XIX Congreso Latinoamericano de DIABETES
Asociacion Latinoamericana de Diabetes ALAD

19-21 NOVIEMBRE 2025
CENTRO DE CONVENCIONES PALACIO MUNICIPAL
CUSCO - PERÚ

DP-Next:
Prevención sostenible de la diabetes tipo 2 para el Siglo XXI
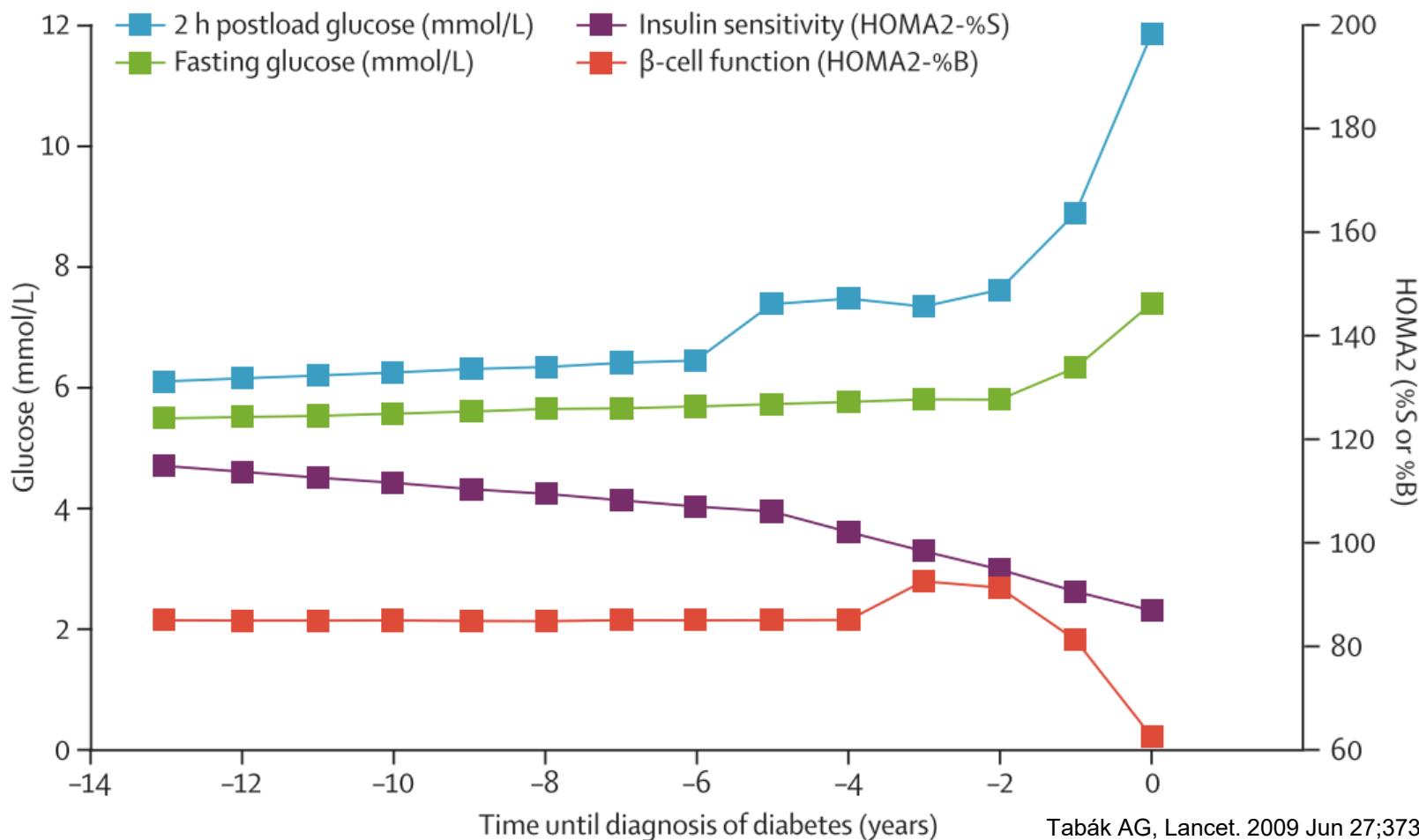
Dr. Daniel R. Witte
Steno Diabetes Center Aarhus – DK
daniel.witte@ph.au.dk

ORGANIZA
ALAD
Asociación Latinoamericana de Diabetes
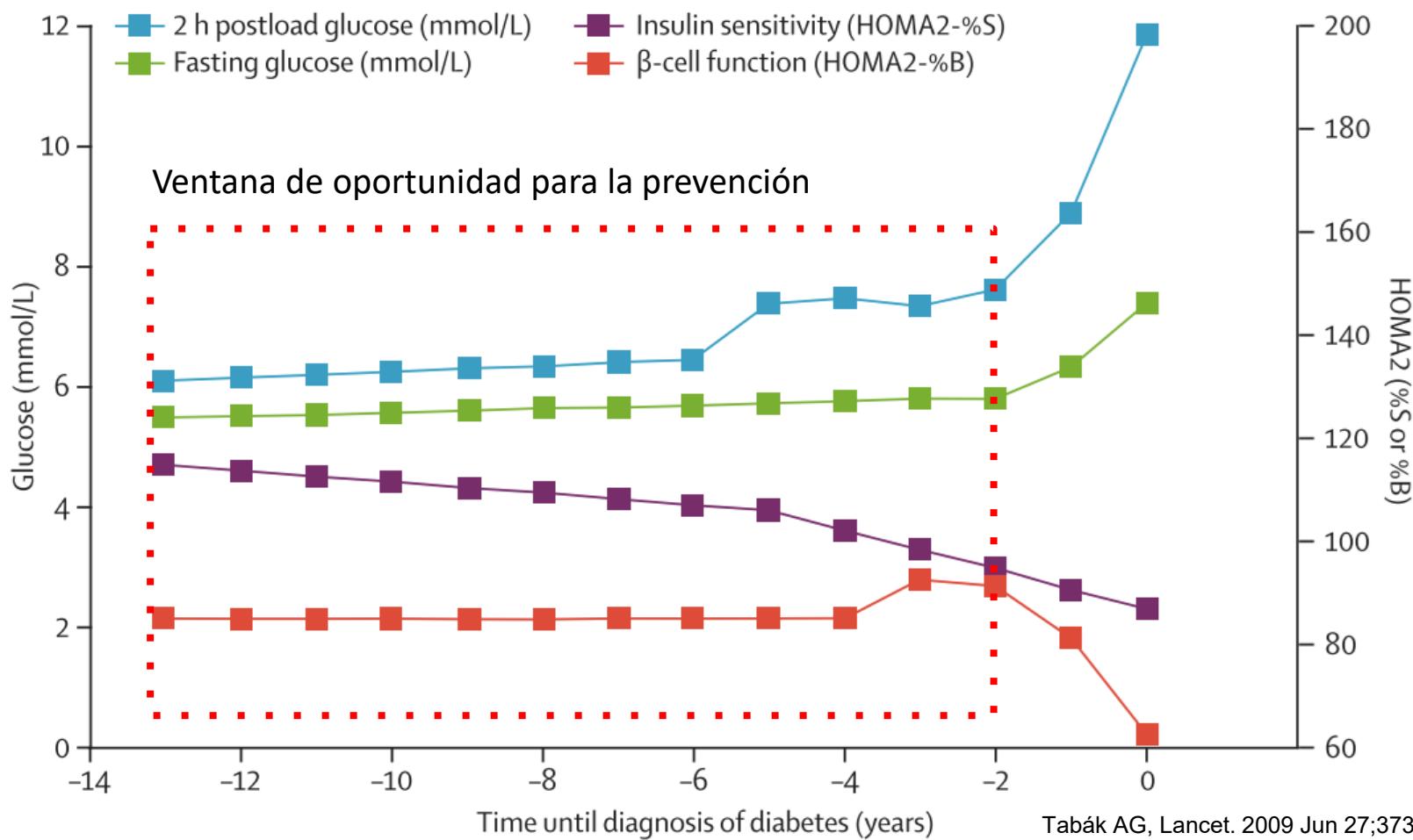
DP-NEXT:
PREVENCIÓN SOSTENIBLE DE LA DIABETES TIPO 2 PARA EL SIGLO XXI


- Un nuevo enfoque mínimamente invasivo para la <u>detección y prevención</u> del riesgo de la diabetes tipo 2 a nivel poblacional

- Utilización de nuevos conocimientos y tecnología

- Ofrecer una <u>prevención sostenible de la diabetes</u> en Dinamarca, Groenlandia y las Islas Feroe.

Ventana de oportunidad para la prevención

Legend:
- 2 h postload glucose (mmol/L)
- Fasting glucose (mmol/L)
- Insulin sensitivity (HOMA2-%S)
- β-cell function (HOMA2-%B)

Y-axis (left): Glucose (mmol/L)
Y-axis (right): HOMA2 (%S or %B)
X-axis: Time until diagnosis of diabetes (years)
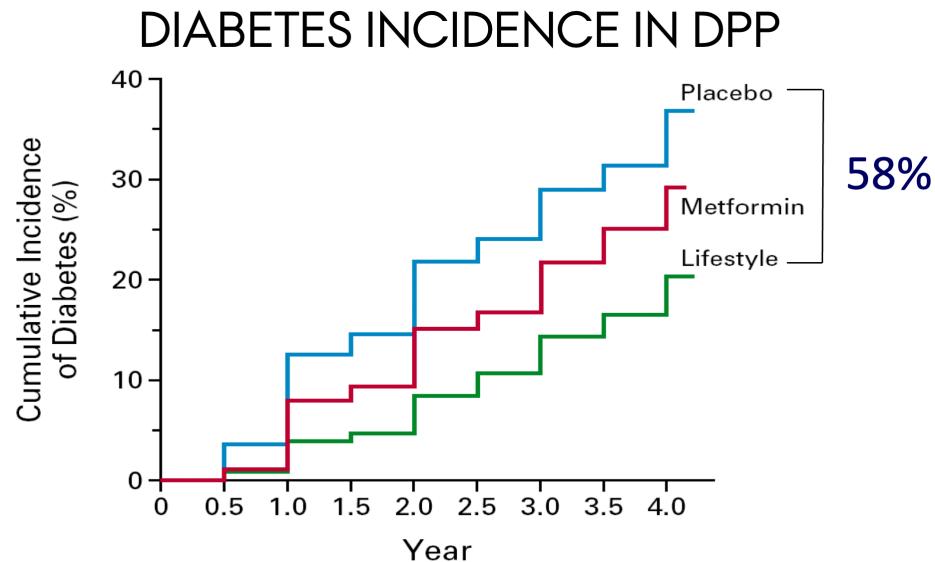
Tabák AG, Lancet. 2009 Jun 27;373(9682):2215-21.
Tabák AG, Lancet. 2012 Jun 16;379(9833):2279-90

¿POR QUÉ ES NECESARIA UNA NUEVA ESTRATEGIA PARA LA PREVENCIÓN DE LA DIABETES?

DIABETES INCIDENCE IN DPP



NEJM 2002;Volume 346:393-403

# ¿POR QUÉ ES NECESARIA UNA NUEVA ESTRATEGIA PARA LA PREVENCIÓN DE LA DIABETES?

DIABETES INCIDENCE IN DPP

58%

NEJM 2002;Volume 346:393-403

C Waist Circumference

Main effect, –3.2 (95% CI, –3.9 to –2.4)
P<0.001

D Glycated Hemoglobin

Main effect, –0.22 (95% CI, –0.28 to –0.16)
P<0.001

Look AHEAD Research Group. N Engl J Med 2013;369:145-54.

Diabetologia

Population-based stepwise screening for unrecognised Type 2 diabetes is ineffective in general practice despite reliable algorithms

J. O. Christensen[1] · A. Sandbæk[2] · T. Lauritzen[2] · K. Borch-Johnsen[1, 3]
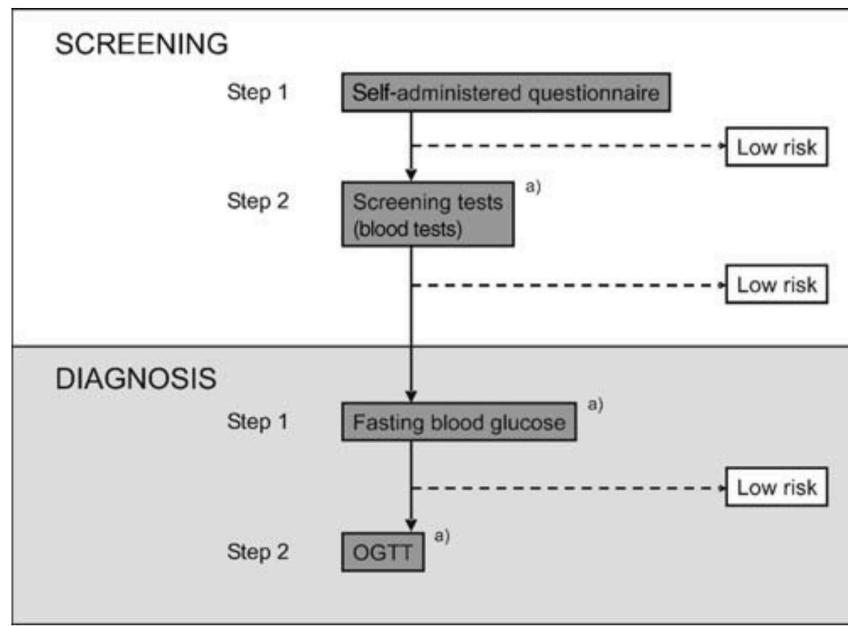
Fig. 1. Overall outline of the stepwise screening programme.
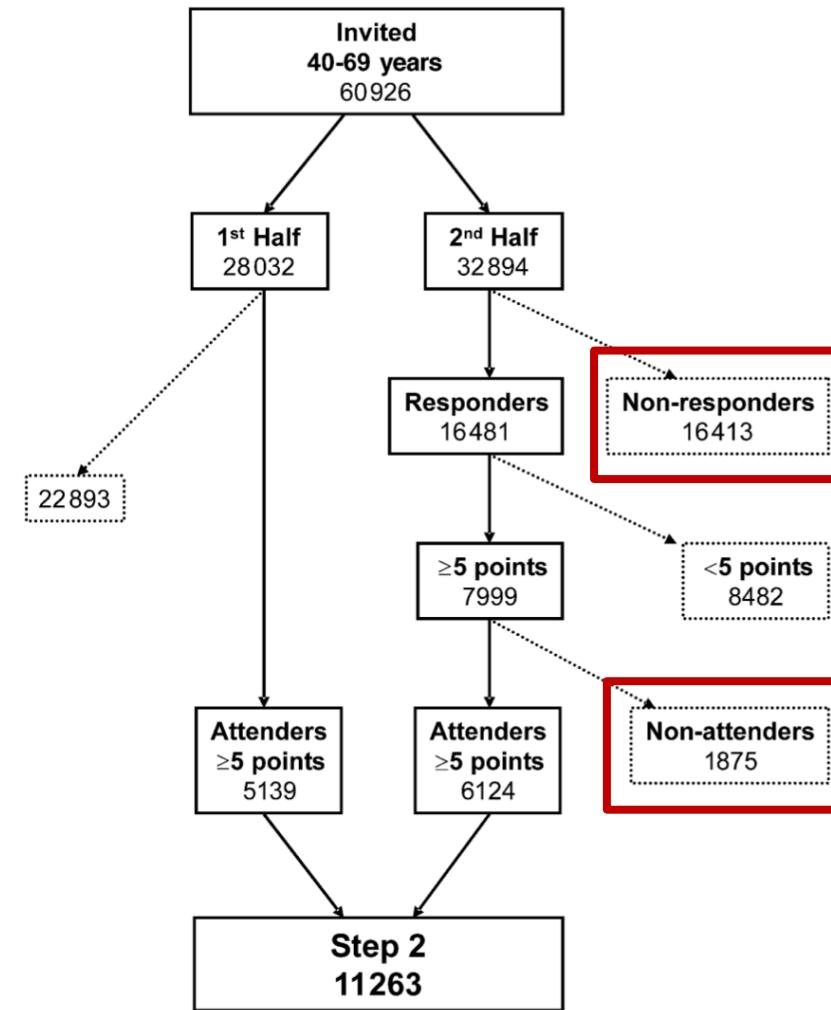

**Fig. 2.** Screening algorithm: Step 1
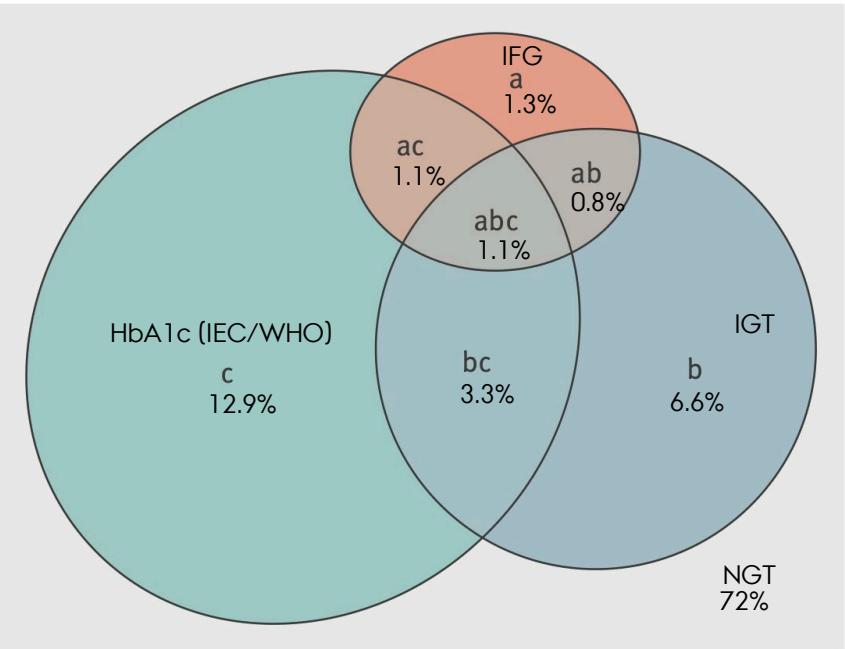
Fig 4 | Prevalence of pre-diabetes by diagnostic test with IEC and WHO criteria, showing overlap with all three tests. Prevalence of pre-diabetes was 27%. Of those with abnormal results, a=4.7% isolated IFG; b=24.4% isolated IGT; c=47.8% isolated HbA_{1c}; ab=2.9% IFG+IGT; ac=4.1% IFG+HbA_{1c}; bc=12.2% IGT+HBA_{1c}; abc=3.9% IGT+IFG+HbA_{1c}; d (area outside ellipse)=72% (normal result)
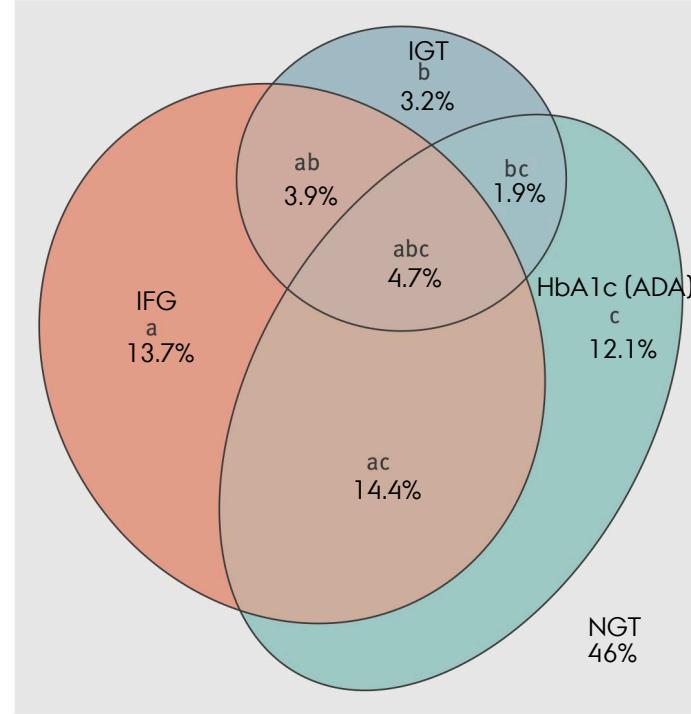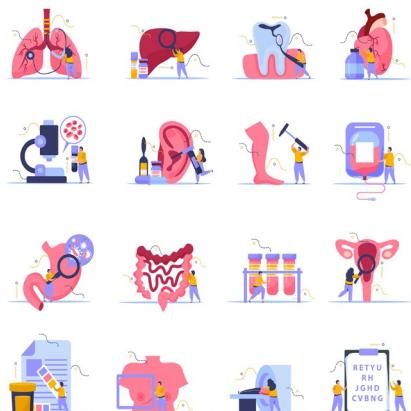
Fig 5 | Prevalence of pre-diabetes by diagnostic test with ADA criteria for all tests. Prevalence of pre-diabetes was 54%. Of those with abnormal results, a=25.4% isolated IFG; b=6% isolated IGT; c=22.4% isolated HbA_{1c}; ab=7.2% IFG+IGT; ac=26.7% IFG+HbA_{1c}; bc=3.6% IGT+HBA_{1c}; abc=8.7% IGT+IFG+HbA_{1c}; d (area outside ellipse)=46% (normal result)

