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The prevalence of type 2 diabetes mellitus among older people in Africa: A Systematic Review Study Protocol

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Key words : elderly, diabetes mellitus, type 2 diabetes, prevalence, Africa

Abstract

Introduction: The number of people with diabetes in Africa is projected to increase substantially in the next two decades, explained by a number of factors. These include rapid urbanization, adoption of unhealthy diets and exercise patterns, and the ageing of the population. There are currently uncertainties regarding the incidence, prevalence, and management patterns of diabetes in older people across the diversity of African countries. We wish to perform a systematic review to determine the prevalence of type 2 diabetes in Africa in the older individual, over the age of 55 years, reported in studies from 2000 to 2013, hypothesising that it may be higher than reported in Western countries.

Methods and analyses: A comprehensive literature search will be undertaken, using an African search filter to identify diabetes prevalence studies that were published from 2000 to 2013. The African filter comprises African country names as well as truncated terms such as 'north* Africa' to ensure that records indexed using regional terms rather than country-specific terms are also captured. Database subject headings (MeSH in PUBMED /MEDLINE, CINHAL, scholarly Google) will be combined with a range of text words (African search filter). Publications of identified key authors will be examined by citation searches on MEDLINE and (ISI) Web of Science. The World Health Organization (WHO) and International Diabetes Federation (IDF) websites will be searched. Full copies of articles identified by the search, and considered to meet the inclusion criteria, will be obtained for data extraction and synthesis. Two reviewers will apply the criteria independently to the

results; prevalence of type 2 diabetes from different studies will be pooled in a meta-analysis using (STATA version 12 statistical software). This systematic review will be reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA).

Introduction

During the last decade the prevalence of type 2 diabetes has increased dramatically in many parts of the world. The International Diabetes Federation (IDF) projects an increase in the number of people living with diabetes from 382 million in 2013 to 592 million by 2035, should there be no serious action to stem this tide.[1] In Africa, diabetes already contributes significantly to morbidity and mortality with the highest global age-specific mortality rate recorded in this part of the world.[2-5] As such a broad based strategy aimed at prevention, early identification and appropriate management is critical to reduce the burden of diabetes in Africa.[5]

The annual growth rate of older persons in Africa has been estimated at 3.1% between 2007 and 2015, and 3.3% between 2015 and 2050, which is greater than the global average.[2] Given that aging is one of the major drivers for diabetes, it is concerning that there will be approximately 64.5 million African persons aged ≥ 55 years in 2015, and more than 103 million and 205 million in 2030 and 2050, respectively.[6] Delivering appropriate care for older people with diabetes presents a growing challenge to all health-care systems. Health literacy, comorbidities, polypharmacy, higher risk of cognitive impairment, functional limitations, and financial problems significantly affect the ability of older people in general to understand and follow complex treatment regimens.[7] Yet guidelines for the older person with diabetes are limited by a dearth of evidence and therefore recommendations rely on expert opinion and extrapolation from younger populations.[8] Diabetes, in view of its high prevalence, prolonged duration, wide spectrum of complications, emotional and psychological sequelae, provides a complex case for cost-effective studies, in older people.[9]

Why it is important to do this review

In view of the anticipated growth of older people with diabetes globally and in Africa in particular, adequate baseline epidemiological data are required to monitor future trends. We therefore wish to perform a systematic review to determine the prevalence of type 2 diabetes in Africa in older individuals over the age of 55 years, reported in studies from 2000 to 2013, hypothesising that it may be higher than reported in Western countries.

Objectives

To conduct a systematic review of studies assessing the prevalence of Type 2 diabetes among older people in African countries.

Review question

This systematic review will be guided by the following research question:

What is the prevalence of type 2 diabetes in older persons aged 55 years and older in African countries as reported in studies from 2000 to 2013?

Criteria for considering studies for review

We will consider published articles and unpublished studies reported after 01 January 2000, given that the current criteria for the diagnosis of diabetes have been widely accepted since 1998. Articles published in English or in other languages, with full English abstracts will be eligible for inclusion.

Types of participants

Participants aged 55 years or older, resident in countries belonging to the African continent, in the geographic regions of Sub-Saharan Africa and North Africa diagnosed with type 2 diabetes from all ethnicities, socioeconomic and educational backgrounds will be eligible for inclusion. For the purpose of this review, the diagnosis of diabetes can either be made by physician or defined by available measured fasting plasma glucose (FPG), glucose tolerance test (OGTT) or self-reported, according to WHO criteria. [10]

Types of studies

Population-based studies, cross-sectional studies such as (cross-sectional survey) of type 2 diabetes defined by the WHO, will be potentially eligible for inclusion.

Exclusion criteria

1. Studies confined to subgroups of patients with type 2 diabetes (with any complication of diabetes mellitus for example: myocardial infarction, eye, kidney or other microvascular or macrovacular complications).
2. Studies that do not include a representative sample of older people aged 55 years or older.
3. Narrative reviews, opinion pieces, letters, or any other publications lacking primary clinical data and/or explicit methods descriptions.

4. Duplicate publications of the same material. When the study has been published in more than one journal/conference, the most complete recent version will be used.

Search strategy for identification of relevant studies

The search strategy will be designed to access both published and unpublished studies and will comprise two stages:

Bibliographic databases

A. A comprehensive and sensitive search strategy will be undertaken using a comprehensive African search filter developed by Siegfried [11] to identify prevalence studies conducted from 2000 to 2013 in Africa. The African filter comprises African country names as well as truncated terms such as 'north* Africa' to ensure that records indexed using regional terms rather than country-specific terms are also retrieved. Database subject headings (MeSH in PUBMED /MEDLINE, CINHAL and scholarly Google) will be combined with a range of text words (See Appendix 1). African country names are included in both English and languages relevant to the country, e.g., 'Ivory Coast' and 'Cote d'Ivoire'. Where country names have changed over time both names are included, e.g., 'Democratic Republic of Congo 'and 'Zaire'.[12]

B. Publications of identified key authors will be examined by citation searches on the websites of the IDF and WHO e.g. STEPS surveys studies in Africa as well as 'free word' Internet searches on ISI Web of Science. No language restrictions will be used, Bibliographic software programs for managing the references and documenting the study selection process (Ref Works) will be used in this review. An expert librarian will help in designing the search strategy framework and implementing the appropriate bibliographic software program. For the detailed search strategy (See Appendix 2).

Selecting studies for inclusion

Full copies of articles identified by the search, and considered to meet the inclusion criteria, based on the title and abstract will be obtained for data synthesis. Initially, studies will be screened using pre-defined inclusion and exclusion criteria. Two reviewers will apply the criteria independently to the results of the searches, based first on titles and abstracts only. Studies will then be either (A) excluded, (B) included, or (C) marked as "Pending" if the reviewer is unsure about their

inclusion. The two independent reviews will be compared and contradictory judgments or "pending" will be temporarily "included", and moved to the next phase of review of full texts. Once full texts have been retrieved, two reviewers will independently apply inclusion and exclusion criteria, based on quick assessments of the full texts. Disagreements in reviewer selections will be resolved at a meeting between reviewers prior to selected articles being retrieved. A flow chart will be produced to facilitate transparency of the process**.**

Quality appraisal of included studies

In this review, methodological quality will be distanced from general reporting quality as it is important to clarify and differentiate between quality of reporting and the quality of what was actually done (that is, a study could be well reported but have methodological limits or vice versa). Sensitivity analyses will be based on stratification, by individual items of methodological quality or (where appropriate) individual items of general reporting quality to assess the robustness of the findings. The Guidelines for Evaluating Prevalence Studies developed by Hoy [13] will be used. These guidelines measure the quality of studies across two main areas: both external and internal validity **(Table 1**).

Table 1. Quality assessment criteria for Prevalence studies [13]

External validity
1. Was the study's target population a close representation of the national population in relation to relevant variables? (1 point) **2. Was the sampling frame a true or close representation of the target population? (1 point)** **3. Was some form of random selection used to select the sample, OR was a census undertaken? (1 point)** **4. Was the likelihood of nonresponse bias minimal? (1 point)** **Total points (4 points)**
Internal validity
1. Were data collected directly from the subjects (as opposed to a proxy)? (1 point) **2. Was an acceptable case definition used in the study? (1 point)** **3. Was the study instrument that measured the parameter of interest shown to have validity and reliability? (1 point)** **4. Was the same mode of data collection used for all subjects? (1 point)** **5. Was the length of the shortest prevalence period for the parameter of interest appropriate? (1 point)** **6. Were the numerator(s) and denominator(s) for the parameter of interest appropriate? (1 point)** **Total points (6 points)**

Data extraction and management

Following assessment of methodological quality, two reviewers will extract data onto a purpose-designed data extraction form and independently summarize what they consider to be the most important results from each study. These summaries will be compared and any differences of opinion will be resolved by discussion and consultation with a third reviewer. Any further calculations on study data considered necessary, will be conducted by the first reviewer and checked by the second reviewer. Study characteristics including country where study was conducted, year of publication, journal, language of publication, study population, age range, response rate, study design, criteria for sample selection and sample size, outcome(s) measured, diagnostic criteria, results and notes/comments will be presented in Tables (See Appendix 3).We are anticipating that some eligible studies will not have prevalence data reported for the specific age range (i.e. ≥ 55 years). We will contact the corresponding authors of these studies and request the age-specific prevalence and any other missing information, deemed to be relevant.

