



Screening for people at risk of type 2 diabetes: Current situation and future challenges

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Content

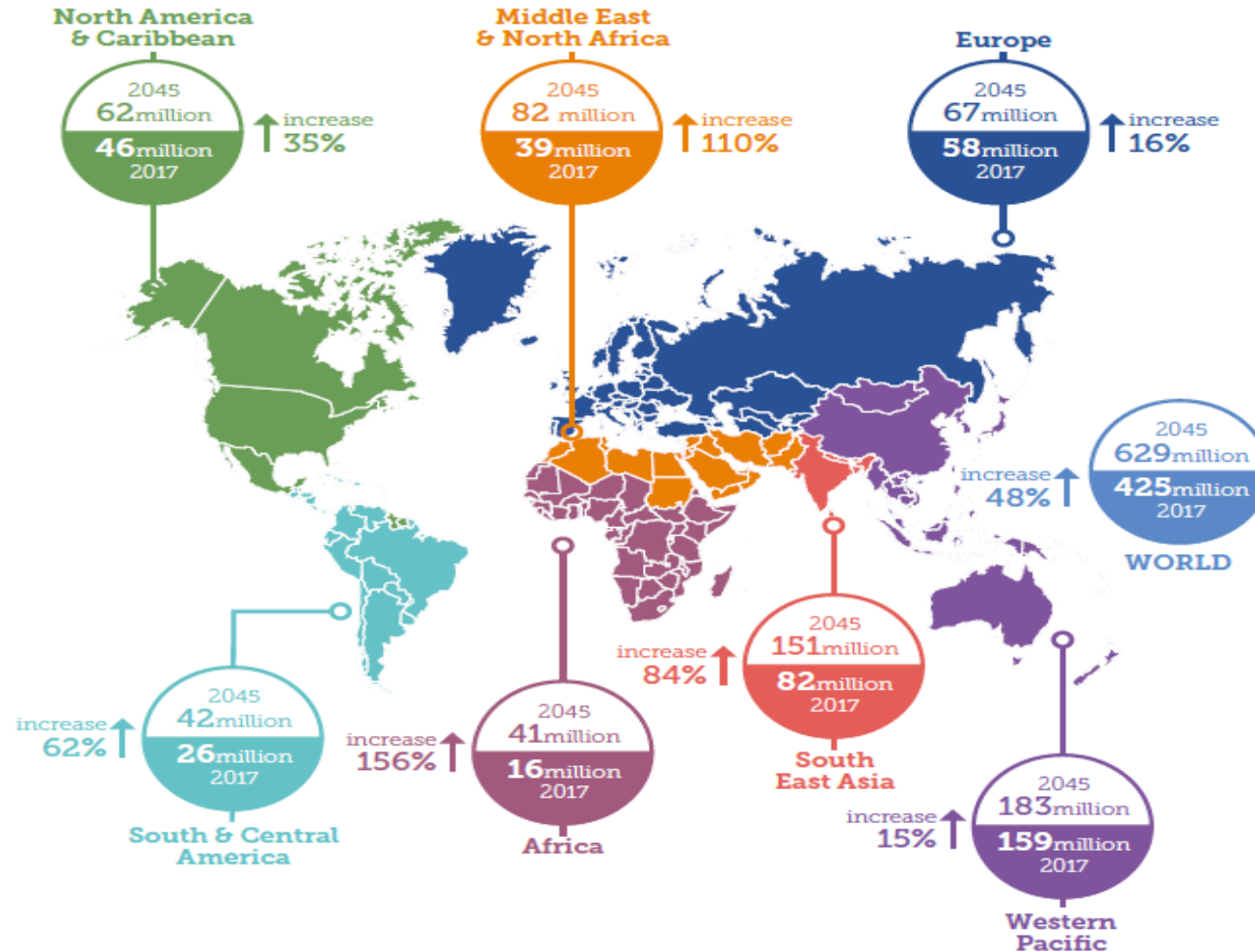
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I. Introduction

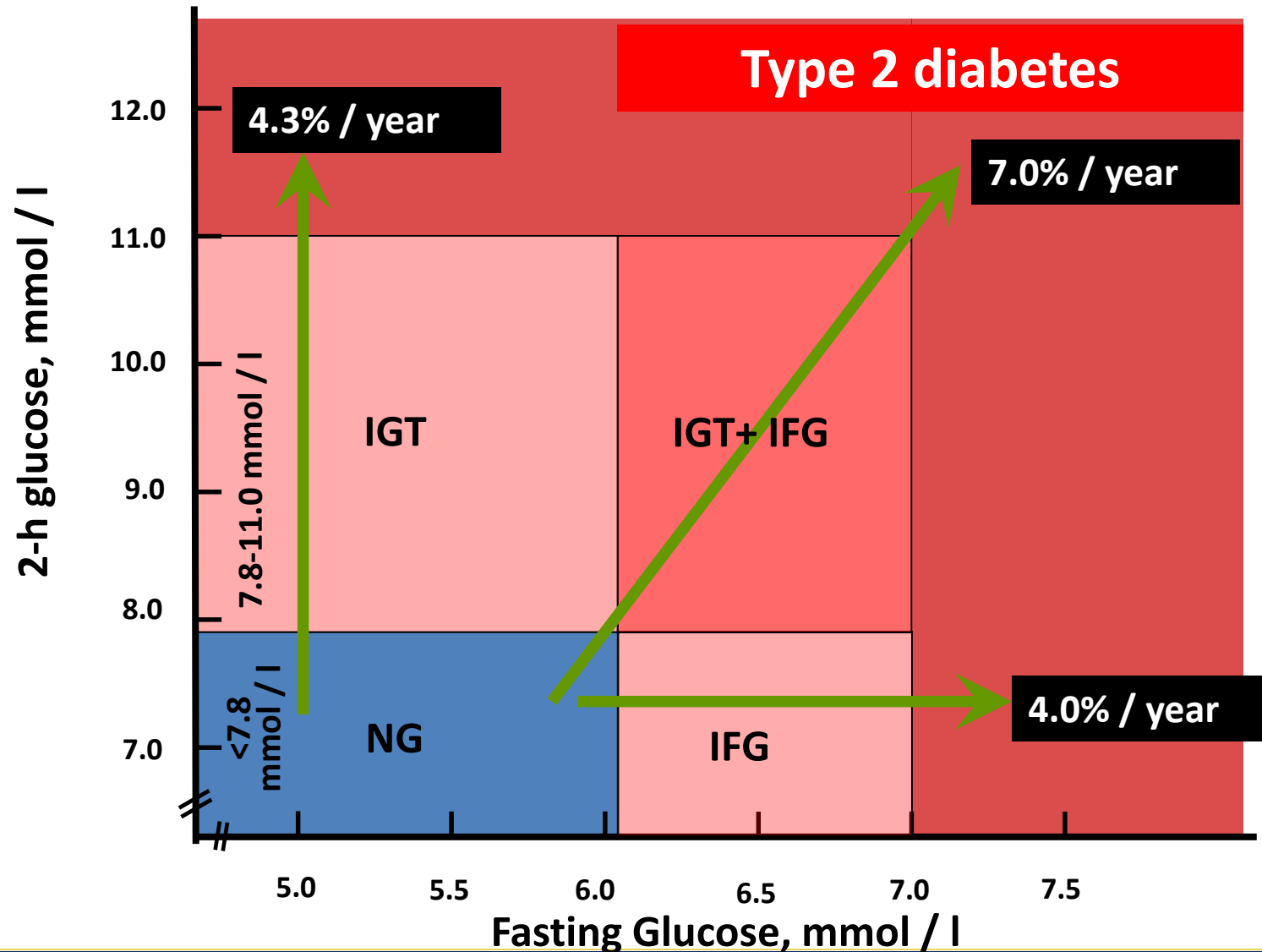


Diabetes: A global emergency

Number of people with diabetes worldwide and per region in 2017 and 2045 (20-79 years)