Barry E. BMJ 2017;356:i6538

¿CUÁLES SON LAS NUEVAS OPORTUNIDADES?
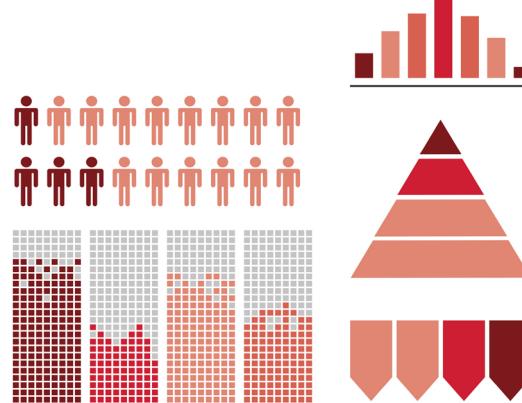
• Registros sanitarios extensos y vinculables con cobertura poblacional

• Métodos avanzados en estadísticas y en inteligencia artificial

• Mayor comprensión de las barreras psicosociales que bloquean cambios sostenibles en estilo de vida

• Mayor experiencia con métodos para el desarrollo de intervenciones complejas

• Amplia evidencia de heterogeneidad sustancial en la (pre)diabetes y el riesgo de la diabetes

• Tecnologías avanzadas para mediciones en tiempo real (CGM, sueño, actividad física)

• Adopción generalizada del uso de smartphones y de aplicativos

WP1: Gestión y Colaboración
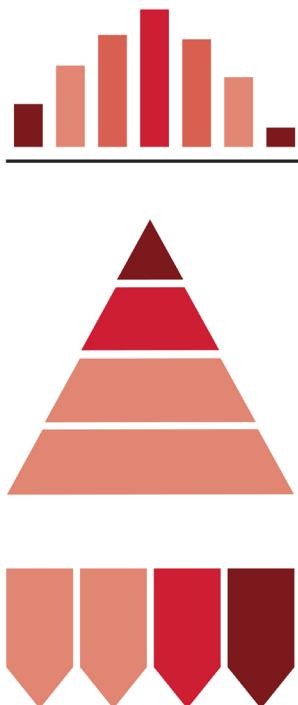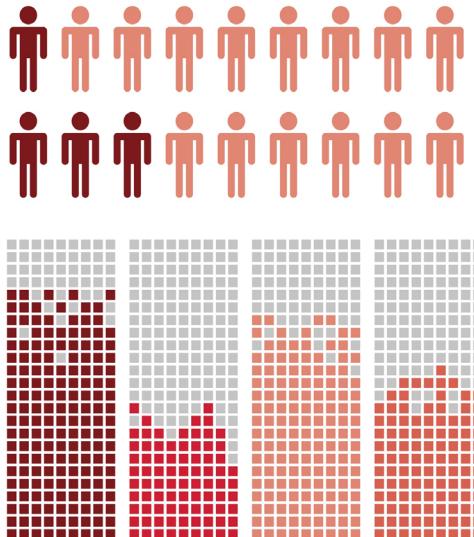


WP2: Predicción de Riesgo

WP3: Heterogeneidad

WP4: Desarrollo de Intervenciones

WP2: PREDICCIÓN DE RIESGO

Predicción individual del riesgo de diabetes tipo 2 para toda la población de Dinamarca, Groenlandia y las Islas Feroe basada exclusivamente en datos existentes provenientes de registros.

WP2: PREDICCIÓN DE RIESGO

Desarrollo: Datos de registro + SIS

Desenlace: Diabetes tipo 2 basada en el registro

**Indicadores de riesgo:** Amplia gama de datos de registros
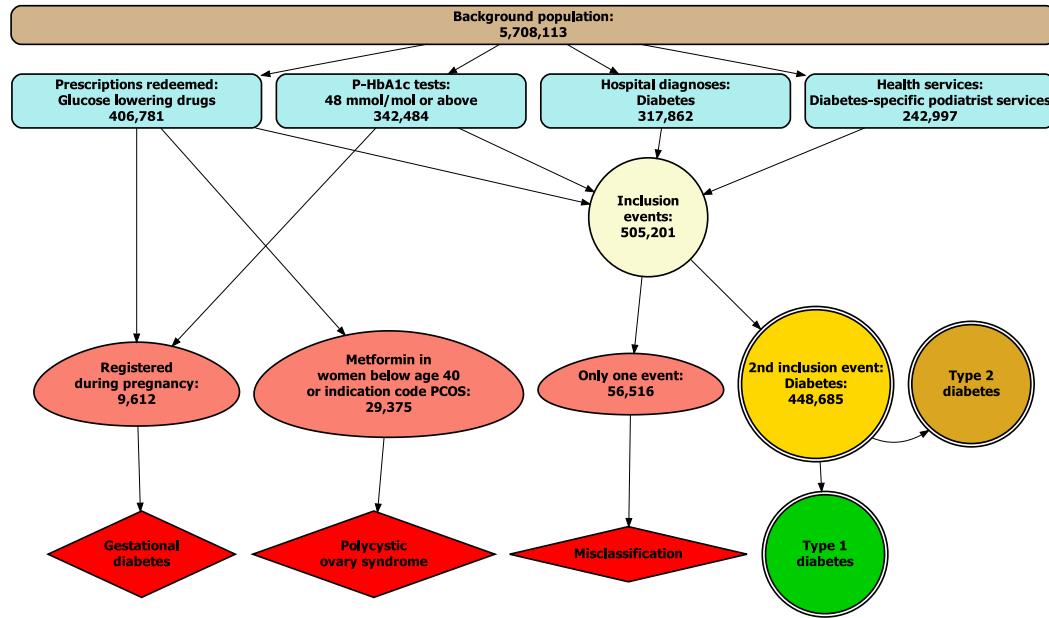
Métodos:
Modelo predictivo convencional
Modelos paralelos + modelo conjunto
Inteligencia Artificial

Calibración: SIS groenlandés y feroés
Validación: Validación cruzada interna y externa (Suecia, Escocia)

Aplicación: Aplicación en datos de SIS
Integración en sistema 'SAMBLIK'

Isaksen A. PhD Dissertation. Aarhus University 2023

SISTEMA DE REGISTROS EN DINAMARCA

Examples of registers

CPR: Registro de Población

The Clinical Laboratory Information Register

The National Hospital Medication Register

The National Cancer Register

The Register of Pharmaceutical Sales

The Register of Rehabilitation

The National Patient Register

The National Medical Implants Register

The Cause of Death Register

The National Child Health Register

The Birth Register

The Cost Database

The National Register of Coercive Measures in Psychiatric Units
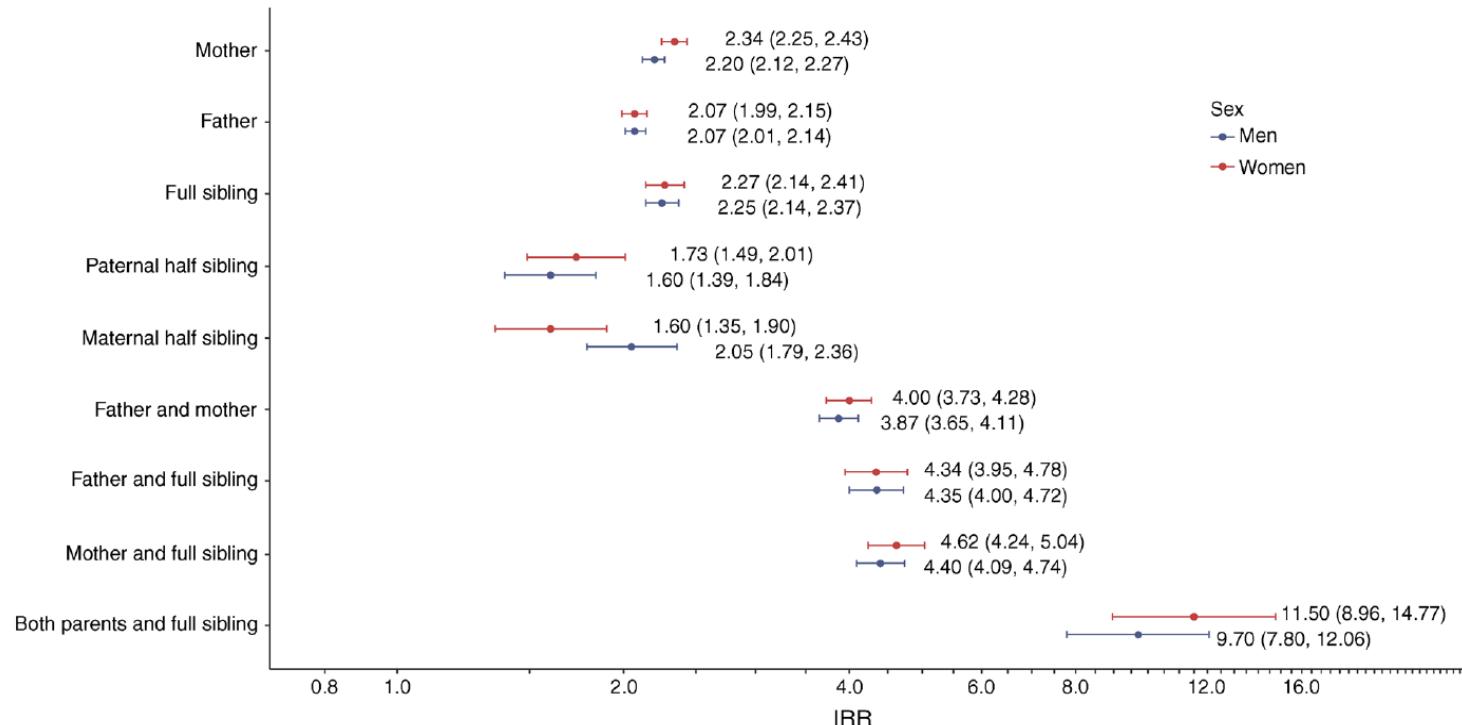
The Danish Pathology Register

https://sundhedsdatastyrelsen.dk/da/english/health_data_and_registers/national_health_registers

EJEMPLO: RIESGO FAMILIAR

Effect of familial diabetes status and age at diagnosis on type 2 diabetes risk: a nation-wide register-based study from Denmark

Silverman-Retana O, Hulman A, Nielsen J, Ekstrøm CT, Carstensen B, Simmons RK, Bjerg L, Johnston LW, Witte DR. Effect of familial diabetes status and age at diagnosis on type 2 diabetes risk: a nation-wide register-based study from Denmark. Diabetologia. 2020 May;63(5):934-943. doi: 10.1007/s00125-020-05113-8. Epub 2020 Feb 19. PMID: 32076733.
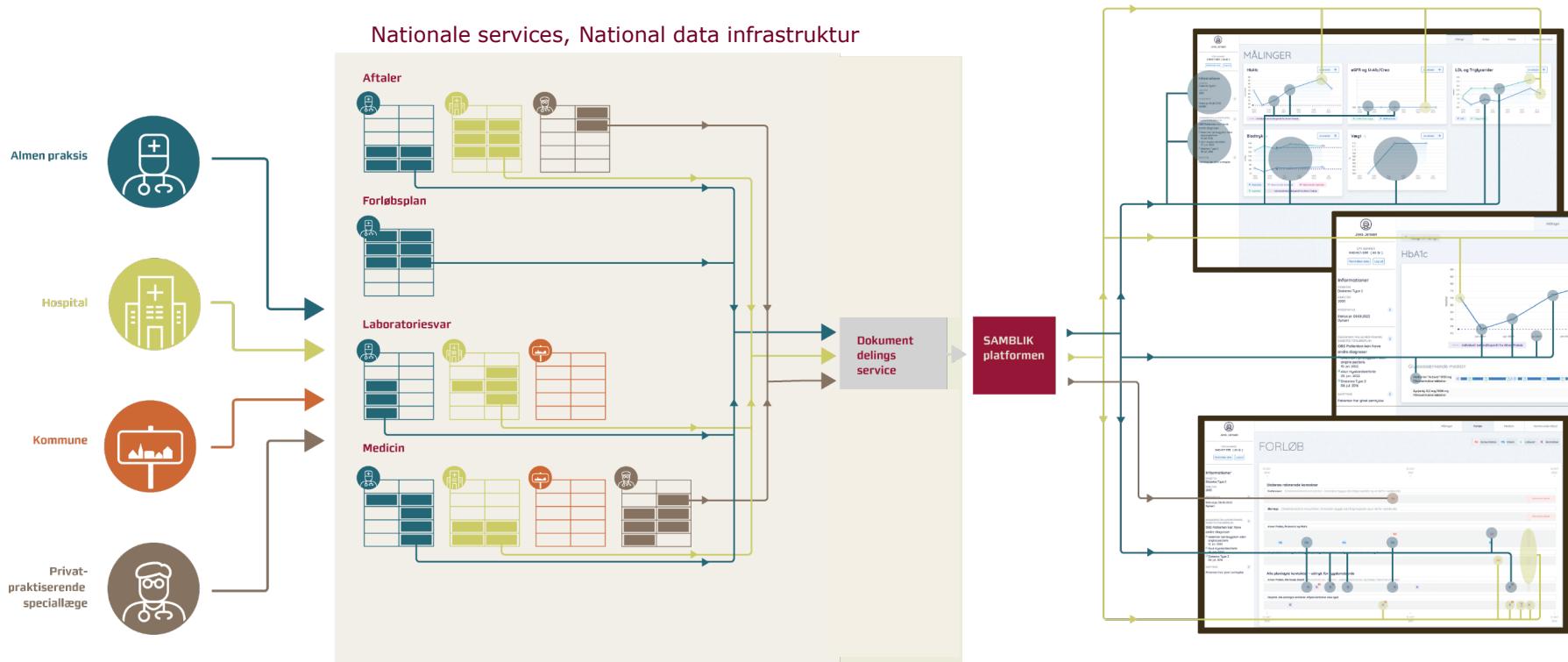
WP2: PREDICCIÓN DE RIESGO
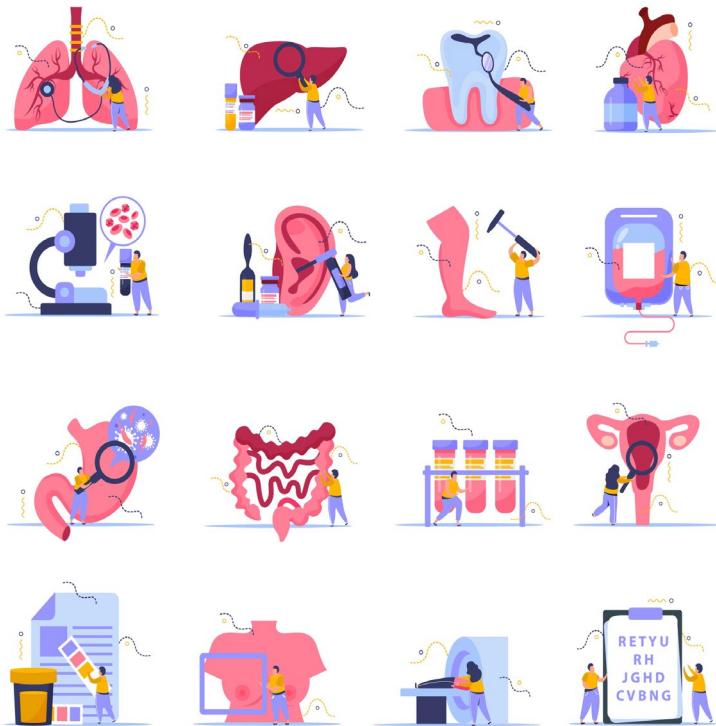
Register	Diabetes Risk Indicators
CPR Register	Demographics, Family Structure and Linkage, Migration and Civil Status
LPR (Danish National Patient Registry)	History + Family history of diabetes, CVD, cancer, multimorbidity
LMDB (Danish National Prescription Registry) and the Hospital Medication Register	Contributes to individual and family history of diabetes and hypertension; specific drug classes (steroids, lipid lowering drugs, antihypertensive medication); wider polypharmacy
LABKA (Laboratory Examination Register)	HbA1c (Pre-diabetes: Intermediate HbA1c), lipid profiles, Urinary Albumin Creatinine Ratio, estimated Glomerular Filtration Rate, c-peptide, GAD65 antibodies.
Cancer Register	Contributes to individual and family history of cancer (e.g. obesity related cancers, lung cancer in family as proxy for smoking)
Pathology Register	Positive FIT test on colorectal cancer screening
Screening Databases	Participation in screening programmes
RKKP (Danish Registry of Diabetes)	Glycaemic and CVD risk factor control in diabetes patients
Health Insurance	GP attendance frequency, healthcare utilisation, procedural codes for diabetes foot care, diabetes specific visit codes as a proxy for diabetes
Medical Birth Register	History of GDM, pre pregnancy BMI, birth weight, hypertensive disorders
DREAM (Socio Economic Status)	SES groups, Educational Attainment, Income, Social Benefit transfers
HANDIC Register	Functional Disabilities
Vaccination Register	Participation in vaccination programmes