Data synthesis including assessment of heterogeneity

Our analysis of the primary measure, FPG and OGTT will include two steps: (1) identification of data sources and documenting estimates and (2) application of statistical models, to estimate the prevalence by country and age. Prevalence of type 2 DM from different studies will be pooled in a meta-analysis using (STATA version 12 statistical software). Heterogeneity between combined studies will be tested using the I^2 heterogeneity statistic to determine the extent of variation in effect estimates that is due to heterogeneity rather than chance. Heterogeneity will be assessed by inspecting forest plots initially , then through the Cochran's Chi-square test (using 10% level of significance due to the low power of the test), and the I-square statistic (where 50% or higher values indicate substantial heterogeneity).[14] Where heterogeneity is statistically significant, subgroup analysis and sensitivity analyses will be conducted to determine the potential sources of heterogeneity.If the identified studies are of substantial heterogeneity and where statistical pooling is not possible, the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate. The narrative will be written by the two reviewers and then checked independently by the other reviewers, any disagreements will be decided by all reviewers.

Assessment of reporting biases

Symmetry of funnel plots will be used to assess for publication or selective reporting bias.

Reporting of this review

This systematic review will be reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement.[15]A reporting guideline for systematic reviews of healthcare intervention and will include a PRISMA checklist. Where necessary, we will adapt the reporting to ensure that all items relevant to this review are included in the report.

Ethics and Dissemination

This study will attempt to fill the gap in knowledge in the prevalence of diabetes among the older population in Africa. As such it will provide impetus to develop an evidence base for policy and practice in this area of research. The study will be disseminated by peer-review publication and conference presentations.

Acknowledgements: We acknowledge Dr Taryn Young, Evidence-based health care Centre, and University of Stellenbosch, who provided guidance for designing the protocol. Ms Tamzyn Suliaman, UCT Libraries, Health Sciences, Information Services Librarian who provided, technical support and assists in the planning of the search strategy and reference management.

Contributors: All authors conceived the study and were responsible for designing the protocol. M. Werfalli and A Musekiwa cod-rafted the protocol manuscript and NS Levitt and ME. Engel, I. Ross, A. Kengne revised it for methodological and clinical content. All authors critically revised successive drafts of the manuscripts and approved the final version.

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Competing interests: None declared.

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Article summary

Article focus

- **This systematic review aims to fill the gap in knowledge in the prevalence of diabetes among older population in Africa.**

Key messages

- **There are currently important gaps in our knowledge on the incidence and prevalence of diabetes mellitus and management patterns for older people in Africa, setting priorities in service delivery for the prevention and treatment of type 2 diabetes requires an empirical understanding of the pattern of disease burden.**

Strengths and limitations of this study

- **A comprehensive search strategy will be undertaken using African search filter to identify prevalence Studies conducted from 2000 to 2013 in Africa.**
- **There is a lack of qualitative and quantitative research on the health status of the older population.**
- **Sensitivity analyses will be based on stratification by individual items of methodological quality.**

Appendix 2: Describing details of search strategy

A. Describing the relevant search terms used in search strategy.

elderly	"aged"[MeSH Terms] OR "aged"[All Fields] OR "elderly"[All Fields]
people	"persons"[MeSH Terms] OR "persons"[All Fields] OR "people"[All Fields]
diabetes mellitus	"diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields]
type 2 diabetes	"diabetes mellitus, type 2"[MeSH Terms] OR "type 2 diabetes mellitus"[All Fields] OR "type 2 diabetes"[All Fields]
Africa	"Africa"[MeSH Terms] OR "Africa"[All Fields]
diabetes	"diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields] OR "diabetes"[All Fields] OR "diabetes insipidus"[MeSH Terms] OR ("diabetes"[All Fields] AND "insipidus"[All Fields]) OR "diabetes insipidus"[All Fields]
prevalence	"epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms]

B. Describing electronic databases searches by using of African Search Filter

(elderly)) AND (elderly people)) AND (diabetes mellitus)) AND (2 diabetes mellitus)) AND (type 2 diabetes)) AND (Africa)) AND (("Africa"[MeSH] OR Africa*[tw] OR Algeria[tw] OR Angola[tw] OR Benin[tw] OR Botswana[tw] OR "Burkina Faso"[tw] OR Burundi[tw] OR Cameroon[tw] OR "Canary Islands"[tw] OR "Cape Verde"[tw] OR "Central African Republic"[tw] OR Chad[tw] OR Comoros[tw] OR Congo[tw] OR "Democratic Republic of Congo"[tw] OR Djibouti[tw] OR Egypt[tw] OR "Equatorial Guinea"[tw] OR Eritrea[tw] OR Ethiopia[tw] OR Gabon[tw] OR Gambia[tw] OR Ghana[tw] OR Guinea[tw] OR "Guinea Bissau"[tw] OR "Ivory Coast"[tw] OR "Cote d'Ivoire"[tw] OR Jamahiriya[tw] OR Jamahiriya[tw] OR Kenya[tw] OR Lesotho[tw] OR Liberia[tw] OR Libya[tw] OR Libya[tw] OR Madagascar[tw] OR Malawi[tw] OR Mali[tw] OR Mauritania[tw] OR Mauritius[tw] OR Mayotte[tw] OR Morocco[tw] OR Mozambique[tw] OR Mozambique[tw] OR Namibia[tw] OR Niger[tw] OR Nigeria[tw] OR Principe[tw] OR Reunion[tw] OR Rwanda[tw] OR "Sao Tome"[tw] OR Senegal[tw] OR Seychelles[tw] OR "Sierra Leone"[tw] OR Somalia[tw] OR "South Africa"[tw] OR "St Helena"[tw] OR Sudan[tw] OR Swaziland[tw] OR Tanzania[tw] OR Togo[tw] OR Tunisia[tw] OR Uganda[tw] OR "Western Sahara"[tw] OR Zaire[tw] OR Zambia[tw] OR Zimbabwe[tw] OR "Central Africa"[tw] OR "Central African"[tw] OR "West Africa"[tw] OR "West African"[tw] OR "Western Africa"[tw] OR "Western African"[tw] OR "East Africa"[tw] OR "East African"[tw] OR "Eastern Africa"[tw] OR "Eastern African"[tw] OR "North Africa"[tw] OR "North African"[tw] OR "Northern Africa"[tw] OR "Northern African"[tw] OR "South African"[tw] OR "Southern Africa"[tw] OR "Southern African"[tw] OR "sub Saharan Africa"[tw] OR "sub Saharan African"[tw] OR "sub-Saharan Africa"[tw] OR "sub-Saharan African"[tw]) NOT ("guinea pig"[tw] OR "guinea pigs"[tw] OR 'aspergillums Niger"[tw]))) AND (diabetes prevalence) AND ("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms])

APPENDIX 3: DATA EXTRACTION FORM

STUDY ID: ☐

Reviewer's Initials ☐

Part 1: COVERSHEET

Study Title: ☐

Journal:

Language:

Citation:

☐

Part 2: STUDY CHARACTERISTICS.

Publication Year: Country of study:

Study design:

☐ cross-sectional

☐ case-report

☐ other _____

Study period:

Data source:

☐ medical records

☐ special survey

☐ multiple source

☐ surveillance

☐ registries

Setting

☐ Urban

☐ Rural

Population study: ☐ total population ☐ specific group population ☐ other _____ Diagnostic Criteria. ❖ WHO Criteria: (Y / N). ❖ Measured or Defined by: • Fasting plasma glucose (FPG) ☐ • glucose tolerance test (OGT) ☐ • Self-reported ☐ ❖ Please use the attached checklist (Tick as appropriate (√) Inclusion criteria: ☐ ☐ ☐ ☐ ☐ Exclusion Criteria: ☐ ☐ ☐ ☐ ☐ Included ☐ Excluded ☐ pending ☐	**Age groups included (describe):** **Genders included:** **(Total numbers)** Male ☐ Female ☐ Both ☐ **Dominator (s) (N):** **Reason(s) for exclusion, uncertainty or to contact authors** 1. 2. 3.

Part 3: RESULTS.

Measure of the prevalence ☐ Crude Measure ☐ Adjusted measure
If **adjusted** what factors were adjusted for in this study (list):

Reported measure of the prevalence:

Missing data to be reported from the author:
(any communication with author Yes ☐ No ☐
If yes, pleases specify

Other comments:

Appendix 1: African Search Filter

African Search Filter
(“Africa”[MeSH] OR Africa*[tw] OR Algeria[tw] OR Angola[tw] OR Benin[tw] OR Botswana[tw] OR “Burkina Faso”[tw] OR Burundi[tw] OR Cameroon[tw] OR “Canary Islands”[tw] OR “Cape Verde”[tw] OR “Central African Republic”[tw] OR Chad[tw] OR Comoros[tw] OR Congo[tw] OR “Democratic Republic of Congo”[tw] OR Djibouti[tw] OR Egypt[tw] OR “Equatorial Guinea”[tw] OR Eritrea[tw] OR Ethiopia[tw] OR Gabon[tw] OR Gambia[tw] OR Ghana[tw] OR Guinea[tw] OR “Guinea Bissau”[tw] OR “Ivory Coast”[tw] OR “Cote d’Ivoire”[tw] OR Jamahiriya[tw] OR Jamahiriya[tw] OR Kenya[tw] OR Lesotho[tw] OR Liberia[tw] OR Libya[tw] OR Libya[tw] OR Madagascar[tw] OR Malawi[tw] OR Mali[tw] OR Mauritania[tw] OR Mauritius[tw] OR Mayotte[tw] OR Morocco[tw] OR Mozambique[tw] OR Mozambique[tw] OR Namibia[tw] OR Niger[tw] OR Nigeria[tw] OR Principe[tw] OR Reunion[tw] OR Rwanda[tw] OR “Sao Tome”[tw] OR Senegal[tw] OR Seychelles[tw] OR “Sierra Leone”[tw] OR Somalia[tw] OR “South Africa”[tw] OR “St Helena”[tw] OR Sudan[tw] OR Swaziland[tw] OR Tanzania[tw] OR Togo[tw] OR Tunisia[tw] OR Uganda[tw] OR “Western Sahara”[tw] OR Zaire[tw] OR Zambia[tw] OR Zimbabwe[tw] OR “Central Africa”[tw] OR “Central African”[tw] OR “West Africa”[tw] OR “West African”[tw] OR “Western Africa”[tw] OR “Western African”[tw] OR “East Africa”[tw] OR “East African”[tw] OR “Eastern Africa”[tw] OR “Eastern African”[tw] OR “North Africa”[tw] OR “North African”[tw] OR “Northern Africa”[tw] OR “Northern African”[tw] OR “South African”[tw] OR “Southern Africa”[tw] OR “Southern African”[tw] OR “sub Saharan Africa”[tw] OR “sub Saharan African”[tw] OR “sub-Saharan Africa”[tw] OR “sub-Saharan African”[tw]) NOT (“guinea pig”[tw] OR “guinea pigs”[tw] OR ‘aspergillums Niger”[tw])