The development of type 2 diabetes



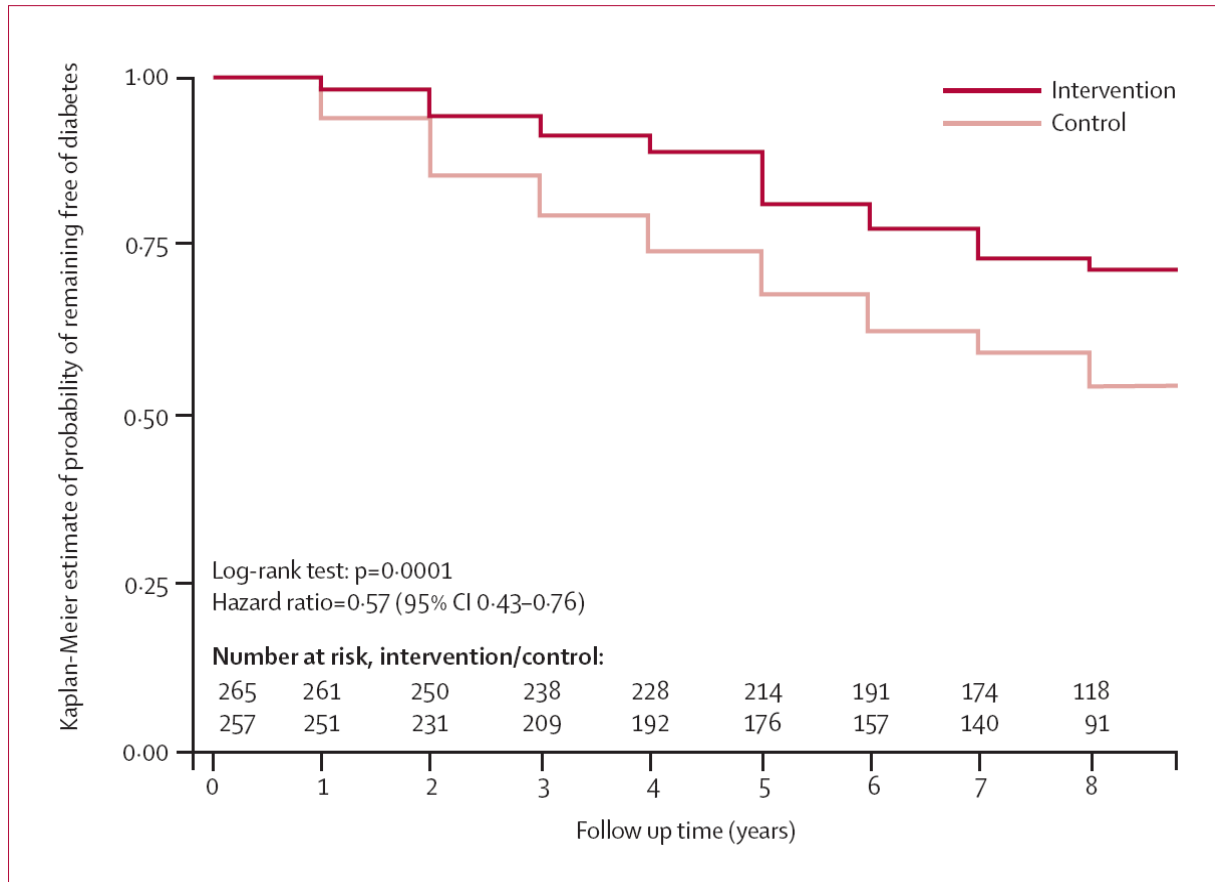
Modifiable type 2 diabetes risk factors

- **Obesity / weight gain**
- **Central obesity**
- **Physical inactivity**
- Sitting time
- Smoking
- Gestational Diabetes
- Pre-eclampsia
- Very low birth weight
- Fatty liver
- Depression
- Anti-psychotic drugs
- Poor sleep
- Hypertension
- Statins
- Dietary Factors (risk increase or decrease)
 - Carbohydrate quality
 - Fat quality
 - Glycemic index
 - Whole grain / cereal fibers
 - Low-fat dairy products
 - Alcohol
 - Coffee
 - Fast food intake
 - Sweet beverages
 - Magnesium

