007. "A Major Transition in Malaria Treatment: The Adoption and Deployment of Artemisinin-Based Combination Therapies." *American Journal of Tropical Medicine and Hygiene* 77(Suppl. 6.): 193–7.
- Brieger, W., L. Salako, R. Umeh, P. Agomo, B. Afolabi and A. Adeneye. 2002. "Promoting Prepackaged Drugs for Prompt and Appropriate Treatment of Febrile Illnesses in Rural Nigerian Communities." *International Quarterly of Community Health Education* 21: 19–40.
- Chen, M. and K.C. Land. 1986. "Testing the Health Belief Model: LISREL Analysis of Alternative Models of Causal Relationships between Health Beliefs and Preventive Dental Behavior." *Social Psychology Quarterly* 49(1): 45–60.
- Cohen, J. and P. Dupas. 2010. "Free Distribution or Cost-Sharing? Evidence From a Randomized Malaria Prevention Experiment." *Quarterly Journal of Economics* 125(1): 1–45.
- Ekanem, O.J. 1996. "Antimalaria Activities in Nigeria: Historical Perspectives." *Malaria Society of Nigeria Newsletter* 1(1): 2–6.
- Erinosho, O.A and E.A. Oke. 1994. "Some Basic Concepts in Medical Sociology and Anthropology." In O. Otite, ed., *Sociology: Theory and Applied* pp. 71–80. Lagos: Malthouse Press Limited.
- Federal Ministry of Health. 2005a. *National Malaria Control Programme: Revised 5-Year Strategic Plan: 2006–2010 – A Road Map for Malaria Control in Nigeria*. Abuja: Federal Ministry of Health.
- Federal Ministry of Health. 2005b. *Federal Republic of Nigeria: National Antimalarial Treatment Guidelines*. Abuja: Federal Ministry of Health.
- Federal Ministry of Health. 2009. *National Malaria Control Programme: Strategic Plan 2009–2013 – A Road Map for Malaria Control in Nigeria*. Abuja: Federal Ministry of Health.
- Federal Ministry of Health. 2010. *Federal Republic of Nigeria: National Policy on Malaria Diagnosis and Treatment*. Abuja: Federal Ministry of Health, National Malaria and Vector Control Division.
- Fielding, N.G. and R.M. Lee. 1998. *Computer Analysis and Qualitative Research*. London: Sage Publications.
- Goodman, C., W. Brieger, A. Unwin, A. Mills, S. Meek and G. Greer. 2007. "Medicine Sellers and Malaria Treatment in Sub-Saharan Africa: What Do They Do and How Can Their Practice Be Improved?" *American Journal of Tropical Medicine and Hygiene* 77(Suppl. 6): 203–18.
- Information, Youth, Sports and Culture Division, INLG. 1997. *Ijebu North Local Government: Past and Present*. Ijebu Ode: Take Bola Enterprises.
- Kokwaro, G. 2009. "Ongoing Challenges in the Management of Malaria." *Malaria Journal* 8(Suppl. 1): S2 doi: 10.1186/1475-2875-8-S1-S2.
- Lindblade, K.A., D.B. O'Neill, D.P. Mathanga, J. Katunga and M.L. Wilson. 2009. "Treatment for Clinical Malaria Is Sought Promptly during an Epidemic in a Highland Region of Uganda." *Tropical Medicine and International Health* 5: 865–75.
- McCombie, S.C. 1996. "Treatment Seeking for Malaria: A Review of Recent Research." *Social Science & Medicine* 43: 933–45.
- Medicines for Malaria Venture. 2008. *Understanding the Antimalarials Market: Uganda 2007 – An Overview of the Supply Side*. Uganda: Medicines for Malaria Venture.
- Miles, M.B. and A.M. Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook* (2nd edition). London: Sage Publications.
- Molyneux, C.S., G. Murira, J. Masha and R.W. Snow. 2002. "Intra-household Relations and Treatment Decision-Making for Childhood Illness: A Kenyan Case Study." *Journal of Biosocial Science* 34: 109–31.
- Muheki, C., D. McIntyre and K.L. Barnes. 2004. "Artemisinin-Based Combination Therapy Reduces Expenditure on Malaria Treatment in KwaZulu Natal, South Africa." *Tropical Medicine and International Health* 9(9): 959–66.
- Munro, S., S. Lewin, T. Swart and J. Volmink. 2007. A Review of Health Behaviour Theories: How Useful Are These for Developing Interventions to Promote Long-term Medication Adherence for TB and HIV/AIDS? *BMC Public Health* 7:104.
- Nabarro, D.N. and E.M. Tayler. 1998. "The Roll Back Malaria Campaign." *Science* 280 (5372): 2067–8.