Appendix 2: Describing details of search strategy

A. Describing the relevant search terms used in search strategy.

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diabetes mellitus	"diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields]
type 2 diabetes	"diabetes mellitus, type 2"[MeSH Terms] OR "type 2 diabetes mellitus"[All Fields] OR "type 2 diabetes"[All Fields]
Africa	"Africa"[MeSH Terms] OR "Africa"[All Fields]
diabetes	"diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields] OR "diabetes"[All Fields] OR "diabetes insipidus"[MeSH Terms] OR ("diabetes"[All Fields] AND "insipidus"[All Fields]) OR "diabetes insipidus"[All Fields]
prevalence	"epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms]

B. Describing electronic databases searches by using of African Search Filter

(elderly)) AND (elderly people)) AND (diabetes mellitus)) AND (2 diabetes mellitus)) AND (type 2 diabetes)) AND (Africa)) AND (("Africa"[MeSH] OR Africa*[tw] OR Algeria[tw] OR Angola[tw] OR Benin[tw] OR Botswana[tw] OR "Burkina Faso"[tw] OR Burundi[tw] OR Cameroon[tw] OR "Canary Islands"[tw] OR "Cape Verde"[tw] OR "Central African Republic"[tw] OR Chad[tw] OR Comoros[tw] OR Congo[tw] OR "Democratic Republic of Congo"[tw] OR Djibouti[tw] OR Egypt[tw] OR "Equatorial Guinea"[tw] OR Eritrea[tw] OR Ethiopia[tw] OR Gabon[tw] OR Gambia[tw] OR Ghana[tw] OR Guinea[tw] OR "Guinea Bissau"[tw] OR "Ivory Coast"[tw] OR "Cote d'Ivoire"[tw] OR Jamahiriya[tw] OR Jamahiriya[tw] OR Kenya[tw] OR Lesotho[tw] OR Liberia[tw] OR Libya[tw] OR Libya[tw] OR Madagascar[tw] OR Malawi[tw] OR Mali[tw] OR Mauritania[tw] OR Mauritius[tw] OR Mayotte[tw] OR Morocco[tw] OR Mozambique[tw] OR Mozambique[tw] OR Namibia[tw] OR Niger[tw] OR Nigeria[tw] OR Principe[tw] OR Reunion[tw] OR Rwanda[tw] OR "Sao Tome"[tw] OR Senegal[tw] OR Seychelles[tw] OR "Sierra Leone"[tw] OR Somalia[tw] OR "South Africa"[tw] OR "St Helena"[tw] OR Sudan[tw] OR Swaziland[tw] OR Tanzania[tw] OR Togo[tw] OR Tunisia[tw] OR Uganda[tw] OR "Western Sahara"[tw] OR Zaire[tw] OR Zambia[tw] OR Zimbabwe[tw] OR "Central Africa"[tw] OR "Central African"[tw] OR "West Africa"[tw] OR "West African"[tw] OR "Western Africa"[tw] OR "Western African"[tw] OR "East Africa"[tw] OR "East African"[tw] OR "Eastern Africa"[tw] OR "Eastern African"[tw] OR "North Africa"[tw] OR "North African"[tw] OR "Northern Africa"[tw] OR "Northern African"[tw] OR "South African"[tw] OR "Southern Africa"[tw] OR "Southern African"[tw] OR "sub Saharan Africa"[tw] OR "sub Saharan African"[tw] OR "sub-Saharan Africa"[tw] OR "sub-Saharan African"[tw]) NOT ("guinea pig"[tw] OR "guinea pigs"[tw] OR 'aspergillums Niger"[tw]))) AND (diabetes prevalence) AND ("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms])

APPENDIX 3: DATA EXTRACTION FORM

STUDY ID: ☐

Reviewer's Initials ☐

Part 1: COVERSHEET

Study Title: ☐

Journal:

Language:

Citation:

☐

Part 2: STUDY CHARACTERISTICS.

Publication Year: Country of study:

Study design:

- ☐ cross-sectional
- ☐ case-report
- ☐ other _____

Study period:

Population study:

- ☐ total population
- ☐ specific group population
- ☐ other _____

Diagnostic Criteria.

- ❖ WHO Criteria: (Y / N).
- ❖ Measured or Defined by:
- Fasting plasma glucose (FPG) ☐
- glucose tolerance test (OGT) ☐
- Self-reported ☐

Data source:

- ☐ medical records
- ☐ special survey
- ☐ multiple source
- ☐ surveillance
- ☐ registries

Setting

- ☐ Urban
- ☐ Rural

Age groups included (describe):

☐

Genders included: **(Total numbers)**

Male ☐

Female ☐ ☐

Both ☐ ☐

Dominator (s) (N): ☐

❖ Please use the attached checklist (Tick as appropriate (√) Inclusion criteria: ☐ ☐ ☐ ☐ ☐ Exclusion Criteria: ☐ ☐ ☐ ☐ ☐ Included ☐ Excluded ☐ pending ☐	**Reason(s) for exclusion, uncertainty or to contact authors** 1. 2. 3.

Part 3: RESULTS.

Measure of the prevalence

☐ Crude Measure

☐ Adjusted measure

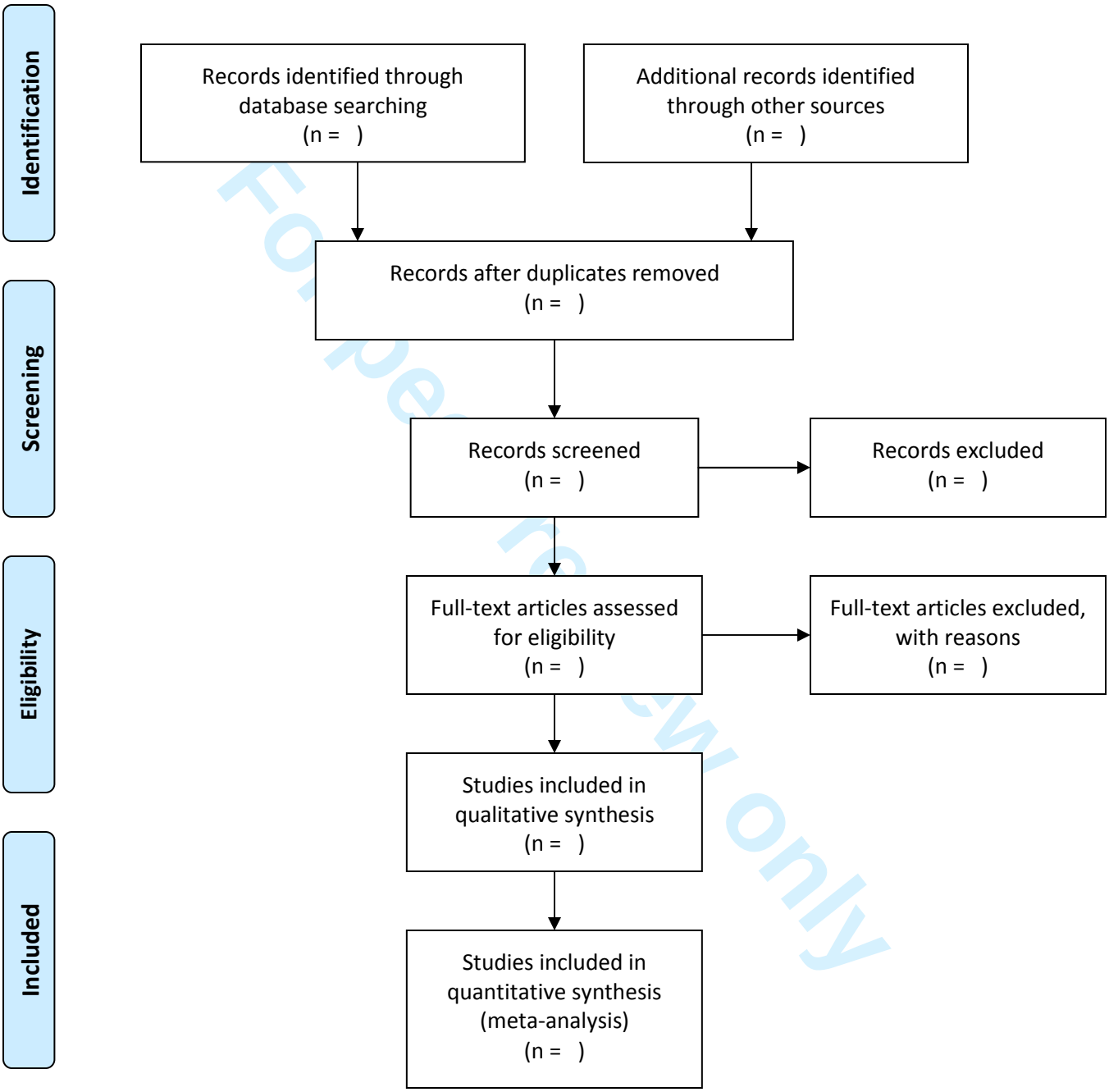
If **adjusted** what factors were adjusted for in this study (list):