Figure 2b. Registers and Diabetes Risk Indicators to be used in WP2

# SAMBLIK: Compartiendo datos a través de sectores

WP3: HETEROGENEIDAD
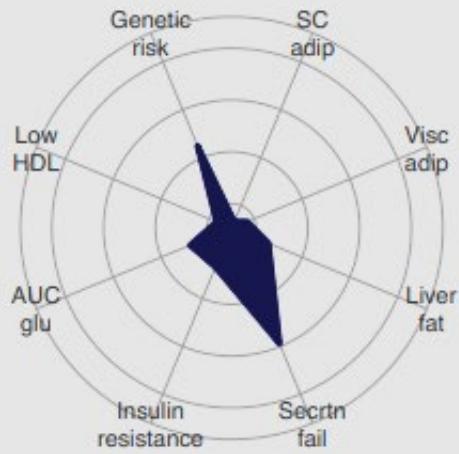
- Caracterizar la heterogeneidad entre personas de mediana edad con prediabetes definida por HbA1c
- Seleccionar biomarcadores fácilmente accesibles para identificar quienes tienen mayor riesgo de progresión hacia la diabetes

Subtipos de pre-diabetes
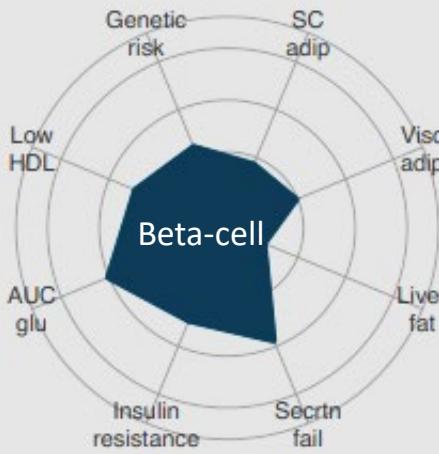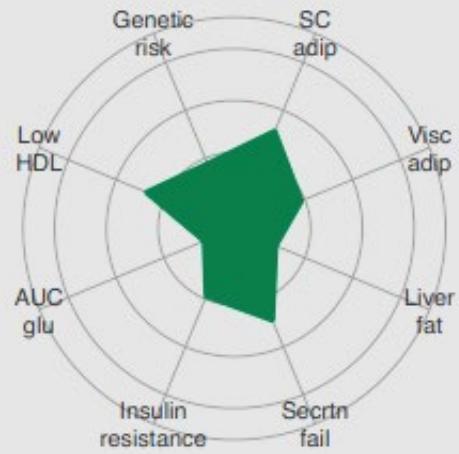
Wagner, Nature Medicine, 2021

SUBTIPOS DE PREDIABETES

$P = 1 \times 10^{-10}$

Impaired insulin secretion

Increased liver fat

Wagner, Nature Medicine, 2021
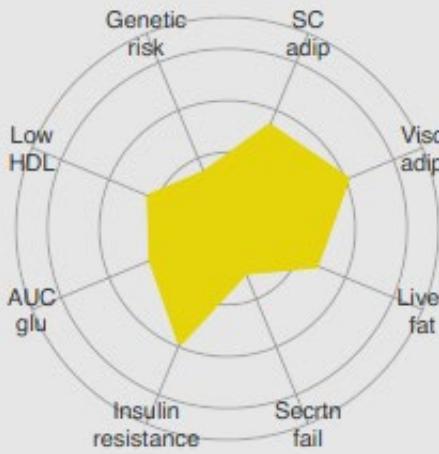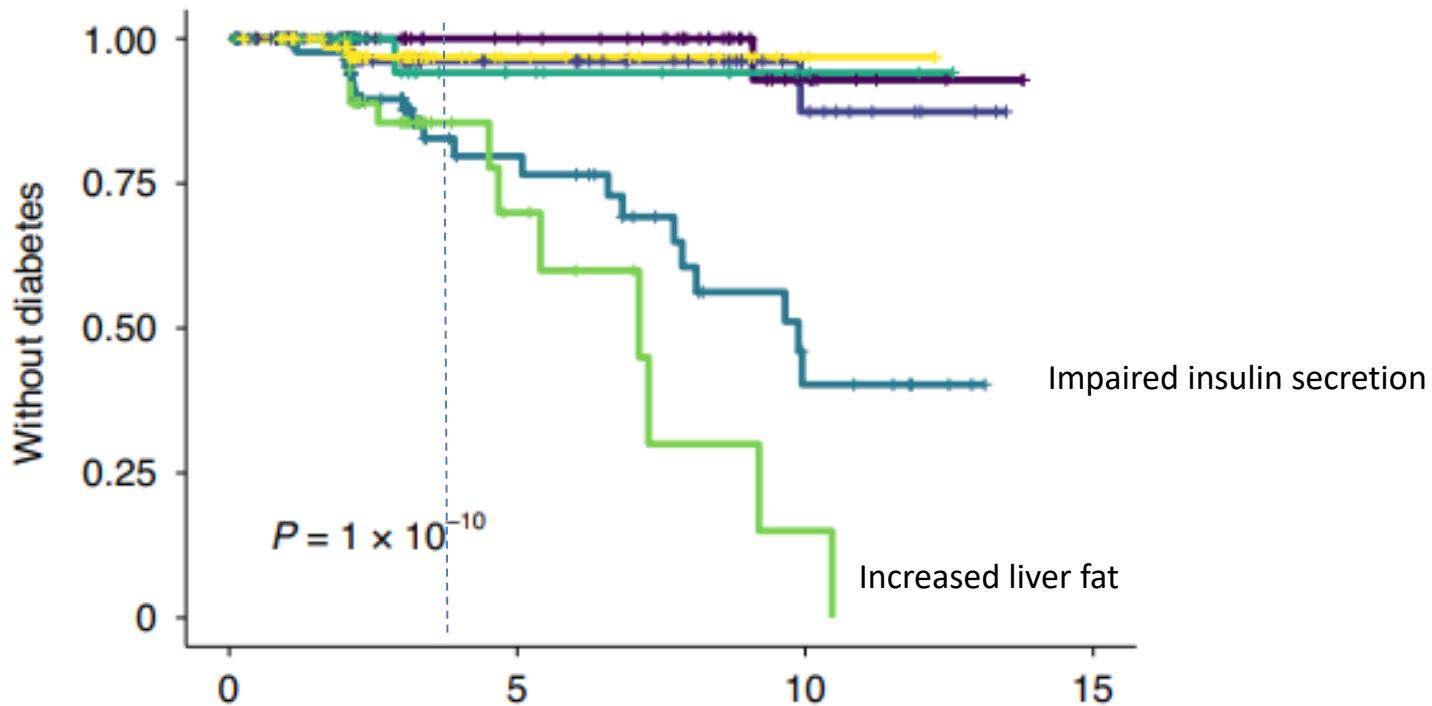
HETEROGENEIDAD EN PRE-DIABETES
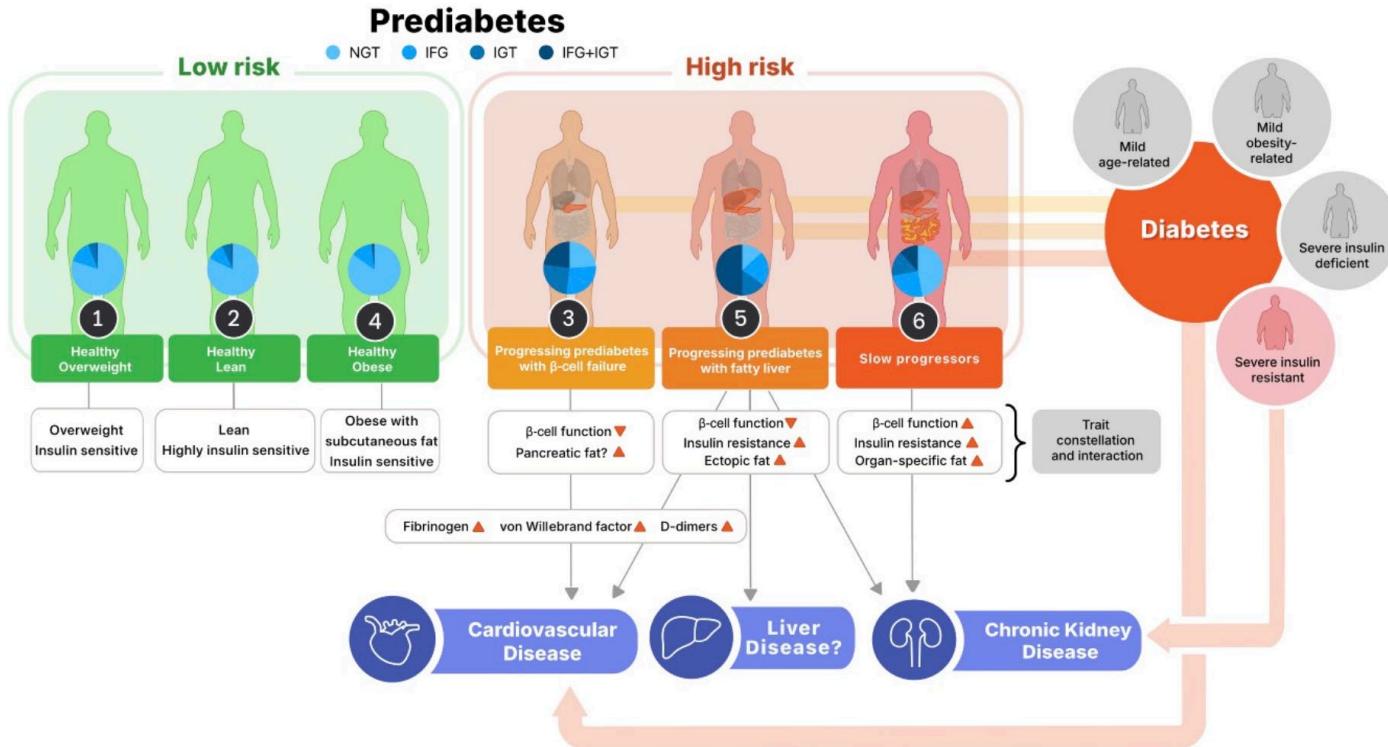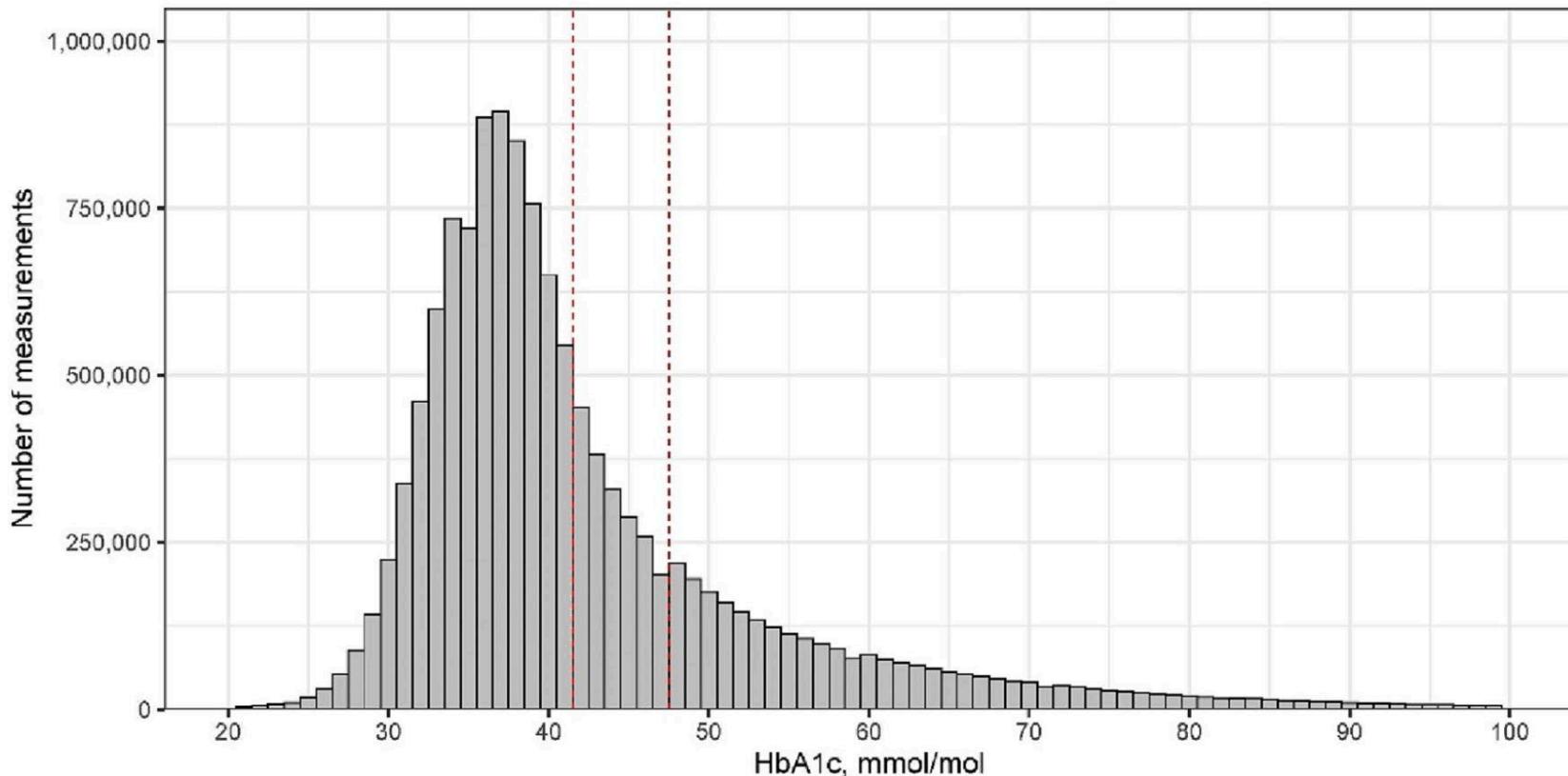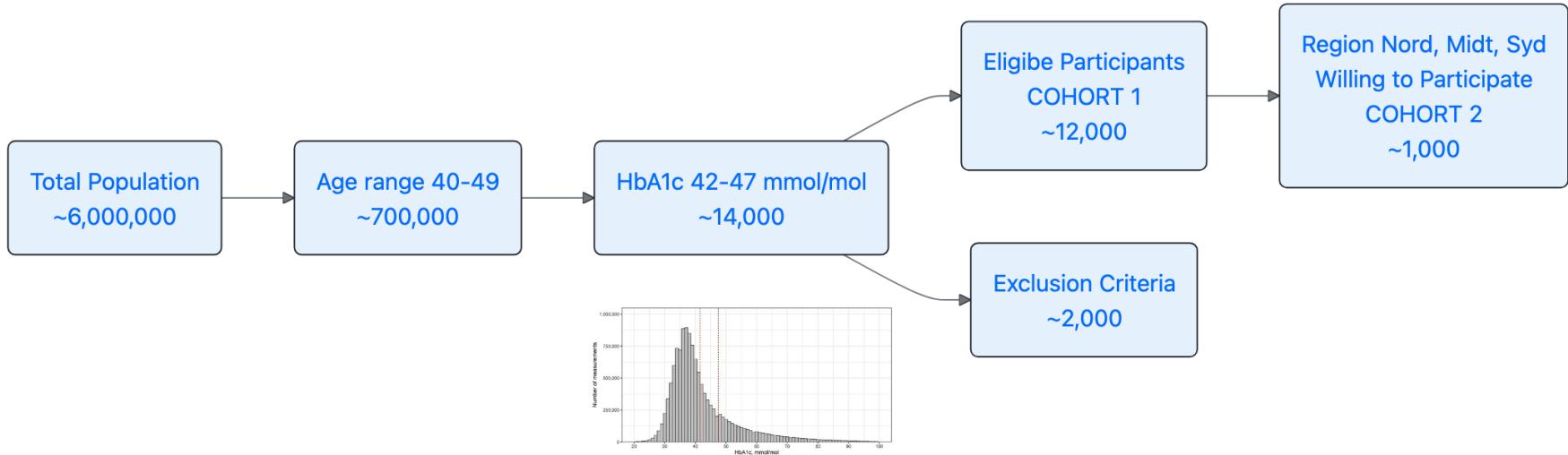
Figure 1—Distinct constellations of traits, including variations in insulin sensitivity, β-cell function, and organ-specific fat distribution, are seen among prediabetes subtypes. For these subtypes there are different trajectories toward diabetes, its subtypes, associated complications, and mortality. NGT, normal glucose tolerance.

Wagner R. Diabetes Care 2025;48(00):1–10

WP3: HETEROGENEIDAD

Nicolaisen SK. Diabetes Res Clin Pract. 2023 Sep:203:110829.
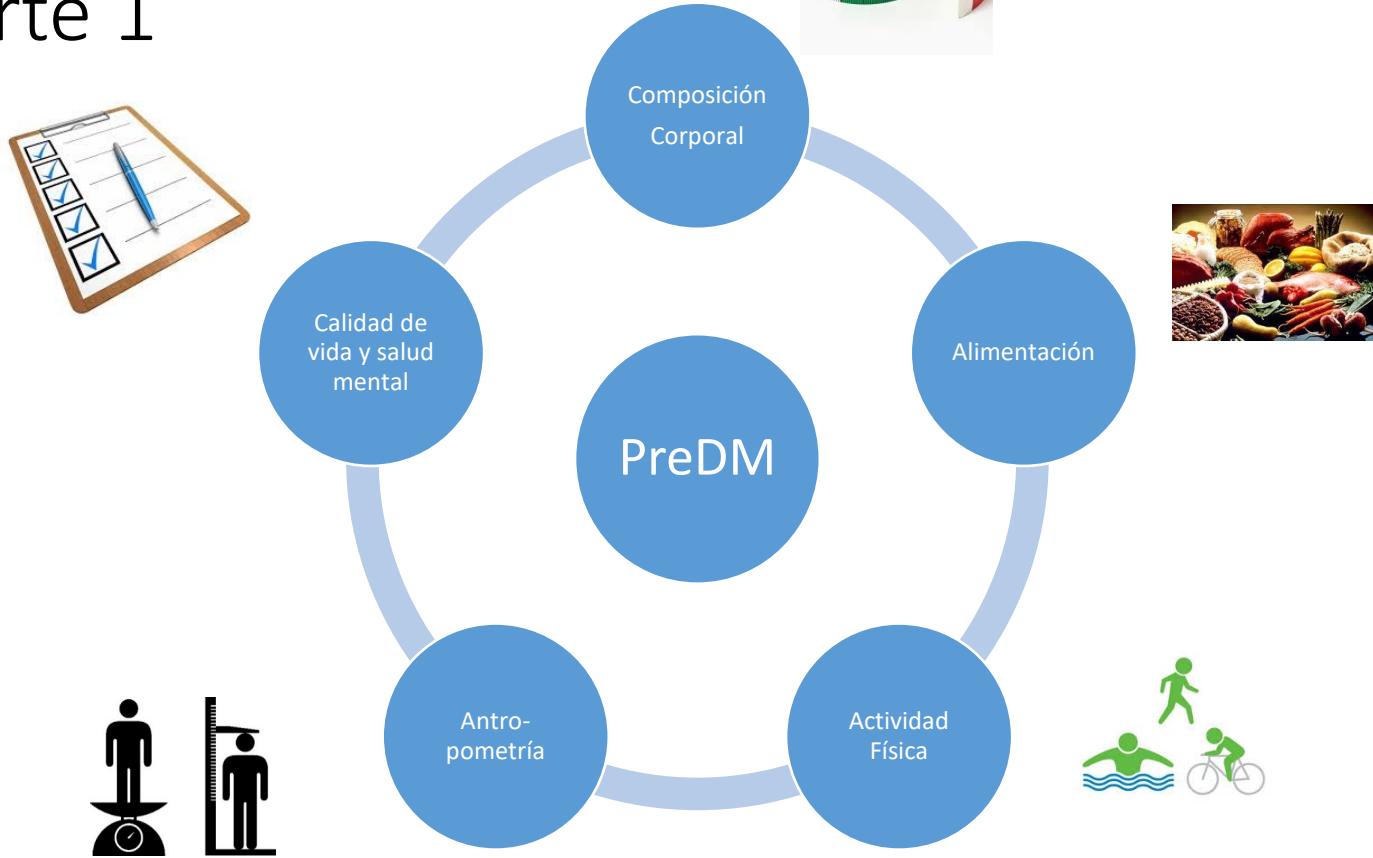
WP3: HETEROGENEIDAD

