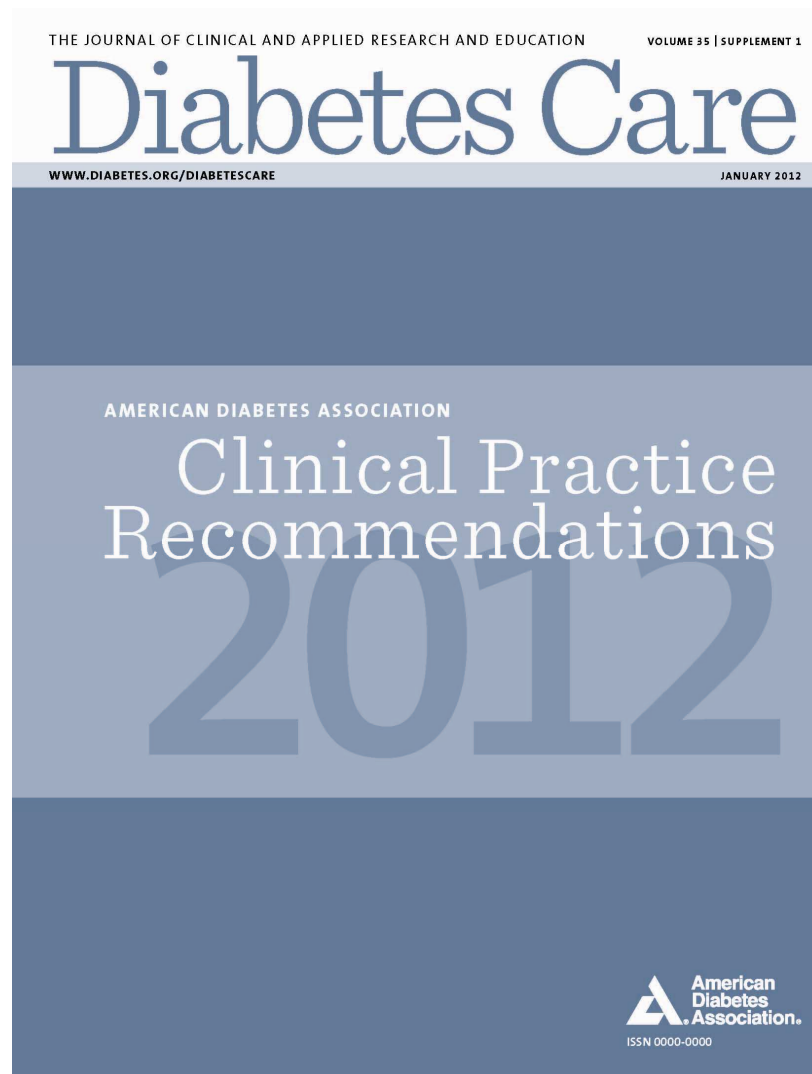


# DIABETES MELLITUS

## Diagnostic, Labostester

13 juin 2013

# STANDARDS OF MEDICAL CARE IN DIABETES—2012




# Table of Contents

Section	Slide No.
ADA Evidence Grading System of Clinical Recommendations	3
I. Classification and Diagnosis	4-11
II. Testing for Diabetes in Asymptomatic Patients	12-15
III. Detection and Diagnosis of Gestational Diabetes Mellitus (GDM)	16-19
IV. Prevention/Delay of Type 2 Diabetes	20-21
V. Diabetes Care	22-67
VI. Prevention and Management of Diabetes Complications	68-112
VII. Assessment of Common Comorbid Conditions	113-114
VIII. Diabetes Care in Specific Populations	115-135
IX. Diabetes Care in Specific Settings	136-144
X. Strategies for Improving Diabetes Care	145-150

Clipboard Slides Font Paragraph Drawing Editing

## Recommendations: Prevention/Delay of Type 2 Diabetes

- Refer patients with IGT (A), IFG (E), or A1C 5.7–6.4% (E) to ongoing support program
  - Targeting weight loss of 7% of body weight
  - At least 150 min/week moderate physical activity
- Follow-up counseling important for success (B)
- Based on cost-effectiveness of diabetes prevention, third-party payers should cover such programs (E)
- Consider metformin for prevention of type 2 diabetes if IGT (A), IFG (E), or A1C 5.7–6.4% (E)
  - Especially for those with BMI >35 kg/m<sup>2</sup>, age <60 years, and women with prior GDM (A)
- In those with prediabetes, monitor for development of diabetes annually (E)

 ADA. IV. Prevention/Delay of Type 2 Diabetes. *Diabetes Care* 2012;35(suppl 1):S16.

- Recommendations for the prevention/delay of type 2 diabetes<sup>1</sup> are summarized on this slide
- Individuals at high risk for developing type 2 diabetes (i.e., those with impaired fasting glucose [IFG], impaired glucose tolerance [IGT] or both) can be given interventions that significantly decrease rate of onset of diabetes
- Based on results of clinical trials and known risks of progression of prediabetes to diabetes, person with an A1C of 5.7%–6.4%, IGT or IFG should be counseled on lifestyle changes: 7% weight loss and moderate physical activity of at least 150 minutes/week
- Regarding drug therapy for diabetes prevention, a consensus panel believed that metformin should be the only drug considered<sup>2</sup>
  - Metformin may be recommended for very high-risk individuals (those with a history of GDM, the very obese, and/or those with more severe or progressive hyperglycemia)
  - Of note, in the Diabetes Prevention Program (DPP), metformin was not significantly better than placebo in those over age 60 years
- For other drugs, issues of cost, side effects, and lack of persistence of effect in some studies<sup>3</sup> require consideration

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# Criteria for the Diagnosis of Diabetes

---

A1C  $\geq 6.5\%$

**OR**

Fasting plasma glucose (FPG)  
 $\geq 126$  mg/dL (7.0 mmol/L)

**OR**

2-h plasma glucose  $\geq 200$  mg/dL  
(11.1 mmol/L) during an OGTT

**OR**

A random plasma glucose  $\geq 200$  mg/dL (11.1 mmol/L)

