Chronic Diseases Initiative in Africa

FIRST ANNUAL REPORT FOR 2010

Contents

▲ Centres of Excellence for Chronic Diseases in Developing Countries and their developed country partners

Director's report

Participants in CDIA

CDIA is a network of researchers drawn from all three major tertiary academic institutions in Cape Town (the University of Cape Town, Stellenbosch University and the University of the Western Cape), the South African Medical Research Council, Harvard University and Shree Hindu Mandal Hospital, Tanzania, as well as representatives from local and national Departments of Health. The initiative was formed in response to an initial call for proposals by United Health, a large US-based health care funder, to set up Centres of Excellence for Chronic Diseases in Developing Countries, with the aim of reducing the impact of these diseases. Although CDIA was initially selected as one of eight such centres, subsequent events necessitated the submission of a second grant proposal, in this case to a supplementary call by the National Heart Lung and Blood Institute of NIH in the USA. Ultimately eleven centres were funded by NHLBI and United Health for an initial period of five years. The location of the centres and their developed country partners is shown on the map opposite.

Our official CDIA launch took place in November 2009 at an event attended by the current South African Minister of Home Affairs (and the-then Minister of Health), Dr Nkosozana Dlamini-Zuma and the Director-General for Health for the the Province of the Western Cape, Dr Craig Household.

▲ Founding members and honoured guests at CDIA launch: *Back left-right*: Dr J Mbatia, Prof K Steyn, Prof T Puoane, Prof R Mash, Prof D Bradshaw, Prof C Lombard, Dr S Kariem, Prof E Bateman, Dr J Ledwaba. *Front left-right*: Dr T Kolbe-Alexander, Dr T Gaziano, Prof E Lambert, Prof N Levitt, Minister N Dlamini-Zuma, Prof B Mayosi, Dr L Fairall.

During 2010 two new members joined the CDIA network. They are Prof Karen Sliwa-Hanhle of the Hatter Institute, and Prof Alan Bryer of the Division of Neurology of the University of Cape Town. The membership of CDIA at the end of our first year of activities is shown below:

Institution or Group	Section	Members
University of Cape Town South Africa	Department of Medicine: Division of Endocrinology	Prof Naomi Levitt (Director) Prof Krisela Steyn (Associate Director) Ms Katherine Everett-Murphy
	Division of Pulmonology	Prof Eric Bateman
	Division of Cardiology	Prof Bongani Mayosi
	Division of Neurology	Prof Alan Bryer
	Hatter Institute	Prof Karen Sliwa-Hanhle
	Lung Institute: Knowledge Translation Unit	Dr Lara Fairall
	Research Unit for Exercise Science and Sports Medicine, Dept of Human Biology	Prof Estelle Lambert Dr Tracy Kolbe-Alexander
Stellenbosch University, South Africa	Division of Family Medicine and Primary Care	Prof Bob Mash
University of Western Cape, South Africa	School of Public Health	Prof Thandi Puoane
Provincial Government of Western Cape, South Africa	Department of Health: Sub-Directorate Chronic Diseases	Ms Unita Van Vuuren Dr Ledwaba
Harvard University, USA	Brigham & Women's Hospital, Harvard Medical School and School of Public Health and the Chronic and Cardiovascular Diseases Program at the Harvard Institute for Global Health	Dr Thomas Gaziano
Shree Hindu Mandal Hospital, Tanzania	Department of Medicine	Dr Kaushik Ramaiya
Ministry of Health and Social Welfare, Tanzania	Non-communicable Diseases Unit	Dr Joseph Mbatia
South African Medical Research Council	Burden of Disease Research Unit	Prof Debbie Bradshaw
	Biostatistics Unit	Prof Carl Lombard
	Chronic Diseases of Lifestyle Unit	Ms Jean Fourie

CDIA's Centre Manager is Ms Carmelita Sylvester, with additional administrative support provided by Mrs Susan Botha.

CDIA's aim, mission and principles of work

CDIA's principal aim is to reduce the burden of chronic diseases and their risk factors in African settings. CDIA 's mission is to serve as a collaborating initiative for the development, evaluation and dissemination of methods and programmes to prevent chronic non-communicative diseases, and improve the quality of care for people with these diseases and their risk factors. The initiative plans to do so by establishing multidisciplinary teams of experts, including those in public health, clinical medicine, epidemiology, lifestyle modification, economics, health behaviour, translational research and health service management. The initiative also plans to develop capacity for chronic disease research and services.

Members have endorsed a number of principles for our activities:

1. We support the framework for Innovative Care for Chronic Conditions (ICCC) promoted by the World Health Organisation.
2. We recognise that the development of sound health policies, the promotion of health and the provision of care to those with chronic diseases is a function and responsibility of governments.
3. We acknowledge that it is the responsibility of all sectors of society, and in particular the scientific community, to collaborate in providing support to governments fulfilling their responsibility in this regard.
4. We apply scientific rigour and evidence-based approaches to interventions, and we prioritise monitoring and evaluation of programmes and interventions.
5. We acknowledge the strategic contributions of all the Initiative's network members and the sectors that they represent.
6. We underpin the work of CDIA with the values of integrity, compassion, excellence and innovation.

The establishment of CDIA

Our first task in forming CDIA was to ensure that key people and organisations engaged in chronic disease research in Southern Africa joined the initiative, and that we created a functioning network. This has been achieved.

The secretariat, housed in the Department of Medicine of the University of Cape Town, has spent the past year developing the structures needed to underpin the initiative. A Director and Associate Director were selected by the network members, and a Management Committee was appointed by nomination from each participating organisation. This committee meets every six to eight weeks, and is responsible for the ongoing management and co-ordination of CDIA activities. A Governing Board has been constituted; this consists of senior level representatives from each of the founding partners, and meets with the Secretariat every six months. The Board is due to elect a Chairperson electronically. The Scientific Advisory Panel, consisting of seven eminent international researchers, has also been constituted. The panel will meet annually via teleconference to review not only the research undertaken by the initiative, but also the training activities with which CDIA is involved, and the strategic direction of the network.

At the time of writing, all contracts between CDIA, as constituted, and our major funders have been signed, with the financial and reporting procedures meeting the requirements of all the parties concerned. Due to the location of the CDIA office at UCT, the financial and administrative mechanisms conform to UCT's standard operating procedures and practices. Funds raised by CDIA members at institutions other than UCT will be administered at those institutions in accordance with their standard practices. Administrative support for the activities of CDIA is largely provided by Carmelita Sylvester and Sue Botha, both situated in the Department of Medicine, Faculty of Health Sciences, UCT.