Two DP-Next cohorts

Cohorte 1

PreDM

Composición Corporal

Alimentación

Actividad Física

Antro-pometría

Calidad de vida y salud mental

WP3: HETEROGENEIDAD
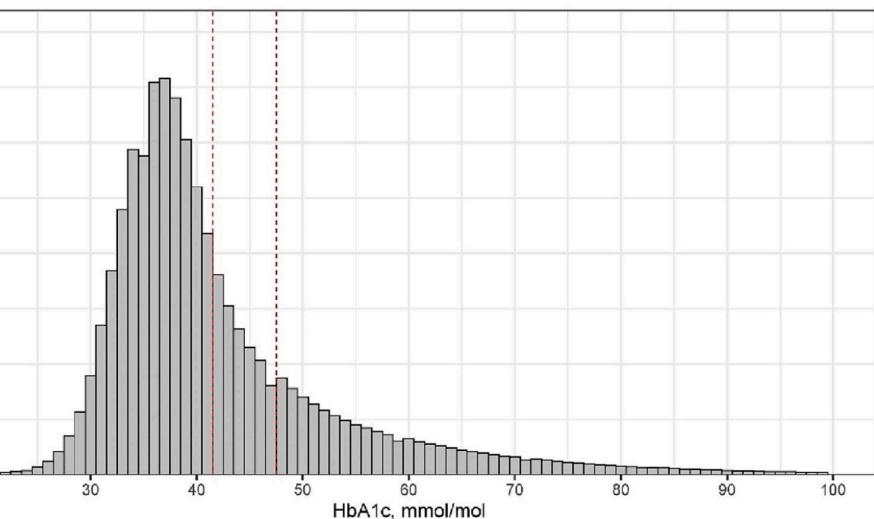
Nueva cohorte con fenotipificación profunda:
Reclutamiento de 1000 nuevos participantes en Dinamarca, Groenlandia y las Islas Feroe

Inclusión:
Edad: 40-50
HbA1c: 42-47 mmol/mol
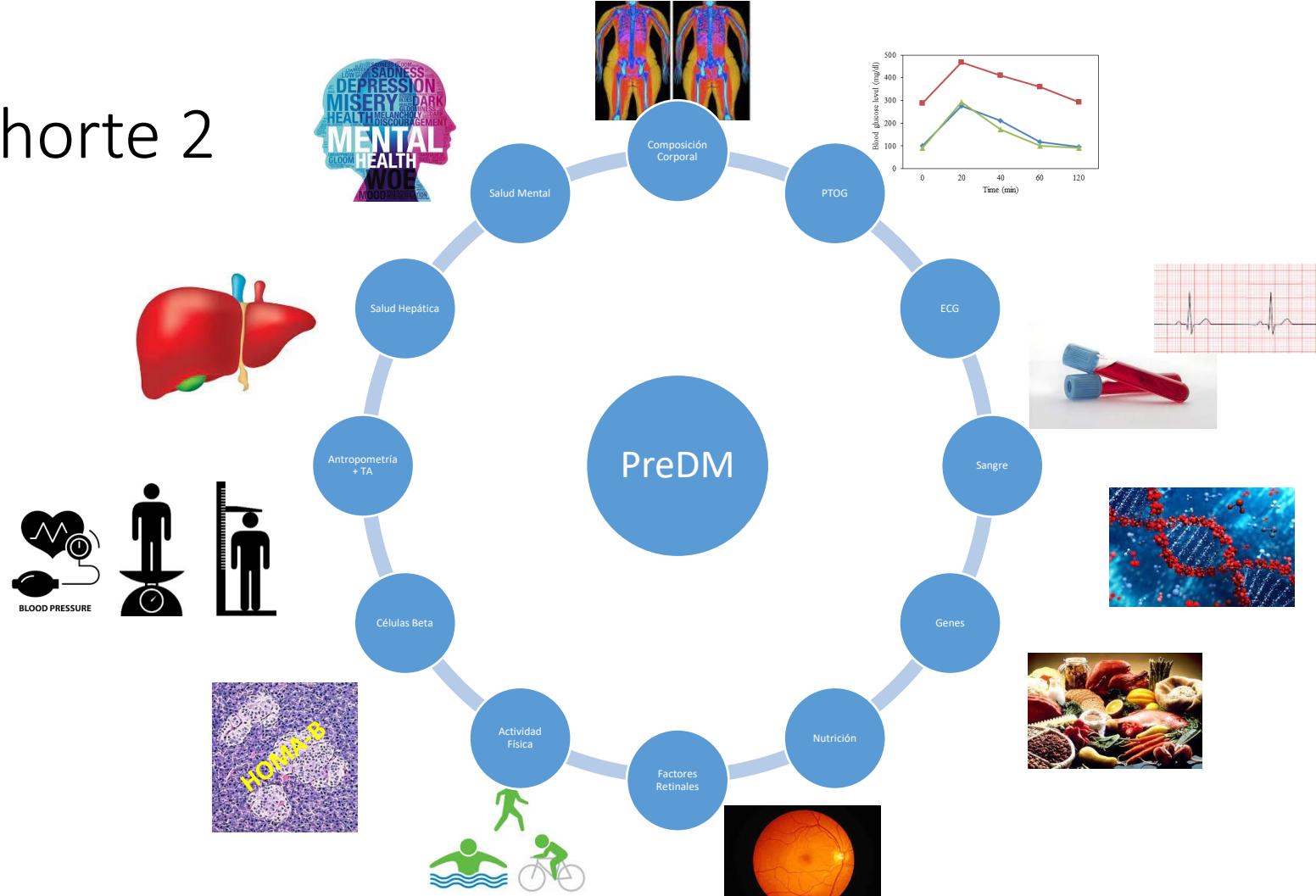
Desenlace: Incidencia de diabetes tipo 2

Exclusión: medicamentos hipoglucemiantes

Cohorte 2

PreDM

Composición Corporal · PTOG · ECG · Sangre · Genes · Nutrición · Factores Retinales · Actividad Física · Células Beta · Antropometría + TA · Salud Hepática · Salud Mental

WP3: HETEROGENEIDAD

Protocolo Central:

Cuestionario en línea

Examen clínico (4 horas):
- Antropometría (altura, peso, relación cintura-cadera y DEXA-scan)
- Prueba de tolerancia oral a la glucosa de 5 puntos
- Elastografía hepática
- Presión arterial, variabilidad de la frecuencia cardíaca y velocidad de las ondas del pulso

Monitoreo en casa:
- Monitor combinado de frecuencia cardíaca/acelerómetro 7 días después de la visita

Cohorte 2+

PreDM

- Composición Corporal
- Salud Mental
- Salud Hepática
- Antropometría + TA
- Células Beta
- Actividad Física
- Factores Retinales
- Nutrición
- Genes
- Sangre
- ECG
- PTOG

WP3: HETEROGENEIDAD

Protocolo Central:

Cuestionario en línea

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Monitoreo en casa:
- Monitor combinado de frecuencia cardíaca/acelerómetro 7 días después de la visita

Ambición para un protocolo detallado:

Monitoreo en casa:

- Presión arterial ambulatoria de 24 horas
- Monitoreo cardiorrespiratorio
- Monitoreo continuo de la glucosa
- Diarios de dieta basados en aplicaciones

Subcohorte con un segundo examen (300):
- Tomografía de coherencia óptica
- Escáner hepático con resonancia magnética
- PTOG con corticoesteroides orales de corto plazo
- Análisis ómicos exhaustivos en materiales de biobancos

WP4: DESARROLLO DE INTERVENCIONES

Desarrollar y evaluar la factibilidad un nuevo conjunto de intervenciones basadas en el Enfoque Participativo de Dinámica de Sistemas (PSDA) para prevenir la diabetes en grupos destinatarios de alto riesgo definidos en WP2.

WP4: DESARROLLO DE INTERVENCIONES

Desarrollo en co-creación:

Participación de ciudadanos, familias, organizaciones locales, municipios y proveedores de atención sanitaria.

Aborda la salud desde un enfoque sistémico en lugar de solo a nivel individual

WP4: DESARROLLO DE INTERVENCIONES

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Aborda la salud desde un enfoque sistémico en lugar de solo a nivel individual

Método:
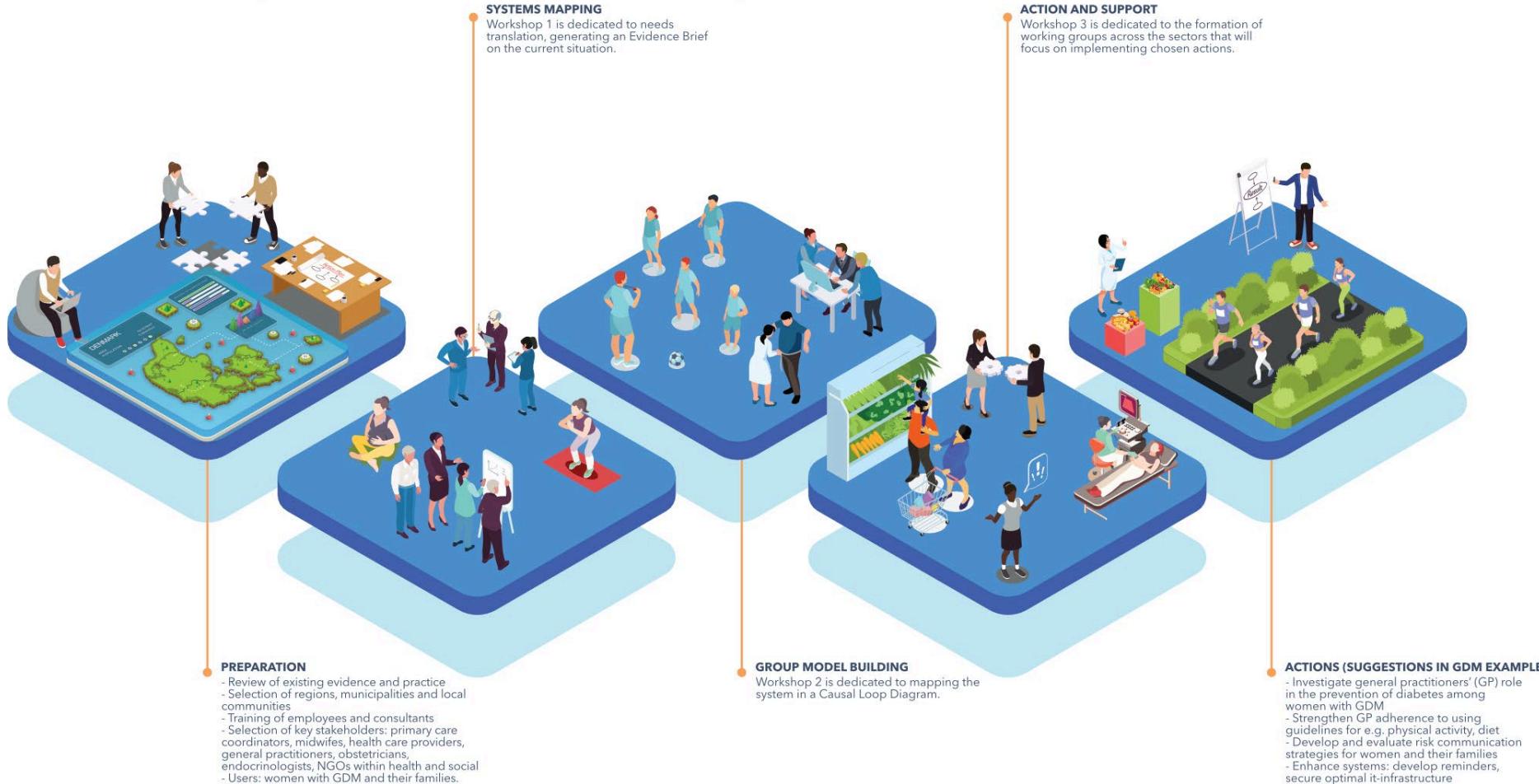
Enfoque Participativo de Dinámica de Sistemas (PSDA):
- ETAPA 1: Preparación
- ETAPA 2: Construcción de modelos de grupo y mapeo de sistemas
- ETAPA 3: Implementación de acciones, apoyo y seguimiento
- Evaluación
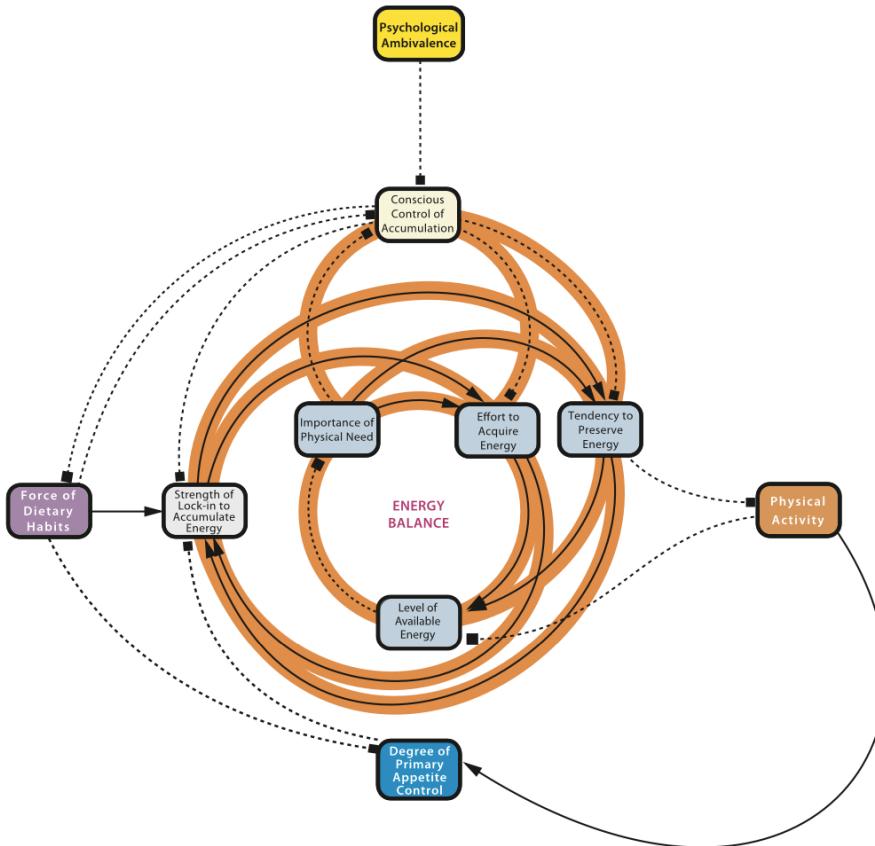
Grupos destinatarios:
Grupos de riesgo definidos en WP2
Por ejemplo: mujeres con antecedentes de diabetes gestacional
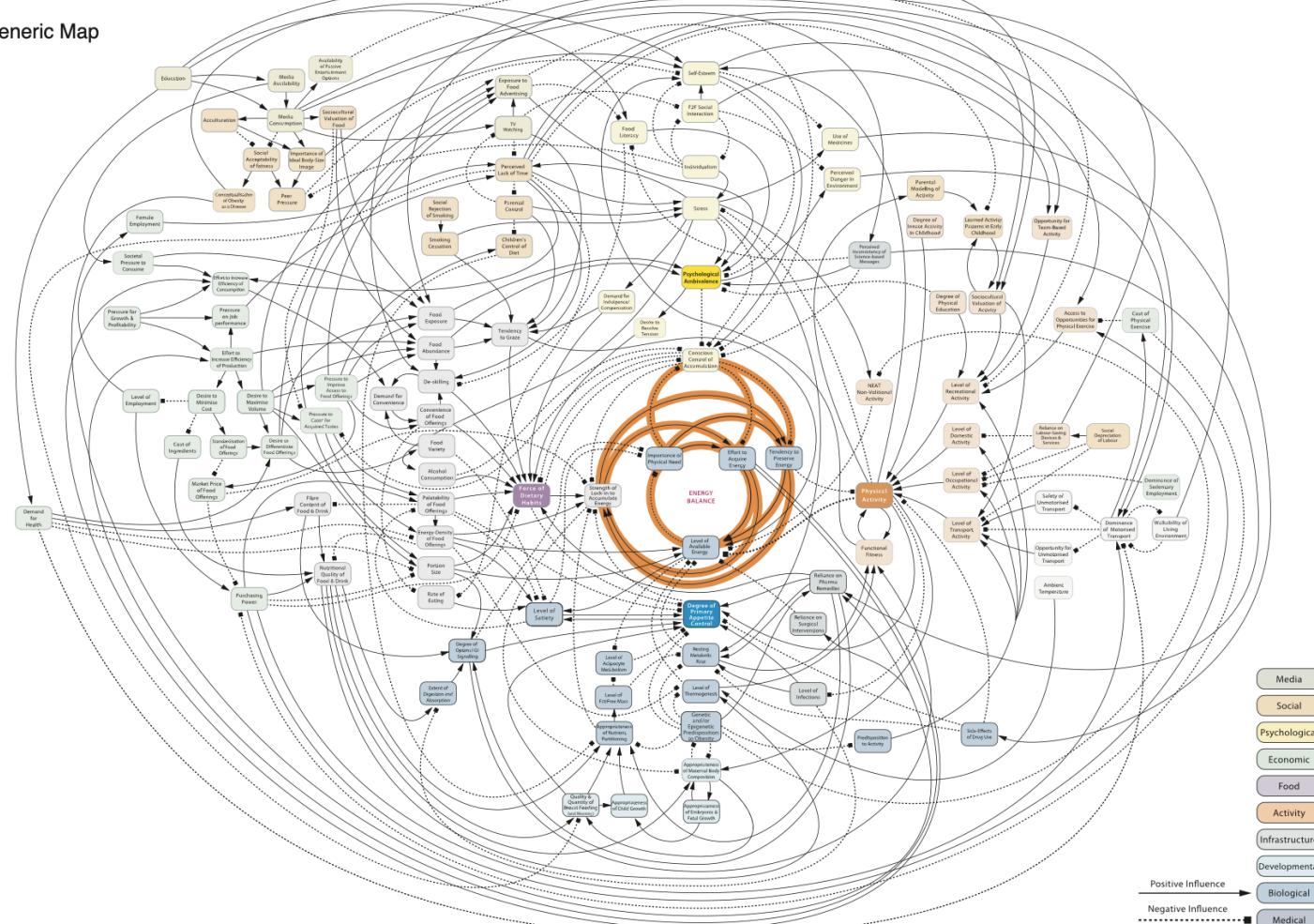
WP4: Participatory System Dynamics Approach (PSDA)

SYSTEMS MAPPING
Workshop 1 is dedicated to needs translation, generating an Evidence Brief on the current situation.

ACTION AND SUPPORT
Workshop 3 is dedicated to the formation of working groups across the sectors that will focus on implementing chosen actions.