# Criteria for the Diagnosis of Diabetes

---

**A1C  $\geq 6.5\%$**

The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay\*

**Fasting plasma glucose (FPG)  
 $\geq 126$  mg/dL (7.0 mmol/L)**

Fasting is defined as no caloric intake for at least 8 h\*



# Criteria for the Diagnosis of Diabetes

**2-h plasma glucose  $\geq 200$  mg/dL  
(11.1 mmol/L) during an OGTT**

The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water\*

In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose  $\geq 200$  mg/dL

\*In

# Prediabetes: IFG, IGT, Increased A1C

Categories of increased risk for diabetes  
(prediabetes)\*

FPG 100–125 mg/dL (5.6–6.9 mmol/L): IFG

**OR**

2-h plasma glucose in the 75-g OGTT  
140–199 mg/dL (7.8–11.0 mmol/L): IGT

**OR**

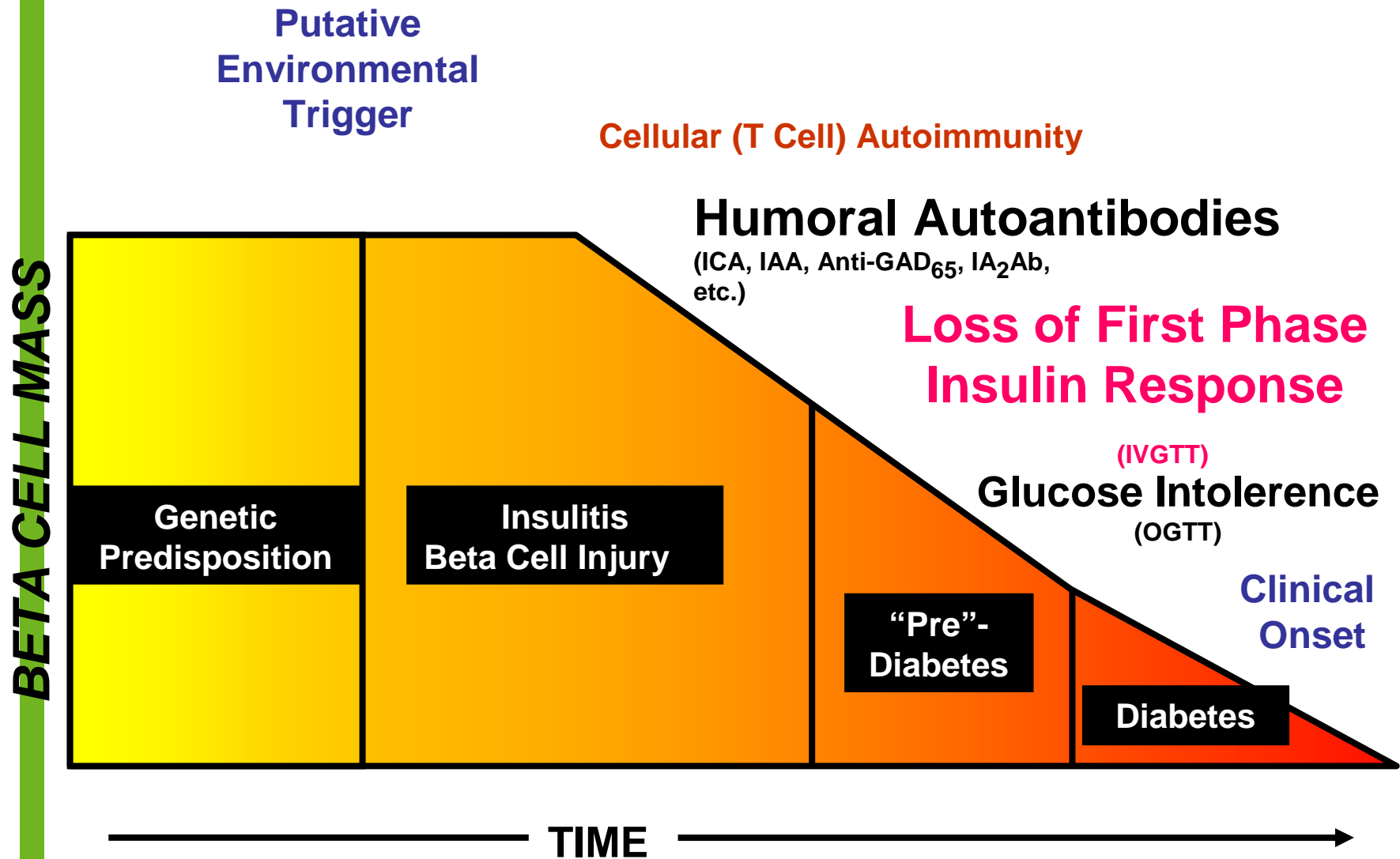
A1C 5.7–6.4%

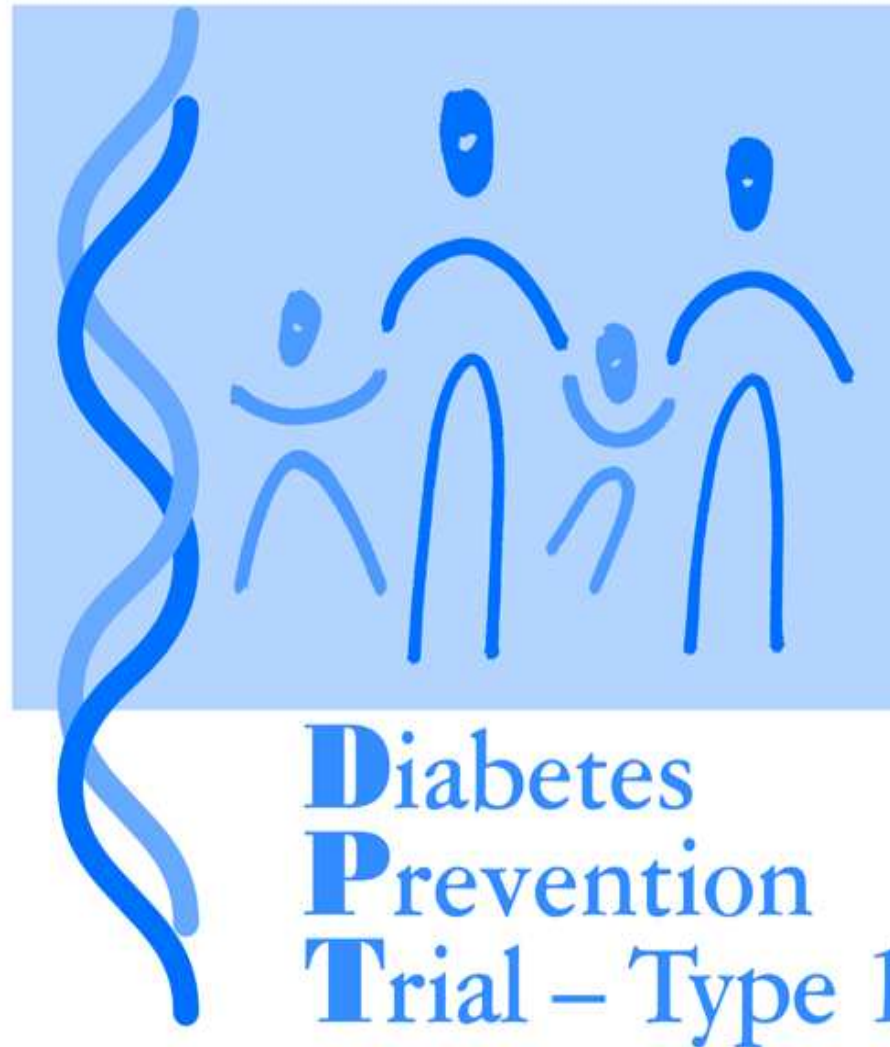
\*

9



# Natural History of Type 1 Diabetes





# DPT-1 Objective

To determine whether  
antigen based therapies  
(specifically, insulin)  
of non-diabetic relatives  
can delay development  
of Type 1 diabetes.

# DPT-1 Intervention Protocols

- Parenteral Insulin

In Subjects with 5 year Risk of  
Type 1 Diabetes > 50%

- Oral Insulin

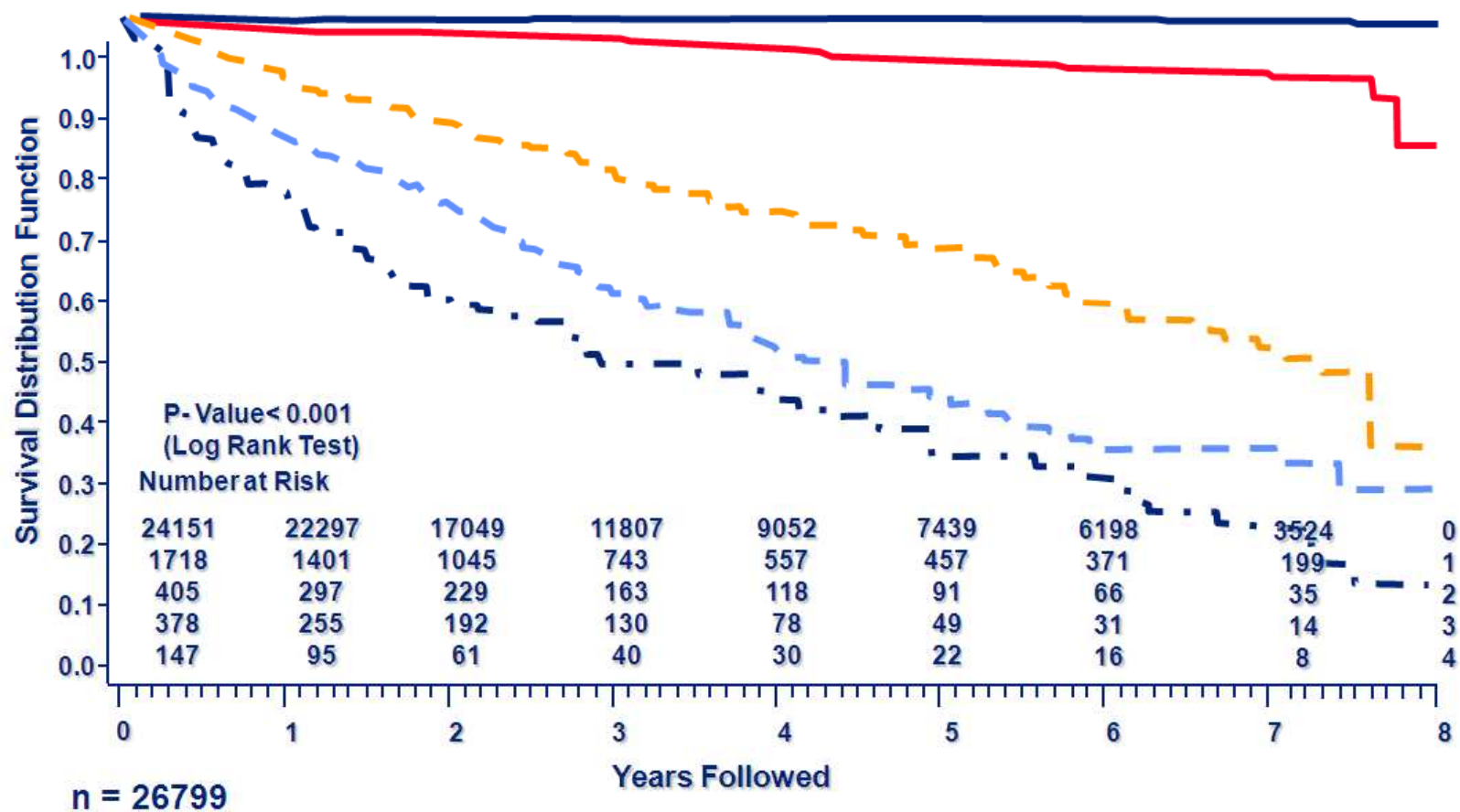
In Subjects with 5 year Risk of  
Type 1 Diabetes = 26-50%



# DPT-1 Screening Results

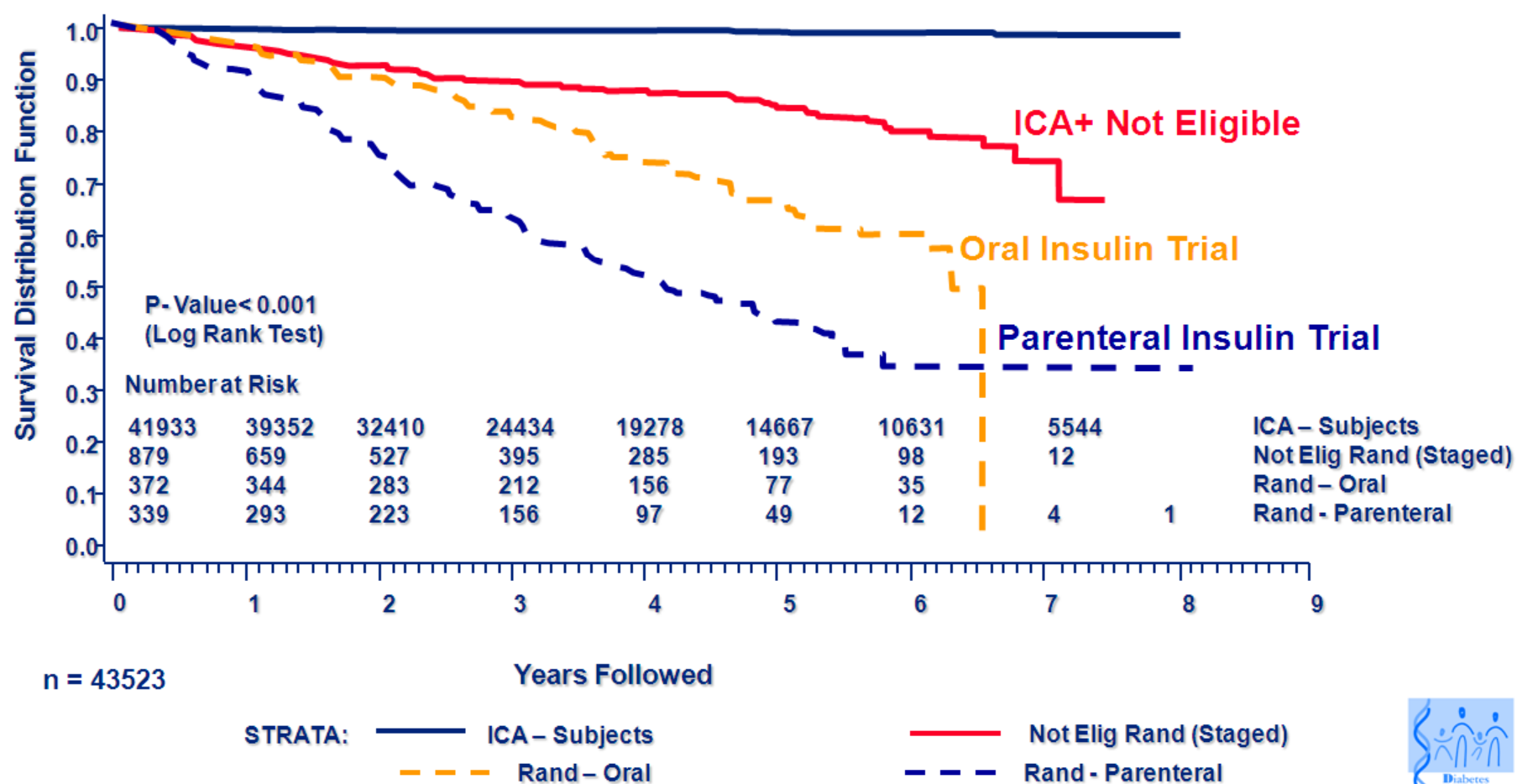
- 103,391 Relatives Screened
- 97,635 Eligible Samples
- 97,273 Samples Analyzed
- 3480 Samples ICA+ (3.58%)