CDIA opted to use Outcome Mapping, designed by Canada's International Development Research Centre, as a method for designing, monitoring and evaluating the initiative's work and activities. At the outset the members identified a number of "boundary partners" – namely bodies or organisations that we wish to influence (shown opposite). Outcome challenges were defined for each boundary partner, strategies required to achieve these challenges were developed, and the process of identifying specific progress markers was begun. At our annual meeting in September 2010, there was unanimous agreement that the initial Outcome Map, with its multiple strategies for the numerous boundary partners was too ambitious, given that CDIA is in its infancy. Consequently, the decision was taken to concentrate on a few key strategies in relation to each boundary partner, at least initially. During 2010, CDIA activities focused on three boundary partners: health care providers; training institutions; and policy makers, with a number of strategies or activities in each instance.

▲ Figure 1: CDIA boundary partners

A central task for the CDIA Secretariat and our research collaborators is raising funds for running costs, research projects and to support postgraduate students. In addition to the initial funding from the United Health/NHLBI's Global Initiative that led to the establishment of CDIA, funds for CDIA projects have been raised from IDRC in Canada, the Cancer Association of South Africa and the Bridges Initiative of the International Diabetes Federation. In the past year, CDIA members have submitted ten more proposals for possible funding. Three pre-proposals were submitted to the UK MRC DIFID call for trials in developing countries; full applications were invited and have been submitted for two of these. A proposal was submitted to the South African MRC for a PhD student and another to the World Diabetes Foundation; both were unfortunately unsuccessful. Decisions are pending on proposals submitted to the EU, the Medtronics Foundation and for a supplementary grant to the NHLBI Global Health Initiative.

Being one of eleven centres funded through United Health/NHLBI Global Health Initiative, we are uniquely placed to collaborate on research on the burden of chronic diseases and innovative models of care in low- and middle-income countries, as well as focusing on these issues in our region.

The contracts with NHLBI and United Health require the attendance of the US partner, as well as two members of each centre's developing country partners, at the initiative's bi-annual Steering Committee meetings. Naomi Levitt, Krisela Steyn and Thomas Gaziano have represented CDIA at these meetings. Students from each centre (up to three from the developing country partners) are also invited to one meeting annually. This has the advantage of potentially linking students and projects from different centres. The meetings have facilitated the development of collaborative relationships and fostered the potential for joint projects between the various centres. In addition, three subcommittees focused on (a) epidemiology, (b) community health worker interventions and (c) training have been created with a view to fostering collaboration, sharing knowledge and enhancing the experience of researchers and trainees across the centres.

Recently NHLBI has provided additional funding for research to be conducted between the centres in an attempt to foster the building of a global research network of chronic disease researchers from low- and middle-income countries. We have responded to the second call for proposals and have submitted a joint application for this supplementary funding (alluded to earlier) with three other centres: Bangladesh, Guatemala and the Mexican–US border.

Projects currently funded from CDIA resources

A project team has been formed for each funded project. These have met regularly in the CDIA offices, and have been supported by the secretariat. An outline of each project, including the progress made to date, is provided below.

Project 1: Eden district randomised, controlled trial for primary care of chronic, non-communicable diseases (NCDs)

Research Team: Lara Fairall, Naomi Levitt, Thomas Gaziano, Eric Bateman, Krisela Steyn, Carl Lombard, Debbie Bradshaw, Max Bachman, Merrick Zwarenstein, Beverley Draper, Ruth Cornick, Crick Lund

PhD student: Naomi Folb

Background

Patients from disadvantaged backgrounds with chronic diseases experience a relatively low quality of care in the public sector primary care community health centres (CHCs). In these CHCs, care is predominantly provided by nurses with support from medical practitioners. It has been shown that these nurses are often inadequately prepared and trained to manage the care of patients with NCDs.

Objectives

This research project is concerned with the optimal management of chronic diseases and their risk factors in CHCs in underserved communities. A pragmatic cluster randomised controlled trial will be conducted to test the effectiveness of a novel training approach based on a previously tested model of syndromic screening and management of patients with conditions such as chronic obstructive pulmonary disease, asthma or TB. A written guideline (101 pages) has been prepared for the management of chronic diseases by primary care nurses and doctors. The trial will test whether the approach, previously shown to be effective for respiratory diseases including tuberculosis and HIV/AIDS, will remain effective when expanded to include the primary care management of other major chronic diseases (hypertension, diabetes, depression).

Study design

Participants will be recruited from among adults attending 44 clinics in the Eden district (George and surrounds) of the Province of the Western Cape. Of this group of possible study participants, the majority will either be people of African descent (speaking predominantly isiXhosa) or people of mixed race ancestry (speaking predominantly Afrikaans).

Inclusion and exclusion criteria

These are summarised in the table overleaf. Participation is restricted to adults ≥18 years old, and to those capable of actively completing an interviewer-administered questionnaire both at the time of recruitment, and twelve to fifteen months later. As a result, potential participants who would be considered vulnerable by virtue of their age (too young), cognitive function or severe co-morbid illness are excluded.

Study	Trial
Inclusion criteria	Age ≥ 18 years *and* Reside in the clinic vicinity for at least the previous year *and* Written consent to participate in the study *and* Self-reported diabetes on treatment *or* Self-reported hypertension on treatment *or* Self-reported asthma/ COPD/ chronic bronchitis/ emphysema on treatment *or* Cough/ difficult breathing > 2 weeks (not on TB treatment) *or* Self Reporting Questionnaire score of 9 or more
Exclusion criteria	Acute and/or terminal condition precluding participation such as AIDS or cancer Psychiatric diagnoses precluding participation such as schizophrenia, dementia and other cognitive impairment measured by self-reported or medical history.

Primary outcome measure

The primary endpoint selected for diabetes, hypertension and chronic respiratory disease is *treatment intensification*, based on research that identifies clinician inertia as a key reason for failure to control these non-communicable chronic diseases The definition of treatment intensification is dependent on the target condition. For depression, *case detection* was selected as the primary outcome because the condition is grossly under-diagnosed in primary care – as many as 1 in 5 people attending primary care services are suffering from a mental health condition, mostly depression, yet only 5% of those with the condition have been diagnosed.

Planned secondary endpoints include disaggregation of primary endpoints, measurement of other processes of care, including screening for complications (e.g. dilated eye exams); monitoring control (e.g. annual HbA1C); symptoms (St Georges Respiratory Questionnaire); changes in risk factors for chronic diseases (e.g. systolic blood pressure, waist circumference); productivity; healthcare utilisation; cardiovascular events (e.g. stroke); and mortality.