PREPARATION
- Review of existing evidence and practice
- Selection of regions, municipalities and local communities
- Training of employees and consultants
- Selection of key stakeholders: primary care coordinators, midwifes, health care providers, general practitioners, obstetricians, endocrinologists, NGOs within health and social
- Users: women with GDM and their families.

GROUP MODEL BUILDING
Workshop 2 is dedicated to mapping the system in a Causal Loop Diagram.

ACTIONS (SUGGESTIONS IN GDM EXAMPLE)
- Investigate general practitioners' (GP) role in the prevention of diabetes among women with GDM
- Strengthen GP adherence to using guidelines for e.g. physical activity, diet
- Develop and evaluate risk communication strategies for women and their families
- Enhance systems: develop reminders, secure optimal it-infrastructure

Department of Innovation Universities and Skills (2007). Foresight Tackling Obesities: Future Choices – Building the Obesity System Map

Map 0

Full Generic Map

Department of Innovation Universities and Skills (2007). Foresight Tackling Obesities: Future Choices – Building the Obesity System Map

Overview

What is DP-Next?

DP-Next is a project aimed at developing a sustainably effective strategy for prevention of Type 2 Diabetes in Denmark, Greenland and the Faroe Islands. The project has been funded by a Steno National Collaborative Grant from the [Novo Nordisk Foundation](#) and will officially start on the 1st of September 2025. The full name of the project is: Sustainable Type 2 Diabetes Prevention for the 21st Century. We call it DP-Next because we intend to develop the next generation of Diabetes Prevention strategies.

Why is a new strategy for diabetes prevention necessary?

We have known for over two decades that it is possible -*in principle*- to prevent Type 2 Diabetes in people at very high risk by encouraging them to participate in a very intensive lifestyle modification program.

▼ The original Diabetes Prevention Studies were conducted around the turn of the century.
- The [Diabetes Prevention Program](#) (USA)
- The [Diabetes Prevention Study](#) (Finland)
- The [Da Qing Study](#) (China)

Unfortunately, subsequent efforts to translate the benefits from these efficacy trials into sustainable day to day practice have largely failed. The first main issue is that the resources and intensity of the trial interventions are not practically achievable at large scale. Studies that have applied less intensive lifestyle interventions have generally shown only temporary impacts on weight, but no long-term impact on diabetes incidence. The second main issue is that the particular subgroup of pre-diabetes recruited into the trials (IGT) is the group at highest diabetes risk, but is rarely identified in daily practice especially since HbA1c has replaced the oral glucose tolerance test (OGTT) as the main diagnostic tool in Europe and the US since 2014. A third issue is that the proportion of people who respond to an invitation to participate in health-related programs has fallen substantially. Unfortunately the people with the highest risk profile are generally the least likely to respond.

Who We Are

DP-Next will be carried out by a cross-disciplinary team of epidemiologists, clinicians, health scientists and data scientists across all seven Steno Diabetes Centres:

Daniel R. Witte

Daniel Witte is professor of Diabetes Epidemiology at Aarhus University and has worked across various themes in prevention and prediction of diabetes and its complications in (inter)national cohorts and register-based studies. He will be the Principal Investigator of the DP-Next project.

Luke Johnston is a team leader at SDCA on the Seedcase Project, a NNF-funded software and training-based project that aims at improving research data engineering and management practices and knowledge. While he now largely develops software and training material, he has a PhD in Nutritional Sciences doing diabetes epidemiology, is a strong advocate for more openness and reproducibility in science, and works to improve operational and organizational practices on several larger projects across SDCA. He will be the work package leader for Work Package 1.

Luke W. Johnston

Stine Byberg is an epidemiologist and Senior researcher at Steno Diabetes Center Copenhagen, and currently also Head of Research at Steno Diabetes Center Greenland. Stine has extensive experience in both conducting and supervising students in prediction models using register-based data. Stine will be the work package leader for Work Package 2.

Stine Byberg

Claus Bogh Juhl is clinical professor at University Hospital of Southern Denmark, Esbjerg and program leader of Clinical Interventions at Steno Diabetes Center Odense. The has extensive experience in clinical research within type 2 diabetes, obesity and type 1 diabetes. He will be the work package leader for Work Package 3.

Claus Bogh Juhl

Jane Nautrup Østergaard is program leader at Steno Diabetes Center Aarhus. She is experienced in the application of the Participatory System Dynamics Approach for the co-creation of complex interventions. She will be the work package leader for Work Package 4.

Jane Nautrup Østergaard

Gunnar Toft is senior researcher at SDCA, with broad epidemiological experience and experience in coordination of international research projects. He will act as general coordinator of the DP-Next project.

Gunnar Toft

Karoline Kragelund Nielsen is a senior researcher and heads the reproductive & family health group at Steno Diabetes Center Copenhagen. She has vast experience with research related to GDM, prevention of type 2 diabetes and health systems research, including intervention, epidemiological and qualitative research. She will contribute to the project with her expertise within GDM, epidemiology and intervention research.

Karoline Kragelund Nielsen

Maria Skaalum Petersen, professor in health science, is Head of Research at SDCF together with Dr. Johannesen, endocrinologist. She is also head of the Department of Research at the National Hospital of the Faroe Islands. She has a broad epidemiological experience and experience in conducting research projects in the Faroe Islands. She will contribute to the project with her expertise within epidemiology and registry data in the Faroe Islands.

Maria Skaalum Petersen

Nicklas Højgaard–Hessellund Rasmussen, is a Senior Researcher and Associate Professor at Steno Diabetes Center North Jutland. He brings extensive expertise in research on the prevention of diabetic complications, including atypical manifestations. His work focuses on epidemiology and intervention research, with much of it funded by the Danish Diabetes and Endocrine Academy (DDEA). Within the DP-Next project, his contributions center on Work Package 3 (WP3).

Nicklas Højgaard–Hessellund Rasmussen

XIX Congreso Latinoamericano de DIABETES

Asociacion Latinoamericana de Diabetes ALAD

19-21 NOVIEMBRE 2025

CENTRO DE CONVENCIONES PALACIO MUNICIPAL CUSCO - PERÚ

GRACIAS

ORGANIZA

ALAD
Asociación Latinoamericana de Diabetes

daniel.witte@ph.au.dk

Agenda de la presentación

1- Registros de diabetes:
    ¿Qué son? ¿ Cuál es su utilidad? ¿ Cómo se integran?
    Algunos ejemplos de cómo utilizarlos
    ¿Existen registros de diabetes en América Latina?

2- De Dinamarca para América Latina
    El proyecto de internacionalización del Steno Diabetes Center Aarhus
    El proyecto LatinDiab-1

3- Conclusiones y mensajes para llevar

¿Qué es un registro?
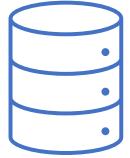
"Archivo de datos relativos a todos los casos de una enfermedad particular u otra condición relevante para la salud en una población definida, de modo que los casos puedan relacionarse con una base poblacional"

Porta, M. (2014). Register, Registry. In A Dictionary of Epidemiology. Oxford University Press. Retrieved 30 Aug. 2025, from https://www-oxfordreference-com.ez.statsbiblioteket.dk/view/10.1093/acref/9780199976720.001.0001/acref-9780199976720-e-1611.
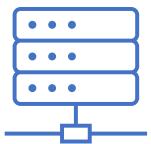
*"Un sistema de datos individualizados, es decir, un mecanismo de **registro continuo** o de **vinculación coordinada** de información seleccionada relativa a cada miembro de la población residente de un país, de tal manera que permita determinar información actualizada sobre el tamaño y las características de esa población en intervalos de tiempo seleccionados"*

United Nations. 2014. Principles and recommendations for a vital statistics system, Revision 3. In: United Nations. 1969. Methodology and evaluation of population registers and similar systems. New York: United Nations. Paragraph 454. 2https://stats.oecd.org/glossary/detail.asp?ID=2089
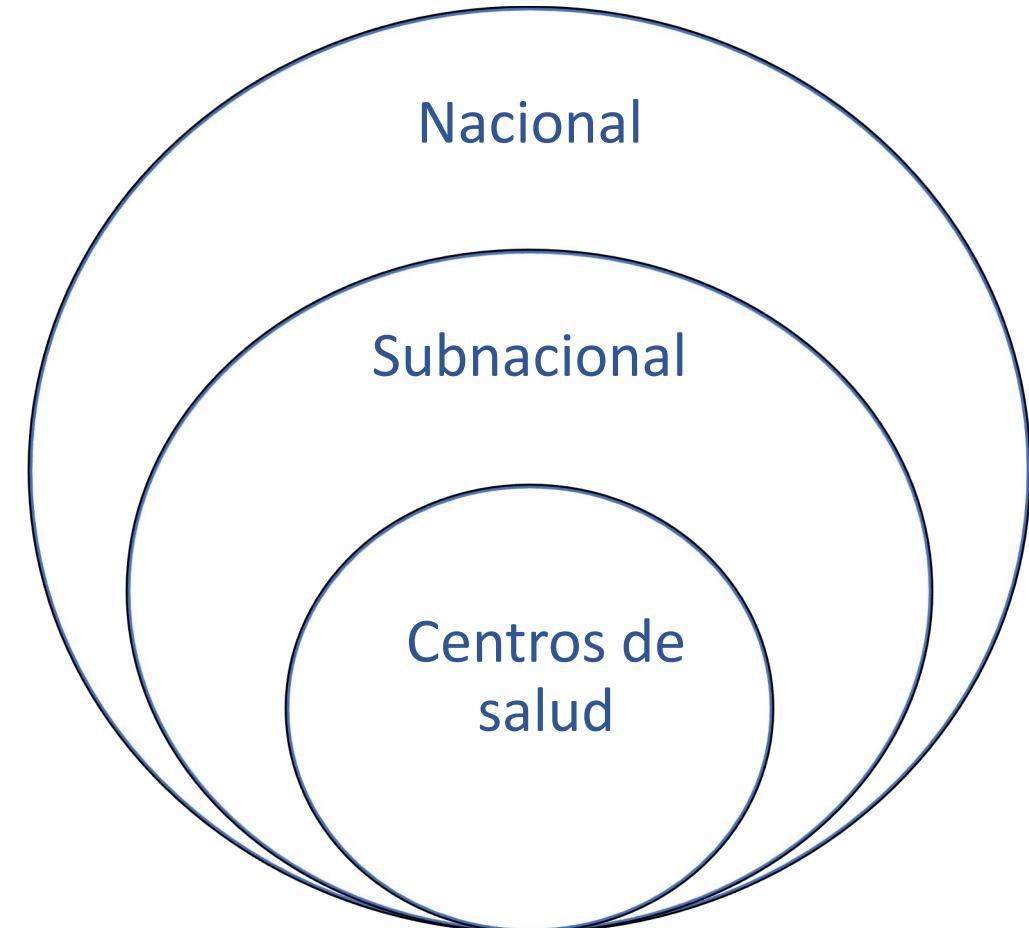
1- Registros de diabetes

¿Qué es un registro de diabetes?

"Es una base de datos específica de personas afectadas por la diabetes, que incluye una lista de pacientes, información de laboratorio, complicaciones de la enfermedad e historial familiar."

Nacional

Subnacional

Centros de salud

Registries and information systems for diabetes care in the WHO European Region: preliminary findings for consultation

¿Cuál es el valor de los registros?
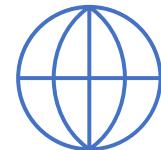
Evaluación comparativa

Monitoreo, vigilancia y planeación del sistema de salud

Empoderamiento de personas que viven con diabetes
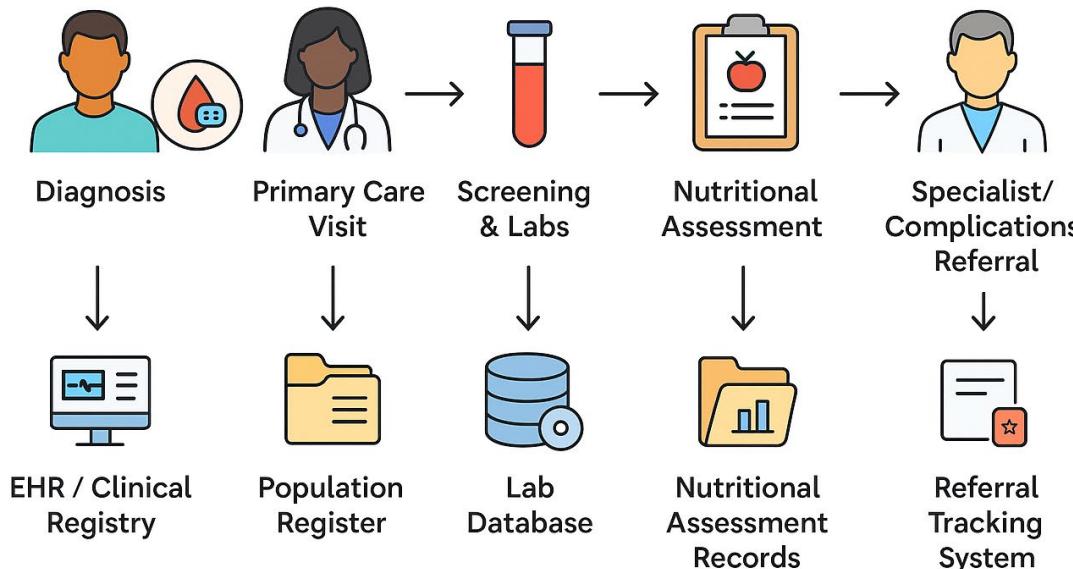
Evidencia del mundo real

Investigación

Diabetes Registries. Enabling high quality diabetes care. European Diabetes Forum
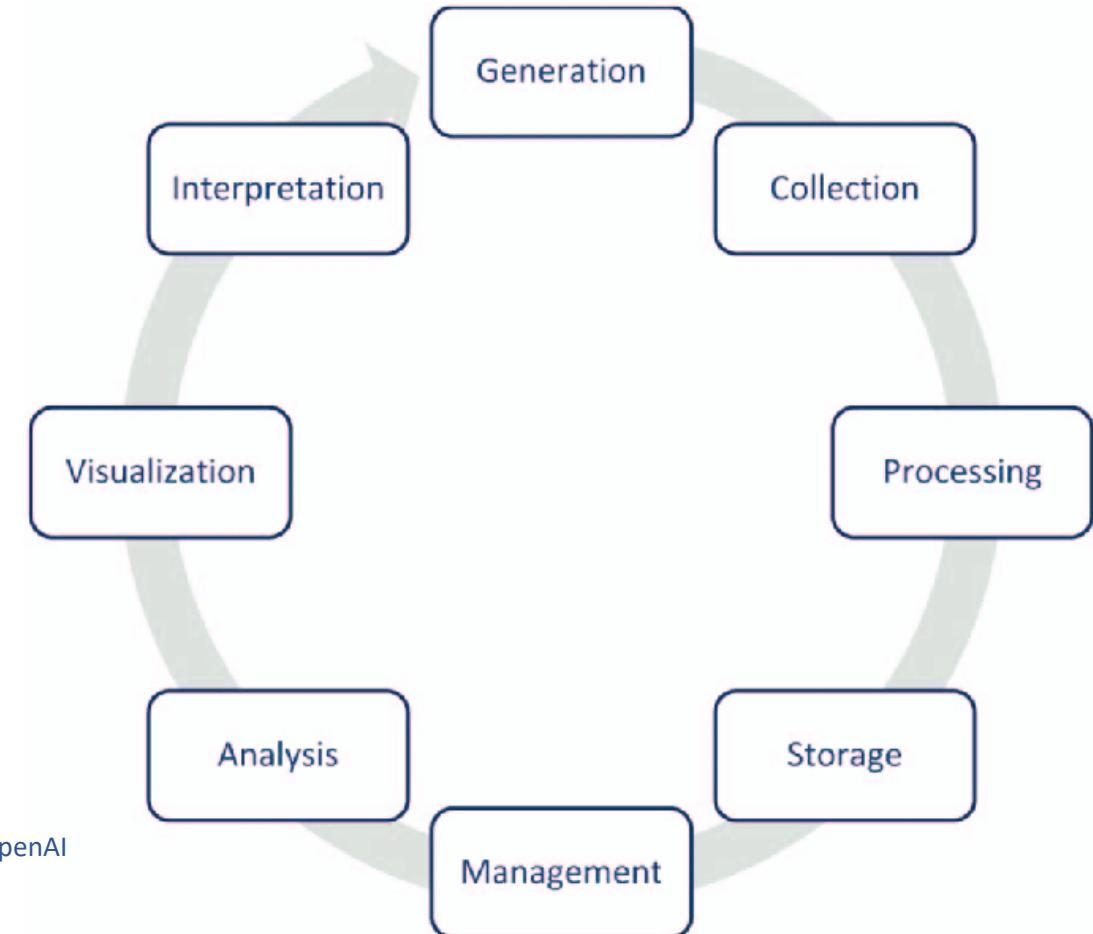
Antes de seguir adelante…

CLINICAL CARE PATHWAY OF PEOPLE LIVING WITH DIABETES

Diagnosis → Primary Care Visit → Screening & Labs → Nutritional Assessment → Specialist/ Complications Referral

- Diagnosis → EHR / Clinical Registry
- Primary Care Visit → Population Register
- Screening & Labs → Lab Database
- Nutritional Assessment → Nutritional Assessment Records
- Specialist/ Complications Referral → Referral Tracking System
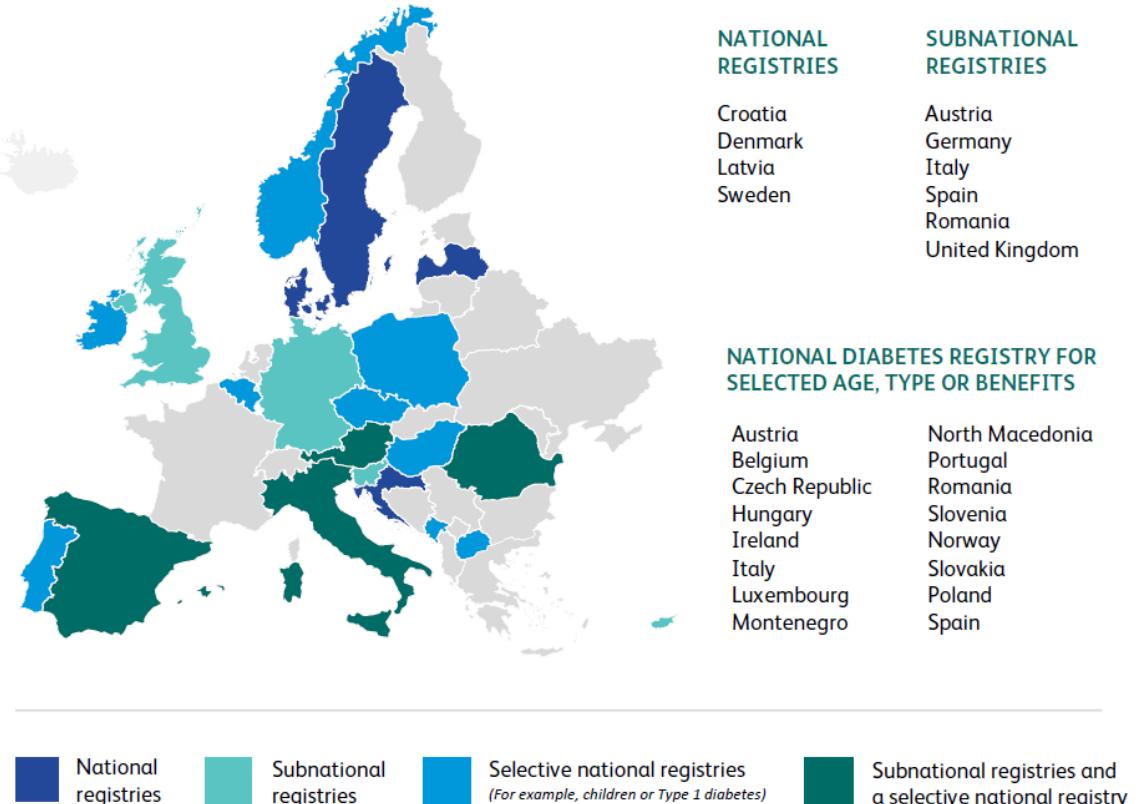
ChatGPT. (2025). *Clinical care pathway of people living with diabetes [AI-generated infographic].* Created with OpenAI

Generation — Collection — Processing — Storage — Management — Analysis — Visualization — Interpretation

Lund, Brady, and Ting Wang. "What Does Information Science Offer for Data Science Research?: A Review of Data and Information Ethics Literature" Journal of Data and Information Science, vol. 7, no. 4, Chinese Academy of Sciences, National Science Library, 2022, pp. 16-38. https://doi.org/10.2478/jdis-2022-0018

¿En donde hay registros de diabetes implementados?