# DPT-1 – Time to Diabetes By Number of Antibodies



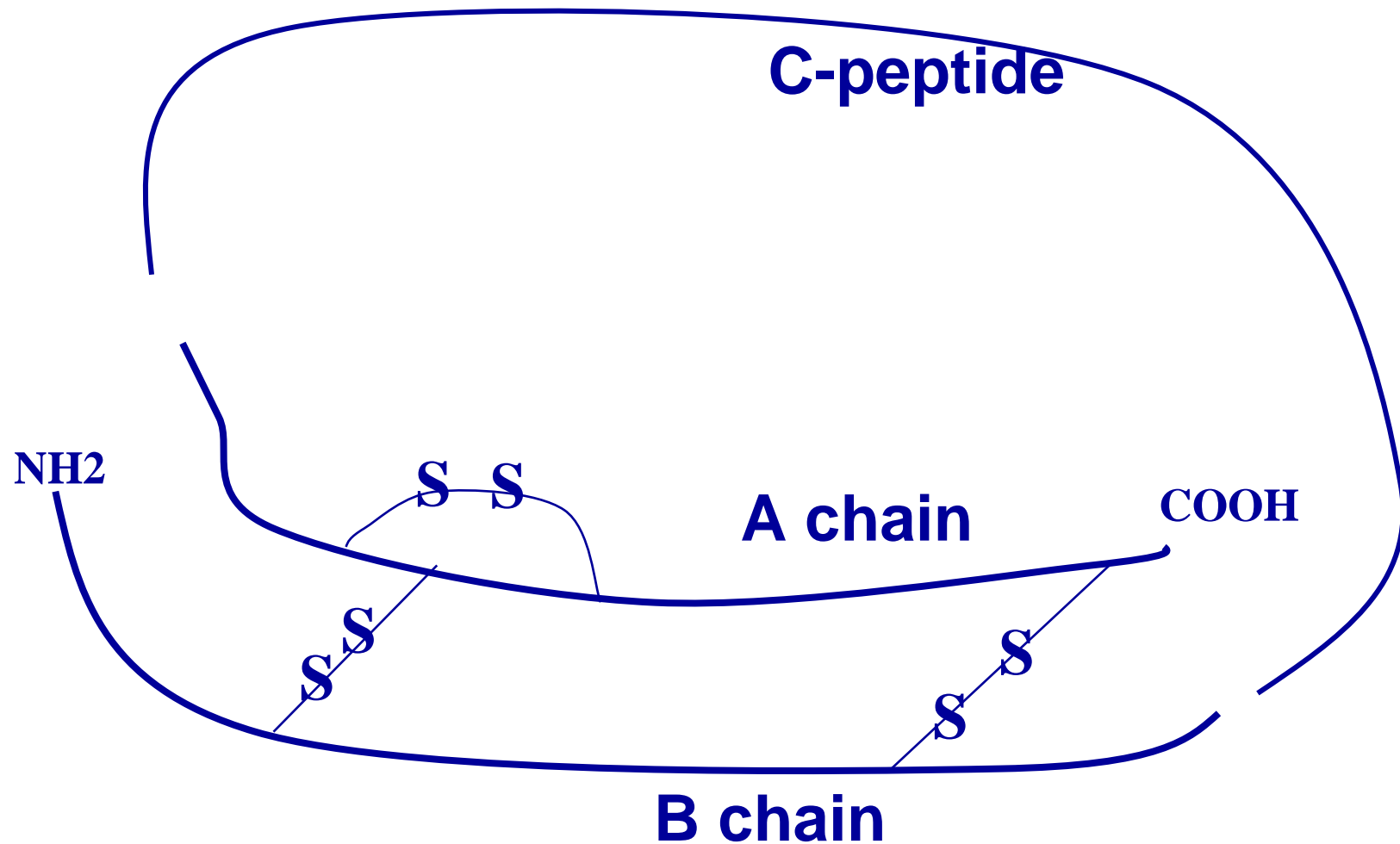
# DPT-1 – Time to Diabetes

## ICA- vs Staging Outcome (Parenteral, Oral, Not Eligible)

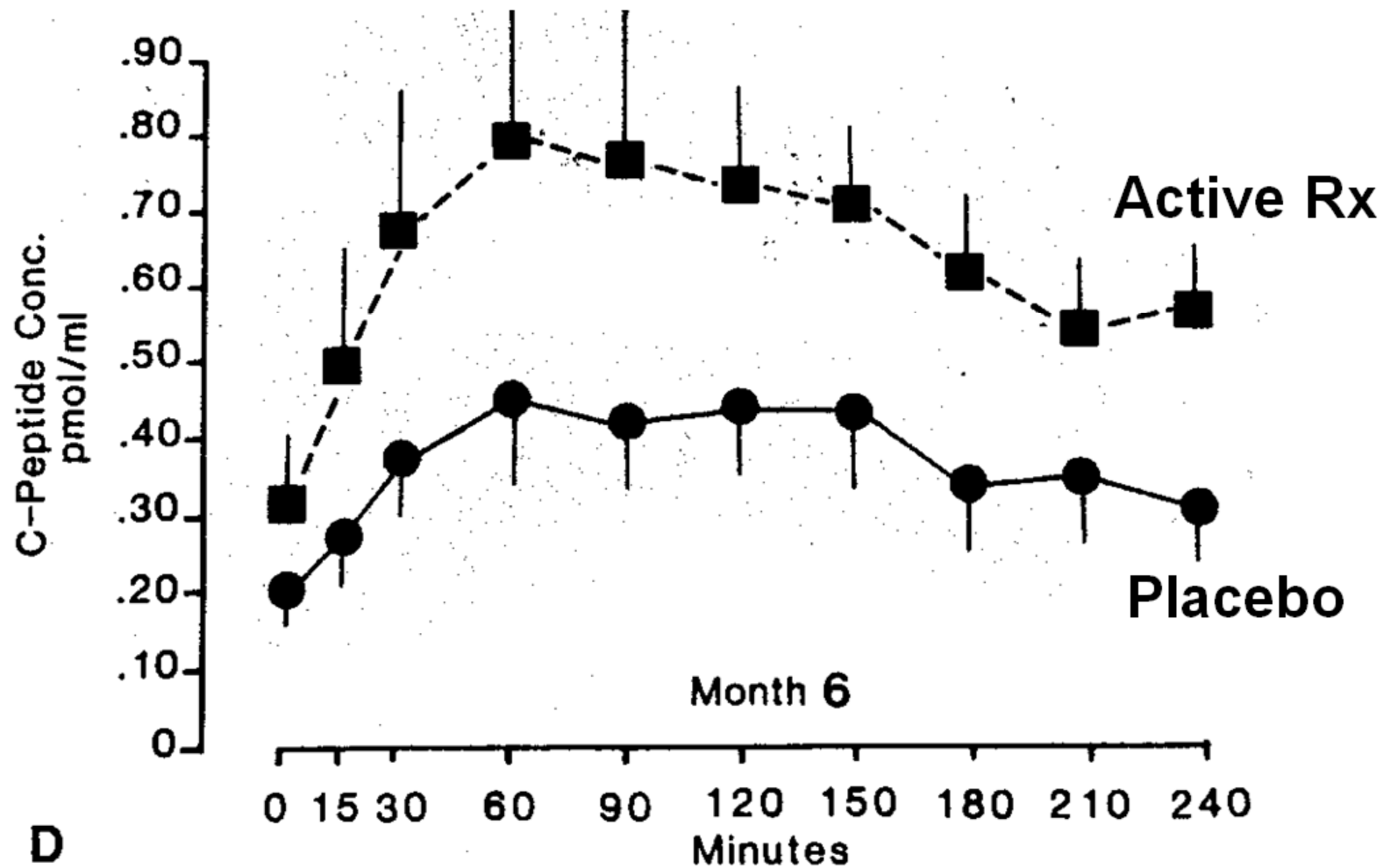




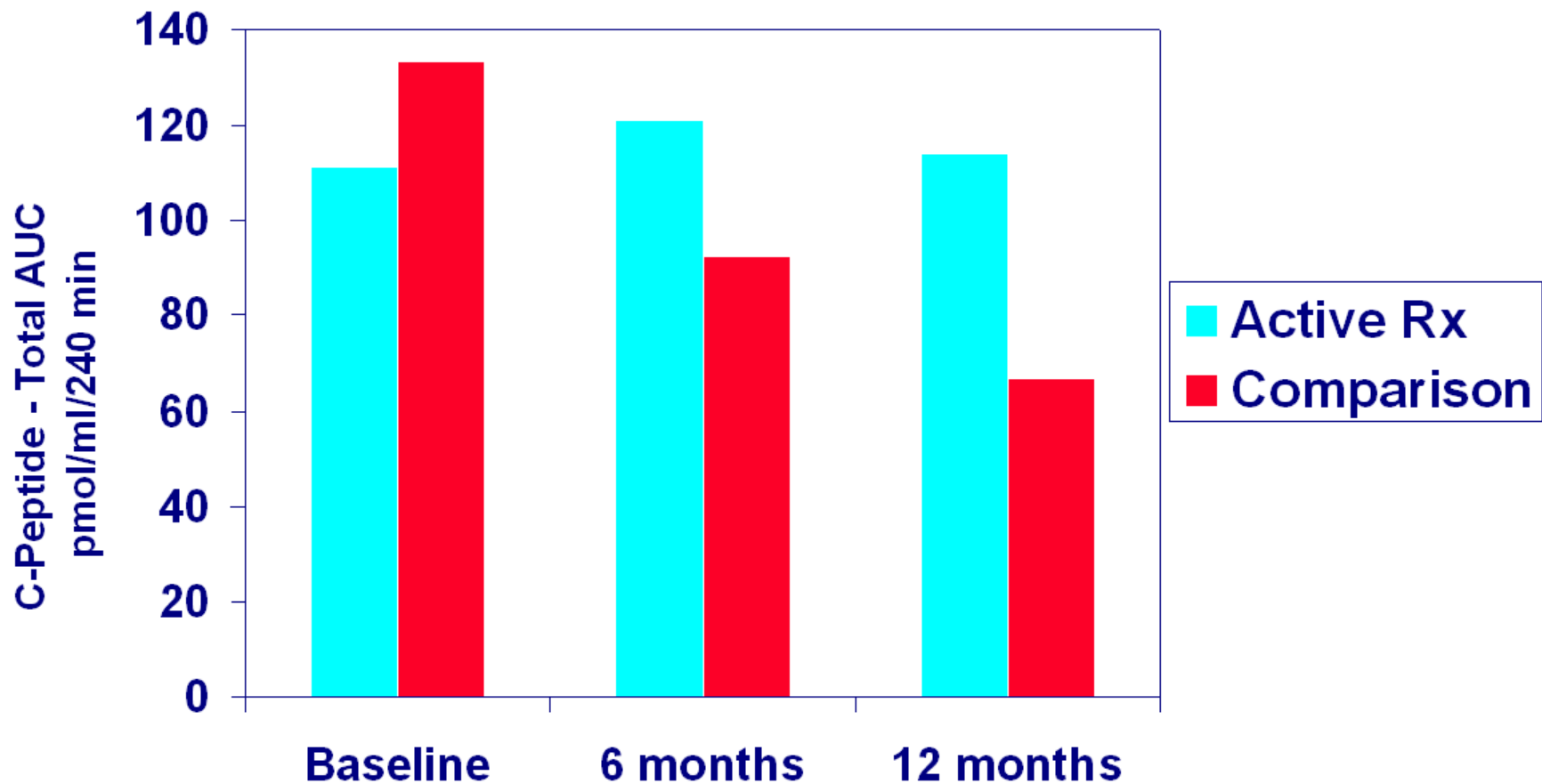
# Pro-Insulin, C-Peptide, Insuline



# Example of Mixed Meal Tolerance Test



# Changes in C-Peptide Responses During MMTT Over Time



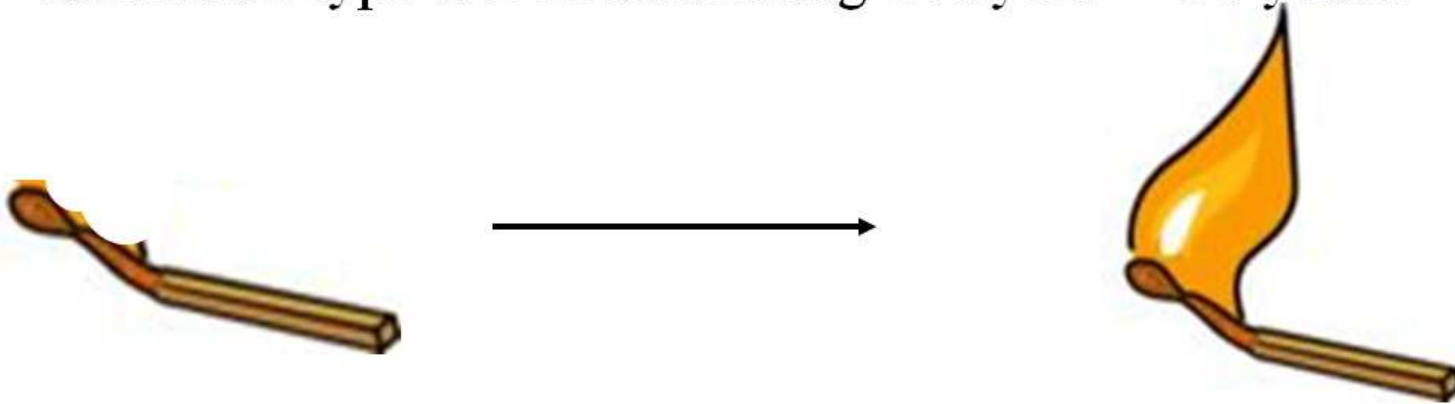
# TrialNet Interventions

- New-Onset Diabetes
  - Anti-CD3 (via ITN collaboration)
  - Mycophenolate Mofetil +/- Anti-CD25
  - Anti-CD20
  - Anti-CD3 + Exenatide
  - IL-2 plus Sirolimus – Phase 1 Safety Study
- Relatives At Risk
  - Natural History
  - Oral Insulin
  - Beta Cell Preservation (exenatide) – pilot study
  - Anti-CD3
- Newborns
  - Nutritional : Omega-3-Fatty Acids



## ***ENVIRONMENTAL FACTORS***

Incidence type 1 DM Increasing 3%/year > 30 years!



