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As a Microbiology student interested in improving healthcare availability for the poor, I have always dismissed cardiovascular diseases and diabetes as “diseases of the wealthy.” It was not until two summers ago during a hospital internship in Hyderabad, India that I began to realize I was mistaken. Cardiovascular diseases (CVD) and diabetes can be devastating to developing countries that are suffering from the double burden of also having to deal with infectious diseases. CVD onset occurs much earlier in these poorer countries and affects the working population – which can take a huge toll on the economy. What is the point, I reasoned, of helping people survive infectious diseases, if they go on just a few years later to develop expensive chronic ones that affect their ability to work and earn a living?

My internship in India gave me a sense of the scope of the CVD and diabetes burden in India. At least half of the patients I saw were suffering from one of these diseases, and most could not afford the expensive treatment they required. Statistics from a review of the literature on the subject gave me a more concrete answer – 1 in 8 Indians have diabetes, and Indians spend \$23 billion each year on treatment of this disease.¹⁷

Spurred on by this newfound realization, I started searching for a mentor at the university who could help me learn more and possibly contribute to advancing knowledge in this area. I wanted to explore the relationship between CVD and various socioeconomic factors. If certain factors were significantly related to increased risk for CVD, the limited money available to be spent on public health programs could be targeted to the types of people that would benefit most from the programs.

After reading many faculty profiles online I found Dr. Alex Anderson, a professor of Nutrition from Ghana. Dr. Anderson had collected a large amount of data from Women's Health clinics in Ghana, and many of the variables he measured were relevant to my interests. He was excited to share the data with me and guide me through the process of epidemiological data analysis.

As I started reviewing the relevant literature, I realized that CVD is an extensively researched topic, and it is very easy to get overwhelmed by the information available. To avoid getting bogged down, I started by reading simple, easy to understand information about cardiovascular diseases and their risk factors on the Mayo Clinic and American Heart Associations' websites.

Having gained a basic understanding of CVD, I was ready to dive into the scientific databases. I separated my quest into three areas: 1. Information about CVD in the developing world, 2. Socioeconomic risk factors for CVD in developing countries, and 3. The pattern and prevalence of CVD in Ghana specifically. Dividing my search into these categories helped me better structure my paper.

I started by looking through the reference list of several literature reviews. This highlighted some of the most prominent papers- papers that I did not want to miss. From there I started searching WorldCat.org. The WorldCat database is extensive, and I found and looked through hundreds of books and papers using search terms such as “CVD Ghana”, “CVD socioeconomic factors”, and “CVD developing world.” I also used the full form of CVD (“cardiovascular disease” and “cardiovascular diseases”) and did similar searches for studies on diabetes. After I was sure that I had exhausted the WorldCat searches, I turned to Web of Science. Using similar search terms, I looked through the results for relevant papers that I had not found through WorldCat.

Another technique I employed to ensure I found all of the relevant literature was to search by author. I searched the list of publications of key authors to check for other articles that might be relevant to my research.

As there were hundreds of results for each search, I determined the relevance of each paper by reading the abstract. Many papers had titles that were not relevant at all to my research, so I did not read the abstracts for those papers. For other papers, I realized they were irrelevant only after reading their abstracts. Another important consideration in selecting papers was the journal they came from. I selected papers from peer-reviewed journals and a few reputed policy papers such as those published by WHO and Oxford Journals. Further, although there were several books that contained information relevant to my research, I concentrated on using primary sources of scientific studies so that I could determine the credibility and objectivity of the data source. In searching for information about economy and demographics in Ghana, I used official publications from government agencies such as the Ghana Health Service.

I was especially interested in the Methods section of the papers so that I could evaluate their study design. In my own research I was struggling with how to calculate “socioeconomic status”, so I wanted to see how other studies had approached this analysis. I was also interested in the Results section of many papers, as I wanted a more in-depth look at the statistical methods they employed. Although I was able to find the full text of most of the articles I wanted through WorldCat, GALILEO, and PubMed, there were several papers for which I could not find the full text online. I was able to retrieve the full text of these papers through the Libraries' ILLIAD system. After submitting an ILLIAD request I would receive an electronic version of the article I requested within just a few days. There was only one article I was not able to get access to, even after submitting an ILLIAD request and consulting with a librarian through the online chat service.