NATIONAL REGISTRIES

Croatia
Denmark
Latvia
Sweden

SUBNATIONAL REGISTRIES

Austria
Germany
Italy
Spain
Romania
United Kingdom

NATIONAL DIABETES REGISTRY FOR SELECTED AGE, TYPE OR BENEFITS

Austria
Belgium
Czech Republic
Hungary
Ireland
Italy
Luxembourg
Montenegro

North Macedonia
Portugal
Romania
Slovenia
Norway
Slovakia
Poland
Spain

National registries

Subnational registries

Selective national registries
(For example, children or Type 1 diabetes)

Subnational registries and a selective national registry

Diabetes Registries. Enabling high quality diabetes care. European Diabetes Forum

Características del sistema de salud Danés

- **Sistema de salud universal** financiado por los impuestos, con derecho basado en la residencia

- **Identificador personal único** asignado a cada residente en Dinamarca, permitiendo vinculación a nivel individual de todos los registros con seguimiento de por vida

- **Registros nacionales** que se mantienen por el gobierno, proveen fuentes longitudinales de **recolección rutinaria** de información administrativa, salud, calidad clínica

Schmidt M, Pedersen L, Sørensen HT. The Danish Civil Registration System as a tool in epidemiology. Eur J Epidemiol. 2014 Aug;29(8):541-9. doi: 10.1007/s10654-014-9930-3. Epub 2014 Jun 26. PMID: 24965263.

Registros nacionales
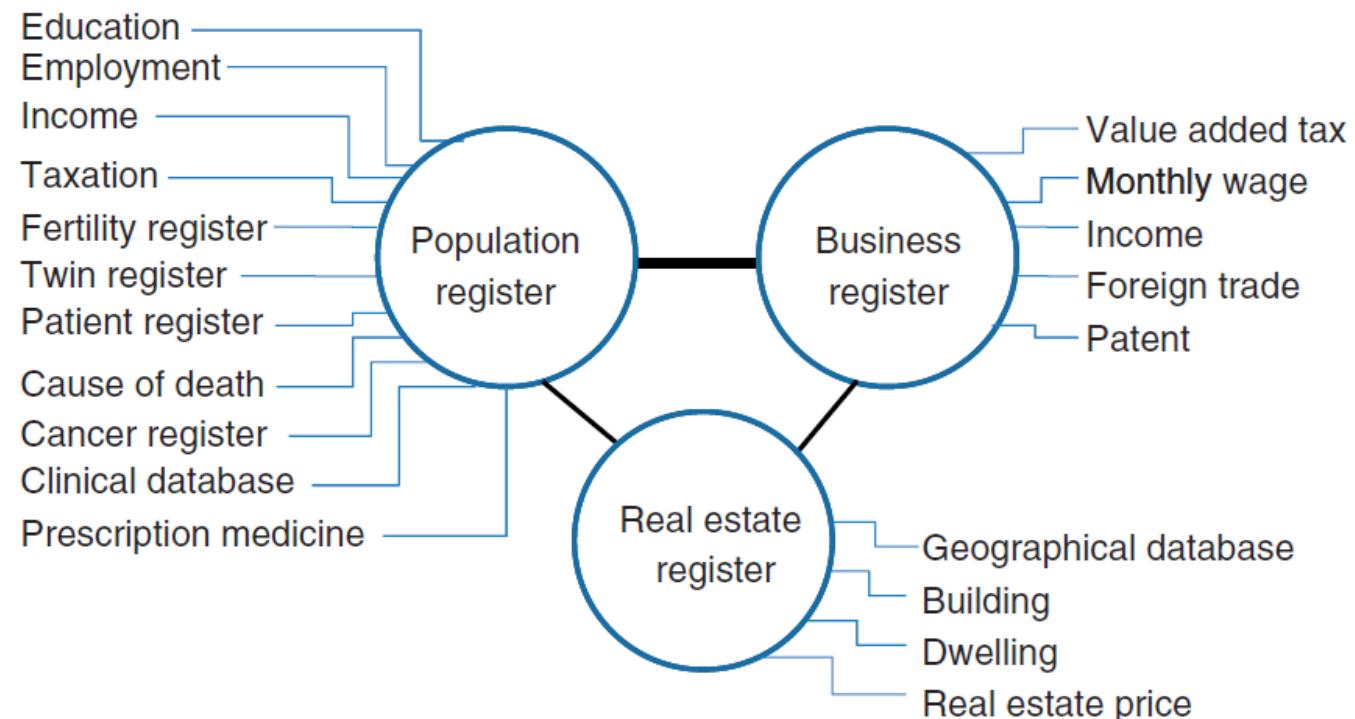
Figure 1. Schematic presentation of the base registers in Denmark. Linkage between all registers through three base registers. The keys are the personal identification number (CPR-number), the business identification number (SE/CVR-number) and the housing identification number (BBR-number). Inspired by Wallgren and Wallgren (2007) [4].

Thygesen LC, Ersbøll AK. Danish population-based registers for public health and health-related welfare research: introduction to the supplement. Scand J Public Health. 2011 Jul;39(7 Suppl):8-10. doi: 10.1177/1403494811409654. PMID: 21775344.

Identificador personal único
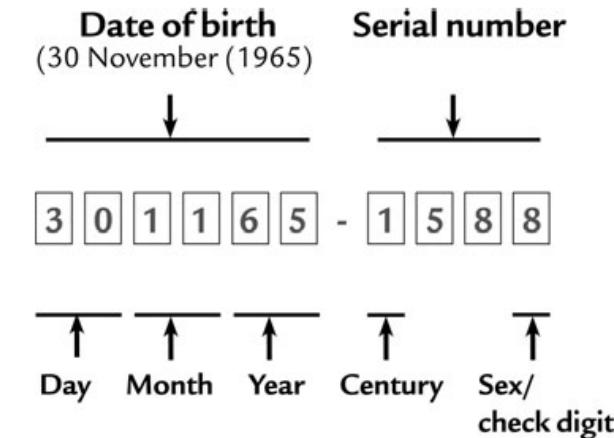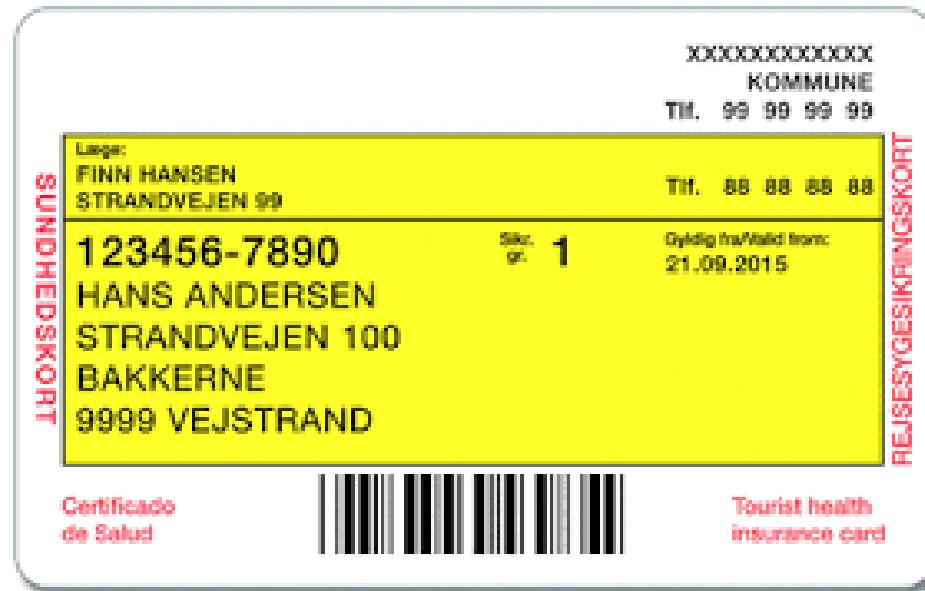
Figure 1 The Civil Personal Register (CPR) number.

Schmidt M, Pedersen L, Sørensen HT. The Danish Civil Registration System as a tool in epidemiology. Eur J Epidemiol. 2014 Aug;29(8):541-9. doi: 10.1007/s10654-014-9930-3. Epub 2014 Jun 26. PMID: 24965263.

Registros nacionales
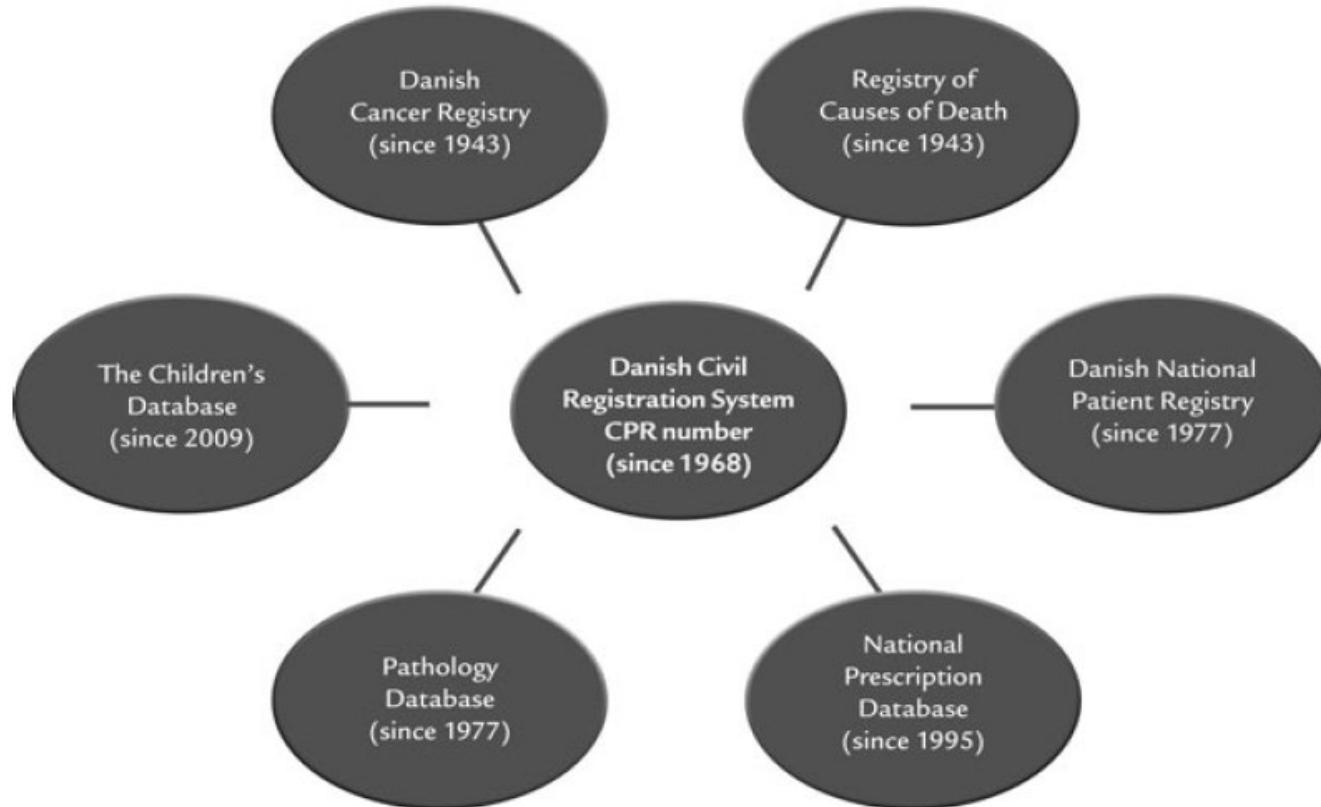
Figure 2 Examples of Danish National Health Registers.

Mainz J, Hess MH, Johnsen SP. The Danish unique personal identifier and the Danish Civil Registration System as a tool for research and quality improvement. Int J Qual Health Care. 2019 Nov 30;31(9):717-720. doi: 10.1093/intqhc/mzz008. PMID: 31220255.

¿Cómo se construye el registro nacional de diabetes en Dinamarca?

Open **S**ource **D**iabetes **C**lassifier

https://steno-aarhus.github.io/osdc/

Segunda ocurrencia de cualquier evento:

Mediciones de HbA1c ≥48 mmol/mol (6,5 %)	Diagnósticos hospitalarios de diabetes
Servicios específicos para la diabetes recibidos por un podólogo	Compra de hipoglucemiantes orales
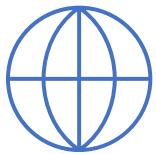
Isaksen AA, Sandbæk A, Bjerg L. Validation of Register-Based Diabetes Classifiers in Danish Data. Clin Epidemiol. 2023 May 5;15:569-581. doi: 10.2147/CLEP.S407019. PMID: 37180566; PMCID: PMC10167973.

14

Algunos ejemplos de su uso

Vigilancia epidemiológica
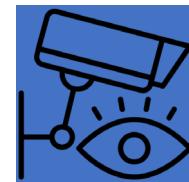
Table 1 Average change (%/year) in prevalence, incidence, mortality and SMR of diabetes in Denmark over the period 1996–2016

% per year		Men		Women	
		Change	95% CI	Change	95% CI
Prevalence	T1D	0.51	(0.46 to 0.57)	0.52	(0.46 to 0.59)
	T2D	5.64	(5.61 to 5.67)	5.22	(5.19 to 5.24)
Incidence	T1D	−3.27	(−3.59 to −2.94)	3.78	(−4.19 to −3.37)
	T2D	3.43	(3.15 to 3.61)	3.16	(2.98 to 3.34)
Mortality	T1D	−0.51	(−1.34 to −0.33)	−0.17	(−1.19 to −0.86)
	T2D	−3.30	(−3.48 to −3.13)	−2.53	(−2.73 to −2.33)
SMR	T1D	2.55	(1.69 to 3.42)	2.45	(1.40 to 3.51)
	T2D	−0.46	(−0.28 to −0.64)	−0.23	(−0.44 to −0.03)
Follow-up only >2005					
Mortality	T1D	−5.10	(−3.53 to −6.63)	−4.98	(−2.88 to −7.03)
	T2D	−3.64	(−3.36 to −3.92)	−3.06	(−2.74 to −3.38)
SMR	T1D	−1.89	(−0.28 to −3.48)	−2.28	(−0.07 to −4.36)
	T2D	−0.72	(−0.43 to −1.01)	−0.60	(−0.27 to −0.92)

SMR, standardized mortality ratio; T1D, type 1 diabetes; T2D, type 2 diabetes.
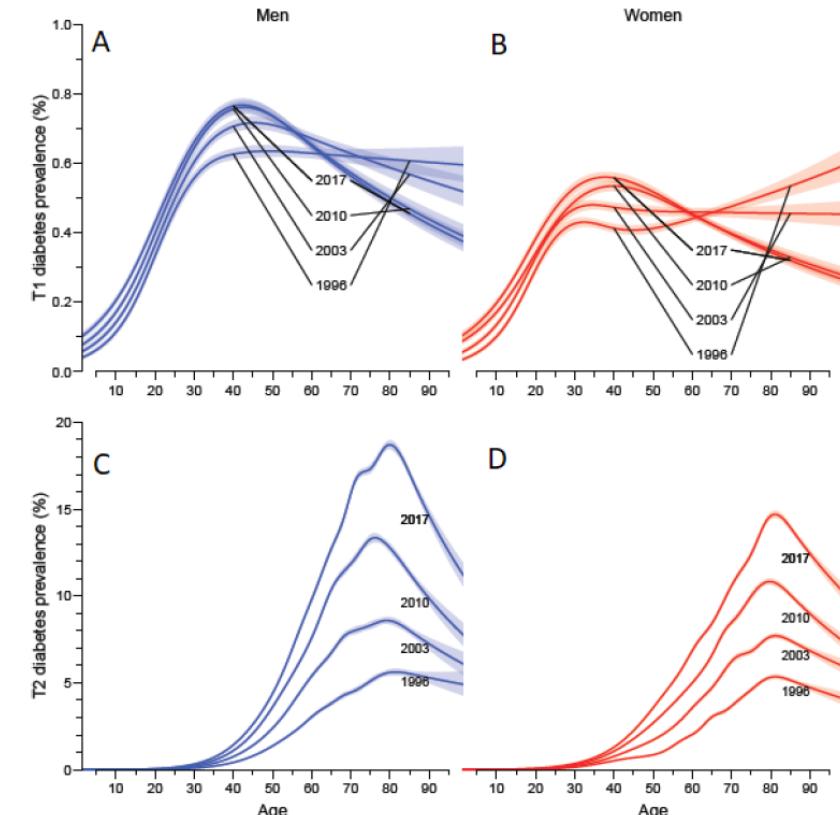
Figure 1 Age-specific prevalence of type 1 diabetes (A, B) and type 2 diabetes (C, D) in Denmark as of 1 January 1996, 2003,..., 2017. Note the different y-axes in the upper and lower panels. Blue curves are men, red curves women; shaded areas represent 95% CIs. (A) men, type 1 diabetes; (B) women, type 1 diabetes; (C) men, type 2 diabetes; (D) women, type 2 diabetes.

Carstensen B, Kristensen JK, Marcussen MM, Borch-Johnsen K. The National Diabetes Register. Scand J Public Health. 2011 Jul;39(7 Suppl):58-61. doi: 10.1177/1403494811404278. PMID: 21775353.

Estimación de costos

DOI: 10.1111/dme.15455

RESEARCH ARTICLE
Health Economics

DIABETIC Medicine

Attributable one-year healthcare cost of incident type 2 diabetes: A population-wide difference-in-differences study in Denmark

Eskild Klausen Fredslund | Annelli Sandbæk | Thim Prætorius

What this study has found?
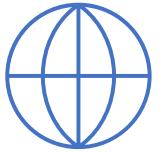
- Using dual strategy combining propensity score matching and difference in difference estimation we found an attributable cost of incident type 2 diabetes of EUR 1316 in the first year after diagnosis. The main cost component is hospital care costs.

What are the implications of the study?

- Our study provides a population based causal estimate of the 1year cost attributable to incident type 2 diabetes. This estimate should be taken into account when planning prevention and delivery of health care for individuals at risk of developing diabetes.