Recruitment, enrollment and data collection

Trained fieldworkers will invite patients eighteen years or older in the waiting room to participate in the study *after* their clinical consultation, and provide them with an information sheet, allowing them time to consider and discuss possible participation. Interested patients will be screened after consultation with the nurse/doctor, and in privacy, in an area of the clinic temporarily allocated to research staff.

Eligible participants who provide consent will be asked to undergo the following research procedures: measurement of their blood pressure, waist circumference, height, weight and an interview to determine: care received at the clinic, symptom severity, impact on their functioning and quality of life, healthcare utilisation, and the costs incurred by illness. Participants will also be asked to provide their South African identity number and any hospital folder numbers if available, to permit linkage with the national mortality register and hospitalisation databases respectively, thereby permitting long-term (five years or more) follow-up.

In around one-third of participants, blood will be drawn to determine blood lipids concentrations and as a marker of control of diabetes. Participants who qualify for the trial will be asked to return to the clinic twelve to fifteen months later for a follow-up interview. An incentive to the value of R60, in the form of a voucher for a local grocery shop, will be provided to those participants who return for the follow-up interview. Participants who incur significant travel costs to return to the clinic for the follow-up interview will be reimbursed accordingly.

Ethical clearance for the study has been given by the Ethics Committee of the University of Cape Town. Informed written consent will given by the study participants. Confidentiality of data will be ensured by using handheld computers for data entry. Once entered, data may not be reviewed, and there are no paper questionnaires that could be lost or left in view of others. Uploaded questionnaires will be stored on a secure server. Access to identifiers will be restricted to a few key study staff for the purposes of data linkage with other datasets, and quality assurance. Only anonymised extracts will be prepared for analysis by study statisticians and researchers.

Progress

A fieldwork co-ordinator and a medical doctor have been appointed to co-ordinate the study. The necessary permissions from the Provincial DOH and the Eden district health authorities have been provided. Field site visits are in progress in order to meet the local clinic staff, identify potential fieldworkers, and to plan the local logistics. Questionnaires have been designed, piloted and translated, equipment (including hand-held computers) is being ordered, and the necessary computer programmes designed for electronic collection of data are being uploaded. Fieldworker training and the initiation of data collection is planned for March 2011.

Project 2: Total Risk Assessment Tools

Research Team: Thomas Gaziano, Krisela Steyn, Debbie Bradshaw, Lara Fairall, Naomi Levitt

PhD Students: Ankur Pandya and Shafika Abrahams-Gessel

Background

Screening to identify patients with high levels of risk for developing cardiovascular diseases is part of an overall public health approach to prevent such diseases. However, using blood tests as a screening tool (e.g., measuring total blood cholesterol), is beyond the means of most developing countries. More cost-effective tools need to be developed to identify those people at highest risk for developing cardiovascular disease, in order to enrol them in an appropriate treatment regime before they develop target organ damage.

Objective

To calibrate and validate a non-laboratory-based screening tool for cardiovascular disease (CVD) risk prediction in South Africa

Design

In this protocol, we seek to use various calibration techniques to adjust cardiovascular model inputs to result in model-predicted outcomes that fit the observed mortality data in South Africa. The calibration process will begin by evaluating the disease model populated with the transition probabilities previously used in South African modelling analyses, which were based on the Framingham risk equations (Gaziano *et al*, 2005) and compared to non-lab-based measures. These inputs will be used to assess the initial fit of the model-predicted outcomes. During the calibration process, these model inputs will be adjusted so that the model outputs better reflect the observed endpoints from the regional/national database. We will employ two alternate calibration approaches and compare the results of each technique: 1) intuitive, or manual, adjustment of individual inputs without any formal algorithm; 2) random variation of the inputs of interest and evaluation of the model results produced by each parameter set to the observed clinical endpoints.

Progress

This year we evaluated how well the risk prediction tool compared with other risk prediction tools in a new population. Specifically, we compared the predictive performance and risk discrimination of the non-laboratory-based risk score to five commonly used laboratory-based scores (Framingham CHD and CVD, SCORE for low and high risk settings, CUORE) in a nationally representative population. Predictive performance was assessed using ten-year CVD death and total death as outcomes for receiver operator characteristic (ROC) curve analysis. The evaluation has been performed in eleven South African cohorts, which represent all cross-sectional studies conducted in the country over the past 25 years for which the necessary data were available.

Project 3: Economic modelling of the impact of preventive and management interventions for chronic diseases

Research Team: Thomas Gaziano, Debbie Bradshaw, James Irlam, Lara Fairall, Krisela Steyn

PhD Student: Ankur Pandya

Background

The assessment of the economic impact of preventive and management interventions for chronic diseases has long been a challenge. However, such information is essential for planning purposes for health care providers when deciding on the allocation of scarce resources, particularly in developing countries.

Objectives

To develop a CVD Prevention and Management Model that would allow us to predict CVD events accurately and be that could be used in cost-effectiveness analyses comparing the use of different screening and intervention strategies.

Design

State-transition simulation models, also called Markov models, will be developed to assess the cost-effectiveness of the integrated care guidelines for CVD in comparison with the base case. The model will be programmed in DATA Professional (Treeage Software, Inc., Williamstown, MA). We will begin with the model for South Africa, where we already have some experience and data for input. Once this model is completed, we will be able to build a similar model for Tanzania, with inputs derived from the epidemiological data in Tanzania. Effects will be measured in life years saved, QALYs and DALYs. Incremental cost-effectiveness (C/E) ratios will be calculated for each of the three strategies compared to the base case under consideration. All costs and benefits are discounted at 3% per year consistent with current guidelines. We will use the US Panel on Cost-effectiveness in Health and Medicine's recommendations in our analyses.

Progress

This year we have been working to complete the refinement of risk factor profiles and disease associations in preparation for work to be done on the calibration of the model. In addition, we have also been working with the publicly available death data for South Africa in order to complete the calibration of our CVD model for South Africa.

Project 4: Lifestyle intervention tools: "Putting prevention into practice" package

Research Team: Katherine Everett-Murphy, Krisela Steyn, Catherine Draper, Tracy Kolbe-Alexander, Estelle Lambert, Bob Mash

PhD student: Zelra Malan

Background

There is strong evidence to show that brief counselling assistance can be effective in changing risk behaviours and can produce clinically meaningful improvements in important biological indicators (Whitlock, 2002). Yet, such interventions are under-utilised in health care and other related settings in South Africa. Reasons for this include structural and human resource issues,

as well as the fact that health care providers lack the requisite knowledge, skills and confidence to undertake effective lifestyle counselling.