### Protective Factor Decreasing

-Hygiene Hypothesis – Bach NEJM 347:911, 2002

### Triggering Factors

- Congenital Rubella-Rubenstein Diabetes 31:1088, 1982
- Kilham Rat Virus (BB-DR rat)-Zipris J. Immunol 174:131, 2005
- Poly-IC Induction Interferon Alpha-Devendra Diabetes 54 2005
- Dietary Factors-Scott Ann Rev Nutr 26:175, 2006

# Diabète LADA

## Latent Autoimmune Diabetes of Adults

Fasting C-peptide (nM/l)

Type 2: n=90

Age: 63 (53-72)

Durée: 8 (3-15)

Type 1: n=57

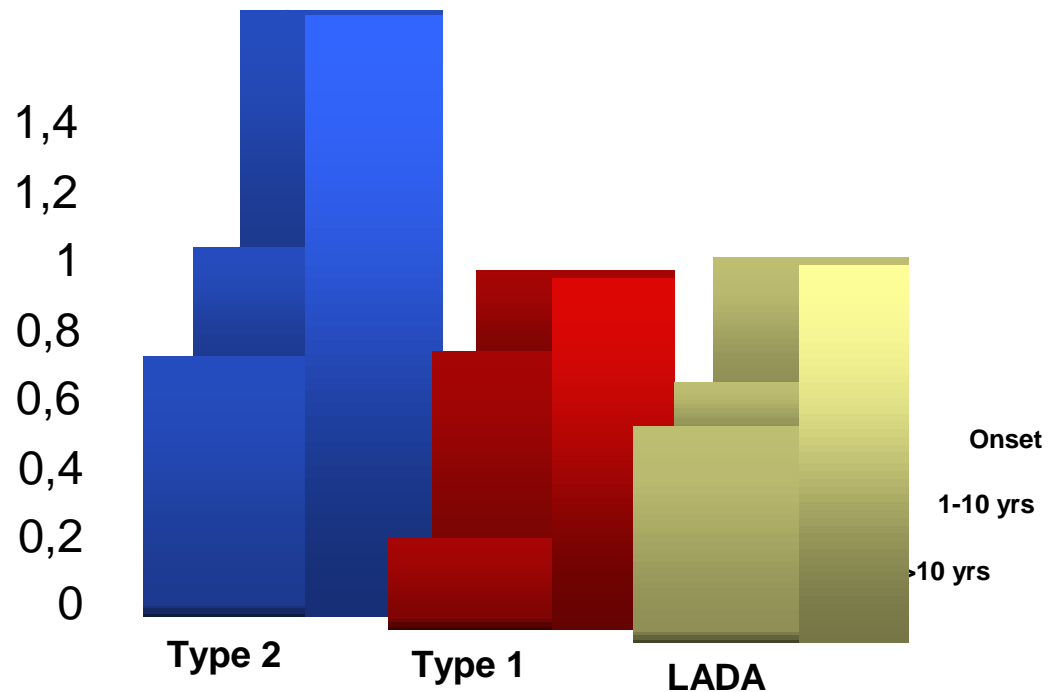
Age: 44,5 (34-53)

Durée: 0,1 (0,1-4,5)

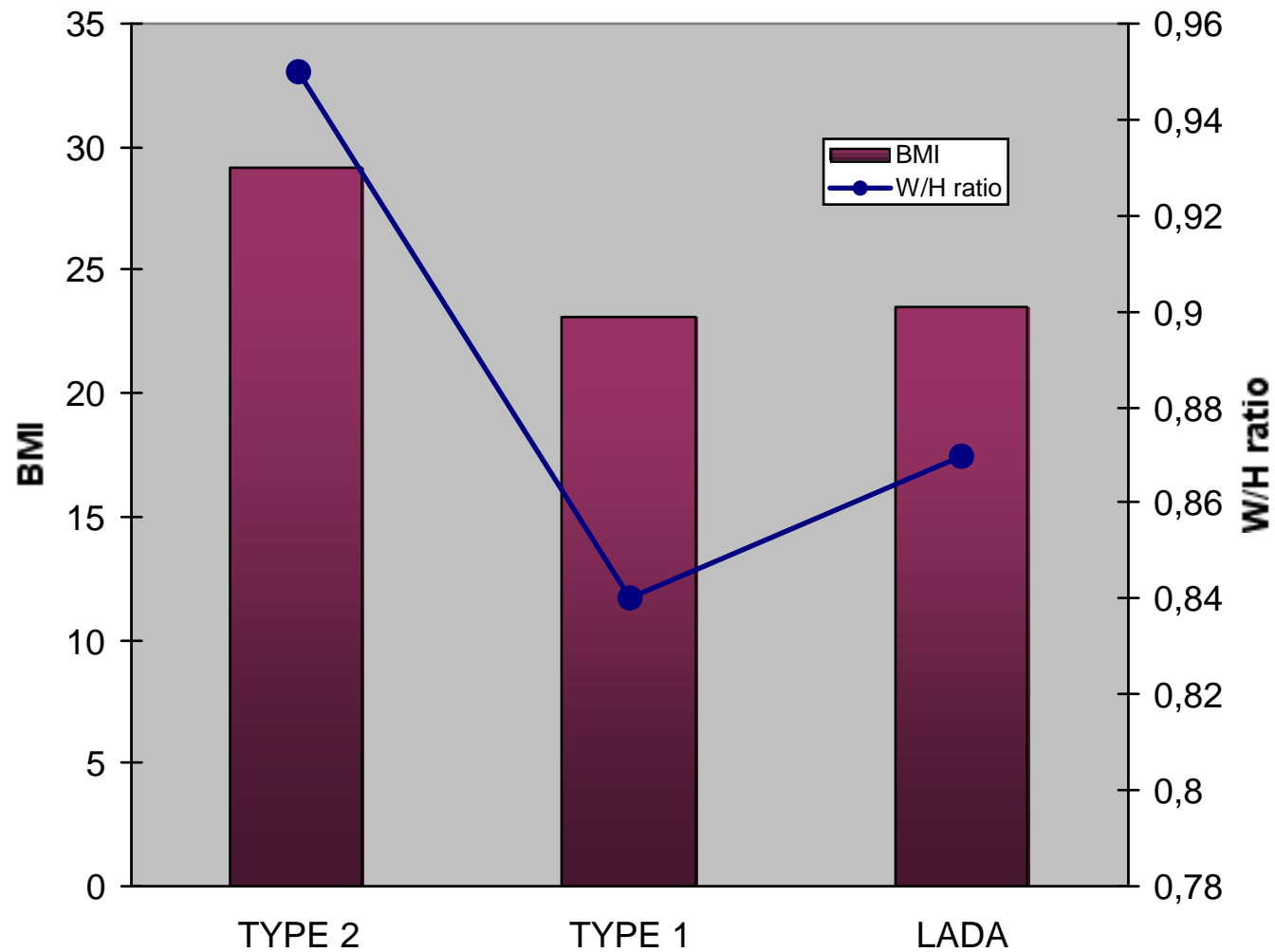
LADA: n=54

Age: 59 (47-67)

Durée: 4 (1-9,5)