Reported measure of the prevalence:

Missing data to be reported from the author:
(any communication with author Yes ☐ No ☐
If yes, pleases specify

Other comments:

PRISMA 2009 Flow Diagram



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The prevalence of type 2 diabetes among older people in Africa: A Systematic Review Study Protocol

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The prevalence of type 2 diabetes mellitus among older people in Africa: A Systematic Review Study Protocol

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Key words: elderly, diabetes mellitus, type 2 diabetes, prevalence, Africa

Abstract

Introduction: The number of people with diabetes in Africa is projected to increase substantially in the next two decades, due to factors including rapid urbanization, adoption of unhealthy diets and exercise patterns, and the ageing of the population. There are currently uncertainties regarding the incidence, prevalence, and management patterns of diabetes in older people across the diversity of African countries. We wish to perform a systematic review to determine the prevalence of type 2 diabetes in Africa in the older individual, over the age of 55 years, reported in studies from 2000 to 2013.

Methods and analyses: A comprehensive literature search among a number of databases will be undertaken, using an African search filter to identify diabetes prevalence studies that were published from 2000 to 2013. Full copies of articles identified by the search, and considered to meet the inclusion criteria, will be obtained for data extraction and synthesis. Statistical analysis of the primary measures, fasting plasma glucose (FPG) and glucose tolerance test (OGTT) will include two steps: (1) identification of data sources and documenting estimates and (2), application of the random-effects meta-analysis model to aggregate prevalence estimates and account for between study variability in calculating the overall pooled estimates and 95% confidence interval (CI) for diabetes prevalence. Heterogeneity will be evaluated using the I-square statistic (I2) to determine the extent of variation in effect estimates that is due to heterogeneity rather than chance. This systematic review will be reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA).

Ethics and dissemination: Ethics is not required for this study, given that this is a protocol for a systematic review, which utilizes published data. The findings of this study will be widely disseminated through peer-reviewed publications and conference presentations.

Introduction

The most recent International Diabetes Federation estimates from 2013 are that 8.3% of adults i.e. 382 million people world-wide have diabetes. This number has doubled over the past 20 years, and notably 80% of people with diabetes live in low and middle income countries (LMIC).[1] Diabetes

already contributes significantly to morbidity and mortality in Africa. The highest global age-specific mortality rate is recorded in this continent. .[2-6]All countries in Africa fall all into the LMIC category, and predominantly the low income category, The rise in the number of people with type 2 diabetes in Africa, similar to LMIC s been attributed to ageing of the population and relatively rapidly changing environmental factors.[1] These include urbanisation, the adoption of health behaviours favouring sedentariness and unhealthy eating patterns. While unhealthy behaviour patterns and obesity are potentially modifiable, ageing one of the major drivers for diabetes, is not.[7] In 2013, the majority of individuals with diabetes in Africa were reported to be under than 60 years of age with the highest proportion (43.2%) in people aged 40–59 years.[7] The relatively small proportion of people aged 60–79 years of age in the region is likely to account for the estimate that only 18.8% of people with diabetes fall in this age group.[1]

Africa is often referred to as the youngest continent in terms of age structure. This may contribute to the current relatively low prioritisation of ageing issues in national policies.[8] Yet thee annual growth rate of older persons in Africa has been estimated at 3.1% between 2007 and 2015, and 3.3% between 2015 and 2050, greater than the global average. In this context , it is concerning that there will be approximately 64.5 million African persons aged ≥ 55 years in 2015, and more than 103 million and 205 million in 2030 and 2050, respectively.[6] Indeed it has been predicted that the diabetes peak in Africa is expected to be in the oldest individual by 2035.[1]We therefore wish to perform a systematic review to determine the prevalence of type 2 diabetes in Africa in older individuals over the age of 55 years, reported in studies from 2000 to 2013 with a view to providing accurate data for monitoring future trends. The data will also be of value in informing health policy makers of the extent of the burden of diabetes in an under researched group whose health care needs may differ from those in younger adult

Objectives

To conduct a systematic review and meta-analysis of studies assessing the prevalence of Type 2 diabetes among older people in African countries.

Review question

This systematic review will be guided by the following research question:

What is the prevalence of type 2 diabetes in older persons aged 55 years and older in African countries as reported in studies from 2000 to 2013?

Criteria for considering studies for review

Inclusion criteria:

1. Studies describing the prevalence of type 2 diabetes among older adults, resident in countries belonging to the African continent, in the geographic regions of both Sub-Saharan and North Africa diagnosed with type 2 diabetes from all ethnicities, socioeconomic and educational backgrounds. Participants should be described as older adults or a minimum of 70% of participants should be within the age groups of 55-64 years, 65-74 years, or 75+ years).

2. Population-based studies, cross-sectional studies of type 2 diabetes. For the purpose of this review, the diagnosis of diabetes should be made by a physician or defined by available measured fasting plasma glucose (FPG), glucose tolerance test (OGTT) or self-reported, according to WHO criteria.[9]

We will consider published articles and unpublished studies reported after 01 January 2000, given that the current criteria for the diagnosis of diabetes have been widely accepted since 1998. Articles published in any language, with full English abstracts will be eligible for inclusion.

Exclusion criteria

1. Studies which include a mixed group of Type 1 and Type 2 participants, or that do not clearly define the type of diabetes as being Type 2, will be excluded.
2. Studies confined to subgroups of patients with type 2 diabetes (with any complication of diabetes mellitus for example: myocardial infarction, eye, kidney or other microvascular or macrovacular complications).
3. Studies that do not include a representative sample of older people aged 55 years or older.
4. Narrative reviews, opinion pieces, letters, or any other publications lacking primary data and/or explicit methods descriptions.
5. Duplicate publications of the same material. When the study has been published in more than one journal/conference, the most complete recent version will be used.
6. They had a low quality scores (equal to or below 5) in the assessment of risk of bias.

Search strategy for identification of relevant studies

The search strategy will comprise two stages:

Bibliographic databases

A. A comprehensive and sensitive search strategy will be undertaken using a African search filter developed by Siegfried[10] to identify prevalence studies conducted from 2000 to The African filter comprises country names from the continent as well as truncated terms such as 'north* Africa' to ensure that records indexed using regional, rather than country-specific terms are also retrieved. Database subject headings (MeSH in PUBMED /MEDLINE, CINHAL and Google Scholar) will be combined with a range of text words (See Appendix 1). African country names are included in both English and languages relevant to the country, e.g., 'Ivory Coast' and 'Cote d'Ivoire'. Where country names have changed over time both names are included, e.g., 'Democratic Republic of Congo 'and 'Zaire'.[11]

B. Publications of identified key authors will be examined by citation searches on the IDF and WHO websites e.g. STEPS surveys studies in Africa as well as on the ISI Web of knowledge platform. A bibliographic software programme for managing the references and documenting the study selection process will be used for this review. An expert librarian will help in designing the search strategy framework and implementing the appropriate bibliographic software program. (For the detailed search strategy, see Appendix 2).

Selecting studies for inclusion

Full copies of articles identified by the search, and considered to meet the inclusion criteria, based on the title and abstract will be obtained for data synthesis. Initially, studies will be screened using pre-defined inclusion and exclusion criteria. Two reviewers will apply the criteria independently to the results of the searches, based first on titles and abstracts only. Studies will then be either (A) excluded, (B) included, or (C) marked as "Pending" if the reviewer is unsure about their inclusion. The two independent reviews will be compared and contradictory judgments or "pending" will be temporarily "included", and moved to the next phase of review of full texts. Once full texts have been retrieved, two reviewers will independently apply inclusion and exclusion criteria, based on quick assessments of the full texts. Disagreements in reviewer selections will be resolved at a meeting between reviewers prior to selected articles being retrieved. A flow chart will be produced to facilitate transparency of the process**.**

Quality appraisal of included studies

A quality assessment tool, based on guidelines for evaluating prevalence studies as suggested by Hoy[12] and colleagues has been developed (Table 1). This will be applied to screened full-text articles in order to code eligibility decisions and to assess study quality and agreement between investigators. Assessment of bias is built into the quality scoring scale. We plan to evaluate risk

of selection and attrition bias using the Cochrane guidelines as set out in Review Manager Version 5.2 (http://ims.cochrane.org/RevMan). This will inform the feasibility of and selection of studies for a pooled analysis. Any disagreements will be resolved by discussion and consensus in consultation with the third author to resolve persistent inconsistencies.