II. Why screen for people at a high risk for T2D?

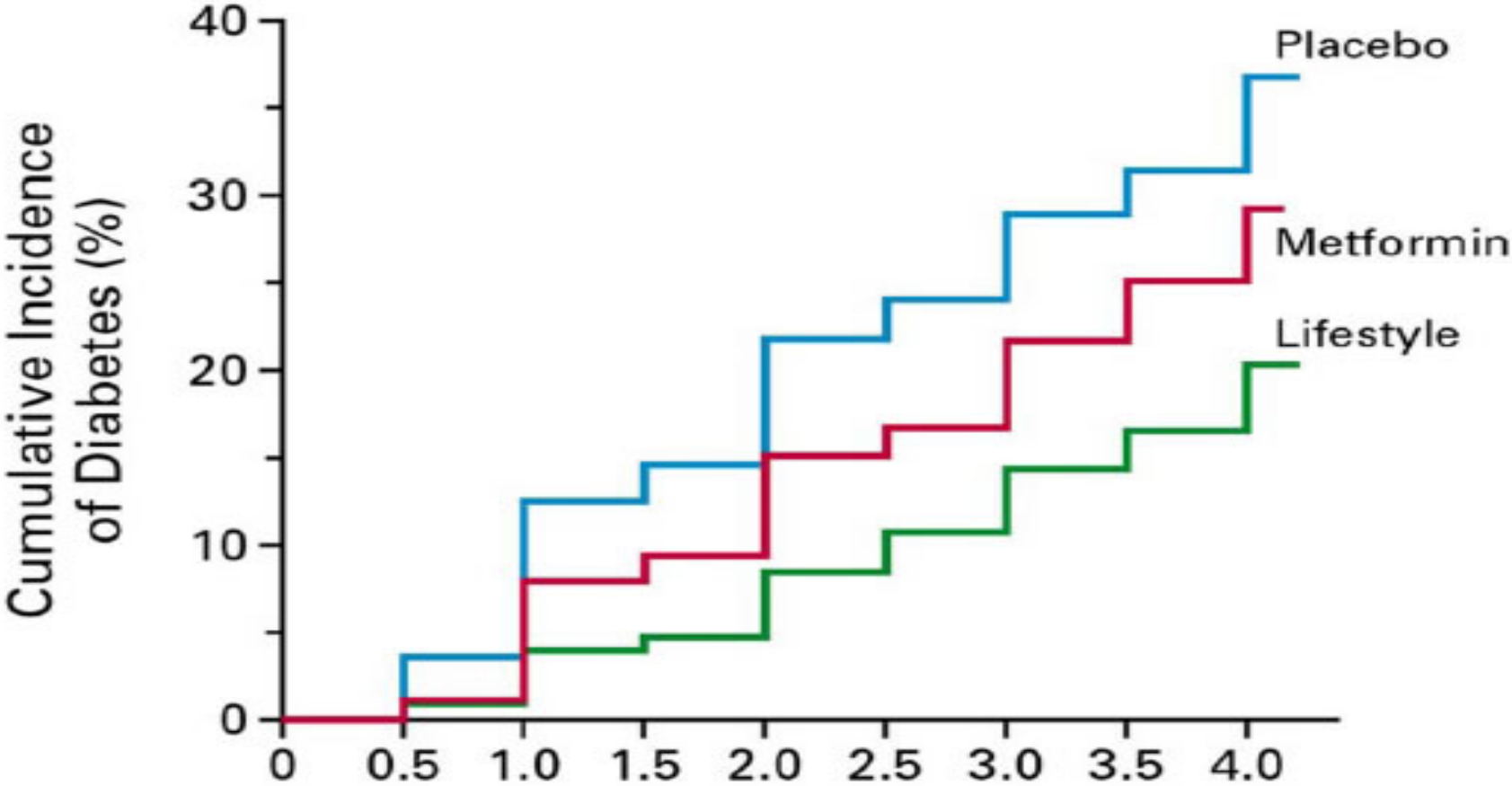


Diabetes Prevention Study



Diabetes Prevention Program

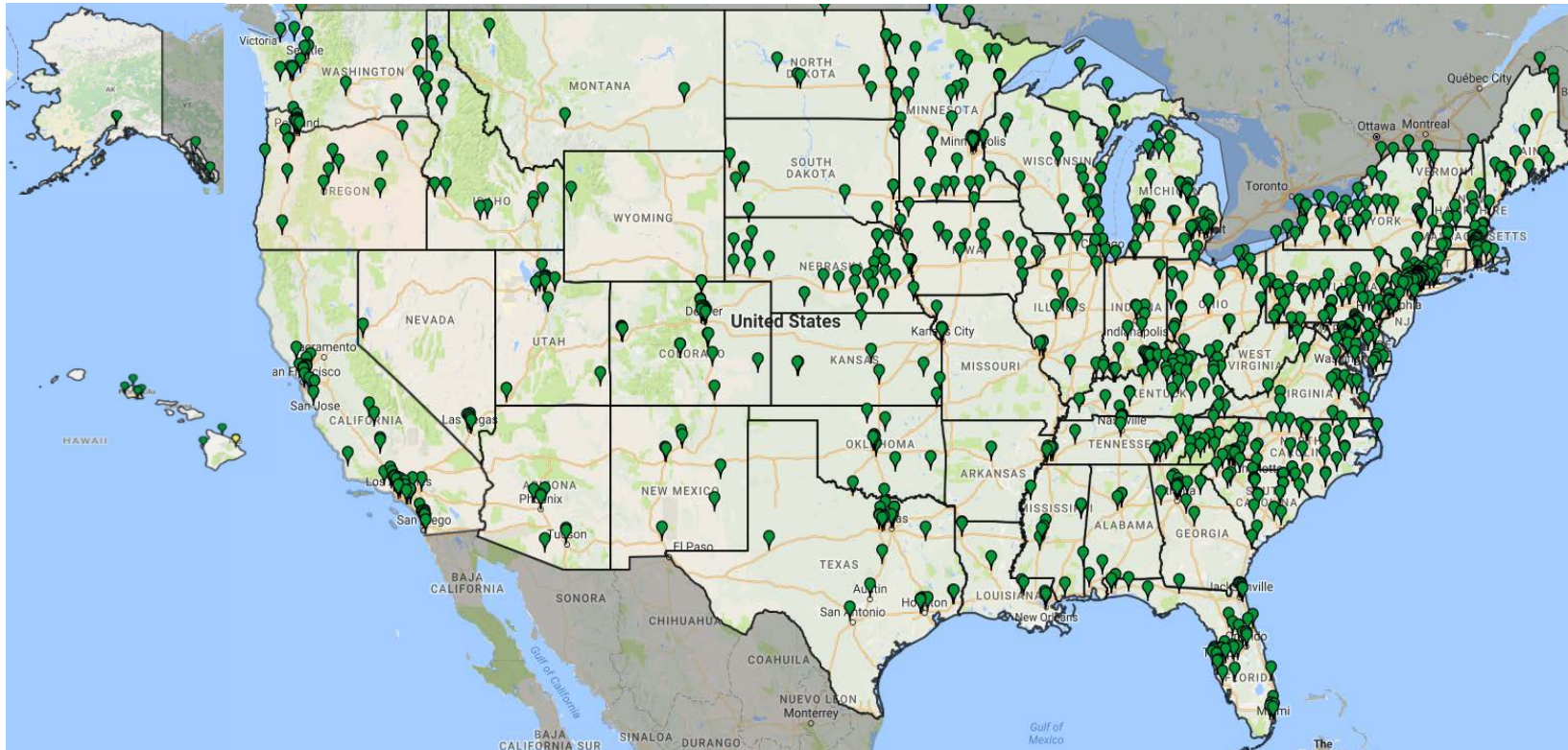
Cumulative incidence of type 2 diabetes with placebo, metformin and lifestyle intervention



