

cities changing diabetes



Risk Monitor How-to guide



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INTRODUCTION

THE INCREASE IN DIABETES IS ONE OF TODAY'S MAJOR HEALTH CHALLENGES, A GLOBAL EMERGENCY IN SLOW MOTION.

Worldwide, 415 million people are living with diabetes.¹ Without concerted action this is estimated to rise to 642 million by 2040.¹ Today, more than half of the world's population live in urban areas,² including two-thirds of people with diabetes.¹ This makes cities an important focal point for studying and tackling diabetes. However, taking action requires a better understanding of what drives diabetes in urban areas.

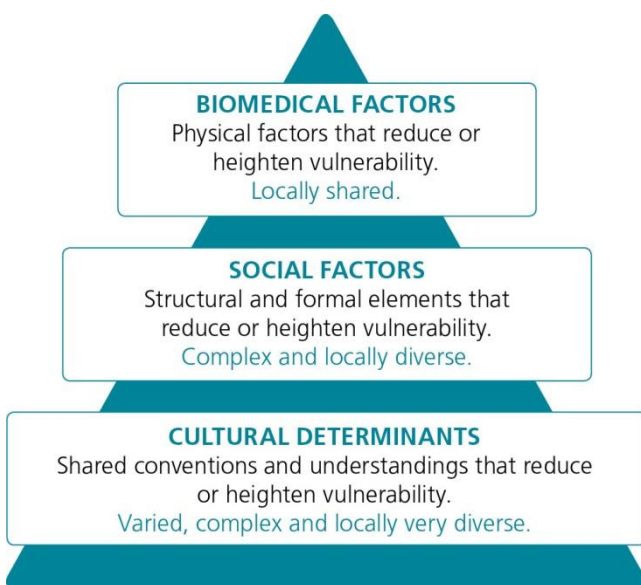


FIGURE 1: The underlying drivers of the diabetes pandemic³

DRIVERS OF THE DIABETES PANDEMIC

Although each person starts out with their own genetic health profile, several social factors and cultural determinants come into play in an individual's overall health throughout their life (Figure 1). Together, these factors impact the way people live their lives and their risk for developing type 2 diabetes, as well as influence the outcome of treatment and care of people who already have diabetes. Increasingly, social factors and cultural determinants are recognised for their relationship with the soaring incidence of type 2 diabetes, as well as the opportunities they present for us to counter it.

CITIES CHANGING DIABETES PROGRAMME

The Cities Changing Diabetes (CCD) programme is a commitment to push for urgent action against diabetes on a global scale. The programme is mapping the extent of the diabetes challenge in cities and working to generate an understanding of the drivers behind this pandemic.

The aim of the programme is to map the problem, share solutions and drive concrete actions to fight the diabetes challenge in cities around the world.

RESEARCH METHODS

RULE OF HALVES

QUANTITATIVE METHOD FOR MAPPING THE EXTENT OF THE CHALLENGE

The Rule of Halves analysis is a quantitative estimation of the diabetes burden in a specific population or community.

RISK MONITOR

QUANTITATIVE METHOD FOR MAPPING AND VISUALIZING POPULATION AT RISK

The Risk Monitor is a framework visualizing the populations at highest risk of developing diabetes and serves as a supportive tool to the Rule of Halves analysis.

DIABETES-VULNERABILITY ASSESSMENT

QUALITATIVE METHOD FOR UNVEILING THE SOCIAL FACTORS AND CULTURAL DETERMINANTS

The Diabetes-Vulnerability Assessment identifies the social factors and cultural determinants of diabetes among people living with the condition.

URBAN DIABETES RISK ASSESSMENT

MIXED METHOD FOR PRIORITISING SOCIAL FACTORS AND CULTURAL DETERMINANTS FOR INTERVENTION

The Urban Diabetes Risk Assessment is a comprehensive data collection and analysis instrument developed to explore priorities, attitudes, and shared points of views about diabetes, health, and wellbeing of people living with diabetes.

THE RISK MONITOR

The Risk Monitor is a framework visualizing the populations at highest risk of developing type 2 diabetes and serve as a supportive tool to the Rule of Halves analysis. While the Rule of Halves framework illustrates the diabetes burden the unmet clinical needs in diabetes, the Risk Monitor adds the perspective of risk to support and extend the results of the Rule of Halves analysis.

In contrast to the Rule of Halves analysis, the Risk Monitor quantifies the number of people with overweight and obesity, the main modifiable risk factor of developing type 2 diabetes, and the high-risk-state pre-diabetes.