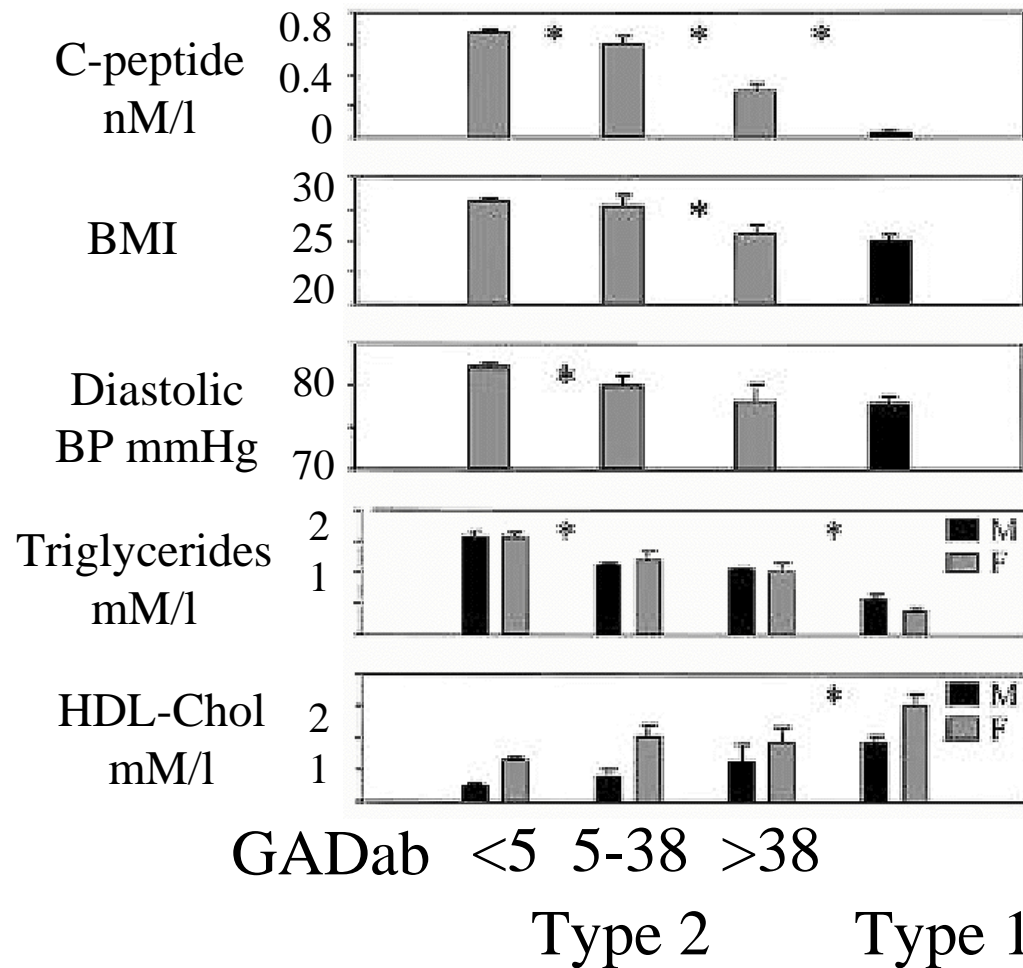
## BMI and W/H ratio





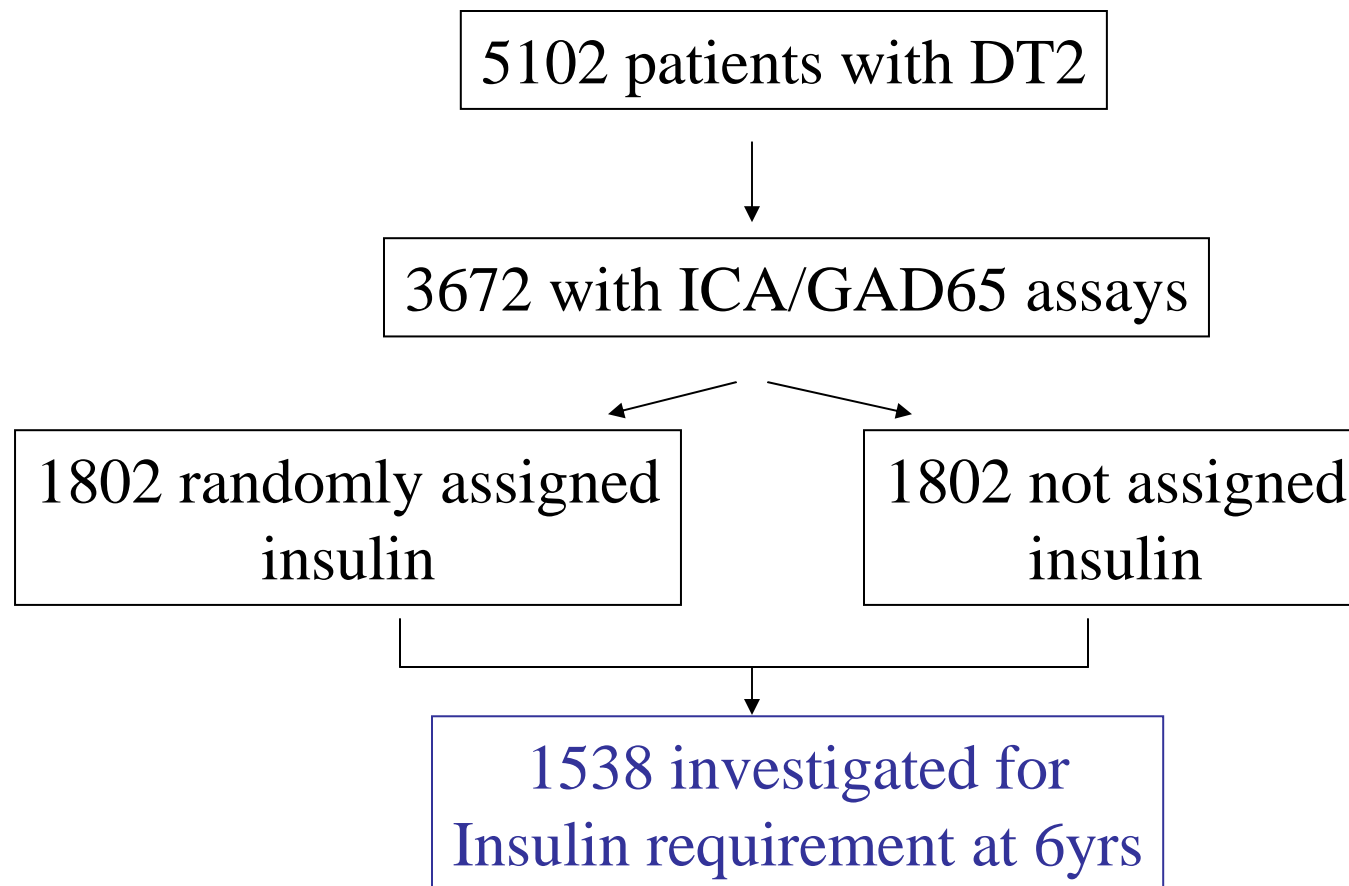
# Syndrome métabolique et LADA

Prévalence GAD: 9,3% de 1122 DT2



## UKPDS 25

Turner R et al, Lancet 1997, 350, 1288, 1997



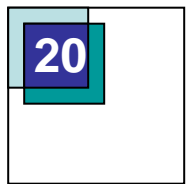
## Diabète LADA et insuline (UKPDS 25)

### Devenir à 6 ans du groupe sans insuline (n=1870)

Paramètre	sans insuline	avec insuline	p
	1644	237	
Age	53.6	48.5	<0.0001
BMI	29.5	27.6	<0.0001
ICA (%)	2.9	26.2	<0.0001
Anti-GAD (%)	5.3	38	<0.0001

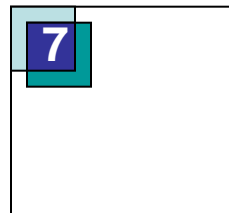
## Présence ICA et GAD en fonction de l'âge au diagnostic

25-35 yrs



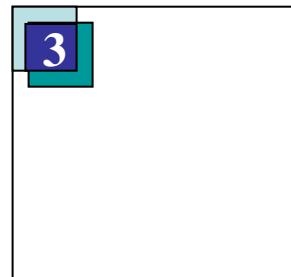
N=157

35-44 yrs



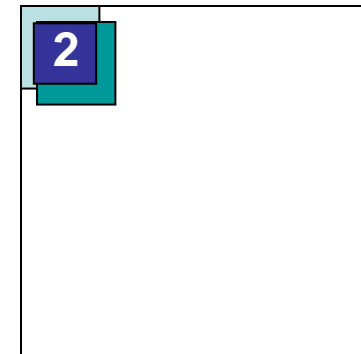
N=508

45-54 yrs



N=1238

55-65 yrs



N=1769



# DETECTION AND DIAGNOSIS OF GESTATIONAL DIABETES MELLITUS (GDM)



# Recommendations: Detection and Diagnosis of GDM (1)

- Screen for undiagnosed type 2 diabetes at the first prenatal visit in those with risk factors, using standard diagnostic criteria (B)
- In pregnant women not previously known to have diabetes, screen for GDM at 24–28 weeks' gestation, using a 75-g OGTT and specific diagnostic cut points (B)



# Recommendations:

## Detection and Diagnosis of GDM (2)

---

- Screen women with GDM for persistent diabetes at 6–12 weeks' postpartum, using a test other than A1C (E)
- Women with a history of GDM should have lifelong screening for the development of diabetes or prediabetes at least every 3 years (B)
- Women with a history of GDM found to have prediabetes should receive lifestyle interventions or metformin to prevent diabetes (A)



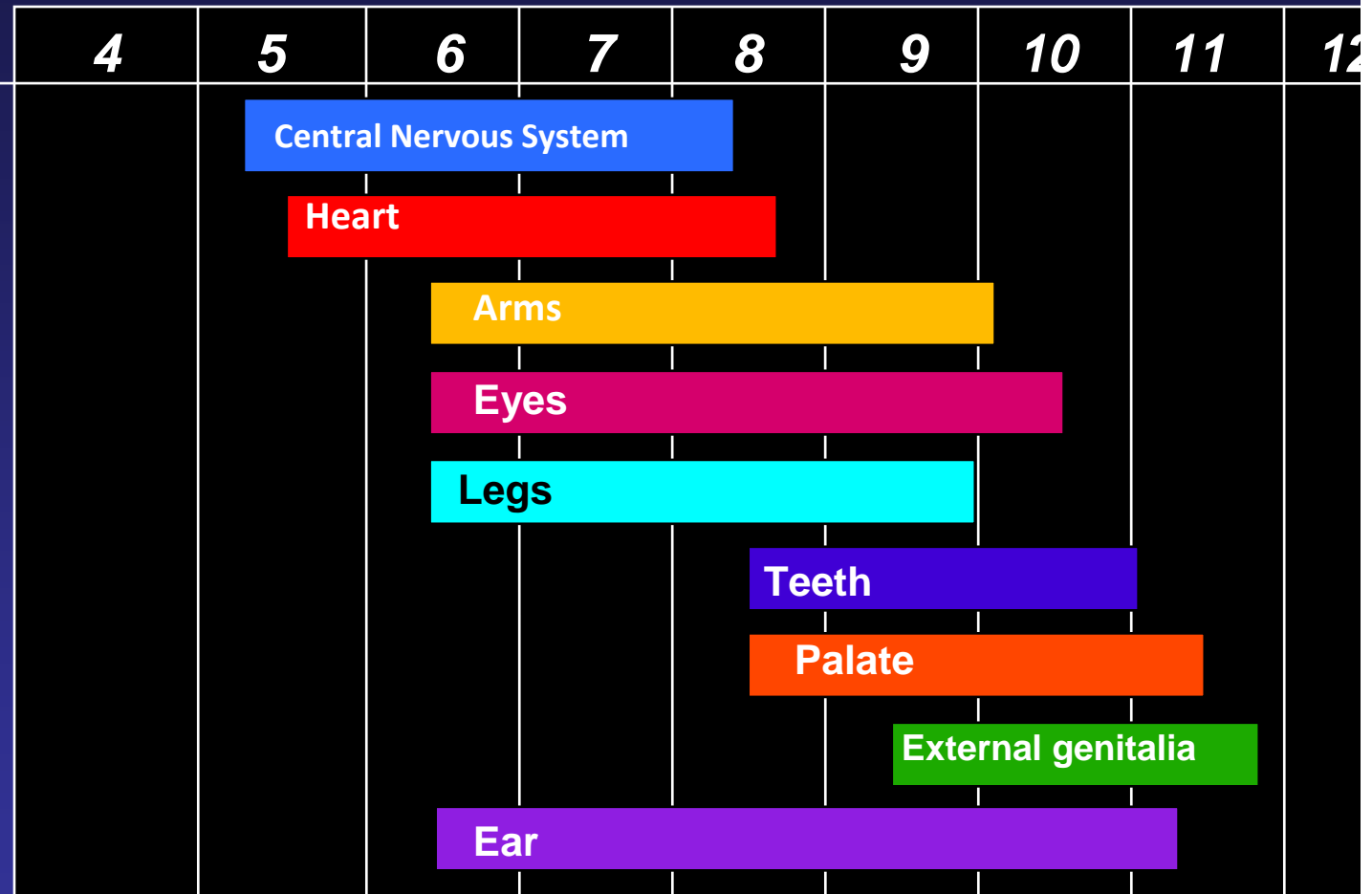
# Screening for and Diagnosis of GDM

- Perform a 75-g OGTT, with plasma glucose measurement fasting and at 1 and 2 h, at 24–28 weeks' gestation in women not previously diagnosed with overt diabetes
- Perform OGTT in the morning after an overnight fast of at least 8 h
- GDM diagnosis: when any of the following plasma glucose values are exceeded
  - Fasting  $\geq 92$  mg/dL (5.1 mmol/L)
  - 1 h  $\geq 180$  mg/dL (10.0 mmol/L)
  - 2 h  $\geq 153$  mg/dL (8.5 mmol/L)