Summary of intervention trials in people with prediabetes

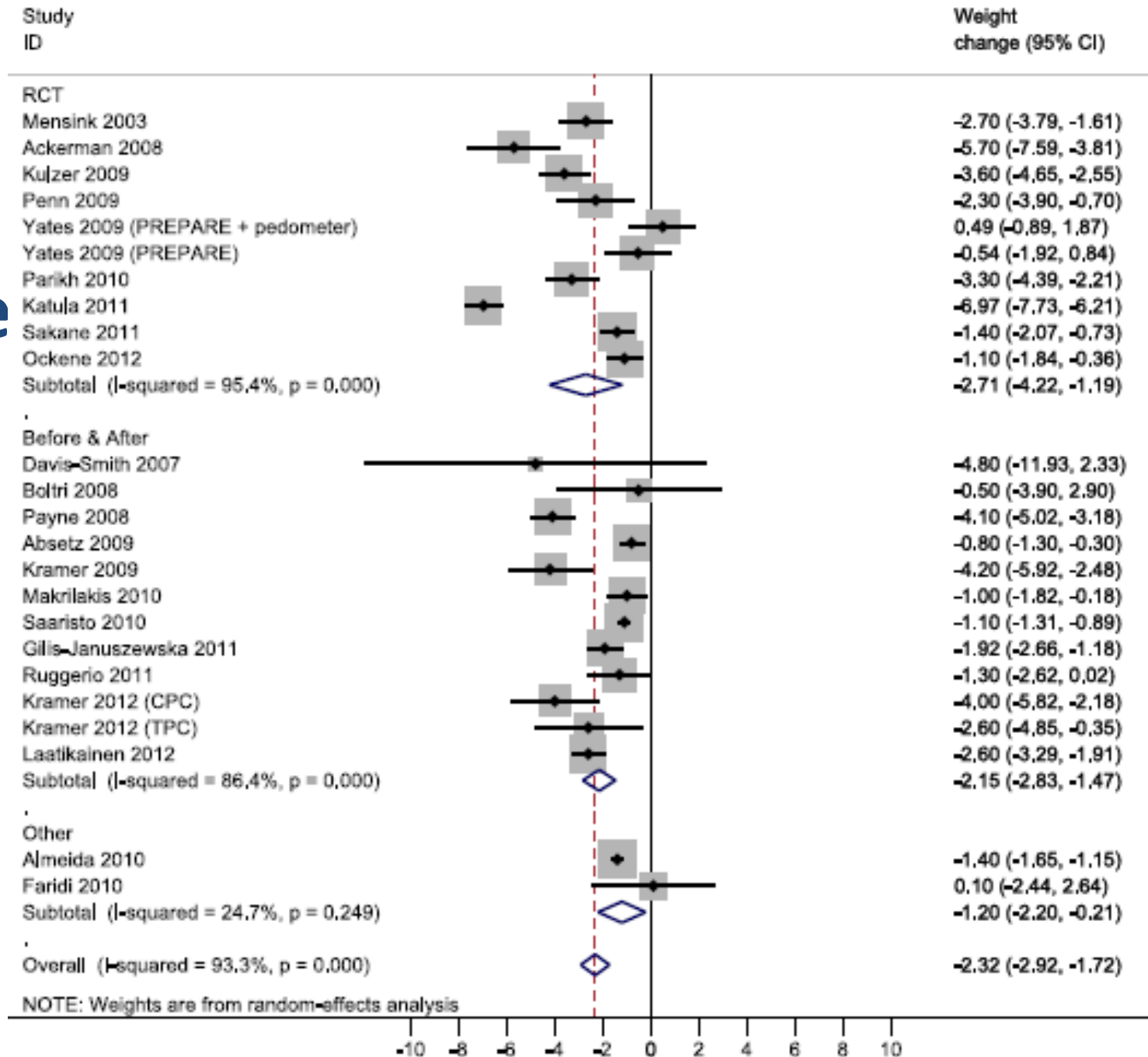
Study	Intervention	Patients (n)	Follow-up (years)	RRR ^a (%)
Da-Qing Study China ⁶²	Diet	130	6	31
	Exercise	141		46
	Diet + exercise	126		42
	Control	133		
Diabetes Prevention Study Finland ²⁷	Diet + physical activity	265	3.2	58
	Control	257		
US Diabetes Prevention Program Outcomes Study USA ²⁸	Diet + physical activity	1079	2.8	58
	Metformin	1073		31
	Placebo	1082		
Indian Diabetes Prevention Program India ³¹	Lifestyle	133	2.5	29
	Metformin	133		26
	Lifestyle + metformin	129		28
	Control	136		
Japanese trial in men with IGT Japan ⁶⁶	Diet + exercise	102	4	67
	Control	356		
Study on lifestyle-intervention and IGT Maastricht study The Netherlands ²⁹	Diet + physical activity	74	3	58
	Control	73		
European Diabetes Prevention Study Newcastle, UK ³⁰	Diet + physical activity	51	3.1	55
	Control	51		
Zensharen ^b Study Japan ³¹	Diet + physical activity	330	3	44
	Control	311		

CDC Diabetes Prevention Recognition Program

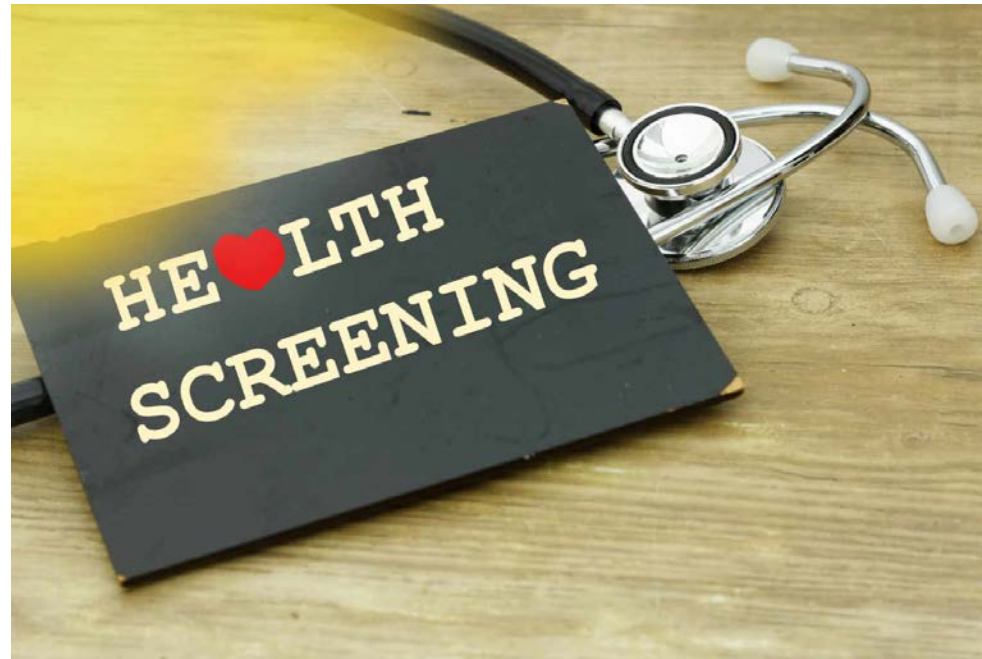


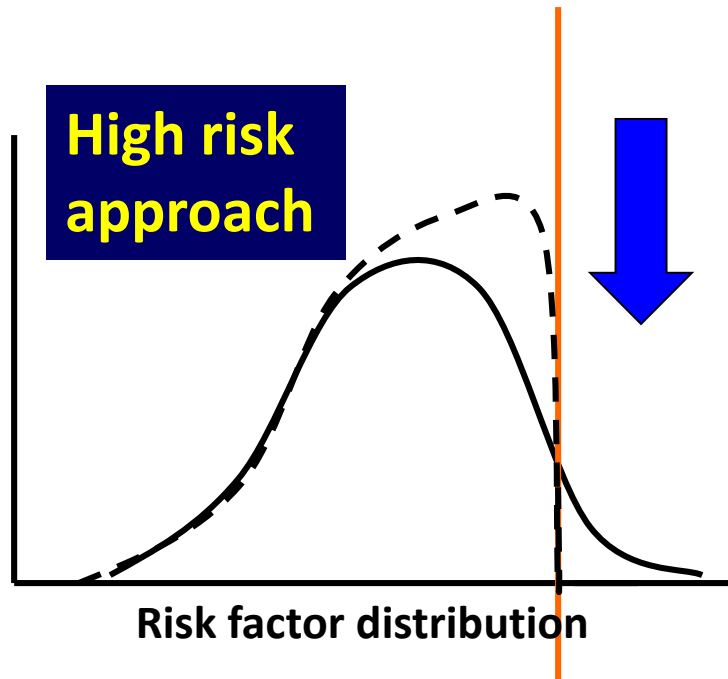
- 1557 CDC-recognized programs across 50 states/territories.
- >10,300 coaches (lay people; health professionals) trained.
- Serving 156,935 eligible participants.
- 65 commercial health plans providing some coverage for 3M in 11 states

