UNIVERSITY OF HELSINKI
FACULTY OF MEDICINE

INNODIA

Is Type 1 Diabetes a Predictable and Preventable Disease?

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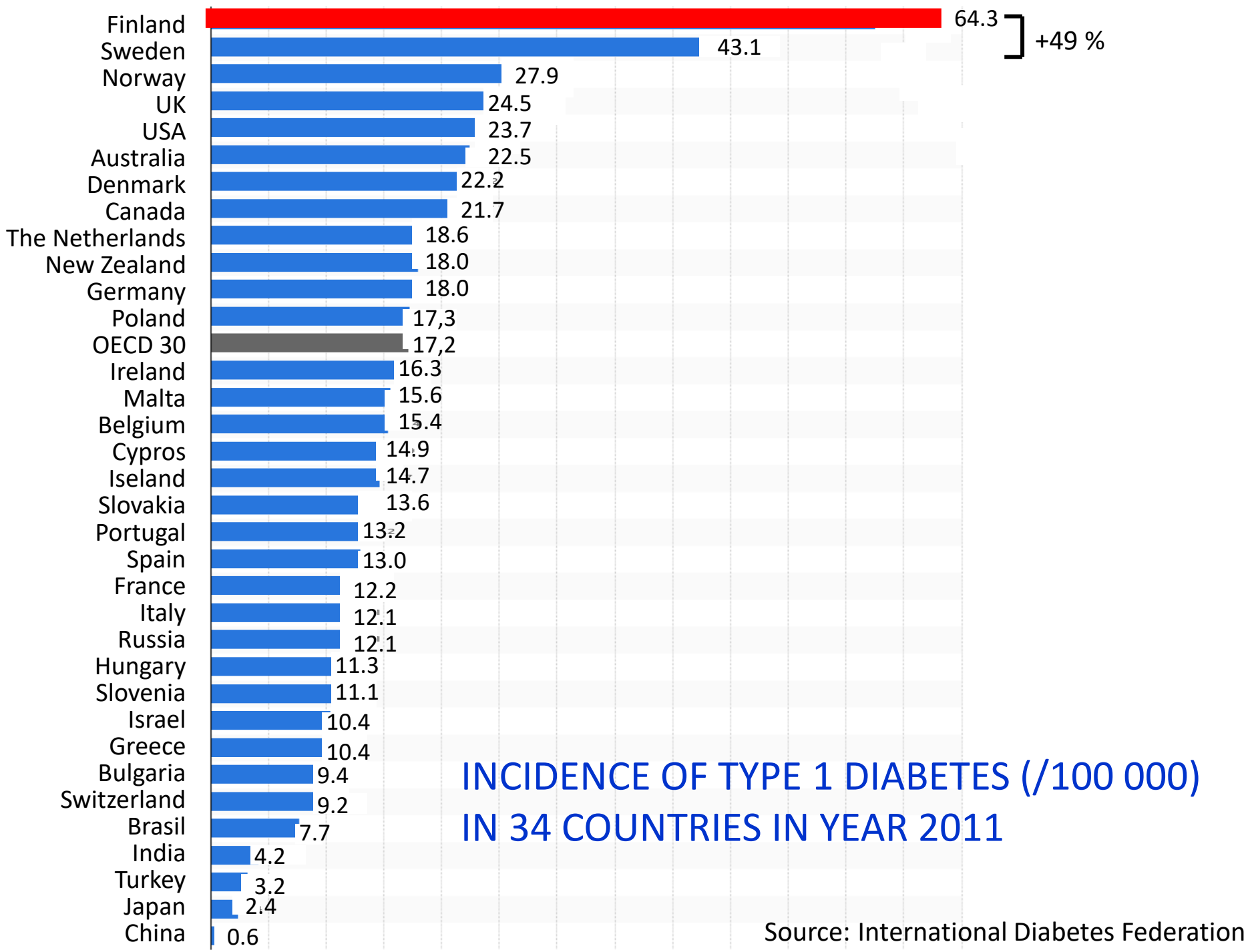
The Finnish Pediatric Diabetes Study Center

Speaker Disclosure

- ✓ Board member: Vactech Oy
- ✓ Scientific Advisory Board (SAB) member: Vactech Oy; Provention Bio, Inc.
- ✓ Patent holder for a product: An antidiabetogenic enterovirus vaccine
- ✓ Stock shareholder: Vactech Oy
- ✓ Honoraria: Novo-Nordisk Farma Oy