# Critical Periods of Development

*Weeks gestation  
from LMP*

Most susceptible  
time for major  
malformation



Missed Period

Mean Entry into Prenatal Care

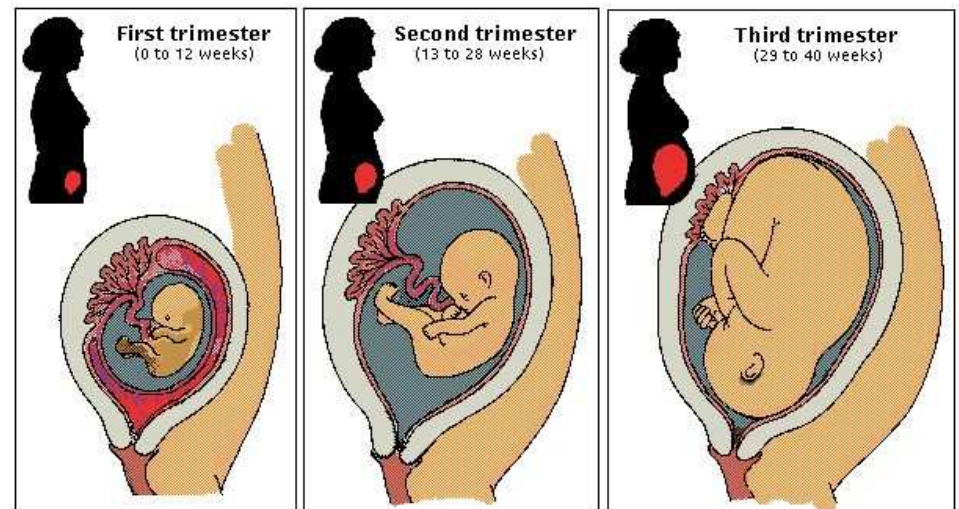
# Recommendations: Preconception Care (1)

- A1C levels should be as close to normal as possible (7%) in an individual patient before conception is attempted (B)
- Starting at puberty, incorporate preconception counseling in routine diabetes clinic visit for all women of childbearing potential (C)
- Women with diabetes contemplating pregnancy should be evaluated and, if indicated, treated for diabetic retinopathy, nephropathy, CVD (B)



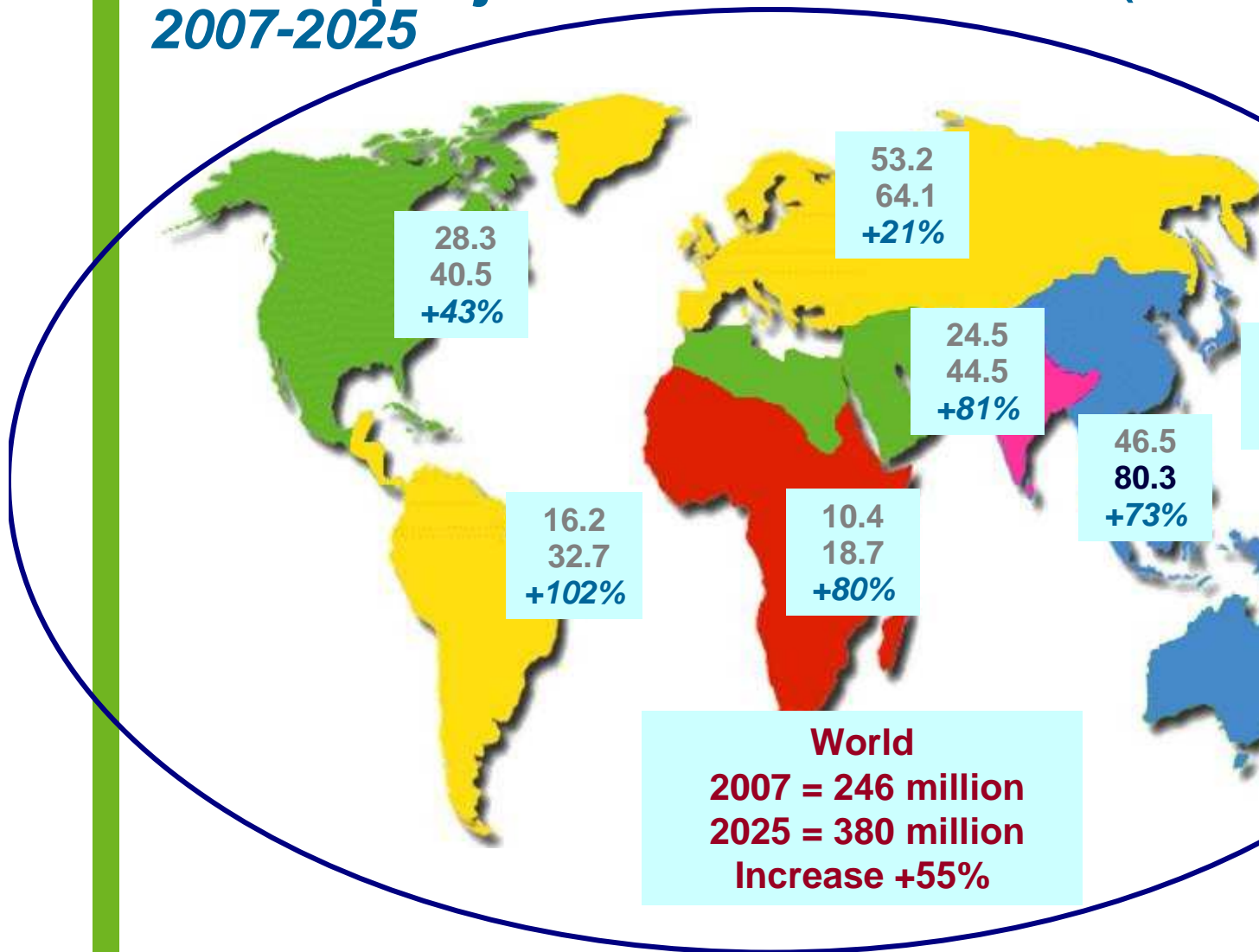
# Recommendations: Preconception Care (2)

- Medications should be evaluated prior to conception, since drugs commonly used to treat diabetes and its complications may be contraindicated or not recommended in pregnancy, including statins, ACE inhibitors, ARBs, and most noninsulin therapies (E)
- Since many pregnancies are unplanned, consider potential risks/benefits of medications contraindicated in pregnancy in all women of childbearing potential; counsel accordingly (E)

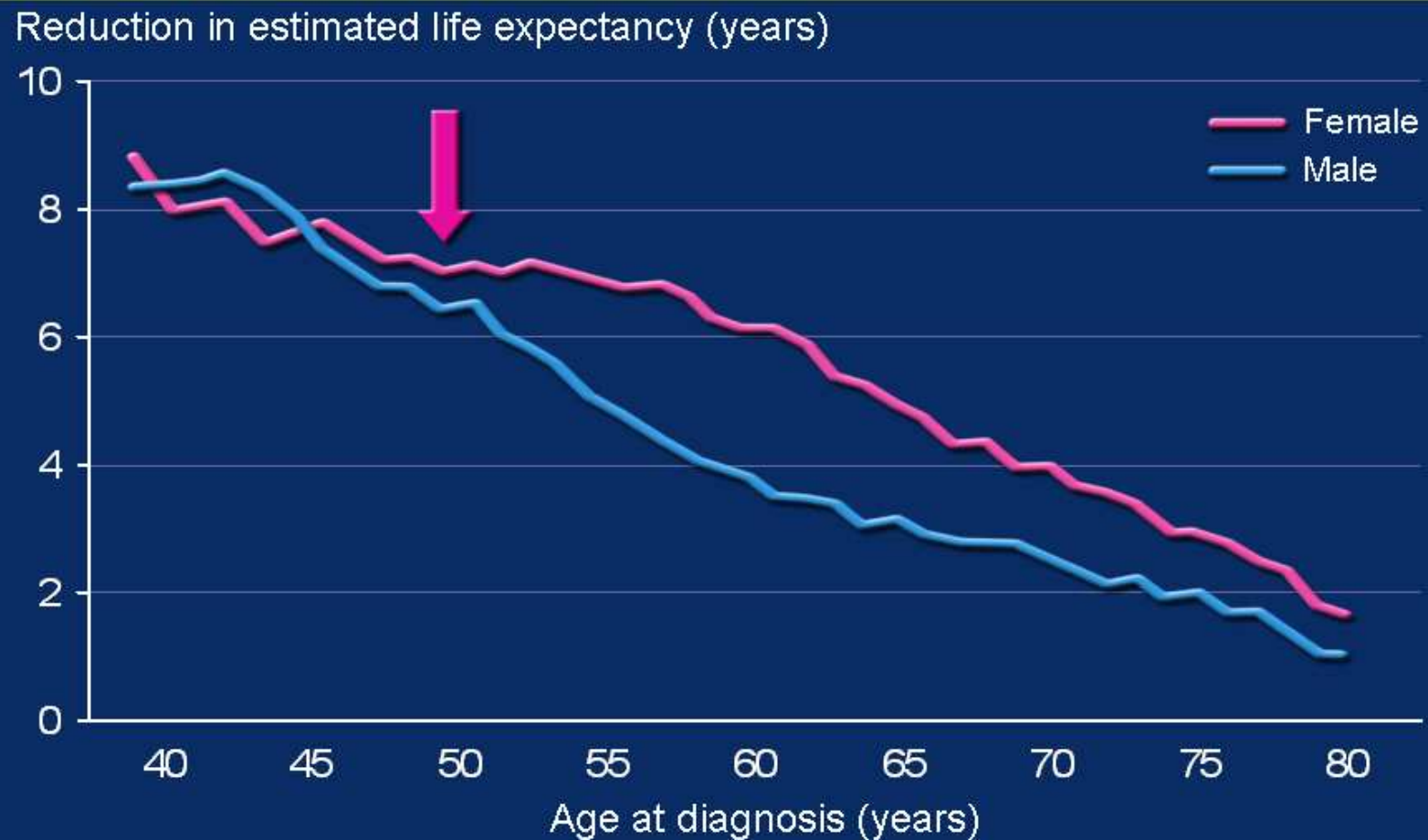




# Global projections for diabetes (millions) 2007-2025



## Reduction in Life Expectancy of Patients with Type 2 Diabetes by Age at Diagnosis



Roper et al. *BMJ* 2001;322:1389-93



Dr Marc KEIPES  
 Directeur  
 Médecin spécialiste en endocrinologie et maladies métaboliques

## Diabète – Évaluez votre risque

Veuillez répondre aux 8 questions suivantes

- Quel âge avez-vous?
 

<input type="checkbox"/> moins de 35 ans	0 points
<input type="checkbox"/> entre 35 et 44 ans	1 point
<input type="checkbox"/> entre 45 et 54 ans	2 points
<input type="checkbox"/> entre 55 et 64 ans	3 points
<input type="checkbox"/> plus de 64 ans	4 points
- Un membre de votre famille (lien d'hérédité) est-il atteint de diabète?
 

<input type="checkbox"/> non	0 points
<input type="checkbox"/> oui, un membre de la famille proche : un père, une mère, un enfant, un frère, une sœur	5 points
<input type="checkbox"/> oui, un membre de la famille plus éloignée : un grand-parent, une tante, un oncle, un(e) cousin(e)	3 points
- Quel est votre tour de taille au niveau du nombril?
 

hommes	femmes	
<input type="checkbox"/> moins de 94 cm	moins de 80 cm	0 points
<input type="checkbox"/> 94 - 102 cm	80 - 88 cm	3 points
<input type="checkbox"/> plus de 102 cm	plus de 88 cm	4 points
- Pratiquez-vous au moins 30 minutes d'activité physique par jour ?
 

<input type="checkbox"/> oui	0 points
<input type="checkbox"/> non	2 points



# ne joue pas ! avec ton corps \*

**Silencieux, le diabète de type 2 est une maladie qui peut longtemps passer inaperçue !**

## Le saviez-vous...

Aujourd'hui, plus de 250 millions de personnes souffrent de diabète, dont 90 % de diabète de type 2. Un diabète diagnostiqué tardivement ou mal soigné peut avoir de lourdes conséquences sur la santé : 2 à 4 fois plus d'infarctus et d'attaques cérébrales, 15 fois plus d'amputations des membres inférieurs, risque accru d'insuffisance rénale et d'insuffisance cardiaque.

## >>Pensez au dépistage !

Plus un diabète est détecté tôt, plus il est facile à traiter, moins grands sont les risques de complications !

En optant pour une meilleure hygiène de vie, on peut l'éviter ou retarder son apparition.