Diabetes Prevention in the Real World

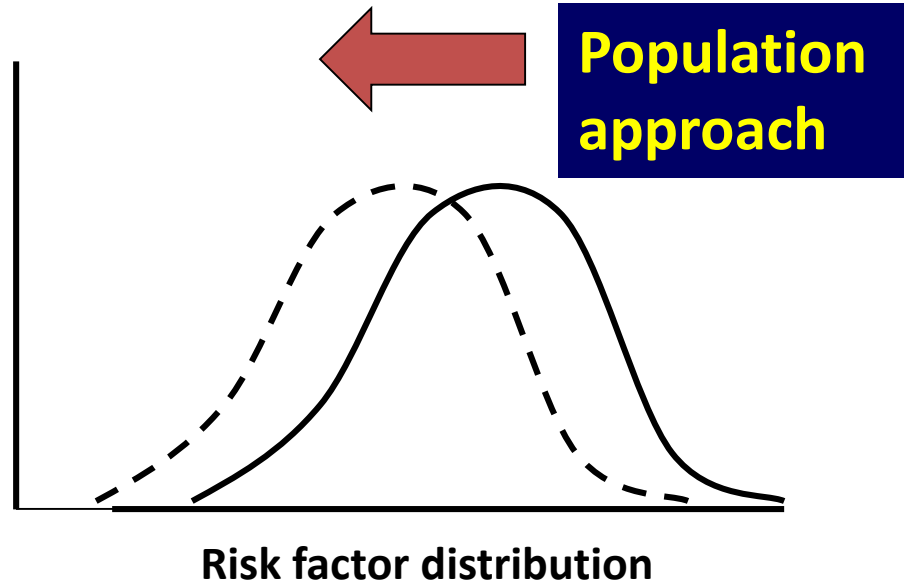


III. How to screen for people with type 2 diabetes?





Identify and treat those beyond a threshold for risk factor



Shift the whole population distribution of risk factor lower

Disease prevention approaches

High risk strategy

- **Identification of people at high risk of type 2 diabetes (screening)**
- Intervention targeting people at high risk of type 2 diabetes

Strategies for detecting DT2 and hyperglycemia

Measurement of blood glucose

- OGTT
- Fasting glucose
- HbA1C
- Capillary glucose

IDENTIFY PEOPLE AT HIGH-RISK OF DT2 LATE

Questionnaires (risk scales) of lifestyle and risk factors for diabetes

IDENTIFY PEOPLE AT HIGH-RISK OF DT2 EARLY

Objectives of screening

- What is the probability that people with a positive test have diabetes?
- Is the test is a good predictor for future diabetes?
- Can the test identify people at low risk?



Screening vs diagnosis

- ✓ A screening test is not diagnostic
- ✓ Screening tests are cheaper than diagnostic tests
- ✓ A positive screening test needs confirmation through a diagnostic test

The concept is developing a screening tool that ...

... is simple, economical and reliable to identify people at high risk for type 2 diabetes.

... can be applied easily in the general population.

... does not require blood extractions or other measures that require special equipment or trained personnel.

FINnish Diabetes Risk Score

Score range 0-26 p

- No laboratory tests
- No specially trained personnel needed
- No special equipments
- Inexpensive, easy, fast
- Accurate

Lindström & Tuomilehto
Diabetes Care 2003; 26: 725-731

TYPE 2 DIABETES RISK ASSESSMENT FORM

Circle the right alternative and add up your points.

1. Age

- 0 p. Under 45 years
- 2 p. 45–54 years
- 3 p. 55–64 years
- 4 p. Over 64 years

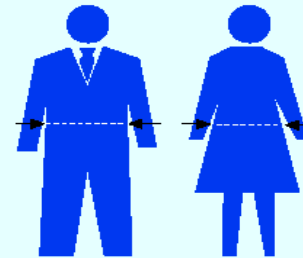
2. Body-mass index

(See reverse of form)

- 0 p. Lower than 25 kg/m²
- 1 p. 25–30 kg/m²
- 3 p. Higher than 30 kg/m²

3. Waist circumference measured below the ribs (usually at the level of the navel)

- | | MEN | WOMEN |
|------|------------------|-----------------|
| 0 p. | Less than 94 cm | Less than 80 cm |
| 3 p. | 94–102 cm | 80–88 cm |
| 4 p. | More than 102 cm | More than 88 cm |



4. Do you usually have daily at least 30 minutes of physical activity at work and/or during leisure time (including normal daily activity)?

- 0 p. Yes
- 2 p. No

5. How often do you eat vegetables, fruit or berries?

- 0 p. Every day
- 1 p. Not every day

6. Have you ever taken antihypertensive medication regularly?

- 0 p. No
- 2 p. Yes

7. Have you ever been found to have high blood glucose (eg in a health examination, during an illness, during pregnancy)?

- 0 p. No
- 5 p. Yes

8. Have any of the members of your immediate family or other relatives been diagnosed with diabetes (type 1 or type 2)?

- 0 p. No
- 3 p. Yes: grandparent, aunt, uncle or first cousin (but no own parent, brother, sister or child)
- 5 p. Yes: parent, brother, sister or own child