Estimación de costos

FIGURE 3   Development in use of hospital care – in patient care and outpatient care with diabetes, CVD, kidney disease or other primary diagnosis. The blue line indicates the shift from pre to post diagnosis.

	Attributable quarterly costs (EUR)	95% CI
Prescription medication—antidiabetics	12.86	[12.65,13.07]
Prescription medication—GLP-1Aa	11.40	[10.94,11.86]
Prescription medication—SGLT-2a	5.31	[5.13,5.49]
Prescription medication—non antidiabetics	6.66	[5.33,7.99]
Total costs prescription medication	36.23	[34.15, 38.31]
Total primary care cost	41.69	[40.44,42.93]
Hospital cost—T2D diagnosis outpatient	16.52	[15.93,17.11]
Hospital cost—T2D diagnosis inpatient	20.02	[17.57,22.47]
Hospital cost—CVD diagnosis outpatient	5.06	[3.18,6.94]
Hospital cost—CVD diagnosis inpatient	9.25	[0.70,17.80]
Hospital cost—Kidney diagnosis outpatient	2.77	[0.72,4.82]
Hospital cost—Kidney diagnosis inpatient	2.05	[−0.75,4.85]
Hospital cost—Other diagnosis outpatient	76.32	[62.11,90.54]
Hospital cost—Other diagnosis inpatient	119.20	[91.75,146.6]
Total hospital outpatient costs	100.67	[81.94, 119.4]
Total hospital inpatient costs	150.52	[109.27, 191.72]

Note: 95% confidence intervals in brackets.

Fredslund EK, Sandbæk A, Prætorius T. Attributable one-year healthcare cost of incident type 2 diabetes: A population-wide difference-in-differences study in Denmark. Diabet Med. 2025 Mar;42(3):e15455. doi: 10.1111/dme.15455. Epub 2024 Oct 16. PMID: 39415474; PMCID: PMC11823369.

Planeación del sistema de salud
Práctica clínica

Cumulative risk of diabetic foot complications in risk groups of type 1 and type 2 diabetes: Real-world evidence from a 22-year follow-up study

Abhilasha Akerkar MMSc[1,2] | Pernille F. Rønn PhD[1] | Vanja Kosjerina MD[1] | Christian Stevns Hansen MD[1] | Adam Hulman PhD[3,4] | Frederik Persson MD[1] | Anne Rasmussen MSc[1] | Peter Rossing MD[1,5] | Tarunveer S. Ahluwalia PhD[1,2,6]

Objetivo: estimar el riesgo acumulado de úlceras por pie diabético en grupos de riesgo de diabetes tipo 1 y tipo 2, utilizando una regla simple de estratificación de riesgo, basado en el sistema de estratificación de riesgo de 4 niveles del Grupo de Trabajo Internacional sobre pie diabético

Akerkar A, Rønn PF, Kosjerina V, Hansen CS, Hulman A, Persson F, Rasmussen A, Rossing P, Ahluwalia TS. Cumulative risk of diabetic foot complications in risk groups of type 1 and type 2 diabetes: Real-world evidence from a 22-year follow-up study. Diabetes Obes Metab. 2025 Apr;27(4):2284-2287. doi: 10.1111/dom.16200. Epub 2025 Jan 22. Erratum in: Diabetes Obes Metab. 2025 Jun;27(6):3552. doi: 10.1111/dom.16381. PMID: 39838911; PMCID: PMC11885098.

Planeación del sistema de salud
Práctica clínica

TABLE 1 Cumulative risk of developing diabetic foot complications every year after baseline, based on risk-stratification method 1 (LOPS/PAD).

	Yearly cumulative risk[a]				
	Year 1	Year 2	Year 3	Year 4	Year 5
Type 1 diabetes					
High risk	1.36% (1.26%–1.49%)	2.67% (2.46%–2.91%)	3.92% (3.62%–4.27%)	5.12% (4.73%–5.58%)	6.28% (5.79%–6.84%)
Low risk	0.07% (0.05%–0.1%)	0.13% (0.09%–0.2%)	0.2% (0.13%–0.3%)	0.25% (0.17%–0.39%)	0.31% (0.21%–0.48%)
Type 2 diabetes					
High risk	1.54% (1.43%–1.65%)	2.98% (2.77%–3.19%)	4.31% (4.01%–4.62%)	5.56% (5.17%–5.95%)	6.72% (6.26%–7.19%)
Low risk	0.14% (0.1%–0.21%)	0.27% (0.18%–0.41%)	0.39% (0.26%–0.58%)	0.5% (0.33%–0.74%)	0.6% (0.4%–0.89%)

[a]Cumulative risk has been expressed as a percentage with 95% confidence intervals (CIs).
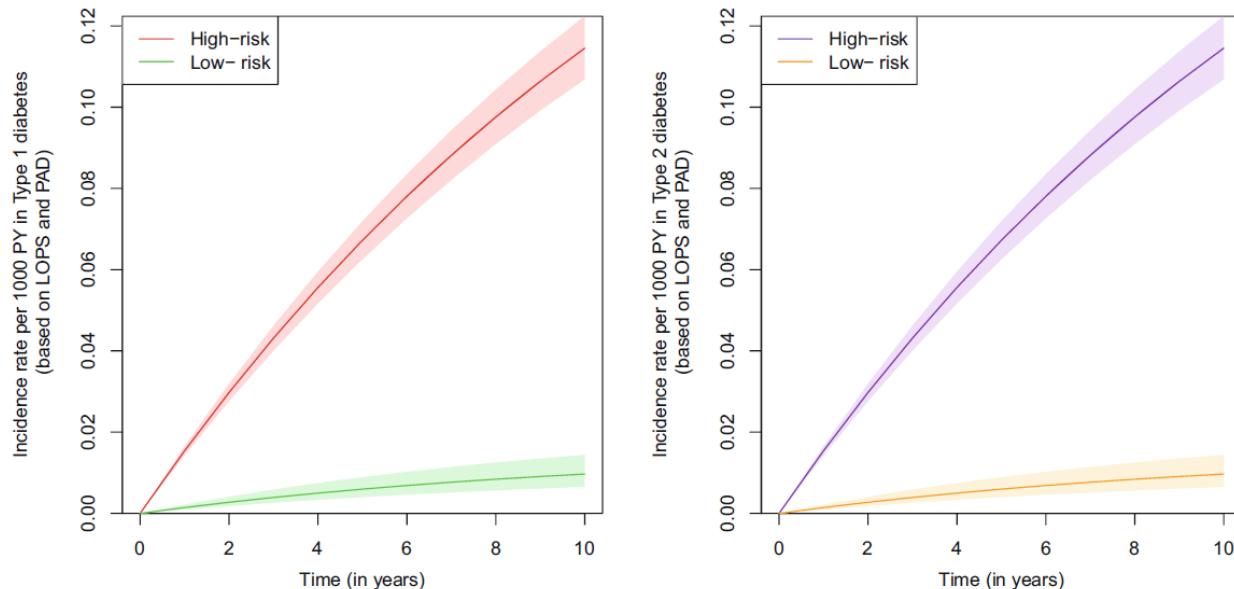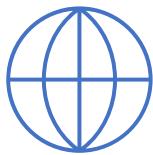
FIGURE 1 Unadjusted incidence rate of diabetic foot complications (DFCs) in type 1 and type 2 diabetes, based on risk-stratification method 1 (LOPS and PAD). Shaded areas represent 95% confidence intervals.

Akerkar A, Rønn PF, Kosjerina V, Hansen CS, Hulman A, Persson F, Rasmussen A, Rossing P, Ahluwalia TS. Cumulative risk of diabetic foot complications in risk groups of type 1 and type 2 diabetes: Real-world evidence from a 22-year follow-up study. Diabetes Obes Metab. 2025 Apr;27(4):2284-2287. doi: 10.1111/dom.16200. Epub 2025 Jan 22. Erratum in: Diabetes Obes Metab. 2025 Jun;27(6):3552. doi: 10.1111/dom.16381. PMID: 39838911; PMCID: PMC11885098.

Investigación

BMJ Open Cohort profile: Health in Central Denmark (HICD) cohort - a register-based questionnaire survey on diabetes and related complications in the Central Denmark Region

Lasse Bjerg [1,2] Else-Marie Dalsgaard,[1] Kasper Norman,[1] Anders Aasted Isaksen,[3] Annelli Sandbæk[1,3]

Cluster	Invited, n	Participants, n (%)
West	22,338	12,607 (56)
Middle	16,324	9,486 (58)
Randers	16,983	9,525 (56)
Aarhus	19,638	11,247 (57)
Horsens	15,571	8,989 (58)

© 2021 Mapbox © OpenStreetMap
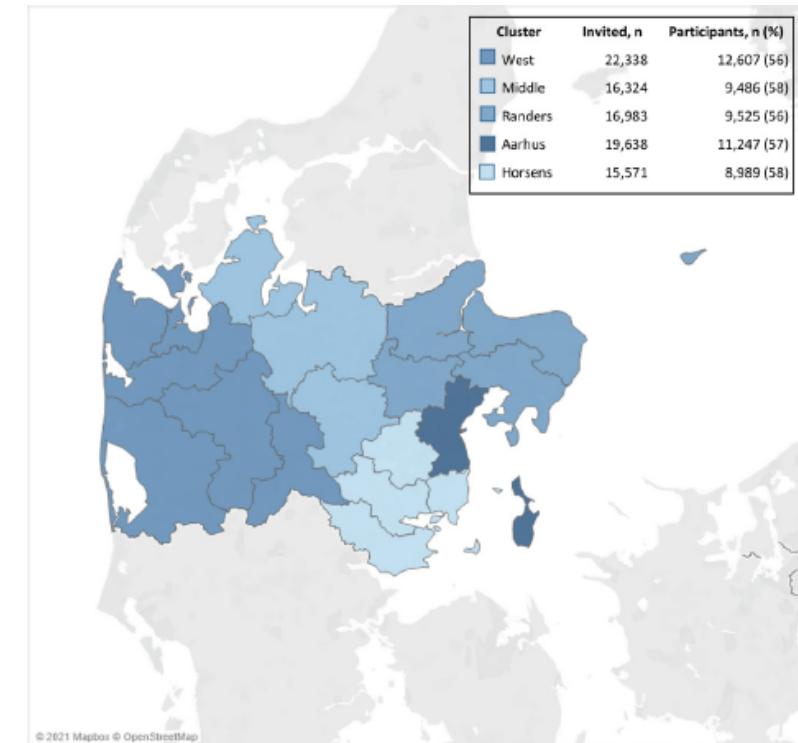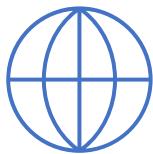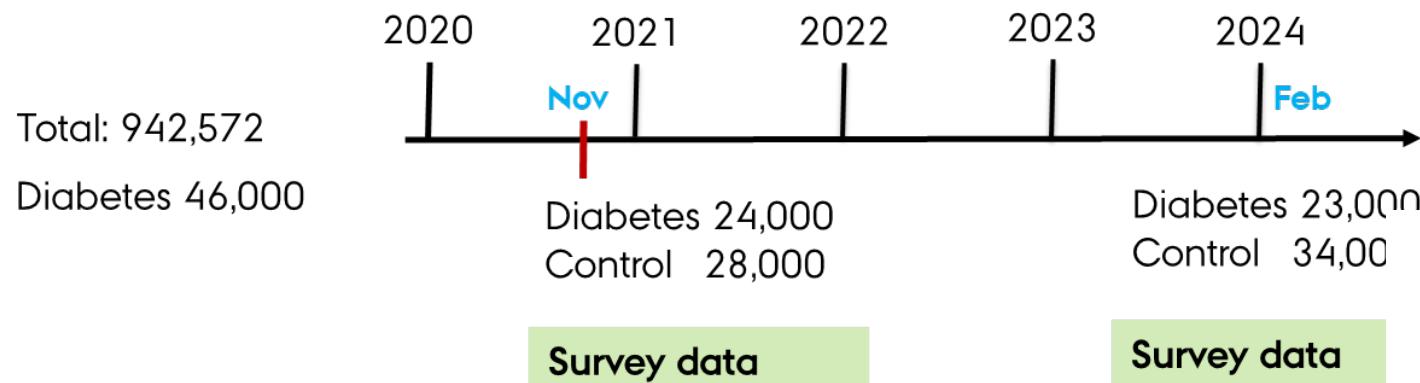
Figure 1 The Health in Central Denmark cohort was invited from the entire Central Denmark Region. This region is divided in five clusters. The box in the top corner provides the number of invitees and the number of participants from each cluster.

Bjerg L, Dalsgaard E, Norman K, *et al.* Cohort profile: Health in Central Denmark (HICD) cohort - a register-based questionnaire survey on diabetes and related complications in the Central Denmark Region. *BMJ Open* 2022;**12**:e060410. doi: 10.1136/bmjopen-2021-060410

Investigación

Total: 942,572

Diabetes 46,000

2020   2021   2022   2023   2024

Nov

Feb

Diabetes 24,000
Control 28,000

Survey data

Diabetes 23,000
Control 34,000
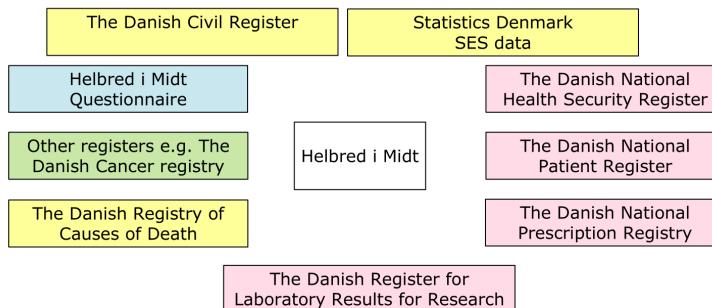
Survey data

Routine registry data

Steno Diabetes Center Aarhus   midt region midtjylland

Helbred i Midt– Data sources:

The Danish Civil Register

Statistics Denmark
SES data

Helbred i Midt
Questionnaire

The Danish National
Health Security Register

Other registers e.g. The
Danish Cancer registry

Helbred i Midt

The Danish National
Patient Register

The Danish Registry of
Causes of Death

The Danish National
Prescription Registry

The Danish Register for
Laboratory Results for Research

Statistics Denmark:
Health care &
socioeconomic
register data

Anthropo-
metrics

Well-being

Symptoms
& diseases

Dental
health

Taste &
smell

Health
literacy

Sexual
dysfunction

Artificial
intelligence

Dyspnoea

Diabetic
status

Sleeping
problems

Diabetes
specific
problems &
motivation

Fertility

Bjerg L, Dalsgaard E, Norman K, *et al.* Cohort profile: Health in Central Denmark (HICD) cohort - a register-based questionnaire survey on diabetes and related complications in the Central Denmark Region. *BMJ Open* 2022;**12:**e060410. doi: 10.1136/bmjopen-2021-060410

¿Existen registros de diabetes en América Latina?

https://es.m.wikipedia.org/wiki/Archivo:Map-Latin_America.png

RENACED1
Diabetes Tipo 1

SOCIEDAD MEXICANA DE NUTRICIÓN Y ENDOCRINOLOGÍA
SMNE

Registro Nacional de Pacientes con Diabetes Tipo 1

Hola, Bienvenido(a) a RENACED-DT1
(Registro Nacional de Pacientes con Diabetes Tipo 1)

ALAD
Asociación Latinoamericana

Rev Invest Clin. 2021;73(4):222-30

TYPE 1 DIABETES CARE IN MEXICO: AN ANALYSIS OF THE RENACED-DT1 NATIONAL REGISTRY

RAQUEL N. FARADJI-HAZÁN[1,2]*, MARISOL VALENZUELA-LARA[3], ANA P. DÍAZ-BARRIGA MENCHACA[2], PALOMA ALMEDA-VALDES[4], NEFTALI E. ANTONIO-VILLA[4,5], MARICELA VIDRIO-VELÁZQUEZ[6], LAURA ISLAS-ORTEGA[7], ANGÉLICA MARTÍNEZ-RAMOS-MÉNDEZ[8], NATALIA E. DE LA GARZA-HERNÁNDEZ[9], JORGE F. BUSTAMANTE-MARTÍNEZ[10], KARLA L. SÁNCHEZ-RUIZ[11], ALICIA E. YEPEZ-RODRÍGUEZ[12], GUILLERMO GONZÁLEZ-GÁLVEZ[13], RICARDO S. NIÑO-VARGAS[14], MARÍA E. SAINZ DE LA MAZA-VIADERO[1], AND CARLOS MAGIS-RODRÍGUEZ[15], ON BEHALF OF RENACED DIABETES TIPO 1 RESEARCH GROUP

RENACED-DT1: A National Type 1 Diabetes Registry Initiative in Mexico

Raquel N Faradji [1][2], Marisol Valenzuela-Lara [3], Maricela Vidrio-Velázquez [4], Alicia E Yepez-Rodríguez [5], Guillermo González-Galvez [6], María E Sainz de la Maza-Viadero [1]; Members of RENACED-DT1 Research Group in alphabetical order:

DIABETES RESEARCH AND CLINICAL PRACTICE
International Diabetes Federation

Log i

RESEARCH ARTICLE | VOLUME 180, 109038, OCTOBER 2021

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Glycemic control, treatment and complications in patients with type 1 diabetes amongst healthcare settings in Mexico

Neftali Eduardo Antonio-Villa, M.D. [1], [2] • Aili García-Tuomola, M.D. [1], [3] • Paloma Almeda-Valdes, M.D. [1], [4] •
... Mario H. Figueroa-Andrade, M.D. • Raquel N. Faradji, M.D. [5] ⚭ ✉ •
for the RENACED-DT1 Research Group • Show all authors • Show footnotes

Check for updates

Design and rationale of DISCOVER global registry in type 2 diabetes: Real-world insights of treatment patterns and its relationship with cardiovascular, renal, and metabolic multimorbidities

Kamlesh Khunti [a,*], Hiddo J.L. Heerspink [b], Carolyn S.P. Lam [c], Antonio Nicolucci [d],
Larisa Ramirez [e], Filip Surmont [f], Peter Fenici [f], Mikhail Kosiborod [g]
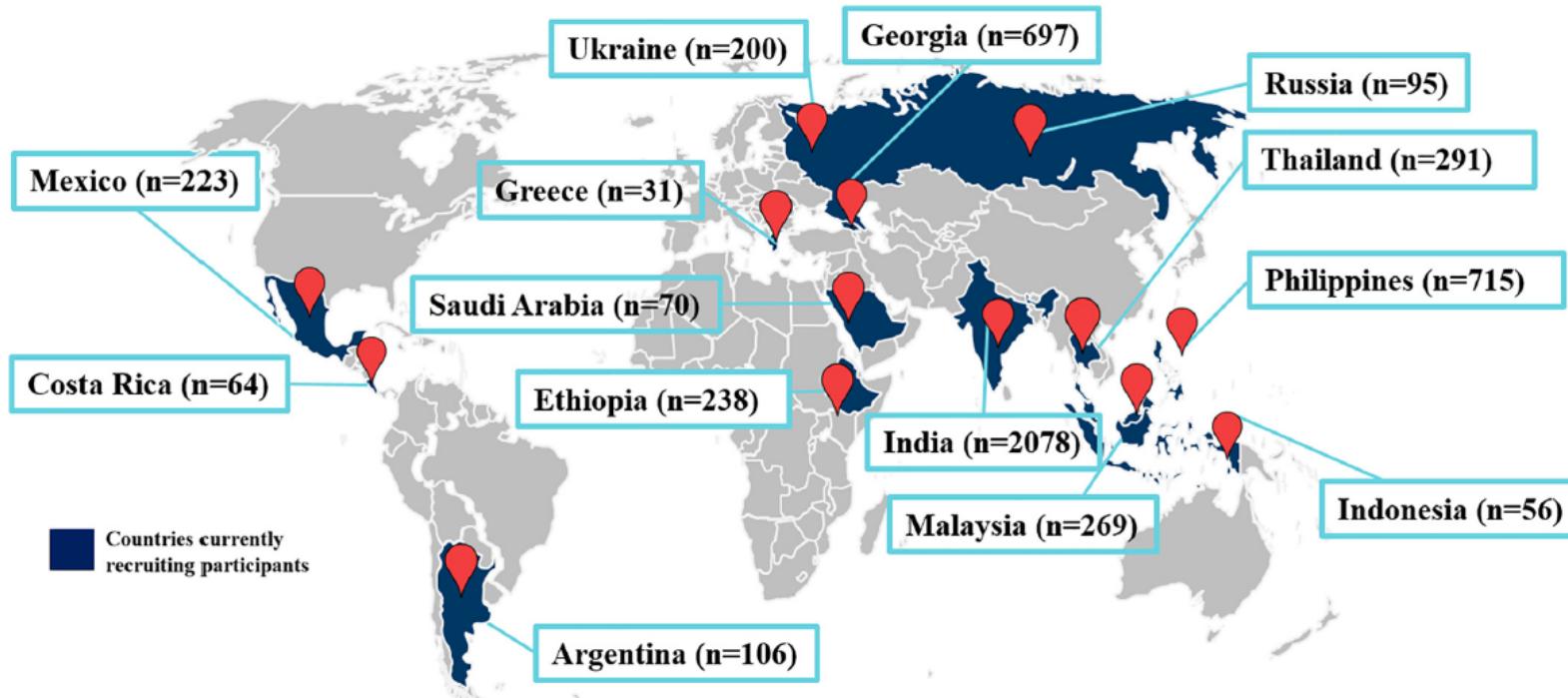
Fig. 2. Current status of countries participating in DISCOVER Global Registry (DGR) and number of enrolled patients in each country (as of 30th November 2019). Countries participating in DISCOVER Global Registry (DGR) are divided into regions according to World Health Organization categories. Enrollment of patients is currently ongoing for other countries.