Table 1. Quality assessment criteria for Prevalence studies [12]

Items	Quality score
External validity	
1. Was the study's target population a close representation of the national population in relation to relevant variables?	**(1 point)**
2. Was the sampling frame a true or close representation of the target population?	**(1 point)**
3. Was some form of random selection used to select the sample, OR was a census undertaken?	**(1 point)**
4. Was the likelihood of nonresponse bias minimal?	**(1 point)**
	Total (4 points)
Internal validity	
1. Were data collected directly from the subjects (as opposed to a proxy)?	**(1 point)**
2. Was an acceptable case definition used in the study?	**(1 point)**
3. Was the study instrument that measured the parameter of interest shown to have validity and reliability?	**(1 point)**
4. Was the same mode of data collection used for all subjects? (1 point)	**(1 point)**
5. Was the length of the shortest prevalence period for the parameter of interest appropriate?	**(1 point)**
6. Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	**(1 point)**
	Total (6 points)

Data extraction and management

Following assessment of methodological quality, two reviewers will extract data onto a purpose-designed data extraction form and independently summarize what they consider to be the most

important results from each study. These summaries will be compared and any differences of opinion will be resolved by discussion and consultation with a third reviewer. Any further calculations on study data considered necessary, will be conducted by the first reviewer and checked by the second reviewer. Study characteristics including country where study was conducted, year of publication, journal, language of publication, study population, age range, response rate, study design, criteria for sample selection and sample size, outcome(s) measured, diagnostic criteria, results and notes/comments will be presented in Tables (See Appendix 3).We are anticipating that some eligible studies will not have prevalence data reported for the specific age range (i.e. ≥ 55 years). We will contact the corresponding authors of these studies and request the age-specific prevalence and any other missing information, deemed to be relevant.

Data synthesis including assessment of heterogeneity

Our statistical analysis of the primary measures, FPG and OGTT will include two steps: (1) identification of data sources and documenting estimates and (2), application of the random-effects meta-analysis model to aggregate prevalence estimates and account for between study variability in calculating the overall pooled estimates and 95% confidence interval (CI) for diabetes prevalence. We will derive standard errors where studies have provided the corresponding numerator and denominator for diabetes prevalence estimates. We will consider non overlapping CIs as an indication of statistically significant differences. Prevalence of type 2 DM from different studies will be pooled in a meta-analysis using (STATA version 12 statistical software). Heterogeneity will be assessed by inspecting forest plots initially, then through the Cochran's Chi-square test using a 10% level of significance cut-off. due to the low power of the test), and the I-square statistic (I2) where values of 25%, 50%, and 75% reflect low, medium, and high heterogeneity, respectively.[13] Where heterogeneity is statistically significant, subgroup analysis, using the following variables: age group, sex, setting e.g. urban/ rural geographical region e.g., northern/ southern, Western/ Eastern, as well as sensitivity analyses will be conducted to determine the potential sources of heterogeneity.

Furthermore a sensitivity analysis will be performed to evaluate how excluding studies that did not meet each quality criterion would affect our overall estimate. Another sensitivity analysis will be conducted to find out how our results would change if only high-quality studies were considered. If the identified studies are of substantial heterogeneity and where statistical pooling is not possible, the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate. The narrative will be written by the two reviewers and then checked independently by the other reviewers, any disagreements will be decided by all reviewers.

Assessment of reporting biases

Symmetry of funnel plots will be used to assess for publication or selective reporting bias.

Reporting of this review

This systematic review will be reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement.[14] A reporting guideline for systematic reviews of healthcare intervention and will include a PRISMA checklist. Where necessary, we will adapt the reporting to ensure that all items relevant to this review are included in the report.

Ethics and Dissemination

Given that this is a protocol for a systematic review, which utilizes published data, ethics is not required for this study. The findings of this study will be widely disseminated through peer-reviewed publications, conference presentations and submitted to relevant authorities in national departments of health. Updates of the review will be conducted to inform and guide healthcare practice.

Acknowledgements: We acknowledge Dr Taryn Young, Evidence-based health care Centre, and University of Stellenbosch, who provided guidance for designing the protocol. Ms Tamzyn Suliaman, UCT Libraries, Health Sciences, Information Services Librarian provided, technical support and assisted in the planning of the search strategy and reference management. Finally, we gratefully

acknowledge support of the Evidence-Based Medicine Research Support Unit, Faculty of Health Sciences at University of Cape Town.

Contributors: All authors conceived the study and were responsible for designing the protocol. M. Werfalli and A Musekiwa co-drafted the protocol manuscript. ME Engel and NS Levitt provided critical guidance on the analysis and overall direction of the study. I. Ross, A. Kengne revised it for methodological and clinical content. All authors critically revised successive drafts of the manuscripts and approved the final version.

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Competing interests: None declared.

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Key words: elderly, diabetes mellitus, type 2 diabetes, prevalence, Africa

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Abstract

Introduction: The number of people with diabetes in Africa is projected to increase substantially in the next two decades, due to ~~explained by a number of~~ factors including~~. These include~~ rapid urbanization, adoption of unhealthy diets and exercise patterns, and the ageing of the population. There are currently uncertainties regarding the incidence, prevalence, and management patterns of diabetes in older people across the diversity of African countries. We wish to perform a systematic review to determine the prevalence of type 2 diabetes in Africa in the older individual, over the age of 55 years, reported in studies from 2000 to 2013~~, hypothesising that it may be higher than reported in Western countries.~~

Methods and analyses: A comprehensive literature search among a number of databases will be undertaken, using an African search filter to identify diabetes prevalence studies that were published from 2000 to 2013. This specific ~~e African~~ search filter comprises African country names as well as truncated terms such as 'north* Africa' to ensure that records indexed using regional terms rather than country-specific terms are also captured. ~~Database subject headings (MeSH in PUBMED,MEDLINE, CINHAL, scholarly Google) will be combined with a range of text words (African search filter).~~

~~Publications of identified key authors will be examined by citation searches on MEDLINE and (ISI) Web of Science. The World Health Organization (WHO) and International Diabetes Federation (IDF) websites will be searched.~~ Full copies of articles identified by the search, and considered to meet the inclusion criteria, will be obtained for data extraction and synthesis. Statistical analysis of the primary measures, fasting plasma glucose (FPG) and glucose tolerance test (OGTT) will include two steps: (1) identification of data sources and documenting estimates and (2), application of the random-effects meta-analysis model to aggregate prevalence estimates and account for between study variability in calculating the overall pooled estimates and 95% confidence interval (CI) for diabetes prevalence. Heterogeneity will be evaluated using the I-square statistic (I^2) to determine the extent of variation in effect estimates that is due to heterogeneity rather than chance. ~~Two reviewers will apply the criteria independently to the results; prevalence of type 2 diabetes from different studies will be pooled in a meta-analysis using (STATA version 12 statistical software).~~ This systematic review will be reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA).

Ethics and dissemination: Ethics is not required for this study, given that this is a protocol for a systematic review, which utilizes published data. The findings of this study will be widely disseminated through peer-reviewed publications and conference presentations. Updates of the review will be conducted to inform and guide healthcare practice.

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Introduction

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~~During the last decade the prevalence of type 2 diabetes has increased dramatically in many parts of the world. The International Diabetes Federation (IDF) projects an increase in the number of people living with diabetes from 382 million in 2013 to 592 million by 2035, should there be no serious action to stem this tide.[1] In Africa, diabetes already contributes significantly to morbidity and mortality with the highest global age-specific mortality rate recorded in this part of the world.[2-5] As such a broad based strategy aimed at prevention, early identification and appropriate management is critical to reduce the burden of diabetes in Africa.[5]~~

~~The annual growth rate of older persons in Africa has been estimated at 3.1% between 2007 and 2015, and 3.3% between 2015 and 2050, which is greater than the global average.[2] Given that aging is one of the major drivers for diabetes, it is concerning that there will be approximately 64.5 million African persons aged ≥ 55 years in 2015, and more than 103 million and 205 million in 2030 and 2050, respectively.[6] Delivering appropriate care for older people with diabetes presents a growing challenge to all health care systems. Health literacy, comorbidities, polypharmacy, higher risk of~~

~~cognitive impairment, functional limitations, and financial problems significantly affect the ability of older people in general to understand and follow complex treatment regimens.[7] Yet guidelines for the older person with diabetes are limited by a dearth of evidence and therefore recommendations rely on expert opinion and extrapolation from younger populations.[8] Diabetes, in view of its high prevalence, prolonged duration, wide spectrum of complications, emotional and psychological sequelae, provides a complex case for cost-effective studies, in older people.[9]~~

The most recent International Diabetes Federation estimates from 2013 are that 8.3% of adults ~~ie~~i.e. 382 million people world-wide have diabetes. This number has doubled over the past 20 years, and notably 80% of people with diabetes live in low and middle income countries (LMIC).[1]

Diabetes already contributes significantly to morbidity and mortality in Africa. The highest global age-specific mortality rate is recorded in this continent.~~7 9~~ .[2-6]

All countries ~~I~~in Africa fall all into the LMIC category, and predominantly the low income category. The rise in the number of people with **type 2** diabetes in Africa, similar to LMIC s been attributed to ageing of the population and relatively rapidly changing environmental factors.[1] These include urbanisation, the adoption of health behaviours favouring sedentariness and unhealthy eating patterns. While unhealthy behaviour patterns and obesity are potentially modifiable, ageing one of the major drivers for diabetes, is not.[7] In 2013, the majority of individuals with diabetes in Africa were reported to be under than 60 years of age with the highest proportion (43.2%) in people aged 40–59 years.[7] The relatively small proportion of people aged 60–79 years of age in the region is likely to account for the estimate -that only 18.8% of people with diabetes fall in this age group.[1]

Africa is often referred to as the youngest continent in terms of age structure. This may contribute to the current relatively low prioritisation of ageing issues in national policies.[8] Yet the annual growth rate of older persons in Africa has been estimated at- 3.1% between 2007 and 2015, and 3.3% between 2015 and 2050, greater than the global average. In this context , it is concerning that there will be approximately 64.5 million African persons aged ≥ 55 years in 2015, and more than 103 million and 205 million in 2030 and 2050, respectively.[6] Indeed it has been predicted that the diabetes peak in Africa is expected to be in the oldest individual by 2035.[1]

We therefore wish to perform a systematic review to determine the prevalence of type 2 diabetes in Africa in older individuals over the age of 55 years, reported in studies from 2000 to 2013 with a view to providing accurate data for monitoring future trends. The data will also be of value in informing health policy makers of the extent of the burden of diabetes in an under researched group whose health care needs may differ from those in younger adult~~s.~~

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Objectives

To conduct a systematic review and meta-analysis of studies assessing the prevalence of Type 2 diabetes among older people in African countries.