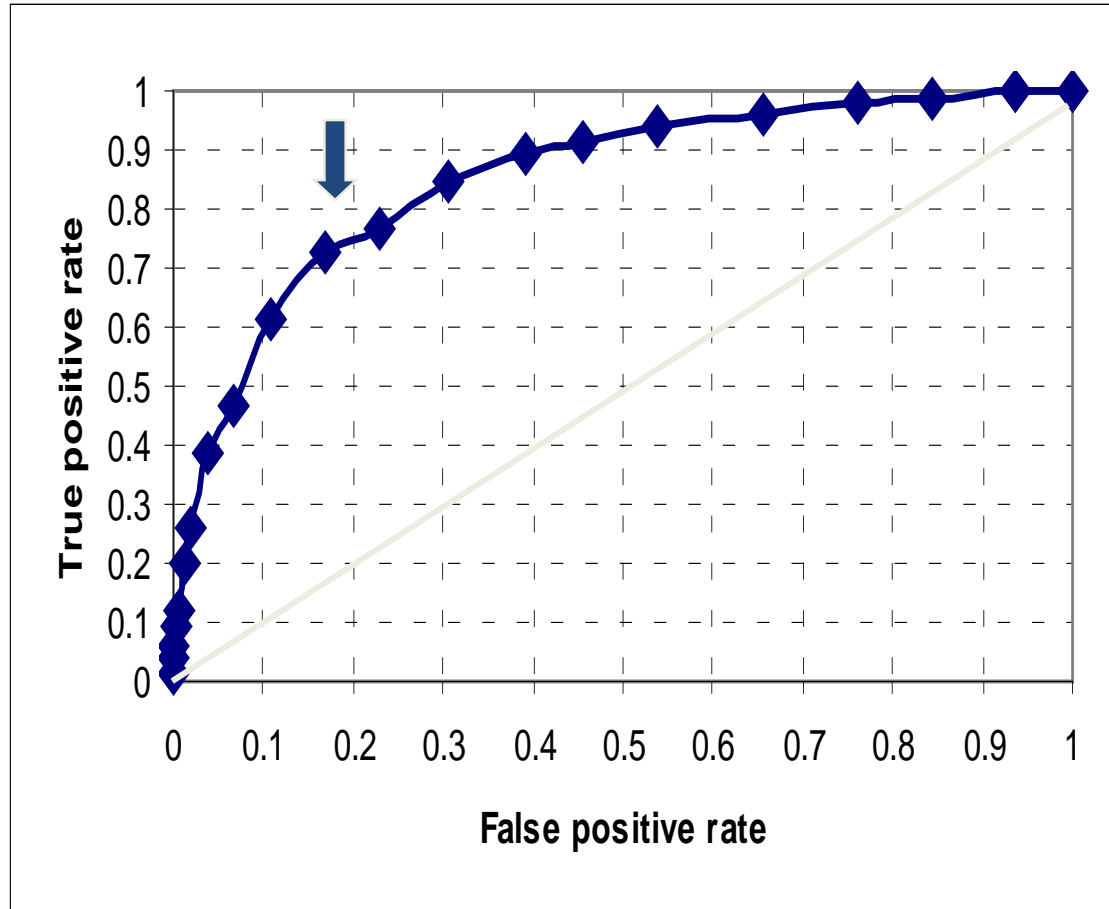
Total Risk Score

The risk of developing type 2 diabetes within 10 years is

- Lower than 7 Low: estimated 1 in 100 will develop disease
- 7–11 Slightly elevated: estimated 1 in 25 will develop disease
- 12–14 Moderate: estimated 1 in 6 will develop disease
- 15–20 High: estimated 1 in 3 will develop disease
- Higher than 20 Very high: estimated 1 in 2 will develop disease

Please turn over

The ROC curve of the FINDRISC



Cut off point: ≥ 10

Sensitivity = 0.73

Specificity = 0.83

Positive predictive value = 0.16

Negative predictive value = 0.99

AUC = 0.85

DIABETES Know the Score

You can do this risk score yourself and it only takes a few minutes.

You may feel fine but Type 2 Diabetes can develop over a number of years without you feeling unwell. By the time the problem is found, the condition can be quite advanced. Diabetes can cause heart attacks, strokes and major problems with your eyes, feet and kidneys if it is not managed early enough.

People with diabetes have high levels of sugar in their blood right now. However at least 1 in 7 middle aged adults have a higher than normal blood sugar. This means they are at greater risk of diabetes in the future.

The good news is that few small changes can prevent or delay diabetes. This test could be the first step.

Do you want to find out how likely you are of having undiagnosed Type 2 Diabetes now or in the future?



KNOW YOUR SCORE



HIGH RISK - 25 or more points
 Your risk of having diabetes now is 7% but your risk of developing diabetes in the next 10 years is 33%.
 You are at high risk of having undiagnosed diabetes now & developing diabetes in the future.
 You need to see your GP for a blood test as soon as possible. The blood test is very important to confirm or rule out diabetes. Either way your GP will support you and Diabetes UK is there to help as well. However it is important for you to follow a healthy lifestyle regardless of whether you have diabetes or not.

MODERATE RISK - 16 to 24 points
 Your risk of having diabetes now is 4% but your risk of developing diabetes in the next 10 years is 15%.
 If your lifestyle does not improve through regular physical activity and a healthy well balanced diet.
 Your risk score may have identified specific areas of your lifestyle that you could improve to reduce your risk. These may be your weight, your diet and/or the amount of physical activity that you do.

INCREASED RISK - 7 to 15 points
 Your risk of having diabetes now is 2% but your risk of developing diabetes in the next 10 years is 10%.
 Even if you do not have diabetes now, you may have elevated blood glucose levels which may increase your risk of developing the diabetes in the future. However you can make a difference through regular physical activity and a healthy well balanced diet.

LOW RISK - 0 to 6 points
 You are at low risk of diabetes - keep up the good work with leading a healthy lifestyle! However as you get older your risk score will increase, so it is important for everyone to follow a healthy lifestyle in order to reduce their risk of diabetes and other problems such as heart disease or high blood pressure.

LOW RISK - 0 to 6 points
 You are at low risk of diabetes - keep up the good work with leading a healthy lifestyle! However as you get older your risk score will increase, so it is important for everyone to follow a healthy lifestyle in order to reduce their risk of diabetes and other problems such as heart disease or high blood pressure.

TRY IT! For each question, tick one box. The number in the blue box next to the box you have ticked is your score for that question. When you have answered all the questions, add up your total score.



- How old are you?
 49 and younger 0 60 - 69 9
 50 - 59 5 70 and older 11
- Are you male or female?
 Male 1 Female 0
- How would you describe your ethnicity?
 White European 0 Other Ethnic Group 6
- Do you have a father, mother, brother, sister and/or own child with Type 1 or Type 2 diabetes?
 Yes 5 No 0
- What is your waist (circumference)? (See instructions)
 Less than 90 cm 0 100 - 109 cm 6
 Less than 35.3 inches 0 39.4 - 42.9 inches 6
 90 - 99 cm 4 110 cm & above 9
 35.4 - 39 inches 4 43 inches and above 9
- What is your Body Mass Index (BMI)? (See instructions)
 Less than 25 0 30 - 34 5
 25 - 29 3 35 & above 9
- Has a doctor given you medicine for high blood pressure OR told you that you have high blood pressure?
 Yes 5 No 0

Add up your score here -

your total score here -

COLDRISC

Colombian Diabetes Risk Score

1. Edad		Puntaje
Menos de 45 años		0
45 a 54 años		1
55 a 64 años		2
Más de 64 años		3
2. Tiene antecedente de padres o hermanos con diagnóstico de diabetes mellitus		Puntaje
No		0
Si		2
3. Toma medicamentos para el tratamiento de la hipertensión arterial		Puntaje
No		0
Si		2
4. Perímetro abdominal*		Puntaje
<small>*Ver instrucciones de medición en cara 2</small>		
Hombres 	Mujeres 	
Menos de 94 cm.	Menos de 90 cm.	0
94 cm. o más	90 cm. o más	2

Puntos por edad

Puntos por diabetes en familiar de primer grado

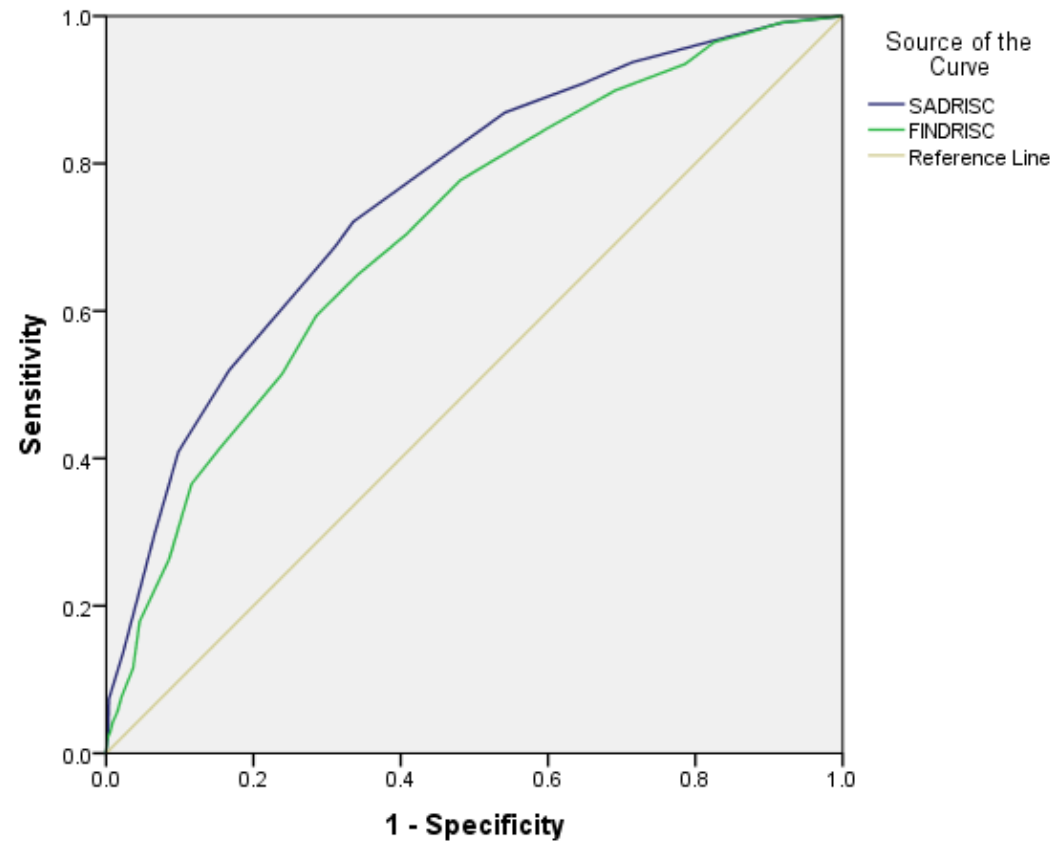
Puntos por medicamentos para hipertensión arterial