The Development of the Municipal Registry of People with Diabetes in Porto Alegre, Brazil

Rafael Dal Moro [1,2,*], Lucas Helal [1], Leonel Almeida [1,2], Jorge Osório [2], Maria Ines Schmidt [1], Sotero Mengue [1] and Bruce B. Duncan [1]

Table 1. Information systems, databases, main variables, and criteria applied to identify people with diabetes.

| Information Systems	Databases	Main Variables	Criteria for Identifying People with Diabetes
Medication Dispensing System	Prescribed and dispensed medications	Medication, prescription date, dispensing date, dispensing location, dispensed quantity	Dispensing metformin, glibenclamide, gliclazide, insulin, or supplies—syringes and needles for insulin application
Electronic Health Record System of Primary Care	Primary care consultations	Date of service, place of service, specialty	ICD (E10 to E14.9) or ICPC-2 (T89 and T90) codes
Consultation and Exams Management System	Specialized consultations	Specialty, diagnostic code, appointment date, referral, and place of care.	ICD codes (E10 to E14.9)
	Outpatient exams *	Requesting unit, request date, type of exam.	ICD codes (E10 to E14.9)
Hospitalization Management System	Hospital admissions—patient flow management system occurrences	Request date, admission date, the diagnostic reason for the request, discharge date, type of bed, and reason for discharge.	ICD codes (E10 to E14.9) or SIGTAP codes for diabetes complication treatment procedures
Hospital Billing System	Hospital admissions—billing occurrences	Date of admission, diagnostic code, procedure performed	ICD codes (E10 to E14.9) or SIGTAP codes for diabetes complication treatment procedures
Hospital Information System	Emergency consultations	Date of care, diagnostic code, procedures, type of discharge	ICD codes (E10 to E14.9)
Mortality Information System	Deaths	Date of death, place of death, main and contributory causes of death	ICD codes (E10 to E14.9)
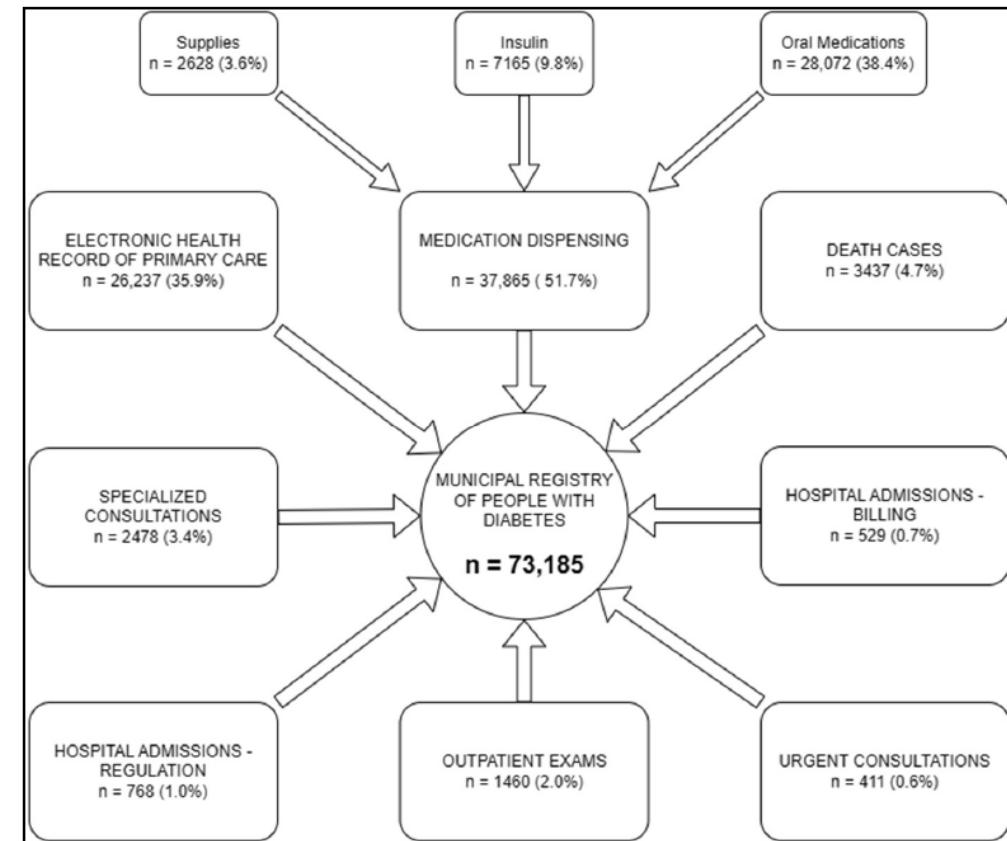
Figure 1. Municipal registry of people with diabetes in Porto Alegre, according to th number of people identified.

Dal Moro R, Helal L, Almeida L, Osório J, Schmidt MI, Mengue S, Duncan BB. The Development of the Municipal Registry of People with Diabetes in Porto Alegre, Brazil. J Clin Med. 2024 May 9;13(10):2783. doi: 10.3390/jcm13102783. PMID: 38792326; PMCID: PMC11121854.

2- De Dinamarca para América Latina

https://steno-aarhus.github.io/internationalization/

El Proyecto LatinDiab-1

Establecer registros de diabetes tipo 1 mediante la implementación de un software abierto para datos en salud

México

Dinamarca

Colombia

Argentina

Perú

https://seedcase-project.org/

https://community.seedcase-project.org/posts/open-science-symposium-2025/

Mapear el flujo de datos, barreras y oportunidades

CLINICAL CARE PATHWAY OF PEOPLE LIVING WITH DIABETES

Diagnosis → Primary Care Visit → Screening & Labs → Nutritional Assessment → Specialist/Complications Referral

EHR / Clinical Registry ← Population Register ← Lab Database ← Nutritional Assessment Records ← Referral Tracking System

Generation — Collection — Processing — Storage — Management — Analysis — Visualization — Interpretation
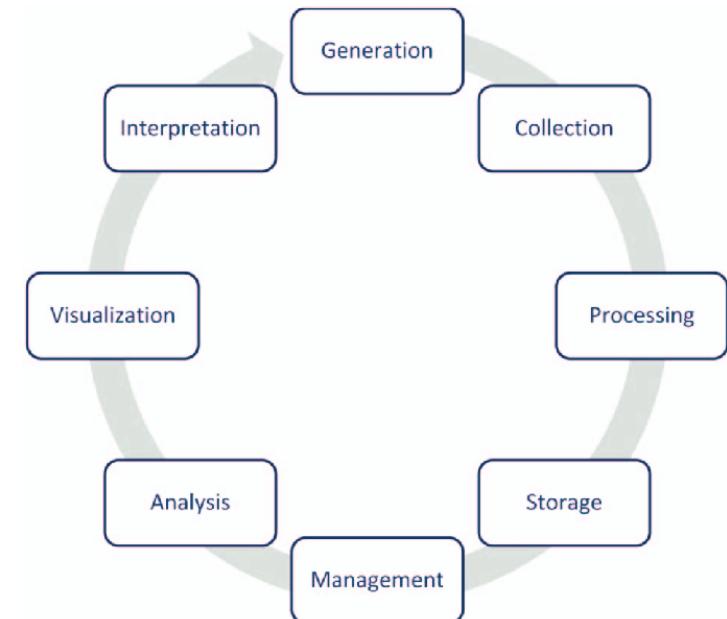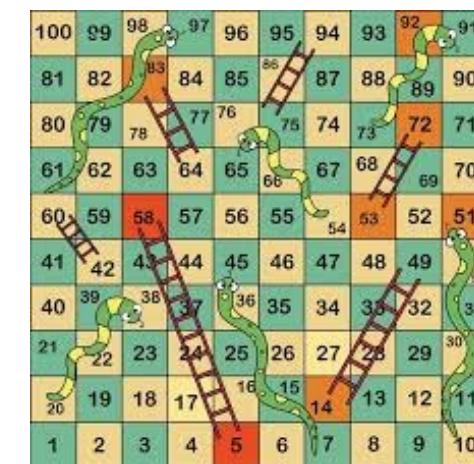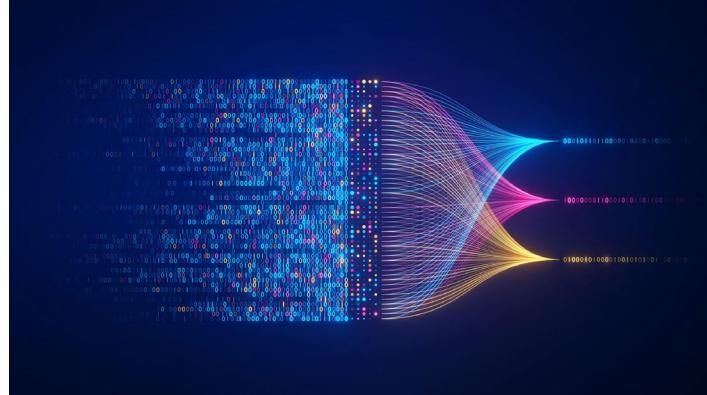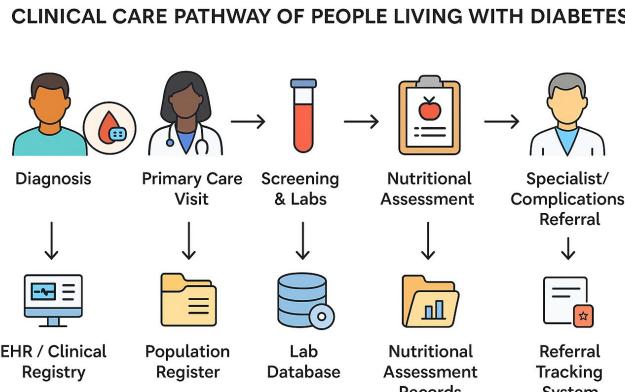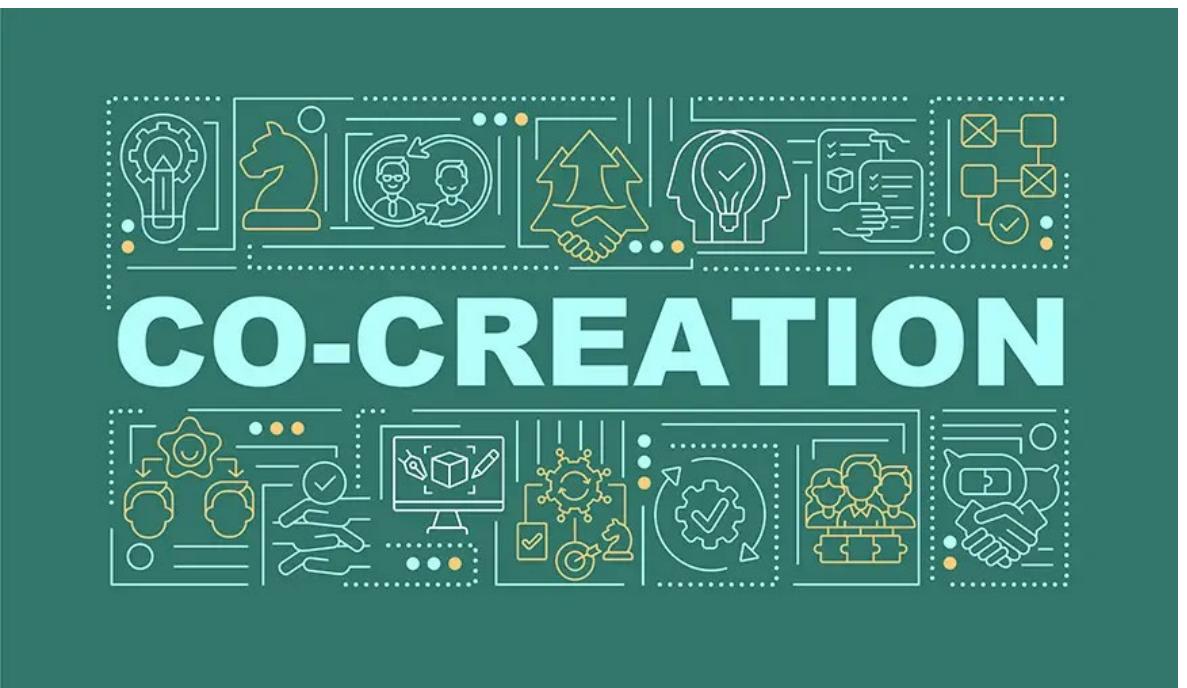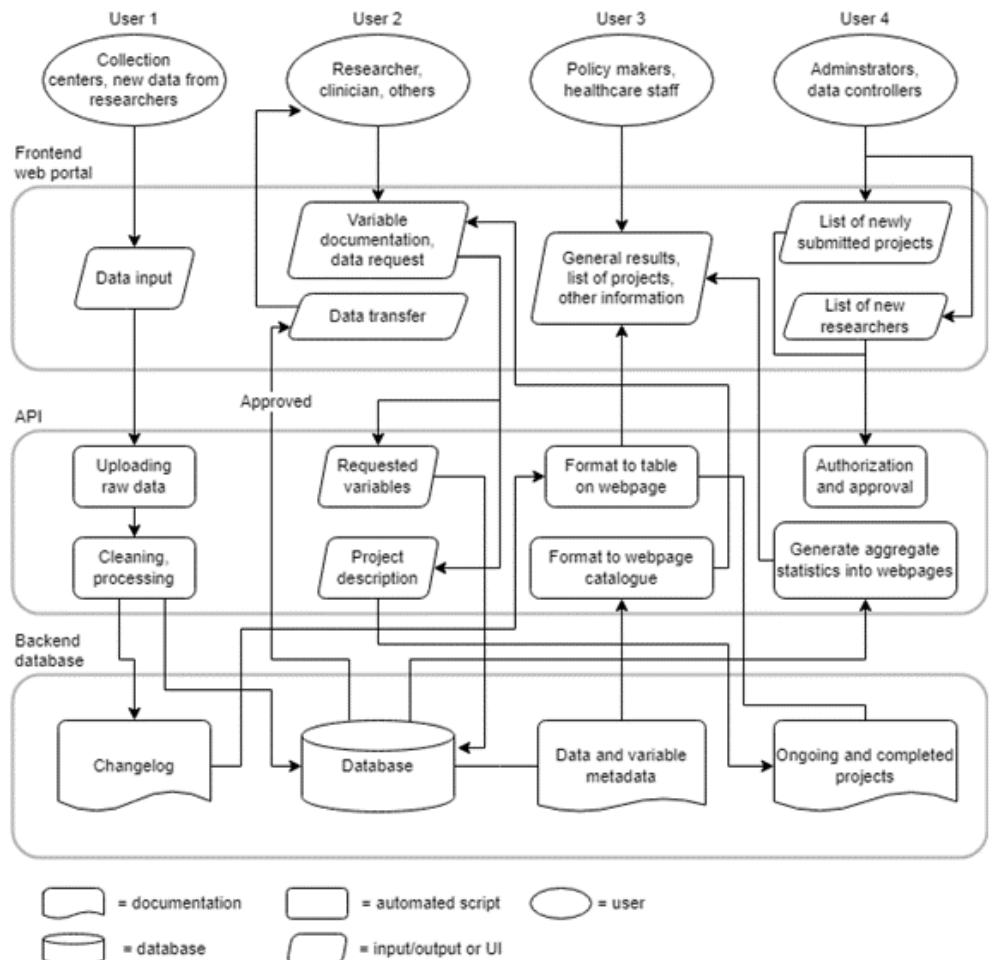
Figure 1. Detailed schematic of the data infrastructure framework [4]

https://seedcase-project.org/about/history/nnf-application

Desarrollo de capacidades de investigación
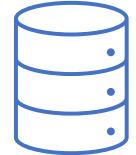
- Ciencia abierta y reproducibilidad

- Uso de herramientas modernas para colaborar y documentar proyectos

# Retos en la creación de registros
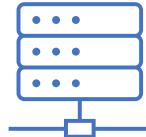
Voluntad política

Cálidad de los datos
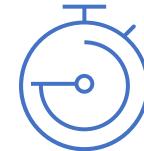
Regulación
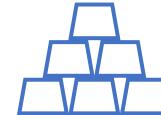
Infraestructura digital

Buen uso de la información
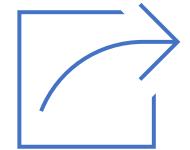
Datos en tiempo real
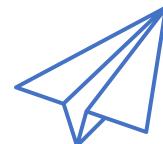
Incentivos

Educación y confianza

3- Conclusiones y mensajes para llevar

1. Los registros son sistemas información recaban información de manera **automatizada, continua y de vinculación coordinada**

2. Los registros de diabetes **son un herramienta** que sirven para el monitoreo, vigilancia, evaluación y planeación de la atención de las personas que viven con diabetes

3. Es importante diseñarlos bajo los **principios FAIR**

4. Es importante conocer el **contexto** y a los **actores claves** para una implementación exitosa

5. Es crucial tener un ***horizonte real de su implementación,*** con metas claras y transparentes