INCIDENCE OF TYPE 1 DIABETES (/100 000) IN 34 COUNTRIES IN YEAR 2011

Source: International Diabetes Federation

DIABETES IN FINLAND

There are approximately 450 000 patients with diabetes in Finland

About 50 000 (11%) have type 1 diabetes

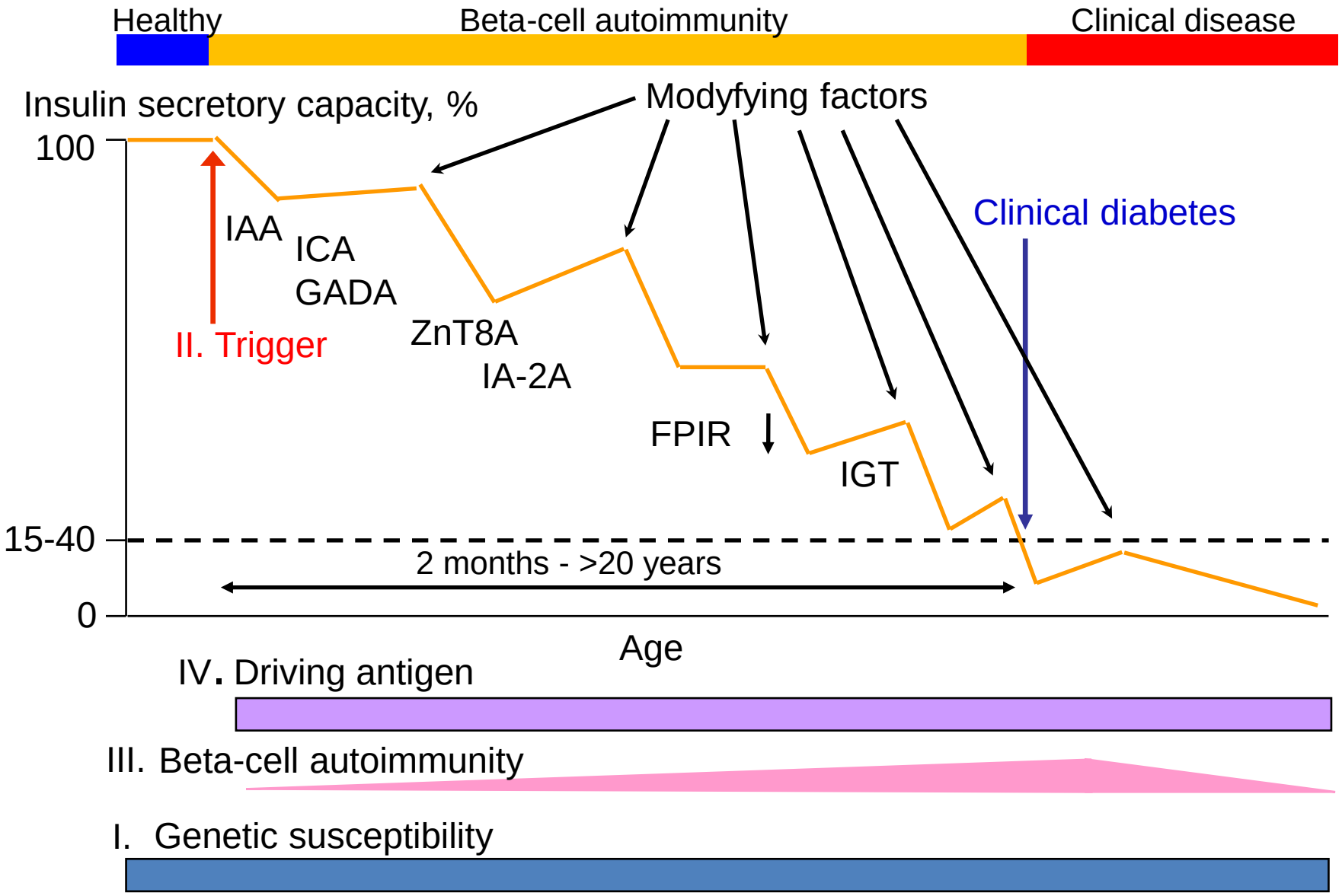
Around 400 000 (89%) suffer from type 2 diabetes

In addition it has been estimated that there are about 100 000 citizens, who have type 2 diabetes without being aware of that