A systematic review of behavioural interventions by the US Preventive Services Task Force (Whitlock 2002), judged the 5As construct for brief behavioural counselling (Fiore et al., 2008) to have the highest degree of empirical support for each of its elements. This construct was originally developed by the National Cancer Institute in the USA to guide physician intervention in smoking cessation, but has since been recommended to a variety of health care providers as a general approach to engaging patients in the self-management practices needed to change and maintain health related behaviours (Elford et al., 2001; Van Schayck, 2008). The effectiveness of the 5As is enhanced when a patient-centred approach, such as Motivational Interviewing (Rollnick 2002), is adopted in its delivery.

Aims and objectives of the project

The aim of this project is to produce and pilot a resource package for primary health care providers and community health workers to enable them to offer brief, best practice, behavioural change counselling in a variety of settings, on the topics of smoking; poor diet; obesity and overweight; and lack of physical activity.

The package will include:

- The 5As best practice guideline, adapted to suit the South African context and explicitly including the key principles of Motivational Interviewing (MI)
- Educational/motivational resources for patients, which providers can use and distribute in the context of brief counselling
- A training course for healthcare providers, which will focus on giving them the motivation, confidence and skills to undertake brief behavioural change counselling based on the 5As protocol and using an MI approach
- Guidelines on how to integrate brief behavioural change counselling into primary healthcare practice and community outreach work
- Healthcare provider aids, such as prompts, patient records and a resource directory to enable providers to refer patients to specialised health services and community-based resources.

The development of the package will be a collaborative effort, involving practitioners and researchers from the areas of nutrition, physical activity and smoking cessation. All components of the package will be piloted in the field before being finally produced.

Progress

An audit of existing educational materials has been completed; two consultative meetings with experts and stakeholders in the field have been held this year; sub-groups have been formed to take responsibility for developing and testing the various components of the package (with CDIA playing the central co-ordinating role); options for pre-testing the package in 2011, using healthcare providers working in the public sector, personnel from organisations such as CANSA or the Heart Foundation, or medical or nursing students are being investigated.

Once the package has been developed, various advocacy activities will be undertaken to disseminate the intervention and promote its use, with public health services, civil society organisations and universities and colleges training health science students.

Project 5: Community health workers (CHW) project

Research Team: Thandi Puoane, Naomi Levitt, Krisela Steyn, Kathy Goggin, Delywn Catley

PhD student: Lungisha Tsolokile

Background

The inclusion of community health workers as part of the healthcare provider team has been strongly supported by the National and Provincial DOH in South Africa. The detailed planning for incorporating this cadre of health worker in public sector health services is still in progress, and requires extensive assessment of their role, responsibilities and the administrative processes required to operationalise their contribution.

The specific contribution that community health workers can make to the care of patients with chronic diseases has, to date, not been studied or defined, although there are a variety of community health workers currently active in chronic disease care in various NGO settings. In addition, the Departments of Health are considering integrating the NCDs with HIV/AIDS as the models of care, as both groups of disease have similar care requirements. It is envisaged that community health workers will play a key role in the care of patients with these chronic conditions.

Aims and objectives

The aim of the overall project is to collaborate with the Province of the Western Cape's DOH to define the role of a community health worker in caring for patients with chronic diseases, and to develop suitable chronic disease training materials and tools for community health workers.

An additional aim of the project is to provide a PhD fellowship for a student working on the community health worker project.

The specific objectives are:

- To consult extensively with members of the Province of the Western Cape's DOH on their vision and plans for the role of community health workers in the care of patients with NCDs, with reference to their role at health care facilities and at the community level
- To conduct a situational analysis of community health workers active in NCD care activities in Khayelitsha
- To review any available NCD community health worker training materials currently in use
- To draft and evaluate community health worker NCD curriculum, training materials and tools for use in the Western Cape
- To consult with government agencies running the Expanded Public Works Programme to ensure the training planned for community health workers in NCDs will be formally recognised, and that community health workers will be provided with a qualification that will contribute to their career path.

Progress

A lecturer at the School of Public Health at the University of the Western Cape has been appointed as a PhD Fellow working on this project. A series of consultation meetings were held in order to identify the roleplayers in the Western Cape DOH, in academic settings and with CDIA staff in order to define the plan of work for the project in general and the PhD student in particular. The PhD student has participated in three general consultation workshops organised by the University of the Western Cape, together with University of Cape Town, to facilitate debates between community health worker managers, NGO co-ordinators and government officials regarding the following:

- Clarifying the existing roles of community health workers in the Province of the Western Cape
- Exploring the different models of community health worker activities and possible roles that community health workers could fulfil; e.g., as generalist versus specialist community health workers

- Reviewing the current general models of training provided for CHWs, especially in the Expanded Public Works Programme run by government, as well as reviewing the current qualifications that community health workers can obtain

In addition, four meetings have been held by CDIA members, with the PhD student and Western Cape DOH staff responsible for NCD care in attendance. The focus of these meetings was the role of community health workers in chronic disease care; and supporting the student in formulating a PhD project based on work in Khayelitsha. The following tasks were planned:

- To identify stakeholders (NGOs) involved with chronic diseases in Khayelitsha
- To identify sources of information that will aid understanding of the situation in Khayelitsha regarding CHWs and NCDs, especially data available in the Metro district
- To better understand the role of CHWs in Khayelitsha.

Project 6: A randomised controlled trial to evaluate the effectiveness of a group diabetic education programme using motivational interviewing in underserved communities in South Africa

Research Team: Prof Bob Mash, Prof Naomi Levitt, Prof Stephen Rollnick, Ms Katherine Everett-Murphy, Prof Krisela Steyn, Prof Merrick Zwarenstein, Sr Hilary Rhode (Co-ordinator), Ms Unita Van Vuuren, Ms Maureen Mc Rae

Masters students: Sr Buyelwa Majikela-Dlangamandla, Dr Annie Botes, Dr Fanie Serfontein, Dr Roland Kaukamp

Background

Diabetes affects 11% of the adult population in Cape Town and is an important contributor to the burden of disease. Previous studies show that quality of care and health outcomes are poor. The development of an effective education programme should have an effect on self-care, lifestyle change and adherence to medication; and lead to better control of diabetes, fewer complications and better quality of life. The study will inform policymakers and managers of the district health system whether they should implement the programme more widely.