Review question

This systematic review will be guided by the following research question:

What is the prevalence of type 2 diabetes in older persons aged 55 years and older in African countries as reported in studies from 2000 to 2013?

Criteria for considering studies for review

~~We will consider published articles and unpublished studies reported after 01 January 2000, given that the current criteria for the diagnosis of diabetes have been widely accepted since 1998. Articles published in English or in other languages, with full English abstracts will be eligible for inclusion.~~

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exclusion criteria, based on quick assessments of the full texts. Disagreements in reviewer selections will be resolved at a meeting between reviewers prior to selected articles being retrieved. A flow chart will be produced to facilitate transparency of the process.

Quality appraisal of included studies

A quality assessment tool, based on guidelines for evaluating~~ulating~~ prevalence studies as suggested by Hoy[12] and colleagues has been developed (Table 1). This ~~and~~ will be applied to screened full-text articles in order to code eligibility decisions and to assess study quality and agreement between investigators. Assessment of bias is built into the quality scoring scale. We plan to evaluate risk of selection and attrition bias using the Cochrane guidelines as set out in Review Manager version 5.2 (http://ims.cochrane.org/RevMan). This will inform the feasibility of and selection of studies for a pooled analysis. Any disagreements will be resolved by discussion and consensus in consultation with the third author to resolve persistent inconsistencies.

~~The strengths and limitations of systematic reviews and meta-analyses have been well established for randomized clinical trials, largely through the efforts of The Cochrane Collaboration. Although they have been used in parallel for observational epidemiological studies, such as cohort, case-control and cross-sectional studies, considerably less attention has been paid to their methodology in this area of application. It is important, however, to distinguish between quality of reporting and quality of what was actually done in the design, conduct and analysis of a study. A high quality report ensures that all relevant information about a study is available to the reader, but does not necessarily reflect a low susceptibility to bias. An important component of a thorough systematic review is therefore an evaluation of the methodological quality of the primary research. For this purpose an innovative Guidelines for Evaluating Prevalence Studies have been developed by Hoy and other colleagues will be used in this review. They measure the quality of studies across two main areas: both external and internal validity (**Table 1**).~~

Formatted: Pattern: Clear (Background 1)

~~In this review, methodological quality will be distanced from general reporting quality as it is important to clarify and differentiate between quality of reporting and the quality of what was actually done (that is, a study could be well reported but have methodological limits or vice versa). Sensitivity analyses will be based on stratification, by individual items of methodological quality or (where appropriate) individual items of general reporting quality to assess the robustness of the findings. The Guidelines for Evaluating Prevalence Studies developed by Hoy [13] will be used. These guidelines measure the quality of studies across two main areas: both external and internal validity (**Table 1**).~~

Table 1. Quality assessment criteria for Prevalence studies [12~~13~~]

Items	Quality score
External validity	
1. Was the study's target population a close representation of the national population in relation to relevant variables?	(1 point)
2. Was the sampling frame a true or close representation of the target population?	(1 point)
3. Was some form of random selection used to select the sample, OR was a census undertaken?	(1 point)
4. Was the likelihood of nonresponse bias minimal?	(1 point)
	Total (4 points)
Internal validity	
1. Were data collected directly from the subjects (as opposed to a proxy)?	(1 point)
2. Was an acceptable case definition used in the study?	(1 point)
3. Was the study instrument that measured the parameter of interest shown to have validity and reliability?	(1 point)
4. Was the same mode of data collection used for all subjects? (1 point)	(1 point)
5. Was the length of the shortest prevalence period for the parameter of interest appropriate?	(1 point)
6. Were the numerator(s) and denominator(s) for the parameter of interest appropriate?	(1 point)
	Total (6 points)

Data extraction and management

Following assessment of methodological quality, two reviewers will extract data onto a purpose-designed data extraction form and independently summarize what they consider to be the most important results from each study. These summaries will be compared and any differences of opinion will be resolved by discussion and consultation with a third reviewer. Any further calculations on study data considered necessary, will be conducted by the first reviewer and checked by the second reviewer. Study characteristics including country where study was conducted, year of publication, journal, language of publication, study population, age range, response rate, study design, criteria for sample selection and sample size, outcome(s) measured, diagnostic criteria, results and notes/comments will be presented in Tables (See Appendix 3).We are anticipating that some eligible studies will not have prevalence data reported for the specific age range (i.e. ≥ 55 years). We will contact the corresponding authors of these studies and request the age-specific prevalence and any other missing information, deemed to be relevant.

Data synthesis including assessment of heterogeneity

Our statistical analysis of the primary measures, FPG and OGTT will include two steps: (1) identification of data sources and documenting estimates and (2), application of the ~~a~~ random-effects meta-analysis model ~~will be used~~ to aggregate ~~individual~~ prevalence estimates and account for between study variability in calculating the overall pooled estimates and 95% confidence interval (CI) for diabetes prevalence. We will derive standard errors w~~W~~here studies have provided the corresponding numerator and denominator for diabetes prevalence estimates~~, the random effects method will be used to derive standard errors.~~. We will consider non overlapping CIs as an indication of statistically significant differences. Prevalence of type 2 DM from different studies will be pooled in a meta-analysis using (STATA version 12 statistical software). ~~Heterogeneity between combined studies will be tested using the I square statistic (I2) heterogeneity statistic to determine the extent of variation in effect estimates that is due to heterogeneity rather than chance.~~ Heterogeneity will be assessed by inspecting forest plots initially, then through the Cochran'~~'~~s Chi-square test ~~(~~using a 10% level of significance cut-off. due to the low power of the test), and the ~~Heterogeneity between combined studies will be tested using the~~ I-square statistic (I2) ~~heterogeneity statistic to determine the extent of variation in effect estimates that is due to heterogeneity rather than chance. I square,~~ where values of ~~(an I2 (~~25%~~)~~, ~~I2 (~~50%~~)~~, and 75% reflect~~ed~~ low, medium, and high heterogeneity, respectively.[13] Where heterogeneity is statistically significant, subgroup analysis, using the following variables: age group, sex, setting e.g. urban/ rural geographical region e.g., northern/ southern, Western/ Eastern, as well as ~~and~~ sensitivity analyses will be conducted to determine the potential sources of heterogeneity. ~~Subgroup analyses will be conducted by using the following variables age group, sex, setting e.g. urban/ rural geographical region e.g., northern/ southern, Western/ Eastern~~

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Furthermore a sensitivity analysis will be performed to evaluate how excluding studies that did not meet each quality criterion would affect our overall estimate. Another sensitivity analysis will be conducted to find out how our results would change if only high-quality studies were considered. If the identified studies are of substantial heterogeneity and where statistical pooling is not possible, the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate. The narrative will be written by the two reviewers and then checked independently by the other reviewers, any disagreements will be decided by all reviewers.

~~Our analysis of the primary measure, FPG and OGTT will include two steps: (1) identification of data sources and documenting estimates and (2) application of statistical models, to estimate the prevalence by country and age. Prevalence of type 2 DM from different studies will be pooled in a meta-analysis using (STATA version 12 statistical software). Heterogeneity between combined studies will be tested using the I^2 heterogeneity statistic to determine the extent of variation in effect estimates that is due to heterogeneity rather than chance. Heterogeneity will be assessed by inspecting forest plots initially , then through the Cochran's Chi square test (using 10% level of significance due to the low power of the test), and the I square statistic (where 50% or higher values indicate substantial heterogeneity).14 Where heterogeneity is statistically significant, subgroup analysis and sensitivity analyses will be conducted to determine the potential sources of heterogeneity.If the identified studies are of substantial heterogeneity and where statistical pooling is not possible, the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate. The narrative will be written by the two reviewers and then checked independently by the other reviewers, any disagreements will be decided by all reviewers.~~

Assessment of reporting biases

Symmetry of funnel plots will be used to assess for publication or selective reporting bias.

Reporting of this review

This systematic review will be reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement.[14 15]A reporting guideline for systematic reviews of healthcare intervention and will include a PRISMA checklist. Where necessary, we will adapt the reporting to ensure that all items relevant to this review are included in the report.

Ethics and Dissemination

Given that this is a protocol for a systematic review, which utilizes published data, ethics is not required for this study. The findings of this study will be widely disseminated through peer-reviewed publications, conference presentations and submitted to relevant authorities in national departments of health. Updates of the review will be conducted to inform and guide healthcare practice.