RISK MONITOR

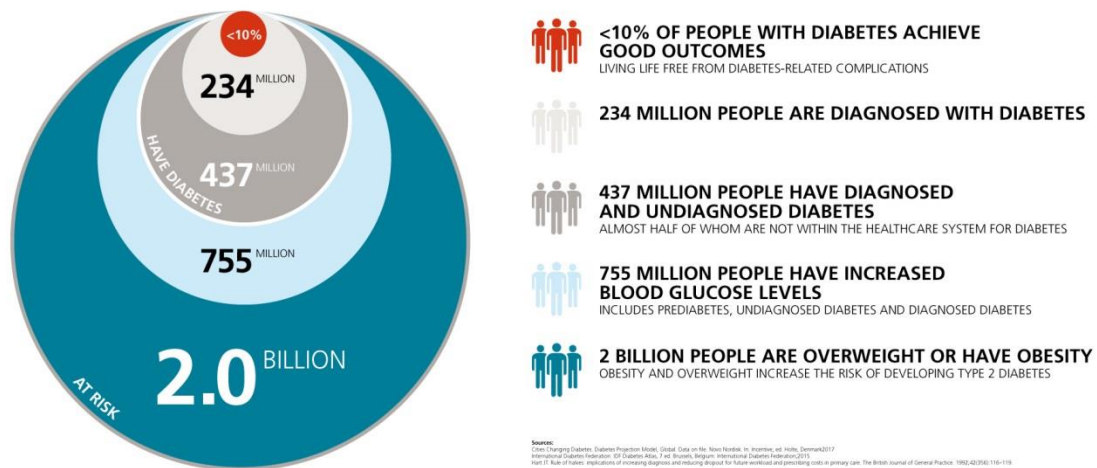


FIGURE 2: Risk Monitor

Why create a Risk Monitor?

By presenting the results of the Risk Monitor alone or in addition to the Rule of Halves analysis, cities can prioritize at which stage action needs to be taken to push back the condition. The Risk Monitor helps to illustrate the challenge around diabetes, and helps to emphasize initiatives/interventions for populations at risk developing diabetes.

The model can be used as a mean to start a conversation about people at risk of developing diabetes. It can help leverage the arguments around prevention of type 2 diabetes and the scale of the challenge found in this high risk population.

What differentiates the Risk Monitor and the Rule of Halves?

Risk Monitor is aiming to visualize especially the populations at high risk of developing diabetes, and also conveying a general oversight of the current diabetes situation. It transcends the borders of the Rule of Halves and puts emphasis on both prevention, diagnosis and good treatment, showing indicators of the full spectrum. The three inner circles are similar to those of the Rule of Halves, and can be taken directly from the Rule of Halves or provide the basis for the Rule of Halves if conducted before the Rule of Halves itself.

Populations at risk

The two outer circles of the Risk Monitor, are visualizing populations at risk. These are based on the fact that people with high BMI and people in a state of pre-diabetes are at highly increased risk of developing type 2 diabetes.⁴ Other risk factors are also important such as age, family history and ethnicity⁵, but this model puts emphasis on the largest modifiable factors.

STEP-BY-STEP GUIDE

This guide serves as an instruction in how to create a Risk Monitor as a first step before conducting a Rule of Halves analysis or as an added asset on risk, supporting and extending the results of a Rule of Halves analysis.

To add the perspective of risk to the Rule of Halves analysis, it requires epidemiological data of equally high quality on diabetes and its risks.

The Risk Monitor is working with the absolute number of people, which should be displayed in each of the five circles. The numbers quantify the burden and determine the size of the circle in proportion to the antecedent circle.

There are four phases to creating a Risk Monitor. Phase one deals with planning, while phase two involves data collection. Phase three describes how to analyse the data and lastly, phase four is about presenting and reporting the data. This manual provides guidance and examples for each of the four phases.

PLEASE NOTICE! If the Risk Monitor serves as an addition to a previously made Rule of Halves analysis, the first phase of planning should align with the choices made in the Rule of Halves analysis.

Definitions

When searching for existing data or want to obtain new data, please align with the recommended definitions of the risk factors and diseases shown below.

Overweight and obesity⁶

Overweight: BMI \geq 25 and $<$ 30.

Obesity: BMI \geq 30

Note that for some population groups other cut-off points apply, including Asian populations and children.