Aim

To evaluate, by means of a pragmatic cluster randomised controlled trial, the effectiveness of a group diabetes education programme delivered by health promoters with a guiding (Motivational Interviewing) style, in community health centres in Cape Town, South Africa.

Method

Type 2 diabetic patients attending 45 public sector community health centres are the target population. A sample size of 1360 patients in 34 clusters of 40 patients will give a power of 80% to detect the primary outcomes with 5% precision. Seventeen health centres have been randomly assigned to either control or intervention groups. In the intervention group, the patients are receiving a structured education programme of four sessions, delivered by health promoters to groups of 10–15 diabetic patients at a time. The control group will receive usual care and the individual educational materials.

Primary outcomes: diabetes self-care activities.

Secondary outcomes: self-efficacy, locus of control, mean blood pressure, mean weight loss, mean waist circumference, mean HbA1c, mean total cholesterol, diabetes-specific quality of life.

Data will be collected at baseline and twelve months. Primary intention-to-treat analysis will assess the outcomes, and a secondary analysis will be done on those who attended the educational sessions.

Progress

The preparation phase of this trial was from April to September 2010. During this period, the project co-ordinator, Ms Hilary Rhode, was employed. The educational intervention was designed in terms of its structure, content, educational materials and motivational interviewing. Formal permission to conduct the project was obtained from the Province, and preparatory meetings held with the management teams from all four sub-structures in the Metropole. The project co-ordinator visited each of the seventeen intervention sites, and discussed the project with the facility managers and staff. A preparatory meeting was held with the health promoters and their manager, and training in the educational intervention was held over a four-day period in September (see picture overleaf).

Research assistants (field workers and nurses) were recruited during August and trained in the recruitment of patients and baseline data collection. Starting from the 1st September, teams of research assistants began recruiting patients from all seventeen intervention sites. Currently 720 patients have been recruited in the intervention arm and 850 in the control arm.

The first group of patients began receiving the educational intervention by October 2010, with all groups of patients receiving sessions 1 and 2 prior to the December holiday season.

The trial is on target in terms of its timeline, although recruitment of patients has been much slower than anticipated. The main threat to the success of the project is under-funding and additional proposals for funding have been submitted.

Research projects funded from other sources or being planned

Burden of Disease Studies

Debbie Bradshaw, Director of the MRC Burden of Disease Research (BOD) Unit is currently leading the second National Burden of Disease Study for South Africa. During 2010, the team analysed the vital statistics from Statistics South Africa to assess data quality concerns and identify the nature of adjustments that will need to be made to develop coherent estimates of the cause of death profile.

The BOD Unit is also developing a mortality surveillance system for the the Province of the Western Cape so that local level statistics are available to monitor trends in mortality.

The BOD Unit runs a population-based cancer register in a rural setting in Eastern Cape province. This has provided a profile of the

common cancers experienced in the area, and shows that cervical cancer and oesophageal cancer are the leading cancers. Plans are underway to assess the twelve-month treatment patterns at the two referral hospitals, and to evaluate the cervical cancer screening programme.

Eric Bateman chairs a working group planning a Burden of Asthma study group, a project to develop methodologies for assessing the global impact of asthma on patients, healthcare resources and societies. This is a collaboration between GINA, the International Union against Tuberculosis and Lung Disease (IUATLD) and the ISAAC investigators.

Eric Bateman also prepared an application for a Fogarty-funded research fellow (physician) from Dar Es Salaam, Tanzania, to carry out a Burden of Obstructive Lung Disease (BOLD) methodology population survey of COPD among residents in Cape Town, with a second phase in Dar Es Salaam.

Cohort Studies

Thandi Puoane is the principal investigator for the South African arm of the PURE study (Prospective Urban and Rural Epidemiological Study (PURE): A Prospective Cohort Study to Track Changing Lifestyles, Risk Factors and Chronic Disease in Urban and Rural Areas). She works with Vicki Lambert and Naomi Levitt on this project. This multi-country 15-year study is designed to explore the manner and extent to which environmental/societal factors influence the development of cardiovascular diseases. It is led the Population Health and Research Institute, McMaster University, Canada.

In South Africa, researchers at the School of Public Health and the University of the North-West are collaborating with the international team in carrying out the study in two urban and two rural sites in South Africa, involving a total of 2,000 participants.

The research explores a range of factors to understand whether, and how, they influence the development of cardiovascular disease. These factors include:

- the environment, which includes the physical environment (buildings, land use, transport system), as well as the perception of the environment (how conducive people believe a community is for walking);
- nutrition policy and environment, which includes issues such as food affordability and availability;
- psychosocial and socio-economic factors, which include issues such as income inequality, literacy, level of perceived stress, and social networks; and
- tobacco use, including policies on tobacco products, and tobacco exposure.

Bob Mash is part of the steering committee for Partnership for Cohort Research and Training (PaCT) Study. This is piloting a large multinational cohort that will be followed up in relation to risk factors for chronic NCDs in Africa.

Cost-effectiveness Studies

Debbie Bradshaw and Naomi Levitt are on the committee of the PRICELESS project. This is led by Dr Karen Hoffmann of the Fogarty Foundation, and is housed at the University of the Witwatersrand. The project is developing capacity to undertake economic evaluations in the area of NCDs, as well as maternal and child health. As part of this project, Krisela Steyn is collaborating on a project to assess the economic impact of reducing salt in South African food. Naomi Levitt and Bob Mash are also part of a collaboration to assess the cost-effectiveness of a diabetic retinal screening programme.

Thomas Gaziano leads projects to evaluate the costs of hypertension in South Africa and assess the effect of restricted prescription roles for nurses, who are engaged in task-shifting related to management of hypertension in the South African primary health care system.

Work-based Interventions

Tracy Kolbe-Alexander prepared maps of the campus of the University of Cape Town and the environment in preparation for a research project that will evaluate the effectiveness of a worksite-based walking intervention programme at the university. These maps record the longest, fastest and most weather protected (covered) routes to encourage employees to increase daily walking. The 54 maps with routes across the campus and surroundings were digitised on WGS 1984 high-resolution geo-referenced true colour imagery. The next phase is to implement a walking and pedometer-based intervention at UCT. This aims to increase physical activity and determine whether other risk factors for NCDs can also be reduced by providing staff with appropriate walking routes.