Puntos por perímetro abdominal

Sume los puntos de cada pregunta. Si el **puntaje total es mayor o igual a 4**, indique una **prueba de tolerancia a la glucosa** dado que, la persona tiene 5 veces más posibilidades de tener diabetes mellitus en comparación con aquellos sujetos con menos de 4 puntos.

PUNTAJE TOTAL

Receiver operating characteristics (ROC) curves for the prevalence of abnormal glucose tolerance for the SADRISC (Saudi Arabian Diabetes Risk Score) and the original FINDRISC.



ROC for original FINDRISC

Area under the curve: 0.71; 95% CI
0.68-0.74

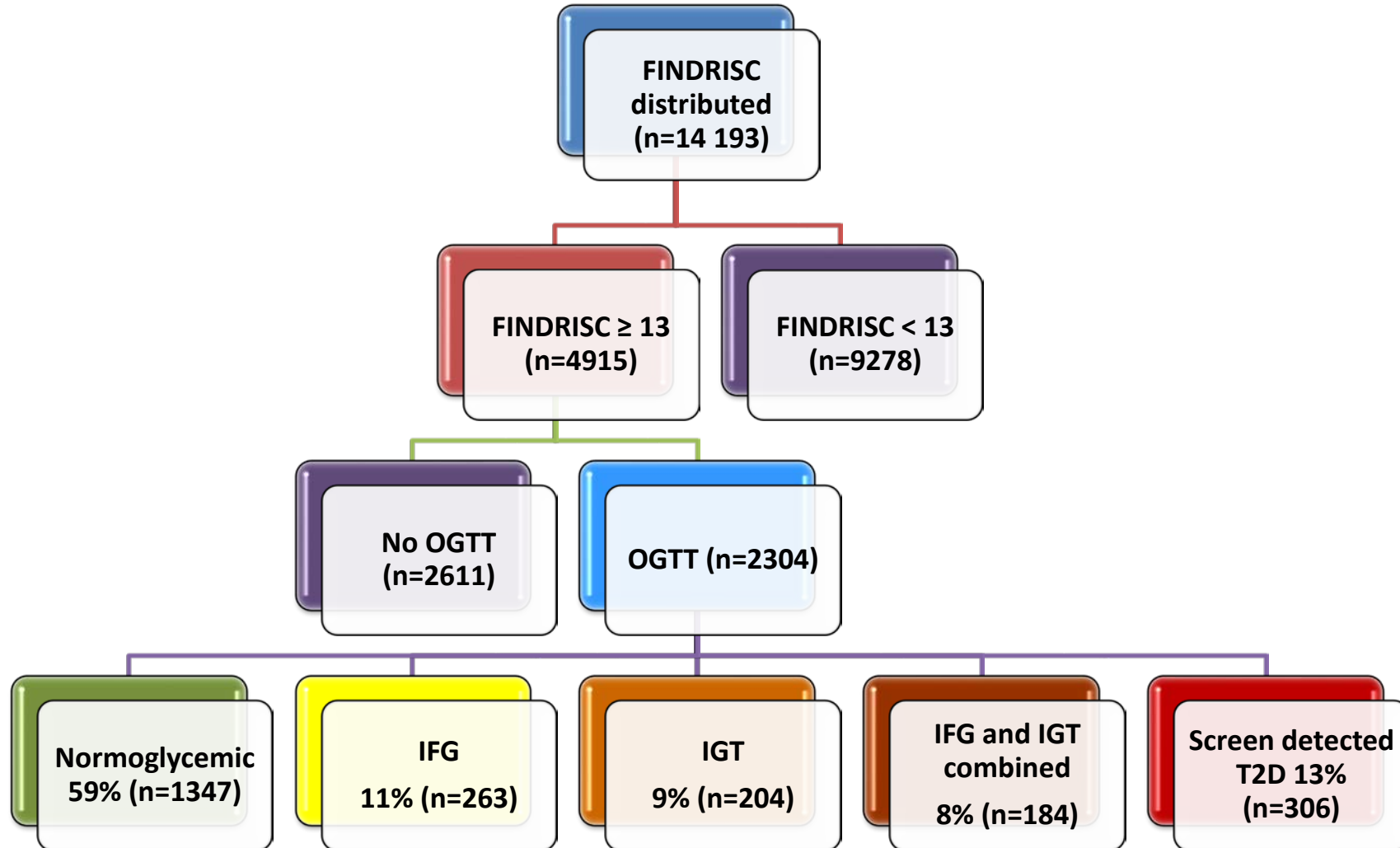
ROC for SADRISC

Area under the curve: 0.76; 95% CI
0.73-0.79

**Are there differences in risk factors for
type 2 diabetes among different
populations?**

NO!

**But the relative contribution (weight) may
vary between populations.**



IV. Unsolved questions and challenges



Which diagnostic test to use?

Which invasive diagnostic test to use after screening (fasting glucose, HbA1C, 2-hour glucose, 1-hour glucose, capillary glucose)?



Optimal time interval

What is the optimal time interval between screening activities?



Changing lifestyle

Are people diagnosed as being at a high risk of T2D more likely to change their lifestyle than people who are unaware of their risk or whether a negative test may have an adverse shift in health behaviors?



“What fits your busy schedule better, exercising one hour a day or being dead 24 hours a day?”

Long term benefits



Information on long-term benefits of T2D screening programs?