YEARS OF DIABETES IN FINLAND

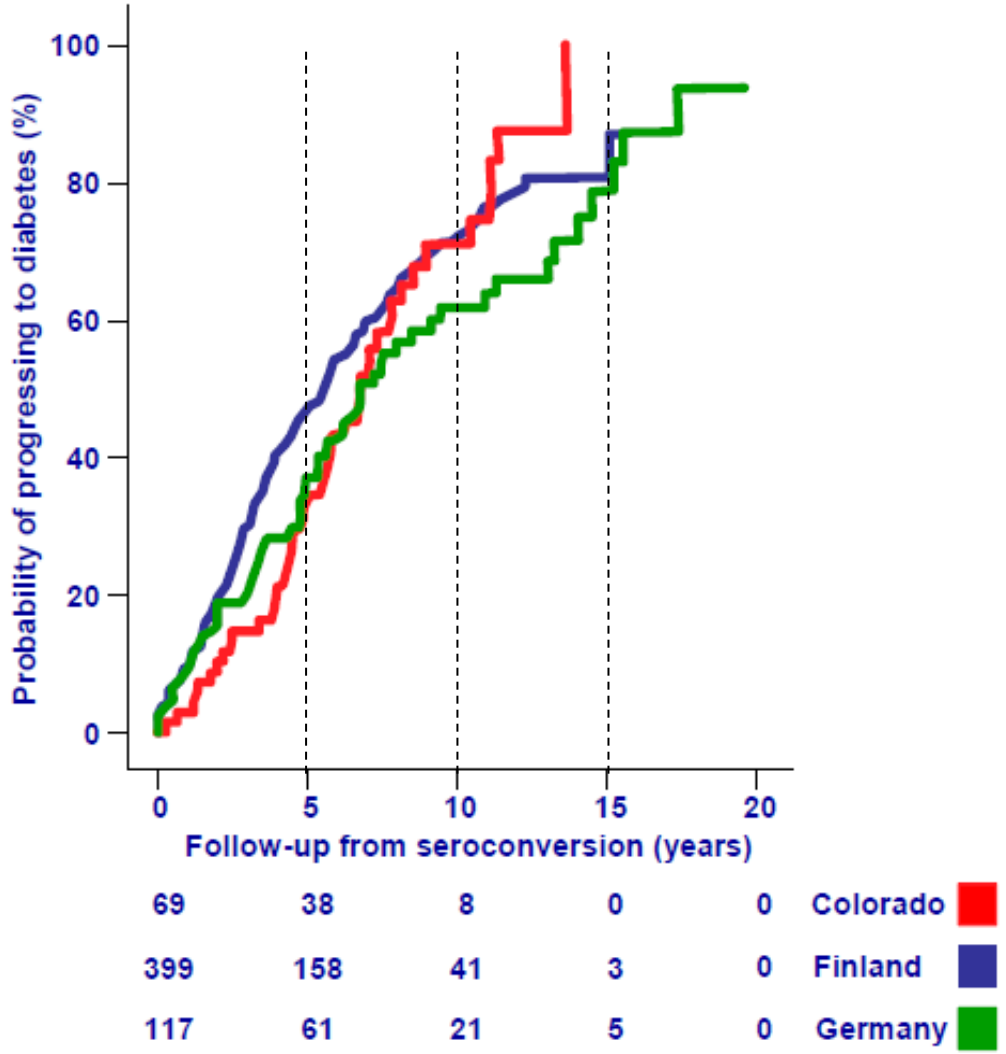
	Patients	Average age at diagnosis	Years with diabetes
Type 1 diabetes	50,000	14 years	3,050,000 (34%)
Type 2 diabetes	400,000	60 years	6,000,000 (66%)