National Population Commission (NPC) [Nigeria] and MEASURE DHS ICF Macro. 2009. *Nigeria Demographic and Health Survey 2008*. Calverton, Maryland: National Population Commission and MEASURE DHS ICF Macro.

National Population Commission (NPC) [Nigeria], National Malaria Control Programme (NMCP) [Nigeria] and ICF International. 2012. *Nigeria Malaria Indicator Survey 2010*. Abuja, Nigeria: NPC, NMCP, and ICF International.

National Bureau of Statistics. 2012. *Nigeria Poverty Profile 2010*. Abuja: National Bureau of Statistics.

Okeke, T.A., B.S. Uzochukwu and H.U. Okafor. 2006. "An in-Depth Study of Patent Medicine Sellers' Perspectives on Malaria in a Rural Nigerian Community." *Malaria Journal* 5: 97

Omikunle, T. 1999. *Ogun State Annual and Investment Digest*. Lagos: Visionlink Nigeria Ltd.

Rosenstock, I.M. 1966. "Why People Use Health Services." *Milbank Quarterly* (Milbank Memorial Fund Quarterly Bulletin) 44: 94.

Teklehaimanot, A, B. Singer and A. Spielman. 2005. *UN Millennium Project. Coming to Grips with Malaria in the New Millennium*. Task Force on HIV/AIDS, Malaria, TB and Access to Essential Medicines, Working Group on Malaria. Sterling, VA: Earthscan.

TDR News. 1999. *Rolling Back Malaria*. Geneva: World Health Organization 58: 1–2.

TDR News. 2000. *Roll Back Malaria: Spotlight on Africa*. Geneva: World Health Organization 62: 10 & 15.

TDR News. 2002. *Scaling up Home Management of Malaria*. Geneva: World Health Organization 67: 1–2.

TDR. 2006. *TDR Summary Report 2004–05: With an Overview of Some Key Activities for 2006–07*. Geneva: World Health Organization.

The Global Fund to Fight AIDS, Tuberculosis and Malaria. 2013. "Affordable Medicines Facility – Malaria." Retrieved January 9, 2013. <<http://www.theglobalfund.org/en/amfm/>>

Varkevisser, C.M., I. Pathmanathan and A. Brownlee. 2003. *Designing and Conducting Health System Research Projects, Volume 1: Proposal Development and Fieldwork*. Amsterdam: KIT Publishers and International Development Research Centre and Brazzaville: Africa Regional Office of the World Health Organization.

Williams, H.A. and C.O. Jones. 2004. "A Critical Review of Behavioural Issues Related to Malaria Control in sub-Saharan Africa: What Contributions Have Social Scientists Made?" *Social Science & Medicine* 59: 501–23.

World Health Organization. 2000. *The Use of Essential Drugs*. Geneva: World Health Organization (WHO Technical Report Series, No. 895).

World Health Organization. 2001. *Antimalarial Drug Combination Therapy: Report of a WHO Technical Consultation*. Geneva: World Health Organization. (WHO/CDS/RBM/2001.35).

Yewa North Local Government. 2003. *Wind of change in Yewa north local government, Ogun State*. Ayetoro: Information Department, Yewa North Local Government, 7-9.



World Health and Population provides a forum for researchers and policy makers worldwide to publish original research, reviews and opinions on health- and population-related topics. The journal encourages the conduct and dissemination of applied research and policy analysis from diverse international settings. Its stated goal is to explore ideas, share best practices and enable excellence in healthcare worldwide through publishing contributions by researchers, policy makers and practitioners.



Longwoods Publishing  
*Enabling Excellence*

[worldhealthandpopulation.com](http://worldhealthandpopulation.com)