Healthy Cities

Naomi Levitt, Vicki Lambert, Krisela Steyn and Tracy Kolbe-Alexander are working with the African Centre for Cities at the University of Cape Town to support the development of research projects on health and the

development of cities. One such project involves Prof Estelle Lambert, who has jointly applied with Prof Robert Dover (from Antioquia University in Medellin, Colombia) for funding for a project called “Changing Stakeholders and Local Strategies: Social-Environmental Policy in Transition Contributes to Participation and Personal Choice in Health Behaviour: A Global South Comparative Perspective for Healthy Cities”. The aim of the proposed project will be to determine the influences of personal/experiential, socio-environmental/socio-cultural factors, public policy and education, and demographics on health-seeking behaviour in two comparative cities in the global South (from Colombia and South Africa). Colleagues from the African Centre for Cities, and from the School of Public Health, at the University of the Western Cape will collaborate.

Monitoring and evaluation

At the Western Cape Province’s Department of Health, Unita van Vuuren led the initiative to audit patient folders for the first time in 2010. This initiative aims to assess the quality of care provided to patients with chronic conditions, to develop a culture of self-assessment in the primary care clinics, to set standard for good care for patients with chronic conditions, and to identify aspects of chronic care in which staff require additional training. The audit is spearheaded by the family physicians who work in the community health centres, and who are responsible for quality governance.

The results showed many aspects of chronic disease care that require attention. Dedicated chronic disease teams of health workers were only present in 73% of the metro clinics and 50% of the rural clinics. At more than half of the clinics participating there were shortfalls in necessary equipment, such as appropriately sized cuffs for measuring blood pressure in obese patients. Foot examinations of patients with diabetes were seldom recorded in the folders. Although more than 80% of patients with asthma had inhaled steroids prescribed, only about half of patients in the cities and about a quarter of patients in rural areas had peak flow measurements recorded in their folders. These data have been successfully used to motivate for additional training for staff at primary care facilities.

Capacity development and research training activities

The School of Public Health at the University of Cape Town approached the Chronic Diseases Initiative in Africa (CDIA) to assist with the revision of the curriculum of the current Chronic Disease Module in their Masters in Public Health (MPH) course. This is an elective module in the MPH programme of the School, and was successfully run over a six-month period with five CDIA members participating in teaching on the course. A number of CDIA members also taught on this course when it was first offered in 2010.

Prof Naomi Levitt lectured on the Advanced Clinical Postgraduate Course in the Management of Diabetes and its Complications in June 2010 in Tanzania, sponsored by the American Diabetes Association, the International Diabetes Federation and the European Association for the Study of Diabetes.

A six-month training course for professional nurses for a certificate in the management of diabetes is offered by the Diabetes and Endocrine Division of the Department of Medicine at UCT at Groote Schuur Hospital. This programme is currently not formally accredited

Currently one Masters and one PhD student are registered at UCT for work on NCD projects with CDIA members.

The University of the Western Cape's (UWC) School of Public Health offered a distance-learning module in Chronic Diseases as part of their Masters in Public Health (MPH) degree. The course was co-ordinated by Thandi Puoane, assisted by Lungi Tsolikele. A week-long lecturing course during their winter school programme introduced the distance-learning course. The course targets individuals working in health services. The winter school course is also open to participants not registered for the MPH degree. This is an opportunity to train staff in health services research for chronic diseases. Bob Mash also co-ordinated a one-week training course in Motivational Interviewing at the University of the Western Cape's winter school.

At the University of Stellenbosch (US), Bob Mash of the Division of Family Medicine continues to teach post-graduate students in Family Medicine about chronic diseases and health systems. He is supervising one PhD student and five Masters students on chronic disease research projects.

Bongani Mayosi of the Department of Medicine at UCT took the local lead on the International Course on Health Research Methodology, jointly sponsored by the SA Medical Research Council (MRC), SA DOH and the Population Health Research Institute at McMaster University (and supported by an unrestricted educational grant from AstraZeneca), from 28 January to 1 February 2010, held at Zevenwacht Wine Farm Conference Centre, Kuilsriver, South Africa. The course coincided with the launch of

the newly established National Collaborative Research Programme (NCRP) in Cardiovascular and Metabolic Disease of the MRC, and was designed to equip young and promising researchers in the cardiovascular and metabolic field with basic clinical research skills.

At the University of Harvard, Thomas Gaziano is supervising four PhD students. One works on cost-effectiveness of interventions at the primary health care level. Another in Health Policy and Management is engaged in the calibration model for CVD risk assessment. The third is engaged in work on obesity, and its effect on efforts to use CHW to manage chronic disease screening and prevention at the primary care level. The fourth, who is also supervised by Bongani Mayosi, is based at the University of Cape Town and engaged in work on rheumatic heart disease.

CDIA members' interactions with policymakers

Dr Lara Fairall and her colleagues at the Knowledge Translation Unit of the Lung Institute have been funded by the National DOH to complete Clinical Guidelines by integrating the common chronic diseases. They have provided an integrated guideline entitled *Primary Care 101*. As part of this process, Dr Fairall reviewed the drug coding lists of the nine provinces and the Essential Drug List. The discrepancies identified in the various settings have been brought to the attention of the National DOH.

Dr Fairall has also been instrumental in elucidating the legal ability of nurses to initiate and prescribe chronic disease medications in primary care settings. This is necessary as the implementation of *Primary Care 101* is dependent on nurses' ability to initiate drug regimes for patients with chronic diseases. In the Province of the Western Cape, an application to the Pharmaceutical and Therapeutic Committee of the DOH has been submitted, requesting permission for nurses to prescribe seven common chronic disease drugs during the pragmatic randomised controlled trail that will be conducted in the Eden district in 2011 and 2012.

Prof Krisela Steyn has been involved with the National DOH in arranging a workshop to start planning for the reduction of salt in South African food, particularly in bread. Prof Graham MacGregor, a leading figure in salt reduction in the UK, attended the meeting and contributed his extensive experience in this regard.

An intervention programme for smoking cessation during pregnancy, developed by Ms Katherine Murphy, has been adopted by the Western Cape DOH. The scope of the intervention has been expanded to address multiple risk behaviours in pregnancy, including alcohol and drug abuse, stress and depression. The intervention is currently being piloted in two

maternity obstetric units in Cape Town, with a view to provincial roll-out within the next year.

Dr Tracy Kolbe-Alexander is developing a South African Fittest City Index. This index will hopefully encourage policymakers and local government to create supportive environments for health-seeking behaviours, such as regular physical activity.