PATHOGENESIS OF TYPE 1 DIABETES

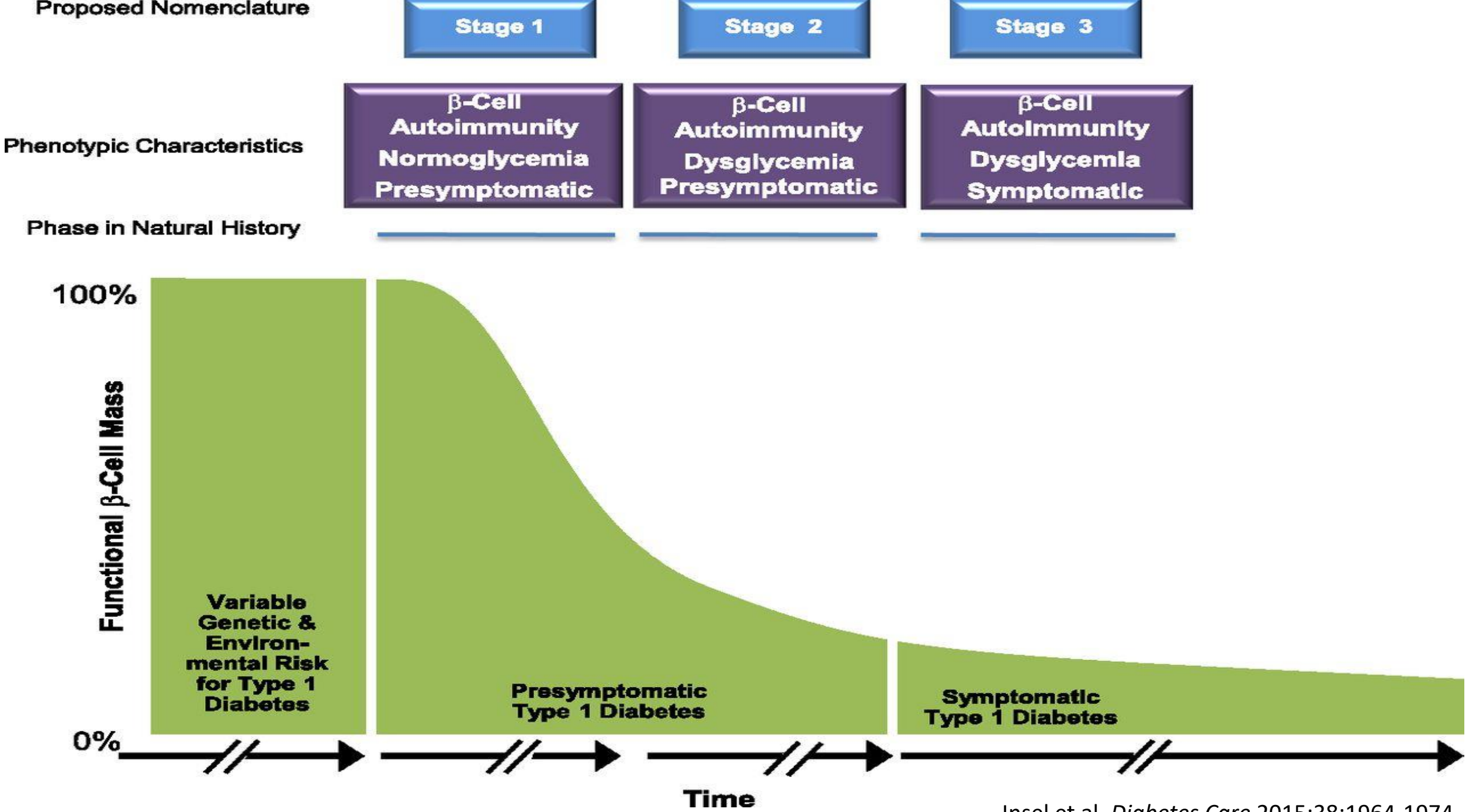


Knip et al. *Diabetes* 2005; 54, Suppl. 2: S125-S136

Progression to Type 1 Diabetes From the Time of Seroconversion in Children With Multiple Islet Autoantibodies