~~This study will attempt to fill the gap in knowledge in the prevalence of diabetes among the older population in Africa. As such it will provide impetus to develop an evidence base for policy and practice in this area of research. The study will be disseminated by peer review publication and conference presentations.~~

Acknowledgements: We acknowledge Dr Taryn Young, Evidence-based health care Centre, and University of Stellenbosch, who provided guidance for designing the protocol. Ms Tamzyn Suliaman, UCT Libraries, Health Sciences, Information Services Librarian provided, technical support and assisted in the planning of the search strategy and reference management. Finally, we gratefully acknowledge support of the Evidence-Based Medicine Research Support Unit, Faculty of Health Sciences at University of Cape Town.

Contributors: All authors conceived the study and were responsible for designing the protocol. M. Werfalli and A Musekiwa co-drafted the protocol manuscript. ME Engel and NS Levitt provided critical guidance on the analysis and overall direction of the study. I. Ross, A. Kengne revised it for methodological and clinical content. All authors critically revised successive drafts of the manuscripts and approved the final version.

Funding: None

Competing interests: None declared.

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Article summary

Article focus

- **This systematic review aims to fill the gap in knowledge in the prevalence of diabetes among older population in Africa.**

Key messages

- **There are currently important gaps in our knowledge on the incidence and prevalence of diabetes mellitus and management patterns for older people in Africa, setting priorities in service delivery for the prevention and treatment of type 2 diabetes requires an empirical understanding of the pattern of disease burden**

Strengths and limitations of this study

- **A comprehensive search strategy will be undertaken using African search filter to identify prevalence Studies conducted from 2000 to 2013 in Africa.**
- **There is a lack of qualitative and quantitative research on the health status of the older population.**
- **Sensitivity analyses will be based on stratification by individual items of methodological quality.**

Appendix 2: Describing details of search strategy

A. Describing the relevant search terms used in search strategy.

elderly	"aged"[MeSH Terms] OR "aged"[All Fields] OR "elderly"[All Fields]
people	"persons"[MeSH Terms] OR "persons"[All Fields] OR "people"[All Fields]
diabetes mellitus	"diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields]
type 2 diabetes	"diabetes mellitus, type 2"[MeSH Terms] OR "type 2 diabetes mellitus"[All Fields] OR "type 2 diabetes"[All Fields]
Africa	"Africa"[MeSH Terms] OR "Africa"[All Fields]
diabetes	"diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields] OR "diabetes"[All Fields] OR "diabetes insipidus"[MeSH Terms] OR ("diabetes"[All Fields] AND "insipidus"[All Fields]) OR "diabetes insipidus"[All Fields]
prevalence	"epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms]

B. Describing electronic databases searches by using of African Search Filter

(elderly)) AND (elderly people)) AND (diabetes mellitus)) AND (2 diabetes mellitus)) AND (type 2 diabetes)) AND (Africa)) AND (("Africa"[MeSH] OR Africa*[tw] OR Algeria[tw] OR Angola[tw] OR Benin[tw] OR Botswana[tw] OR "Burkina Faso"[tw] OR Burundi[tw] OR Cameroon[tw] OR "Canary Islands"[tw] OR "Cape Verde"[tw] OR "Central African Republic"[tw] OR Chad[tw] OR Comoros[tw] OR Congo[tw] OR "Democratic Republic of Congo"[tw] OR Djibouti[tw] OR Egypt[tw] OR "Equatorial Guinea"[tw] OR Eritrea[tw] OR Ethiopia[tw] OR Gabon[tw] OR Gambia[tw] OR Ghana[tw] OR Guinea[tw] OR "Guinea Bissau"[tw] OR "Ivory Coast"[tw] OR "Cote d'Ivoire"[tw] OR Jamahiriya[tw] OR Jamahiriya[tw] OR Kenya[tw] OR Lesotho[tw] OR Liberia[tw] OR Libya[tw] OR Libya[tw] OR Madagascar[tw] OR Malawi[tw] OR Mali[tw] OR Mauritania[tw] OR Mauritius[tw] OR Mayotte[tw] OR Morocco[tw] OR Mozambique[tw] OR Mozambique[tw] OR Namibia[tw] OR Niger[tw] OR Nigeria[tw] OR Principe[tw] OR Reunion[tw] OR Rwanda[tw] OR "Sao Tome"[tw] OR Senegal[tw] OR Seychelles[tw] OR "Sierra Leone"[tw] OR Somalia[tw] OR "South Africa"[tw] OR "St Helena"[tw] OR Sudan[tw] OR Swaziland[tw] OR Tanzania[tw] OR Togo[tw] OR Tunisia[tw] OR Uganda[tw] OR "Western Sahara"[tw] OR Zaire[tw] OR Zambia[tw] OR Zimbabwe[tw] OR "Central Africa"[tw] OR "Central African"[tw] OR "West Africa"[tw] OR "West African"[tw] OR "Western Africa"[tw] OR "Western African"[tw] OR "East Africa"[tw] OR "East African"[tw] OR "Eastern Africa"[tw] OR "Eastern African"[tw] OR "North Africa"[tw] OR "North African"[tw] OR "Northern Africa"[tw] OR "Northern African"[tw] OR "South African"[tw] OR "Southern Africa"[tw] OR "Southern African"[tw] OR "sub Saharan Africa"[tw] OR "sub Saharan African"[tw] OR "sub-Saharan Africa"[tw] OR "sub-Saharan African"[tw]) NOT ("guinea pig"[tw] OR "guinea pigs"[tw] OR 'aspergillums Niger"[tw]))) AND (diabetes prevalence) AND ("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms])

APPENDIX 3: DATA EXTRACTION FORM

STUDY ID:

Reviewer's Initials

Part 1: COVERSHEET

Study Title:

Journal:

Language:

Citation:

Part 2: STUDY CHARACTERISTICS.

Publication Year:

Country of study:

Study design:

- ☐ cross-sectional
- ☐ case-report
- ☐ other _____

Study period:

Population study:

- ☐ total population
- ☐ specific group population
- ☐ other _____

Diagnostic Criteria.

- ❖ WHO Criteria: (Y / N).
- ❖ Measured or Defined by:
  - Fasting plasma glucose (FPG) ☐
  - glucose tolerance test (OGT) ☐
  - Self-reported ☐

Data source:

- ☐ medical records
- ☐ special survey
- ☐ multiple source
- ☐ surveillance
- ☐ registries

Setting

- ☐ Urban
- ☐ Rural

Age groups included (describe):

Genders included: **(Total numbers)**

Male ☐

Female ☐

Both ☐

Dominator (s) (N):

❖ Please use the attached checklist (Tick as appropriate (√)	**Reason(s) for exclusion, uncertainty or to contact authors**
Inclusion criteria: ☐ ☐ ☐ ☐ ☐ Exclusion Criteria: ☐ ☐ ☐ ☐ ☐ Included ☐ Excluded ☐ pending ☐	**1.** **2.** **3.**

Part 3: RESULTS.

Measure of the prevalence

☐ Crude Measure

☐ Adjusted measure

If **adjusted** what factors were adjusted for in this study (list):

Reported measure of the prevalence:

Missing data to be reported from the author:
(any communication with author Yes ☐ No ☐
If yes, pleases specify

Other comments:

Appendix 1: African Search Filter

African Search Filter
(“Africa”[MeSH] OR Africa*[tw] OR Algeria[tw] OR Angola[tw] OR Benin[tw] OR Botswana[tw] OR “Burkina Faso”[tw] OR Burundi[tw] OR Cameroon[tw] OR “Canary Islands”[tw] OR “Cape Verde”[tw] OR “Central African Republic”[tw] OR Chad[tw] OR Comoros[tw] OR Congo[tw] OR “Democratic Republic of Congo”[tw] OR Djibouti[tw] OR Egypt[tw] OR “Equatorial Guinea”[tw] OR Eritrea[tw] OR Ethiopia[tw] OR Gabon[tw] OR Gambia[tw] OR Ghana[tw] OR Guinea[tw] OR “Guinea Bissau”[tw] OR “Ivory Coast”[tw] OR “Cote d’Ivoire”[tw] OR Jamahiriya[tw] OR Jamahiriya[tw] OR Kenya[tw] OR Lesotho[tw] OR Liberia[tw] OR Libya[tw] OR Libya[tw] OR Madagascar[tw] OR Malawi[tw] OR Mali[tw] OR Mauritania[tw] OR Mauritius[tw] OR Mayotte[tw] OR Morocco[tw] OR Mozambique[tw] OR Mozambique[tw] OR Namibia[tw] OR Niger[tw] OR Nigeria[tw] OR Principe[tw] OR Reunion[tw] OR Rwanda[tw] OR “Sao Tome”[tw] OR Senegal[tw] OR Seychelles[tw] OR “Sierra Leone”[tw] OR Somalia[tw] OR “South Africa”[tw] OR “St Helena”[tw] OR Sudan[tw] OR Swaziland[tw] OR Tanzania[tw] OR Togo[tw] OR Tunisia[tw] OR Uganda[tw] OR “Western Sahara”[tw] OR Zaire[tw] OR Zambia[tw] OR Zimbabwe[tw] OR “Central Africa”[tw] OR “Central African”[tw] OR “West Africa”[tw] OR “West African”[tw] OR “Western Africa”[tw] OR “Western African”[tw] OR “East Africa”[tw] OR “East African”[tw] OR “Eastern Africa”[tw] OR “Eastern African”[tw] OR “North Africa”[tw] OR “North African”[tw] OR “Northern Africa”[tw] OR “Northern African”[tw] OR “South African”[tw] OR “Southern Africa”[tw] OR “Southern African”[tw] OR “sub Saharan Africa”[tw] OR “sub Saharan African”[tw] OR “sub-Saharan Africa”[tw] OR “sub-Saharan African”[tw]) NOT (“guinea pig”[tw] OR “guinea pigs”[tw] OR ‘aspergillums Niger”[tw])