Impact

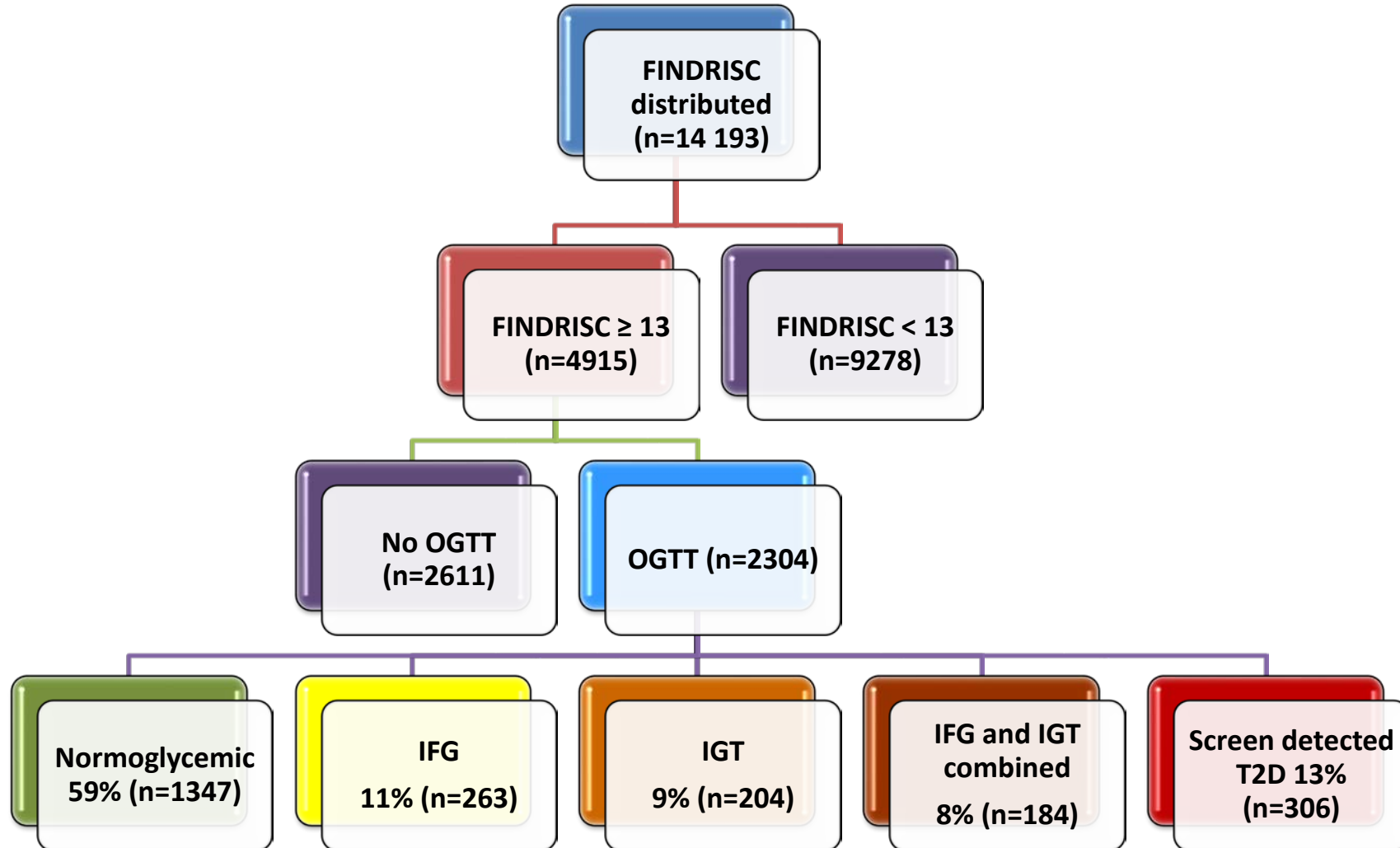
Short or long-term impact
of T2D screening
programs?



Attendance

Attendance for diagnostic tests after positive screening test?

attendance
MATTERS



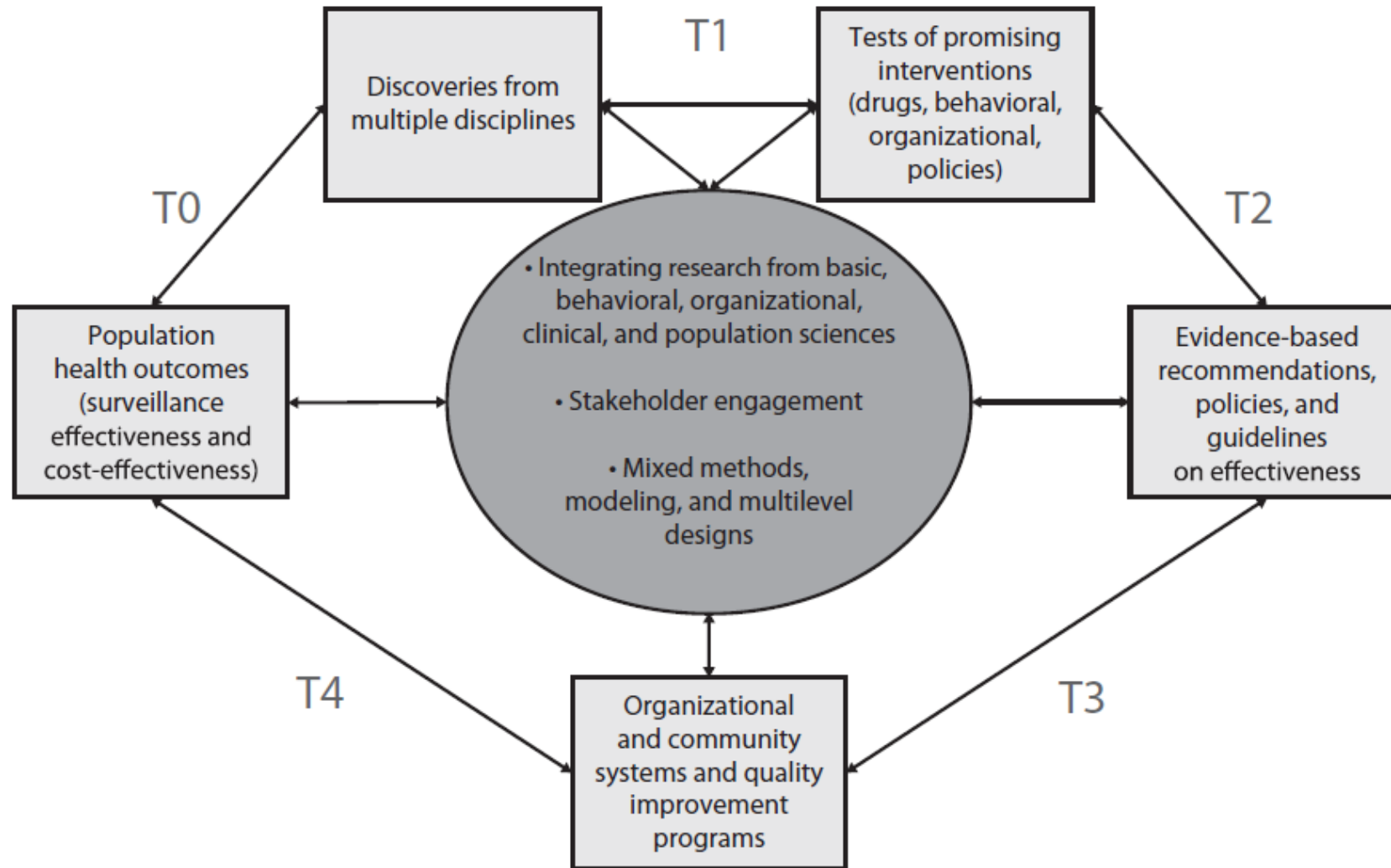
V. Conclusions and recomendations



Conclusions (II)

- Validated screening tests exist
- Screening tests have been successfully implemented in various countries and institutions
- Main challenges include among others monitoring attendance , short- and long term benefits, implementation of guidelines and time interval of screening tests.

Knowledge integration process



Source. Modified from Khoury et al.³¹

Thank you



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