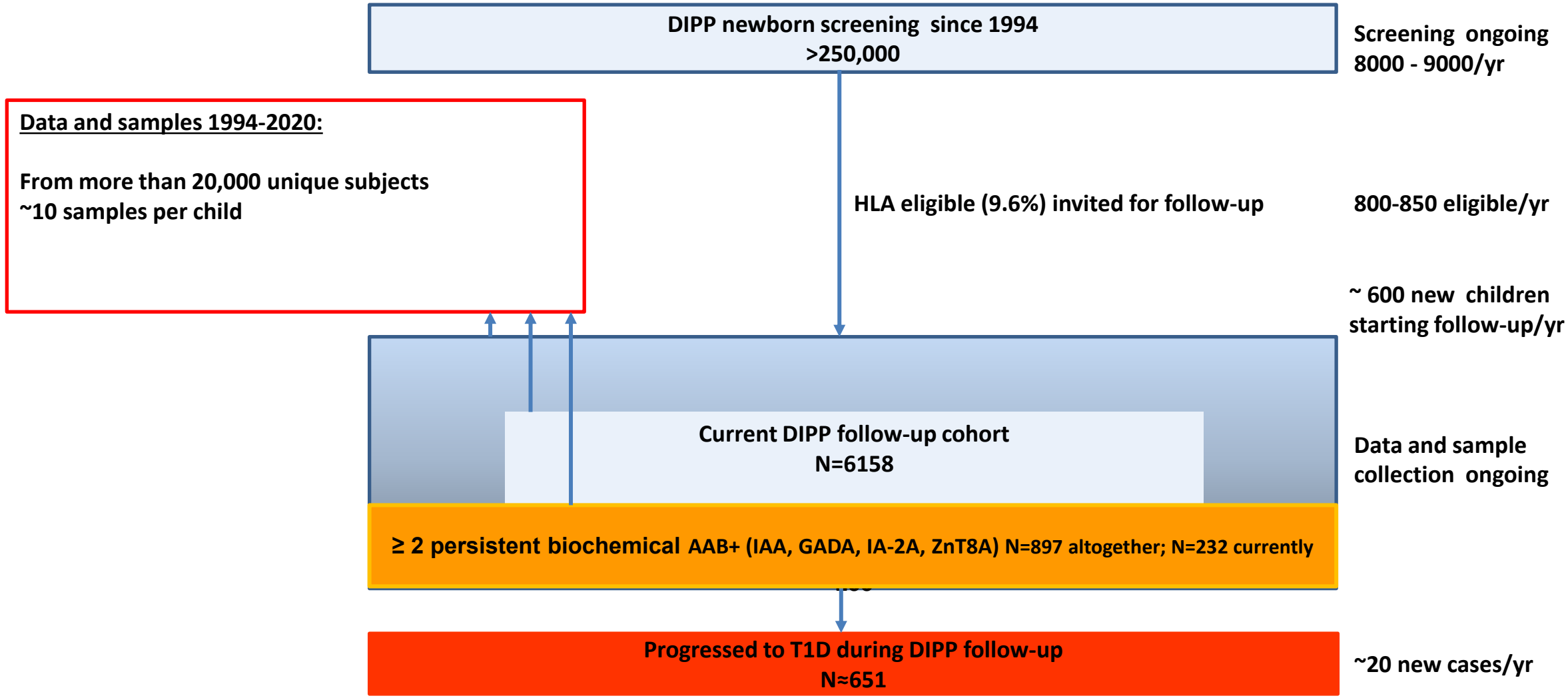


Ziegler et al. *JAMA* 2013;310:2473-2479



Insel et al. *Diabetes Care* 2015;38:1964-1974

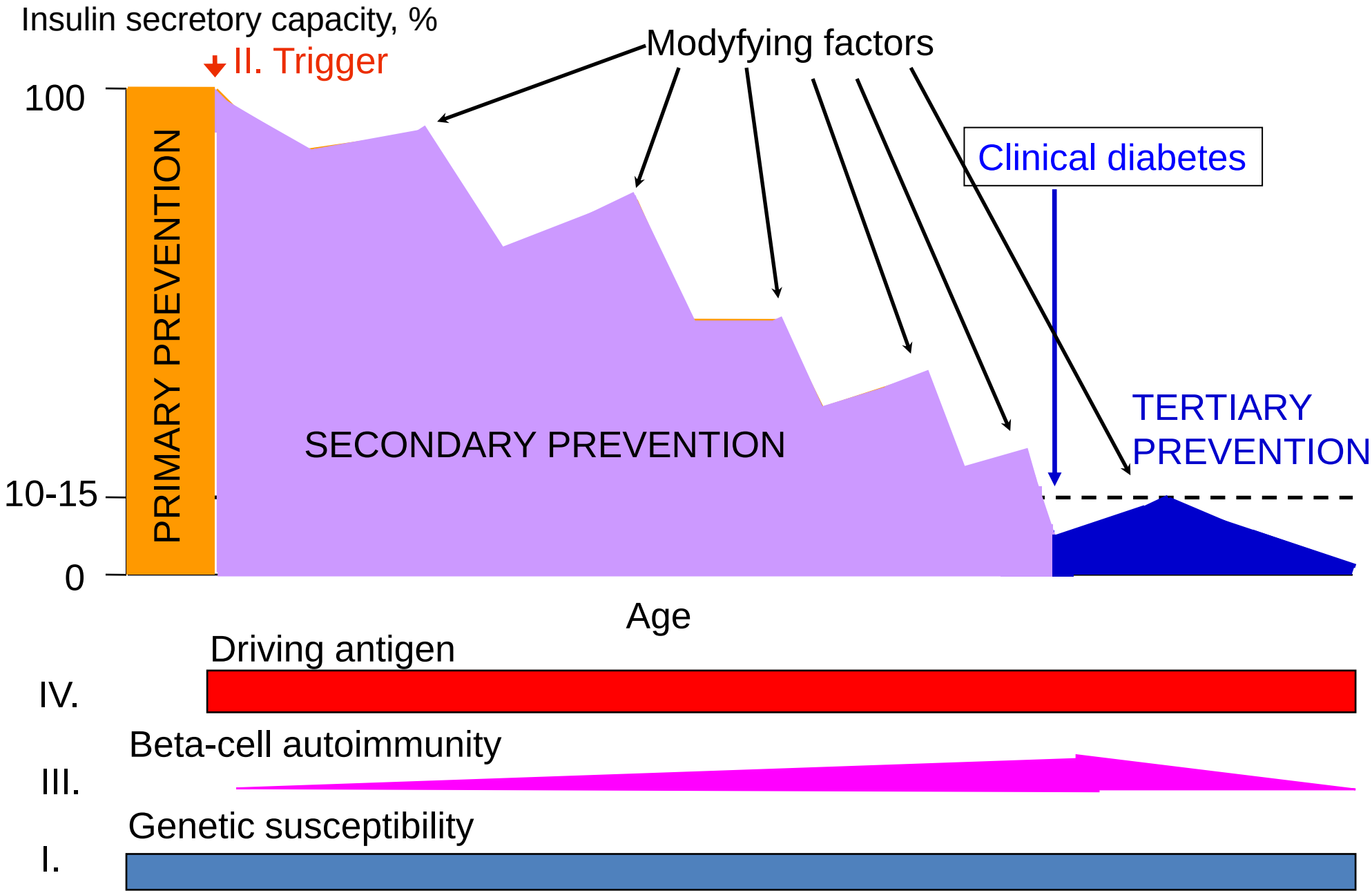
Status of the DIPP Study, August 2021



RISK MARKERS OF TYPE 1 DIABETES

- HLA susceptibility ~ 4%
- High genetic risk score ~10%
- Positivity for one diabetes-associated autoantibody ~10%
- Positivity for multiple (two or more) autoantibodies ~80%
- Abnormal HbA1c in individuals with multiple autoantibodies; half will present with type 1 diabetes within the next 12 months
- Abnormal glucose tolerance in an oral glucose tolerance test; half will present with type 1 diabetes over the next 8 months