Prof Bob Mash continues to follow up on the Asthma Guidelines Implementation Project, with the aim of continuing the work in the Western Cape through the National Asthma Education Programme and DOH, as well as planning to extend the project to other provinces.

CDIA members' interactions with global and regional organisations

In February 2010, the Ministers of Health of the South African Development Communities (SADC) countries visited South Africa as guests of the South African National DOH. CDIA was invited to co-host a scientific meeting for the visiting ministers, and give an overview on NCDs in the region. A very successful meeting was held with active participation by the audience. The exercise of inviting all present to measure their own waist circumferences at the beginning of the meeting to assess whether they were above or within the target for increased cardiovascular risk, focused the attention of the audience on the presentations.

The Diabetes Leadership Forum, Africa 2010 conference held in Johannesburg was one of the early activities preparing for the planned United Nations Summit in September 2011. Bob Mash and Kaushik Ramaiya were guest speakers. Bob Mash presented his work on improving access to retinal screening by fundal camera and improving the diabetic annual review in the Cape Town Metropole. Naomi Levitt chaired a session, and Krisela Steyn also attended.

The WHO invited Prof Naomi Levitt to participate in the WHO consultation for the Development of a Prioritized Research Agenda for Non-communicable Diseases.

Prof Krisela Steyn has been invited to join the International Steering Committee for the First Global Ministerial Conference on Healthy Lifestyles and Non-communicable Diseases, which will be held in Moscow in April 2011.

Dr Thomas Gaziano, Prof Bongani Mayosi and Prof Estelle Lambert participated in the production of the IOM Report entitled *Promoting Cardiovascular Health in the Developing World: A Critical Challenge to Achieve Global Health – Institute of Medicine*. The report is available at: http://www.iom.edu/Reports/2010/Promoting-Cardiovascular-Health-in-

the-Developing-World-A-Critical-Challenge-to-Achieve-Global-Health.aspx [Accessed December 22, 2010].

Prof Estelle Lambert serves on the Scientific Advisory Council of the International Obesity Task Force, and is on the executive board of Agita Mundo as the African representative, as well as the International Society for Physical Activity and Health.

In November 2010, the African Physical Activity Network (AFPAN) was officially launched at Kenyatta University, as part of the Pre-East African University Games Scientific Symposium. At least eight African countries were represented. Prof Estelle Lambert represented AFPAN at the International Congress on Physical Activity and Public Health in Toronto, Canada.

Prof Eric Bateman serves on the Executive Committee of the Global Alliance against Chronic Respiratory Diseases (GARD), a WHO Collaboration. He attended Executive, Planning Committee and General Meetings of GARD, and assisted in the co-ordination of GARD programmes in more than 30 countries that operate through NCD programmes of national ministries of health.

He also serves as Chair of the Global Initiative for Asthma (GINA). Major contributions have included annually updating an Asthma Management workshop report and the publication of an asthma guideline for children aged five and under.

Dr.Tracy Kolbe-Alexander is the representative for Africa on the Council for Global Advocacy of Physical Activity (GAPA) and the ambassador for Africa at the International Society of Behavioural Nutrition and Physical Activity.

CDIA members' interaction with South African advocacy groups

Prof Naomi Levitt is President of Diabetes South Africa. This is a NGO formed by people with diabetes with the objective to educate and support patients to improve their diabetes control. She also serves on the Executive Committee of the Society of Endocrinology and Metabolic Diseases in South Africa.

Prof Krisela Steyn has initiated collaboration with the newly appointed Director of the Heart and Stroke Foundation, Dr Vash Mungal-Singh. The Foundation will be instrumental in carrying out the message to the public to reduce salt in South African food. She also serves on the Board of the Hypertension Society of Southern Africa.

CDIA members' interaction with the private sector

Dr Tracy Kolbe-Alexander was awarded a Medical Research Council Career Development Award to support the development and evaluation of worksite health promotion programmes to reduce the risk for NCDs. After confirming that a number of employers and their employees wanted such programmes, she has developed a worksite health promotion programme toolkit for employees who would like to champion health in their organisations.

Her activities also involve worksite programmes for employees at increased risk for NCDs. Her project "Working on Wellness" trains wellness specialists in the workplace to use Motivational Interviewing in their interactions with clients to encourage healthier lifestyles. She has also developed a "Risk-related Age" model that can be used to motivate individuals to maintain or improve the health behaviour in order to reduce their "risk-related age".

Challenges for the next year

The challenges for the next year and beyond are multiple:

- To support and ensure that the funded research projects are successfully conducted
- To extend the initiative beyond its centre in Cape Town, to other parts of South Africa and other countries in Africa
- To build collaborations with at least one other United Health/NHLBI centre of excellence by means of a joint research study
- To identify promising young researchers to undertake chronic disease research under the leadership of CDIA members, and thus build the future leadership for chronic disease research
- To raise sufficient funding for these planned initiatives and additional research projects.

Publications as a result of CDIA activities

Household KC. Africa's burden of disease: The University of Cape Town Sub-Saharan Africa Centre for Chronic Diseases. Editorial. *S Afr Med J* 2010; 100(2): 94-95.

Publications of network members relevant to CDIA activities

Chapters

Levitt N, Mash B, Unwin N, Mbanya JC, Cho J-H & Yoon K-H. Chapter 58: Models of Diabetes Care Across Different Resource Settings in Holt R, Cockram C, Flyvbjerg A, Goldstein B (Eds) *Textbook of Diabetes* (4th edition) Oxford: Wiley, 2010: 984-998.

Steyn K, Bradshaw D, Levitt N, Lambert EV, Siegel K. Chronic Diseases in South Africa in *Sick Societies: Responding to the global challenge of chronic diseases*. Eds David Stuckler and Karen Siegel. Oxford University Press (in press).

Peer-reviewed articles

Bateman ED, Reddel HK, Eriksson G, Peterson S, Ostlund O, Sears MR, Jenkins C, Humbert M, Buhl R, Harrison TW, Quirce S, O'Byrne PM. Overall asthma control: The relationship between current control and future risk. *J Allergy Clin Immunol* 2010; doi:10.10.16/j.jaci2009.11.033. PMID: 20153029

Bitton A, Gaziano TA. The Framingham Heart Study's impact on global risk assessment *Prog Cardiovasc Dis*. 2010; 53(1): 68-78.

Bousquet J, Kiley J, Bateman ED, Viegi G, Khaltaev N, Cruse AA. Prioritized agenda for Prevention and Control of Chronic Respiratory Diseases. *Eur Respir J* 2010, 36:995-1001. PMID: 20223919

Cruz AA, Bateman ED, Bousquet J. The social determinants of asthma. *Eur Respir J 2010*; 35: 239-42.