Si vous avez des problèmes de poids, une vie sédentaire, une personne diabétique dans votre famille, alors informez-vous et évaluez votre risque de diabète :

[www.edudora2.eu](http://www.edudora2.eu) ou [www.sante.lu](http://www.sante.lu)

## >>Parlez-en à votre médecin !

Vous avez des questions sur le diabète ?



### >> Qu'est-ce qui augmente mon risque de devenir diabétique ?

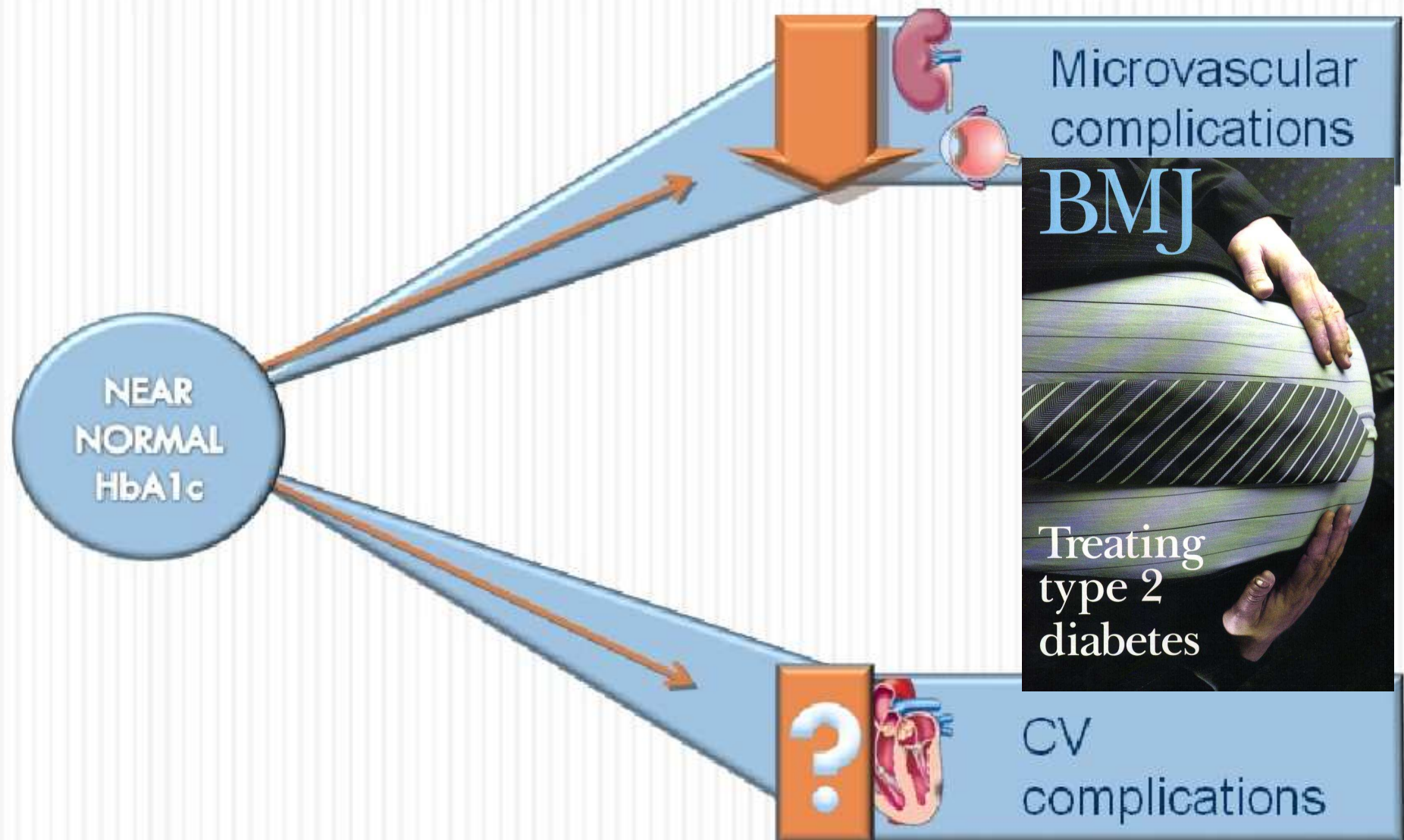
- \* L'âge (> 45 ans)
- \* Diabète dans la famille
- \* Surpoids
- \* Obésité abdominale (BMI > 30)
- \* Tension artérielle élevée
- \* Sédentarité
- \* Taux de graisses dans le sang élevé (cholestérol et triglycérides)

### >> Que puis-je faire pour prévenir ou éviter le diabète de type 2 ?

- \* Maintenir un poids santé
- \* Avoir une activité physique régulière (> 30min/jour)
- \* Manger équilibré
- \* Consommer 5 - 6 portions de légumes ou de fruits par jour
- \* Ne pas trop saler les aliments
- \* Ne pas fumer
- \* Consommer l'alcool avec modération
- \* Boire au moins 1,5l d'eau par jour



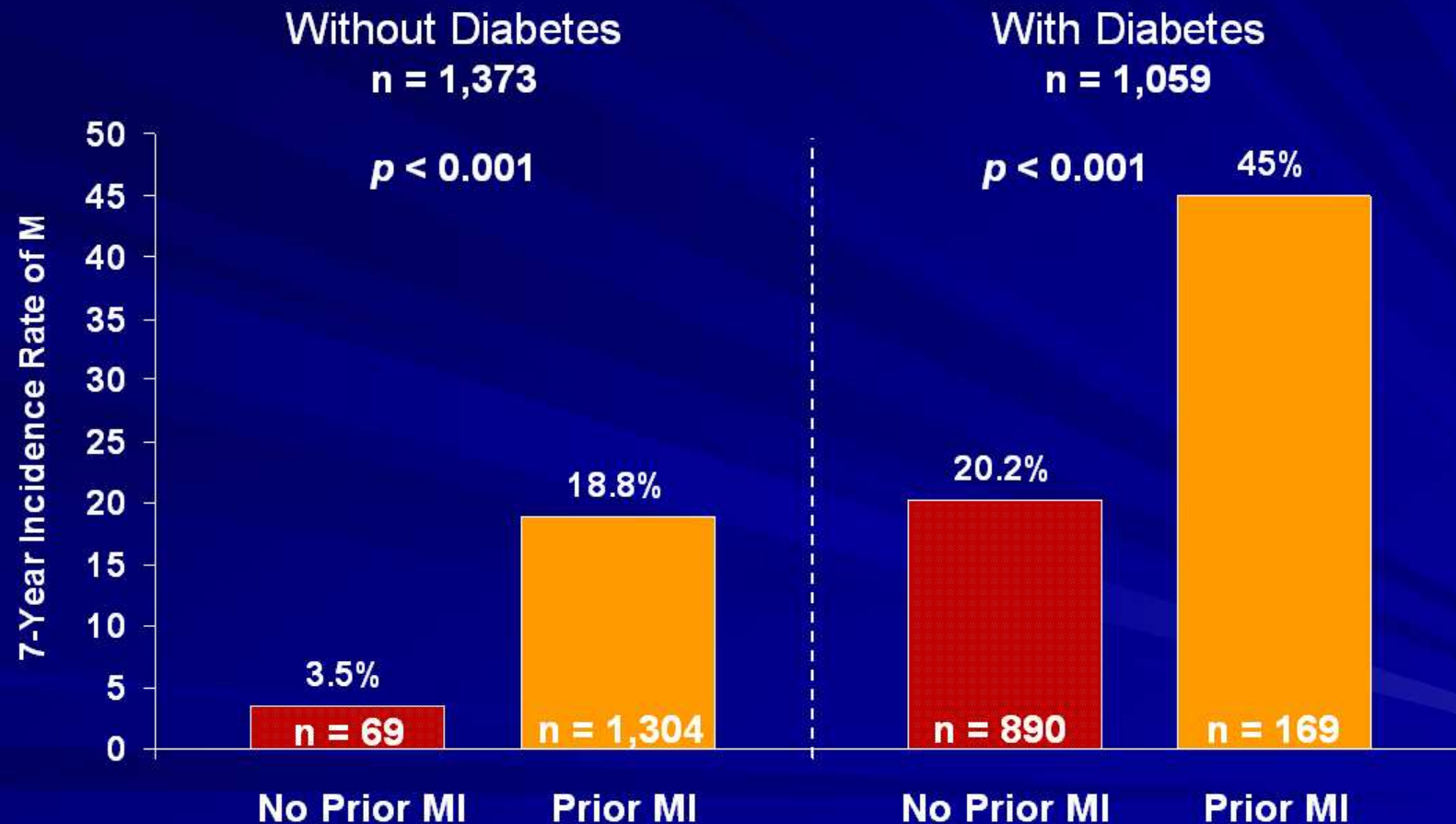
# HbA1c and complications – micro or macro?