PREVENTION OF T1D

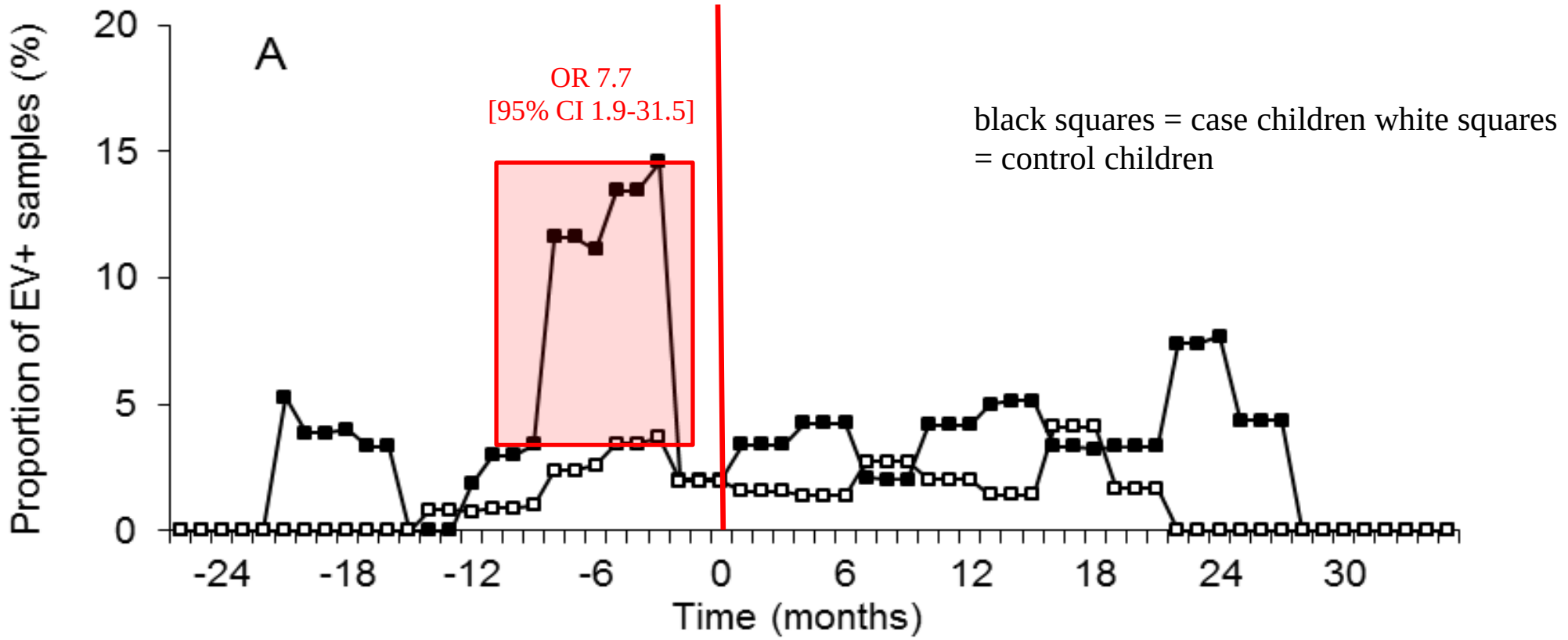


Enterovirus RNA in Blood Is Linked to the Development of Type 1 Diabetes

Sami Oikarinen,[1] Mika Martiskainen,[1] Sisko Tauriainen,[1] Heini Huhtala,[2] Jorma Ilonen,[3,4] Riitta Veijola,[5] Olli Simell,[6] Mikael Knip,[7,8] and Heikki Hyöty[1,9]