Appendix 2: Describing details of search strategy

A. Describing the relevant search terms used in search strategy.

elderly	"aged"[MeSH Terms] OR "aged"[All Fields] OR "elderly"[All Fields]
people	"persons"[MeSH Terms] OR "persons"[All Fields] OR "people"[All Fields]
diabetes mellitus	"diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields]
type 2 diabetes	"diabetes mellitus, type 2"[MeSH Terms] OR "type 2 diabetes mellitus"[All Fields] OR "type 2 diabetes"[All Fields]
Africa	"Africa"[MeSH Terms] OR "Africa"[All Fields]
diabetes	"diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields] OR "diabetes"[All Fields] OR "diabetes insipidus"[MeSH Terms] OR ("diabetes"[All Fields] AND "insipidus"[All Fields]) OR "diabetes insipidus"[All Fields]
prevalence	"epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms]

B. Describing electronic databases searches by using of African Search Filter

(elderly)) AND (elderly people)) AND (diabetes mellitus)) AND (2 diabetes mellitus)) AND (type 2 diabetes)) AND (Africa)) AND (("Africa"[MeSH] OR Africa*[tw] OR Algeria[tw] OR Angola[tw] OR Benin[tw] OR Botswana[tw] OR "Burkina Faso"[tw] OR Burundi[tw] OR Cameroon[tw] OR "Canary Islands"[tw] OR "Cape Verde"[tw] OR "Central African Republic"[tw] OR Chad[tw] OR Comoros[tw] OR Congo[tw] OR "Democratic Republic of Congo"[tw] OR Djibouti[tw] OR Egypt[tw] OR "Equatorial Guinea"[tw] OR Eritrea[tw] OR Ethiopia[tw] OR Gabon[tw] OR Gambia[tw] OR Ghana[tw] OR Guinea[tw] OR "Guinea Bissau"[tw] OR "Ivory Coast"[tw] OR "Cote d'Ivoire"[tw] OR Jamahiriya[tw] OR Jamahiriya[tw] OR Kenya[tw] OR Lesotho[tw] OR Liberia[tw] OR Libya[tw] OR Libya[tw] OR Madagascar[tw] OR Malawi[tw] OR Mali[tw] OR Mauritania[tw] OR Mauritius[tw] OR Mayotte[tw] OR Morocco[tw] OR Mozambique[tw] OR Mozambique[tw] OR Namibia[tw] OR Niger[tw] OR Nigeria[tw] OR Principe[tw] OR Reunion[tw] OR Rwanda[tw] OR "Sao Tome"[tw] OR Senegal[tw] OR Seychelles[tw] OR "Sierra Leone"[tw] OR Somalia[tw] OR "South Africa"[tw] OR "St Helena"[tw] OR Sudan[tw] OR Swaziland[tw] OR Tanzania[tw] OR Togo[tw] OR Tunisia[tw] OR Uganda[tw] OR "Western Sahara"[tw] OR Zaire[tw] OR Zambia[tw] OR Zimbabwe[tw] OR "Central Africa"[tw] OR "Central African"[tw] OR "West Africa"[tw] OR "West African"[tw] OR "Western Africa"[tw] OR "Western African"[tw] OR "East Africa"[tw] OR "East African"[tw] OR "Eastern Africa"[tw] OR "Eastern African"[tw] OR "North Africa"[tw] OR "North African"[tw] OR "Northern Africa"[tw] OR "Northern African"[tw] OR "South African"[tw] OR "Southern Africa"[tw] OR "Southern African"[tw] OR "sub Saharan Africa"[tw] OR "sub Saharan African"[tw] OR "sub-Saharan Africa"[tw] OR "sub-Saharan African"[tw]) NOT ("guinea pig"[tw] OR "guinea pigs"[tw] OR 'aspergillums Niger"[tw]))) AND (diabetes prevalence) AND ("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms])

APPENDIX 3: DATA EXTRACTION FORM

STUDY ID: ☐

Reviewer's Initials ☐

Part 1: COVERSHEET

Study Title: ☐

Journal:

Language:

Citation:

☐

Part 2: STUDY CHARACTERISTICS.

Publication Year: Country of study:

Study design:

- ☐ cross-sectional
- ☐ case-report
- ☐ other _____

Study period:

Population study:

- ☐ total population
- ☐ specific group population
- ☐ other _____

Diagnostic Criteria.

- ❖ WHO Criteria: (Y / N).
- ❖ Measured or Defined by:
- Fasting plasma glucose (FPG) ☐
- glucose tolerance test (OGT) ☐
- Self-reported ☐

Data source:

- ☐ medical records
- ☐ special survey
- ☐ multiple source
- ☐ surveillance
- ☐ registries

Setting

- ☐ Urban
- ☐ Rural

Age groups included (describe):

☐

Genders included: **(Total numbers)**

Male ☐

Female ☐ ☐

Both ☐ ☐

Dominator (s) (N): ☐

❖ Please use the attached checklist (Tick as appropriate (√) Inclusion criteria: ☐ ☐ ☐ ☐ ☐ Exclusion Criteria: ☐ ☐ ☐ ☐ ☐ Included ☐ Excluded ☐ pending ☐	**Reason(s) for exclusion, uncertainty or to contact authors** 1. 2. 3.

Part 3: RESULTS.

Measure of the prevalence

☐ Crude Measure

☐ Adjusted measure

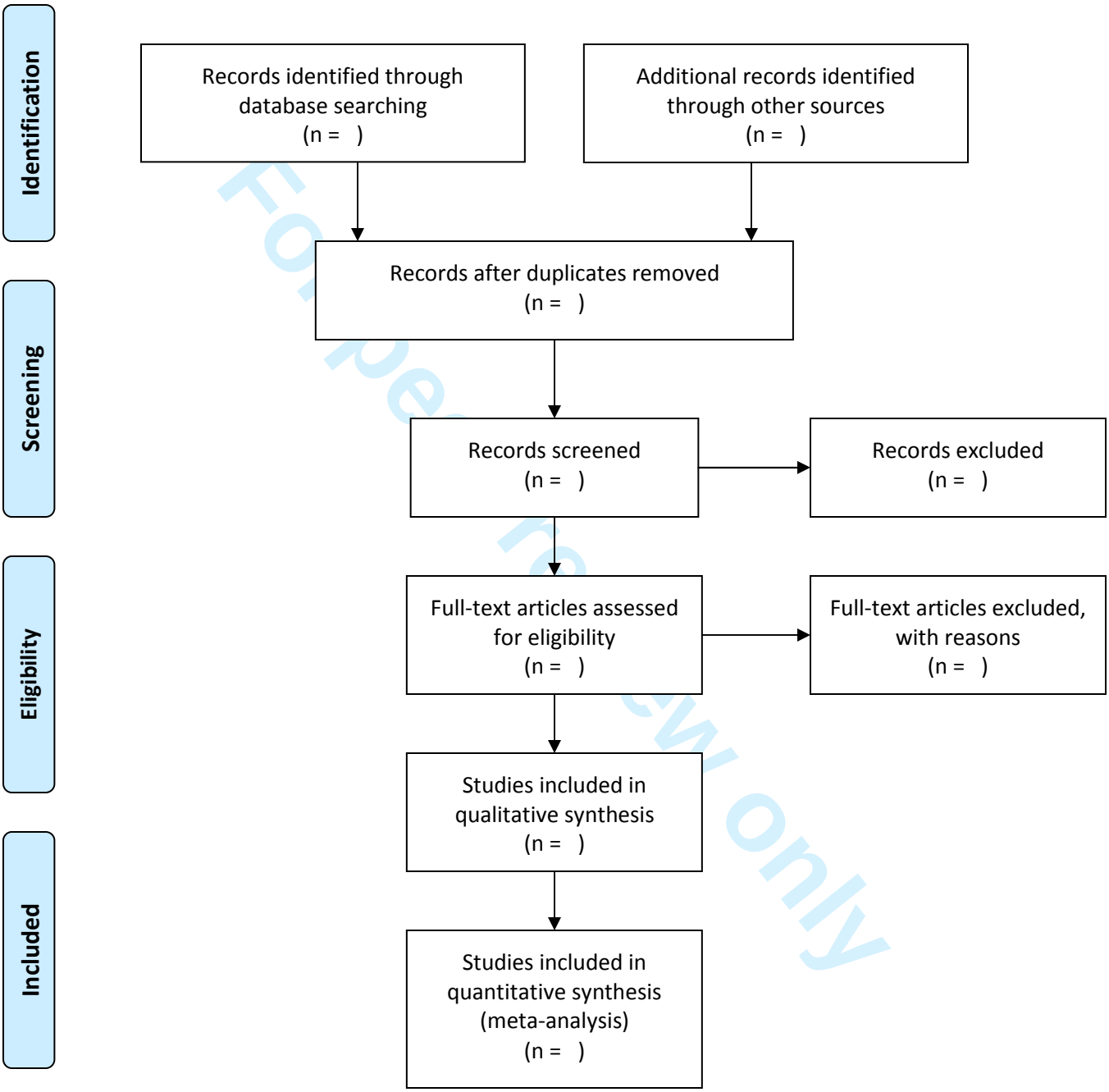
If **adjusted** what factors were adjusted for in this study (list):

Reported measure of the prevalence:

Missing data to be reported from the author:
(any communication with author Yes ☐ No ☐
If yes, pleases specify

Other comments:

PRISMA 2009 Flow Diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

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