[For further details see WHO definition.](#)

Pre-diabetes⁷

IFG:

FPG 100 mg/dl (5.6 mmol/l) to 125 mg/dl (6.9 mmol/l)

or

IGT: 2-h PG in a 75-g OGTT - 140 mg/dl (7.8 mmol/l) to 199 mg/dl (11.0 mmol/l)

or

HbA1c 5.7-6.4%

[For further details see ADA definition.](#)

Diabetes mellitus type 2⁸

FPG \geq 7.0 mmol/L (126 mg/dL)

or

2-h PG \geq 11.1 mmol/L (200 mg/dL) OGTT

or

HbA1c \geq 6.5%

or

Hyperglycaemic symptoms and random PG \geq 11.1 mmol/L (200 mg/dL)

[For further details see ADA definition.](#)

BMI: body mass index; IFG: impaired fasting glucose; FPG: fasting plasma glucose; IGT: impaired glucose tolerance; PG: plasma glucose; OGTT: oral glucose tolerance test; HbA1c: Hemoglobin A1c.

PHASE ONE – STUDY PLANNING

Define the target population

Define the target population for the model by deciding on the age range of the population. Note that the age range has a significant impact of the results, especially in the 1st and 2nd circle where the numbers of obese and pre-diabetics are stated.

Define the geographic scope of the model

Define the geographic scope of the area that will form the basis for the analysis. If the Risk Monitor is a supportive asset to the Rule of Halves, it is highly recommended to stick to the geographic scope for validity reasons. There can be considerable confusion over the term 'city' and urban terms, such as 'urban area' and 'metropolitan area'. This can result in misleading comparisons and inaccurate academic research. Therefore, it is important to define the geographic area and the population that the analysis will apply to upfront, before collecting or analysing any data.

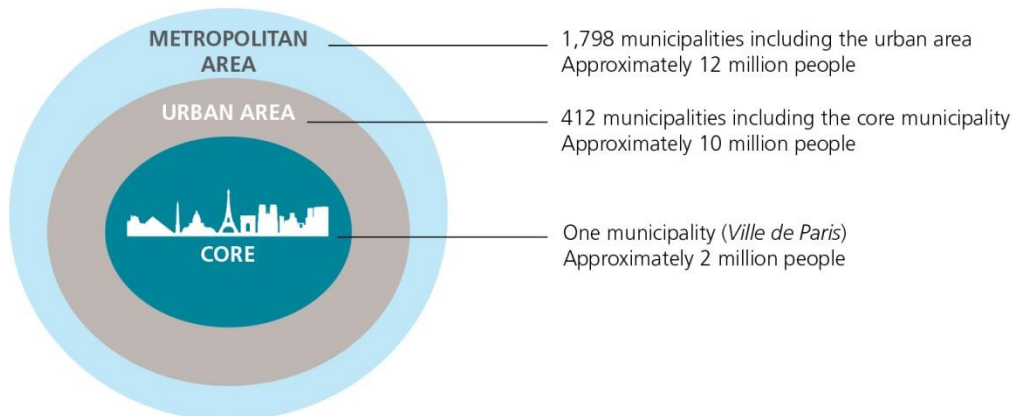


FIGURE 3: Illustrative design of an urban area (Paris, France)

Determine the data needed to populate the Risk Monitor

Some critical questions that should be considered before initiating a data collection process each circle (see Figure 2) include:

1st circle: PEOPLE WITH OVERWEIGHT AND OBESITY

Are there existing estimates or data that indicate the number of people with overweight and obesity for the population and geographical area in scope?

2nd circle: INCREASED BLOOD GLUCOSE LEVELS (Includes prediabetes, undiagnosed diabetes and diagnosed diabetes)

Are there existing estimates or data that indicate the number of people with pre-diabetes and diabetes for the population and geographical area in scope?

3rd circle: PEOPLE WITH DIABETES IN TOTAL (diagnosed and undiagnosed)

Are there existing estimates or data that indicate the number of people with diabetes for the population and geographical area in scope? Use Rule of Halves data if applicable (pillar 1).

4th circle: PEOPLE WITH DIAGNOSED DIABETES

Are there existing estimates or data that indicate the level of diagnosis of diabetes for the population and geographical area in scope? Use Rule of Halves data if applicable (pillar2).

5th circle: PEOPLE WITH DIABETES WHO HAVE BEEN DIAGNOSED, RECEIVE CARE, ACHIEVE TREATMENT TARGETS AND WHO HAVE NO COMPLICATIONS.