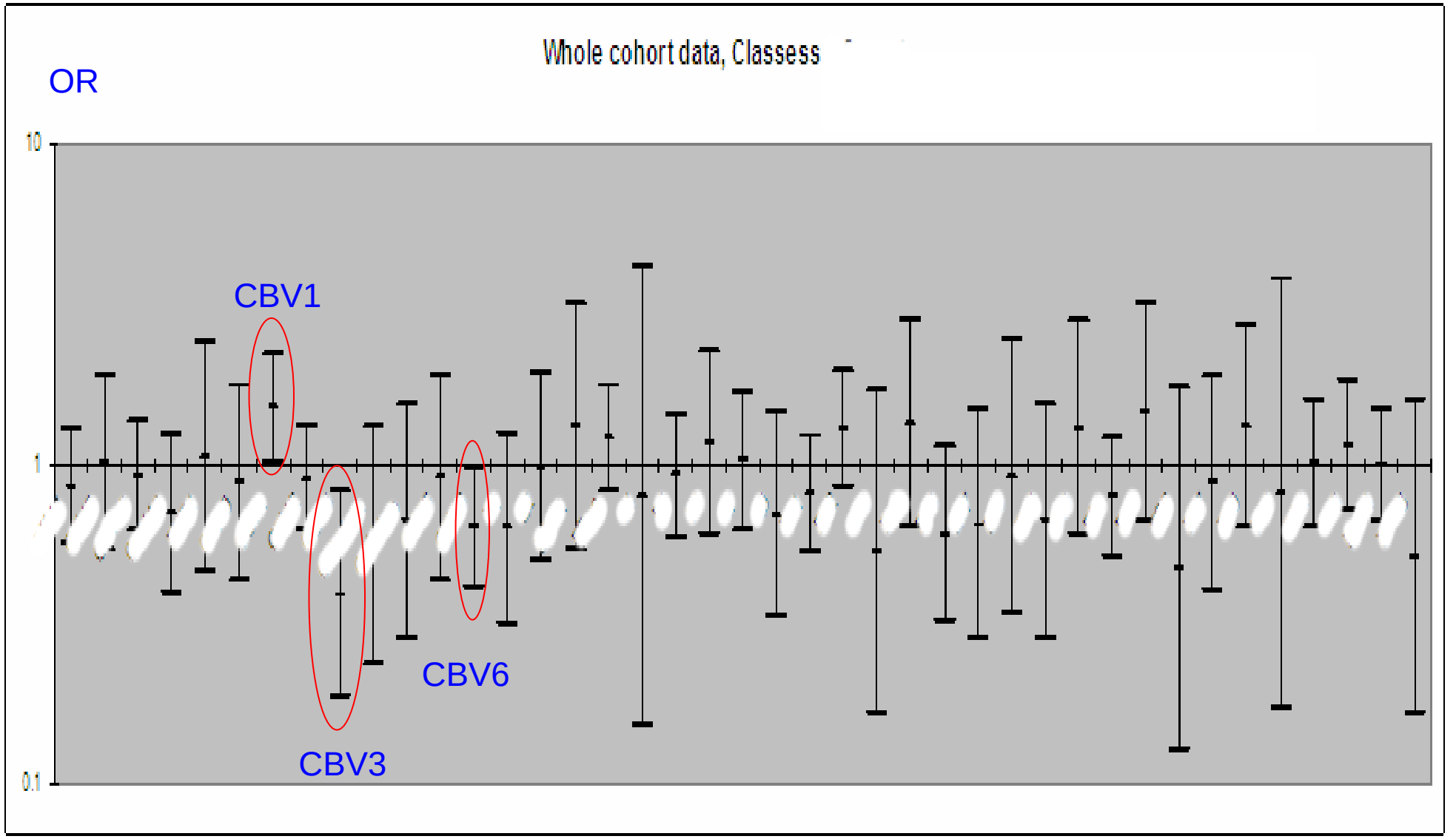
DIABETES, VOL. 60, JANUARY 2011

- 38 case children who progressed to T1D and 140 controls
- 333 serum samples in the case group and 993 from control children