Dekhuijzen PNR, Kneussl M, Bateman ED, Partridge MR, Lavorini F, Virchow JC, Stowasse S, Steinkamp G. Managing asthma in real life: What really matters? *Annals of Respiratory Medicine* 2010; 1: 3-10.

Draper CE, de Villiers A, Lambert EV, Fourie J, Hill J, Dalais L, Abrahams Z, Steyn NP. HealthKick: a nutrition and physical activity intervention for primary schools in low-income settings. *BMC Public Health*. 2010 Jul 6; 10(1): 398.

Gaziano TA, Bitton A, Anand S, Abrahams-Gessel S, Murphy A. Growing epidemic of coronary heart disease in low- and middle-income countries. *Curr Probl Cardiol*. 2010; 35(2): 72-115.

Glassman A, Gaziano TA, Bouillon Buendia CP, Guanais de Aguiar FC. Confronting the chronic disease burden in Latin America and the Caribbean. *Health Aff (Millwood)*. 2010; 29(12): 2142-2148.

Lamprecht, B, McBurnie M-A, Vollmer W, Gudmundsson G, Welte T, Niżankowska-Mogilnicka E, Studnicka M, Bateman E, Anto JM, Burney P, Mannino D, Buist S. COPD in Never-Smokers: Results from the population-based BOLD Study. *Chest* 2010, Sep 30. [Epub ahead of print]PMID: 20884729

O'Byrne P, Reddel HK, Eriksson G, Östlund, O, Peterson, S, Sears MR, Jenkins C, Humbert M, Buhl R, Harrison TW, Quirce S, Bateman ED. Measuring asthma control: a comparison of three classification systems. *Eur Respir J* 2010; 36: 269-276. doi:10.1183/09031936.00124009

Patel DN, Lambert EV, da Silva R, Greyling M, Nossel C, Noach A, Derman W, Gaziano T. The association between medical costs and participation in the Vitality Health promotion program among 948,974 members of a South African health insurance company. *Am J Health Promot*. 2010; 24(3): 199-204.

Rollnick S, Butler C, Kinnersley P, Gregory J, Mash B. Motivational interviewing. *BMJ* 2010; 340: c1900.

Schull MJ, Banda H, Kathyola D, Fairall L, Martiniuk A, Burciul B, Zwarenstein M, Sodhi S, Thompson S, Joshua M, Mondiwa M, Bateman ED. Strengthening health human resources and improving clinical outcomes through an integrated guideline and educational outreach in resource-poor settings: a cluster-randomized trial. *Trials* 2010, 11: 118.

Schulman-Marcus J, Prabhakaran D, Gaziano TA. Pre-hospital ECG for acute coronary syndrome in urban India: a cost-effectiveness analysis. *BMC Cardiovasc Disord*. 2010; 10: 13.

Van Zyl Smit RN, Pai M, Yew WW, Leung C, Zumla A, Bateman ED, Dheda K. Global Lung Health: The Colliding Epidemics of Tuberculosis, Tobacco Smoking, HIV and COPD. *Eur Respir J* 2010; 35: 27-33.

Guest editors

Bob Mash was guest editor for an edition of the *Current Allergy and Immunology Journal* on the theme of primary care, and focused on the management of chronic asthma in adults and children.

Naomi Levitt was guest editor for the South Africa *CME Journal on Diabetes* in October 2010. Bob Mash also contributed an article to the edition: Mash B. Diabetes education in primary care: A practical approach using the ADDIE model. *CME* 2010; 28(10): 484-487.

CDIA funders since CDIA has been established

We would like to acknowledge our funders. Without their support, NCDs would still constitute a neglected area of health research.

United Health Company, USA

Total funding amounts to 1 million dollars over 5 years. Annually renewable.

Funding cycle: From Sept 2009 to August 2014.

National Heart Lung and Blood Institute of the NIH, USA

Total funding amounts to 2 million dollars over 5 years. Pay and claim contract.

Funding cycle: From 8 June 2009 to 7 June 2014.

Cancer Association of South Africa

Total funding amounts to $68571 (R480 000) over 3 years. Annually renewable.

Funding cycle: From 1 June 2010 to 30 May 2013.

International Development Research Centre of Canada

Total funding amounts to $37048.44 (Canadian dollars $38 000) for one year.

Funding cycle: 17 March 2010 to 16 March 2011.

International Diabetes Federation (BRIDGES project)

Total funding amounts to $65000 over 2 years.

Funding cycle: From 1 April 2010 to 31 March 2012.

Department of Medicine and Faculty of Health Sciences, University of Cape Town

Research facilities and accommodation for CDIA administrative offices.

Financial statement

Income and Expenditure Statement for 12 month period
(January to December)

	Note	2010	2009	2008
Income		**4,274,787.82**	**2,825,884.63**	**1,402,755.39**
Grants – Restricted	1	2,522,523.62	1,037,195.69	
Grants – Unrestricted	1	1,697,334.88	1,757,311.53	1,402,755.39
Net Financing Income (Interest received from investments)	2	54,929.32	31,377.41	
Expenditure		**3,741,540.80**	**1,068,809.75**	**436,045.45**
Personnel		1,430,841.83	582,642.49	109,558.50
Travel		236,645.75	47,956.27	40,342.38
Operating costs and supplies		441,472.04	343,210.99	286,144.57
Bursaries		409,450.00	95,000.00	
Subcontracts		1,223,131.18	–	
Lung Institute		422,408.71		
Harvard University		800,722.47		
Surplus		**533,247.02**	**1,757,074.88**	**966,709.94**
Capital invested	3	1,590,658.41	444,266.00	–
Total		**2,123,905.43**	**2,201,340.88**	**966,709.94**

Notes

Basis of accounting
The Income and Expenditure Statement was drawn up according to the cash basis of accounting.

Exchange Rate
The exchange rate used to convert United States Dollars to South African rands is the average weighted exchange rate of the ruling exchange rate on the dates that the funds were received by the recipient.

1. Grants Restricted/Unrestricted
Grants unrestricted represents funding received in advance of expenditure for operational costs and bursaries. Grants restricted represent expenditure incurred on projects for which there are commitments from funders, including funding not yet received by year end.

2. Net Financing Income
Interest received from capital acquired since 2008.

3. Investments
Unrestricted funding invested through UCT portfolio, receiving a market-related interest rate.