How will 'desired outcomes' be defined, ie, are there specific diabetes-related complications that will be included or excluded (for example: hypertension or hypoglycemic events). Use Rule of Halves data if applicable (pillar 5).

PHASE TWO – DATA COLLECTION

Evaluate the availability of data

The Risk Monitor will often assist the Rule of Halves analysis by addressing the areas of risk which are not shown in the Rule of Halves analysis. It provides a wider scope than the Rule of Halves analysis by including the absolute numbers of people affected by pre-diabetes and obesity. The Risk Monitor can be based on existing data, new data (specifically collected for the model) or a combination of both. For the circles 3-5, check if you can use the numbers of a previously made Rule of Halves analysis, if applicable. Consider conducting a literature review to determine what published data are available and if there is a need to collect new data.

Use existing data

Based on the decisions made in phase one regarding target population, geographic area and scope of the circles, identify what data are available to estimate the five circles. For each of the five circles, more than one data source could be relevant to get the most reliable and valid estimation. Optimally, the different circles should be estimated based on the same source. However, often it is not possible to use a single source for all circles. Therefore, the methodology and sources used to calculate each circle must be documented. Especially when the Risk Monitor is based on a previous conducted Rule of Halves analysis, the documentation has to be done in the same manner. Possible data sources include:

- Registries/databases/health surveys/population statistics/health service data/disease registries/ prescription data/claims data/
- Peer-review publications

- Reports

Where possible, use only the most recent published data, preferably from the last five years. Be aware that publications may rely on data preceding the actual publication date.

The analysis should critically assess and report on the quality of the data sources, and the reliability and validity of the data.

NOTE: Refer to Appendix 1 and the example of the Risk Monitor from Copenhagen for more detail on using existing data.

Collect new data

If existing data for the defined population is not available, or insufficient to complete a Risk Monitor, it will be necessary to collect new data. Depending on which circles of the Risk Monitor require additional data, data collection can take the form of either:

- The collection and analysis of blood samples
- A questionnaire about anthropometry, diabetes status and presence of diabetes-related complications
- A combination of both

NOTE: Refer to Appendix 2 and the example of the Risk Monitor from Mexico City for more detail on collecting new data.

Ethics approval

A formal ethics approval process is typically required to collect blood samples. Furthermore, all blood samples should be collected by trained personnel and materials should be handled according to national regulations.

PHASE THREE - DATA ANALYSIS

Analyze the data

On completion of the data collection phase, the data should be analysed and the model circles populated. Conduct the analysis by combining the various data sources to determine the overall population number for each circle.

One should carefully consider the following:

- The objective of the Risk Monitor is to inform stakeholders of the potential burden related to diabetes, people at risk of developing diabetes and people already living with the condition. As the Risk Monitor is often done alongside the Rule of Halves, it is important to be clear about the use of data and overlapping between the two approaches as well as between each circle.

- To have a meaningful dialogue with stakeholders, it is important to have populated the Risk Monitor using local data that is representative of the target population.
- If there is a lack of publicly available data for the chosen population, then consider using the gap in data as a platform to engage with stakeholders. Quantifying the burden of diabetes and the risk population is an important first step to understand where to invest in interventions. One possibility is to advocate for further research into the burden of diabetes in your city, which could, in turn, inform future interventions.

Populate the Risk Monitor

It is recommended to produce a table containing the data that goes into the Risk Monitor's circles. An example can be found in Appendix 1 and 2. The data can be presented here for the different levels and how that translate into the absolute numbers that are used to populate the Risk Monitor's circles.

PHASE FOUR – VISUALIZATION AND REPORTING

Visualization of the circles

A specific method for visualizing the circles, are to calculate the ratio between the circles. The size of each of the circles should reflect the estimated absolute number of people based on the data, with the first circle (overweight and obesity) at a scale of 1. Then the relative size of each circle needs to be calculated in relation to the first circle, with the exception of the last circle, which relates to the antecedent circle.

Produce a one-pager

Following the completion of the Risk Monitor's circles, and/or subsequent Rule of Halves analysis, a next step to help disseminate the results could be to produce a one pager or fact sheet, highlighting the results and implications.

This one-pager can be used as a policy document, emphasizing the need for attention on populations at risk. An emphasis on the scale of the burden contributed by the two first circles of risk is important in when highlighting the need for prevention to reduce the diabetes burden. The document would be of use to local stakeholders, health advocates and city officials in the advocating for more focus on prevention.