DIPP study

ODDS RATIOS OF 40 ENTEROVIRUS SEROTYPES FOR SEROCONVERSION TO AUTOANTIBODY POSITIVITY



Laitinen et al. *Diabetes* 2014;63:446-455

PROMISES FOR PRIMARY PREVENTION

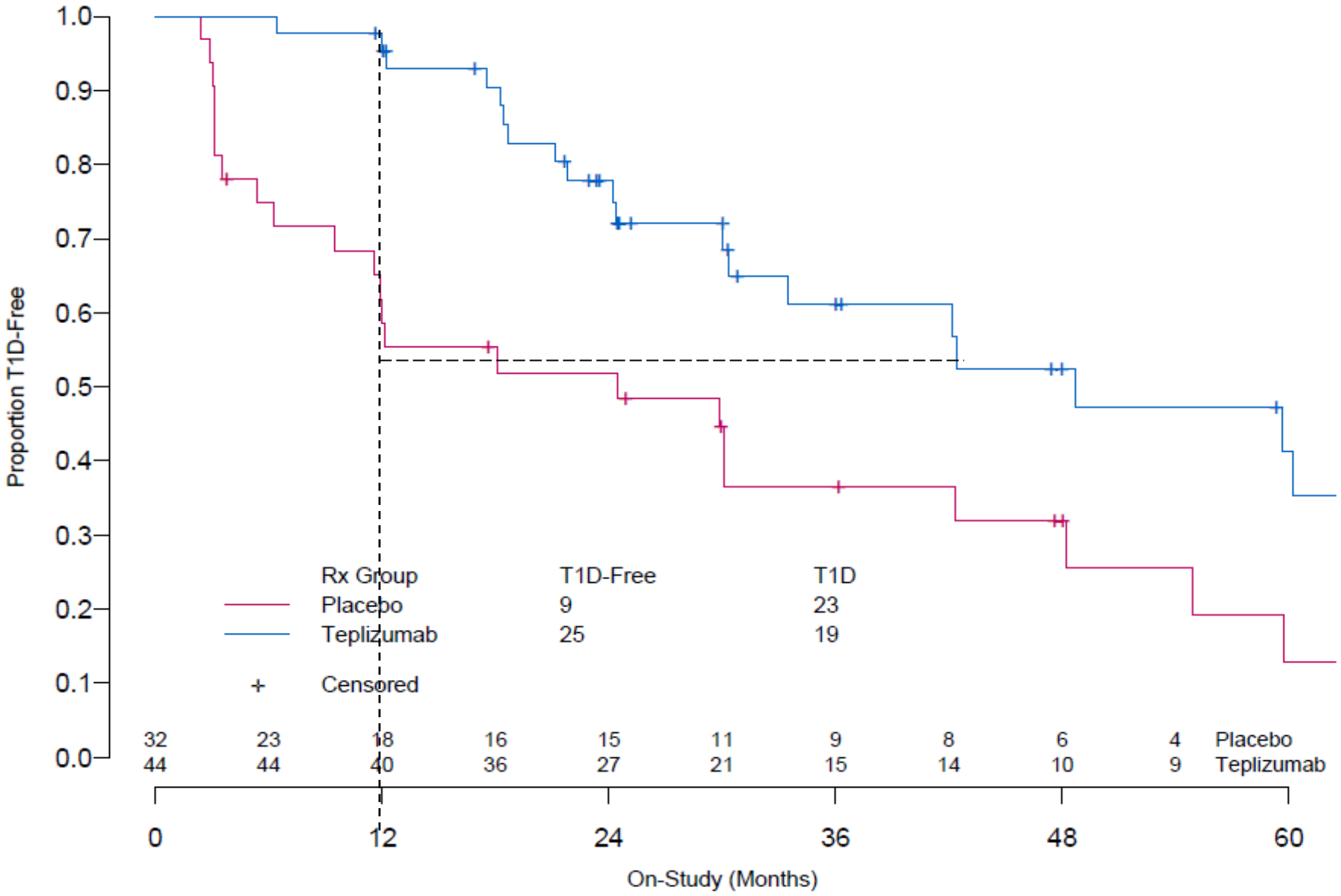
A series of testable intervention methods within reach

- Application of an antidiabetogenic Coxsackie B virus (CBV) vaccine
- Early supplementation with a specific probiotic (*Bifidobacterium longum* subsp. *infantis),* Global Platform for the Prevention of Autoimmune Diabetes (GPPAD)
- Supplementation with acetylated and/or butyrilated starch
- Supplementation with fish-derived fatty acids
- Supplementation with bovine milk fat globule membranes rich in sphingomyelins and specific phosphatidylcholines
- Oral application of insulin, GPPAD-Point study

EXAMPLES OF ONGOING OR PLANNED INTERVENTION TRIALS AIMED AT SECONDARY PREVENTION OF T1D

AGENT	STUDY POPULATION	STUDY GROUP	STATUS
Abatacept	6-45-year-old family members with ≥2 AAB	TrialNet	Recruitment closed, results available in 2021
Hydroxy-chloroquine	Family member > 3 years of age, ≥2 AAB, no dysglycemia	Trialnet	Recruitment will be com-pleted in the fall 2021
Golimumab	Subjects aged 6-21 years with ≥2 AAB and dysglycemia	Janssen	Recruitment ongoing
Liraglutide	A. Subjects aged 10-30 years with ≥2 AAB and dysglyce-mia B. Subjects aged 18-30 years with ≥2 AAB	DIPP	Recruitment ongoing

EFFECT OF TEPLIZUMAB ON PROGRESSION TO CLINICAL T1D



Herold et al. *New Engl J Med* 2019;381:603-613

CURRENT SCENARIO

- Type 1 diabetes is a predictable but not quite yet a preventable disease
- An increasing interest globally in screening the general population for risk of type 1 diabetes
- An antidiabetogenic Coxsackie B virus vaccine can in the best case be available within the next 4-5 years
- FDA may approve already this year the first drug (teplizumab) for the delay of clinical type 1 diabetes in risk indivuals. This will be followed by EMA approval.
- Given that Finland has the highest incidence of type 1 diabetes globally our country could be a forerunner in the struggle to prevent and eliminate type 1 diabetes

FUNDING

National Institute of Diabetes, Digestive and Kidney Diseases (NIDDK), NIH

Juvenile Diabetes Research Foundation

EU 5th and 7th Framework, IMI2

European Foundation for the Study of Diabetes

Academy of Finland, (Finnish CoE in Molecular Systems Immunology and Physiology Research)

Sigrid Juselius Foundation

Medical Research Funds, Helsinki, Tampere, Turku, and Oulu University Hospitals

Novo Nordisk Foundation