Though I read the work of hundreds of esteemed scientists throughout my research process, I cannot overestimate the value of collaboration. Talking about my research with peers in my lab and in my classes gave me many new ideas to explore, and presented different perspectives from which to analyze my data. Collaboration is an essential step in any researcher's journey.

This study was just a small step in my research journey, but I have gained a tremendous amount of knowledge about the quest for information – not only through journals and statistics, but also through peers. The skills I gained in this process will be useful to me throughout my career, and I have already begun to apply them to a study on HIV and skin infections in South Africa.

Abstract

Socioeconomic Associations with Hypertension and Diabetes in Rural Ghana

BACKGROUND: Cardiovascular disease (CVD) is the leading cause of death in much of the developing world. It is responsible for 28% of deaths in low and middle-income countries, and much morbidity as disease onset occurs at a much younger age in these countries.^{1,2} As the limited health resources in sub-Saharan Africa must be divided between communicable and non-communicable diseases, it is important for these resources to be effectively targeted to populations that will benefit from them.

AIM: To examine the risk factors of diabetes and hypertension in mothers in rural Ghana.

METHODS: Data on diabetes, hypertension, and several socioeconomic factors was collected from mothers attending Women's Health Clinics in five centers in the Akuapim North District in the Eastern

Region of Ghana, a rapidly growing district with close proximity to Accra, the capital city of Ghana. Associations between the socioeconomic factors and diabetes and hypertension were examined in univariate and multivariate analyses.

RESULTS: Few of the socioeconomic factors showed significant association with high blood pressure or high blood glucose, although several factors showed trends toward association. BMI status was significantly associated with higher rates of hypertension in obese individuals, and unemployment/not working showed a trend toward association with higher blood glucose levels.

CONCLUSIONS: High-risk socioeconomic factors for diabetes prevention programs cannot be conclusively determined from this study, although further studies should closely investigate the association between employment status and high blood glucose.

Reference List

1. Mathers CD, Lopez A, Stein C, Ma Fat D, Rao C, Inoue M. Deaths and Disease Burden by Cause: Global Burden of Disease Estimates for 2001 by World Bank Country Groups. *Disease Control Priorities Project Working Paper 18*. 2004. <http://www.dcp2.org/file/33/wp18.pdf>. Accessed October 21, 2010.
2. Reddy KS, Yusuf S. Emerging epidemic of cardiovascular disease in developing countries. *Circ*. 1998; 97:596-601. <http://circ.ahajournals.org/cgi/content/full/97/6/596>. Accessed October 21, 2010.
3. Puoane T, Steyn K, Bradshaw D, Laubscher R, Fourie J, Lambert V and Mbananga N. Obesity in South Africa: The South African Demographic and Health Survey. *Obes Rsrch*. 2002; 10:1038–48. <http://www.nature.com/oby/journal/v10/n10/full/oby2002141a.html>. Accessed October 21, 2010.
4. Fezeu L, Minkoulou E, Balkau B, Kengne A-P, Awah P, Unwin N, Alberti GK and Mbanya J-C. Association between socioeconomic status and adiposity in urban Cameroon. *Intl J Epi*. 35(1): 105-111. <http://ije.oxfordjournals.org/content/35/1/105.full>. Accessed October 30, 2010.
5. Boveta P, Rossa AG, Gervasonia J-P, Mkambab M, Mtasiwa DM, Lengeler C, Whiting D, and Paccauda F. Distribution of blood pressure, body mass index and smoking habits in the urban population of Dar es Salaam, Tanzania, and associations with socioeconomic status. *Intl J Epi*. 31(1):240-247. <http://ije.oxfordjournals.org/content/31/1/240.full>. Accessed October 30, 2010.
6. Mendez MA, Cooper R, Wilks R, Luke A, Forrester T. Income, education, and blood pressure in adults in Jamaica, a middle-income developing country. *Intl J Epi*. 2002; 32(3):400-8. <http://ije.oxfordjournals.org/content/32/3/400.full>. Accessed October 30, 2010.
7. Yu Z, Nissinen A, Vartiainen E, Song G, Guo Z, Zheng G, Tuomilehto T, Tian H. Associations between socioeconomic status and cardiovascular risk factors in an urban population in China. *B World Health Organ*. 2000; 78(11). <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2560638/?tool=pubmed>. Accessed October 21, 2010.
8. Gupta R, Gupta VP, Ahluwalia NS. Educational status, coronary heart disease, and coronary risk factor prevalence in a rural population of India. *Brit Med J*. 1994; 309:1332. <http://www.bmj.com/content/309/6965/1332.full>. Accessed January 3, 2011.
9. Ghana Health Service. The Health Sector in Ghana: Facts and Figures since 2005. <http://www.ghanahealthservice.org/includes/upload/publications/Facts%20and%20Figures%202009.pdf>. Accessed January 20, 2011.