Produce a report

Following the completion of the Risk Monitor, it is recommended that an internal research report is produced in conjunction with the Rule of Halves analysis. This can serve as a basis for further communication of the findings to local stakeholders, scientific dissemination and publication planning, follow-up research and intervention design.

The report should follow a standard scientific publication outline:

1. Introduction

- Including background to topic
- Existing additional data on the city of interest
- Background on the CCD collaboration

2. Methods

- Rationale for study
- Objectives
- Outline of methodological principles
- Overview study protocol and methodology

3. Results

- Overview of the circles for the Risk Monitor
- New insights

4. Discussion

- Discussion of results
- Limitations
- Next steps

Publish

Consider how the findings can be made accessible and shared broadly with stakeholders. Incorporating the risk measurements in results from a Rule of Halves analysis could help leverage the findings. Writing an article for a scientific peer-reviewed journal and presenting an abstract and poster at a relevant scientific conference are good ways of sharing the results and making them accessible to other stakeholders.

Appendix 1: Risk Monitor – Copenhagen – Using existing data

Circle	Research question	Data source	Result
1st circle: PEOPLE WITH OVERWEIGHT OBESITY	What is the prevalence of overweight and obesity across demographic, socioeconomic and Copenhagen-subareas?	<ul style="list-style-type: none"> CAMB 	10.2%
2nd circle: PEOPLE WITH HIGH BLOOD GLUCOSE LEVELS Includes pre-diabetes, diagnosed and undiagnosed diabetes	What is the prevalence of pre-diabetes across demographic and socioeconomic groups? + People with diabetes in total (see circle 3)	<ul style="list-style-type: none"> CAMB 	6.6% + 5.1%
3rd CIRCLE: PEOPLE WITH DIABETES IN TOTAL (diagnosed and undiagnosed)	What is the prevalence of type 2 diabetes and what is the proportion of undiagnosed disease across demographic and socioeconomic groups?	<ul style="list-style-type: none"> CAMB 	5.1%
4th CIRCLE: PEOPLE WITH DIAGNOSED DIABETES	What is the prevalence of self-reported diabetes across demographic, socioeconomic and Copenhagen-subareas?	<ul style="list-style-type: none"> Health profile 2010 & 2013 CAMB 	3.7%
5th circle: PEOPLE WITH DIABETES WHO HAVE BEEN DIAGNOSED, RECEIVE CARE, ACHIEVE TREATMENT TARGETS AND WHO HAVE NO COMPLICATIONS.	What are the incidence rate and proportion of those treated for type 2 diabetes without micro-vascular and macro-vascular complications?	<ul style="list-style-type: none"> Health Profile 2010 & 2013 CAMB DVDD LPR LSR 	60%

Appendix 2: Risk Monitor – Mexico City – Using new data

Circle	Considerations	Data source	Result
1st circle: PEOPLE WITH OVERWEIGHT AND OBESITY	BMI \geq 25	<ul style="list-style-type: none"> Questionnaire 	73,6%
2nd CIRCLE: PEOPLE WITH HIGH BLOOD GLUCOSE LEVELS Includes pre-diabetes, diagnosed and undiagnosed diabetes	Glucose levels between 100mg/dl and 126mg/dl and HbA1c levels \geq 6,5%	<ul style="list-style-type: none"> Blood sample and questionnaire 	31.0 % (17.1 % + 13.9%)
3rd CIRCLE: PEOPLE WITH DIABETES IN TOTAL (diagnosed and undiagnosed)	Adults with type 2 diabetes: HbA1c \geq 6.5%	<ul style="list-style-type: none"> HbA1c measurements from blood samples 	13.9%
4th CIRCLE: PEOPLE WITH DIAGNOSED DIABETES	Calculation includes those who have diabetes based on the HbA1c results of those indicating a prior diabetes diagnosis in the questionnaire.	<ul style="list-style-type: none"> HbA1c measurements from blood samples and questionnaire 	9.9%
5th CIRCLE: PEOPLE WITH DIABETES WHO HAVE BEEN DIAGNOSED, RECEIVE CARE, ACHIEVE TREATMENT TARGETS AND WHO HAVE NO COMPLICATIONS.	Calculation includes those who have diabetes based on the HbA1c results of those indicating a prior diabetes diagnosis, indicating receiving care, indicating achieving diabetes treatment target and indicating no complications in the questionnaire.	<ul style="list-style-type: none"> HbA1c measurements from blood samples and questionnaire 	2.2 %

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