10. Amoah AG. Hypertension in Ghana: a cross-sectional community prevalence study in greater Accra. *Ethn Dis*. 2003; 13(3):310-5. <http://www.ishib.org/journal/ethn-13-03-310.pdf>. Accessed May 8, 2010.
11. Addo J, Amoah AG, Koram KA. The changing patterns of hypertension in Ghana: a study of four rural communities in the Ga District. *Ethn Dis*. 2006; 16(4):894-9. <http://www.ishib.org/ED/journal/16-4/ethn-16-04-894.pdf>. Accessed May 8, 2010.
12. Agyemang C, Owusu-Dabo E. Prehypertension in the Ashanti region of Ghana, West Africa: An opportunity for early prevention of clinical hypertension. *Public Health*. 2008; 122 (1):19-24. <http://www.publichealthjml.com/article/S0033-3506%2807%2900153-9/fulltext>. Accessed November 8, 2010.
13. Amoah AG. Diabetes in Ghana: a community based prevalence study in Greater Accra. *Diabetes Res Clin Pract*. 2002; 56(3):197-205. <http://www.diabetesresearchclinicalpractice.com/article/S0168-8227%2801%2900374-6/fulltext>. Accessed November 8, 2010.
14. Increasing CVD Knowledge and Practice Among Health Workers. 2007. http://www.procor.org/news/news_show.htm?doc_id=698392. Accessed January 20, 2011.
15. Cappuccio FP, Kerry SM, Micah FB, Plange-Rhule J, Eastwood JB. A community programme to reduce salt intake and blood pressure in Ghana. *BMC Public Health*. 2006; 6:13. <http://www.biomedcentral.com/1471-2458/6/13>. Accessed August 3, 2010.
16. Amoah AG, Owusu SK, Acheampong JW, Agyenim-Boateng K, Asare HR, Owusu AA, Mensah-Poku MF, Adamu FC, Amegashie RA, Saunders JT, Fang WL, Pastors JG, Sanborn C, Barrett EJ, Woode MK. A national diabetes care and education programme: the Ghana model. *Diabetes Res Clin Pract*. 2000; 49(2-3):149-57. <http://www.diabetesresearchclinicalpractice.com/article/S0168-8227%2800%2900140-6/fulltext>. Accessed August 3, 2010.
17. Abegunde D, Stanciole A. An estimation of the economic impact of chronic noncommunicable diseases in selected countries. *WHO Department of Chronic Diseases and Health Promotion (CHP)*. 2006. http://www.who.int/chp/working_paper_growth_model29may.pdf. Accessed January 20, 2011.
18. Ab van der Sande M, Coleman RL, Schim van der Loeff MF, McAdam KPWJ, Nyan OA, Thien T, Dolmans WMC, Walraven GEL. A template for improved prevention and control of cardiovascular disease in sub-Saharan Africa. *Health Policy Plan*. 2001; 16(4): 345-350. <http://heapol.oxfordjournals.org/content/16/4/345.full.pdf+html>. Accessed January 20, 2011.