# Patients with Diabetes are at Increased Risk for Myocardial Infarction (MI)

## Type 2 Diabetes and CVD: 7-Year Incidence of Fatal/Nonfatal MI

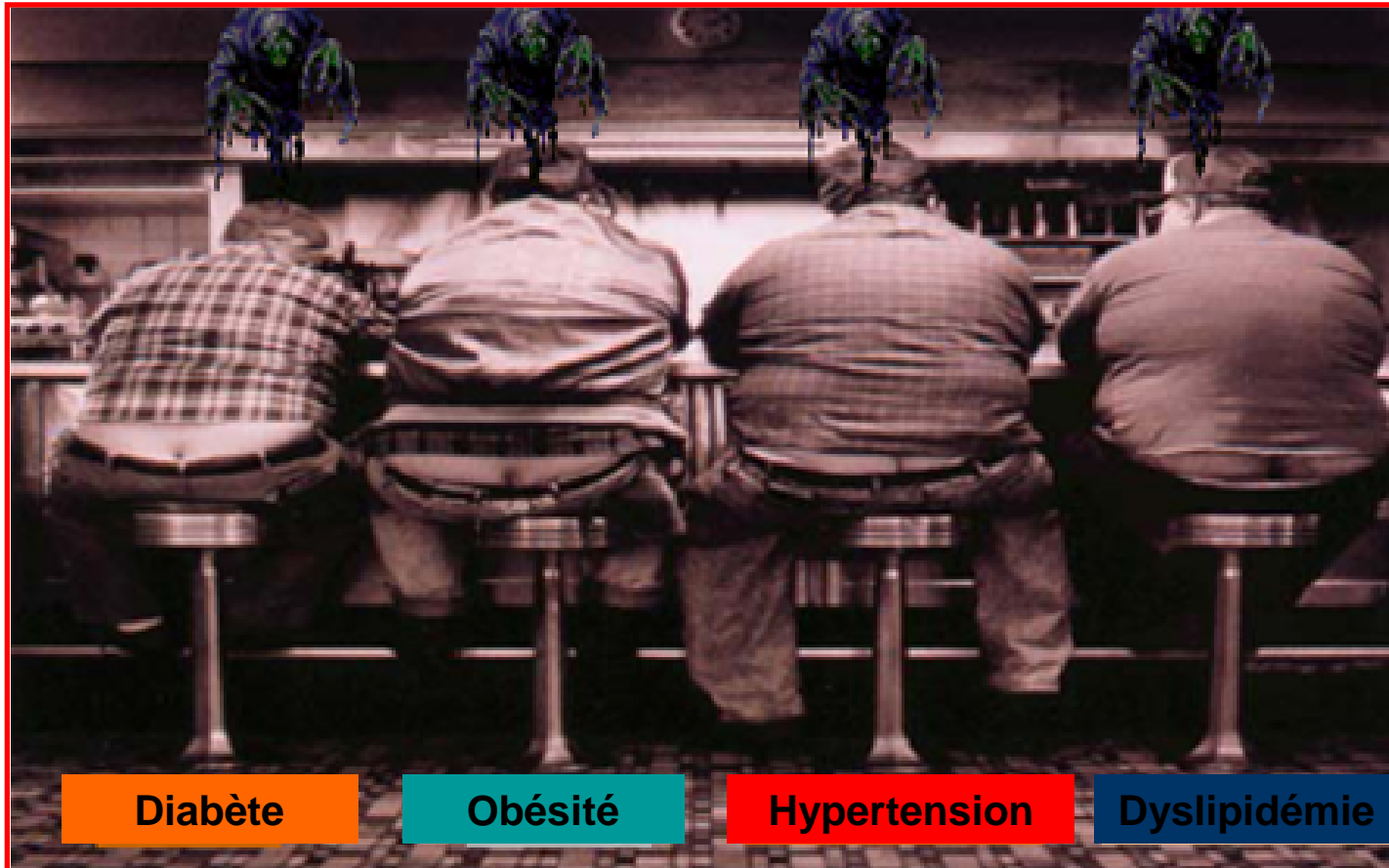


CVD = cardiovascular disease  
MI = myocardial infarction

## Morbi-mortalité cardio-vasculaire chez le diabétique de type 2

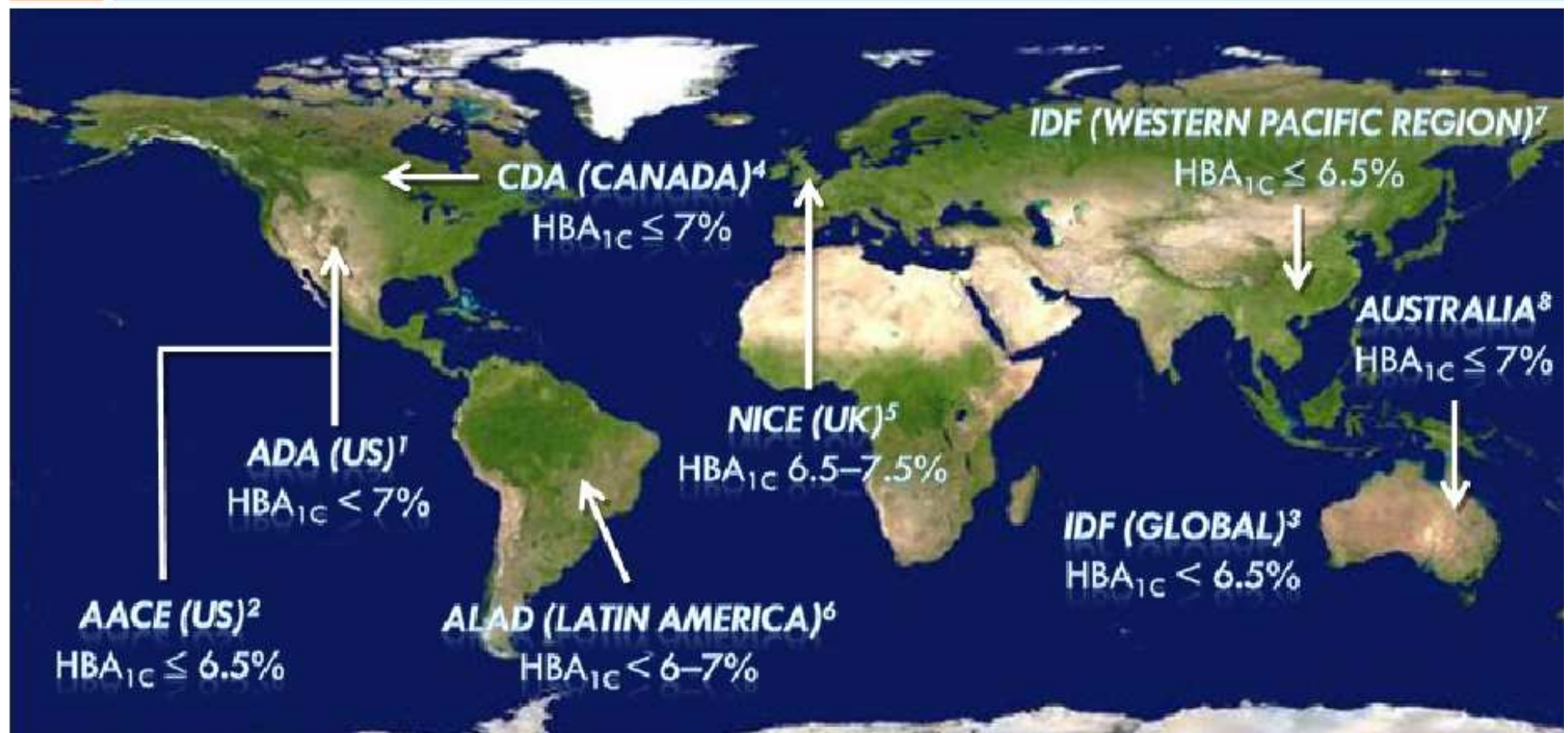
- L'effet de la réduction de la glycémie sur les accidents coronariens ou cérébro-vasculaires est mal connu.
- Niveau d'HbA1c à atteindre reste controversé

# Les 4 mousquetaires



= +/- “syndrome métabolique”

# Diabetes management guidelines for HbA<sub>1c</sub>



**Guidelines recommend target HbA<sub>1c</sub> as near to normal as safely possible**

<sup>1</sup>ADA. Diabetes Care 2007; 30 (Suppl. 1):S4–S41. <sup>2</sup>AACE/AACE Diabetes Road Map Task Force, 2005. Available at: [www.aace.com/meetings/consensus/odimplementation/roadmap.pdf](http://www.aace.com/meetings/consensus/odimplementation/roadmap.pdf) <sup>3</sup>IDF Clinical Guidelines Taskforce, 2005. Available at: [www.idf.org/webdata/docs/IDF%20GGT2D.pdf](http://www.idf.org/webdata/docs/IDF%20GGT2D.pdf). <sup>4</sup>CDA. Can J Diabetes 2003; 27 (Suppl. 2):S1–S152. <sup>5</sup>NICE, 2002. Available at: [www.nice.org.uk](http://www.nice.org.uk). <sup>6</sup>AL/ Rev Asoc Lat Diab 2000; 8 (Suppl. 1):101–167. <sup>7</sup>Asian-Pacific Type 2 Diabetes Policy Group, 2005. Available at: [www.idf.org/webdata/docs/T2D\\_practical\\_tt.pdf](http://www.idf.org/webdata/docs/T2D_practical_tt.pdf). <sup>8</sup>HSW Health Department, 1996.



# Effect of intensive glucose lowering in macrovascular complications of Type 2 diabetic patients

	<b>VADT</b>	<b>ACCORD</b>	<b>ADVANCE</b>
<i>Primary outcome</i>	Non-fatal MI Non-fatal stroke CVD death Hospitalization for CHF Revascularization	Non-fatal MI Non-fatal stroke CVD death	Non-fatal MI Non-fatal stroke CVD death
<i>Hazard Ratio for primary outcome (95% CI)</i>	0.87 (0.730 – 1.04)	0.90 (0.78 – 1.04)	0.94 (0.84 – 1.06)
<i>Hazard Ratio for mortality (95% CI)</i>	1.065 (0.801 – 1.416)	1.22 (1.01 – 1.46)*	0.93 (0.83 – 1.06)

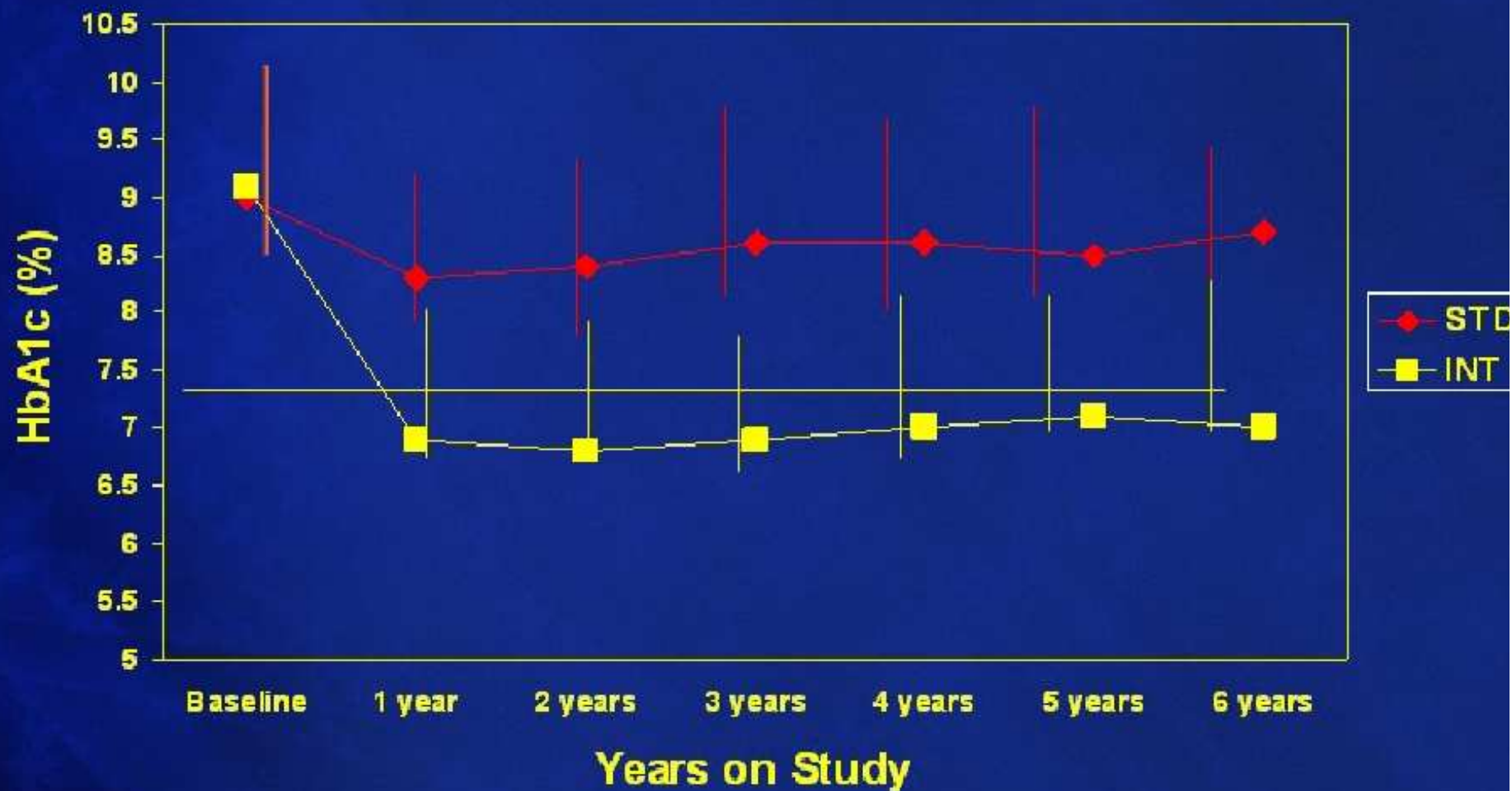
\*P=0.04



# The lower, the worse???

- Ne faut-il plus réduire la glycémie à tout prix?
  - Personnes âgées?
  - Personnes avec durée du diabète très importante?
- Aux prix d'innombrables d'hypoglycémies?
  - Stimulation brusque du système sympathique délétère??
  - Surtout chez patients « cardiaques »???
- Aux prix de prise de poids?
  - Avec risque d'aggravation des autres facteurs de risque cardio-vasculaires?

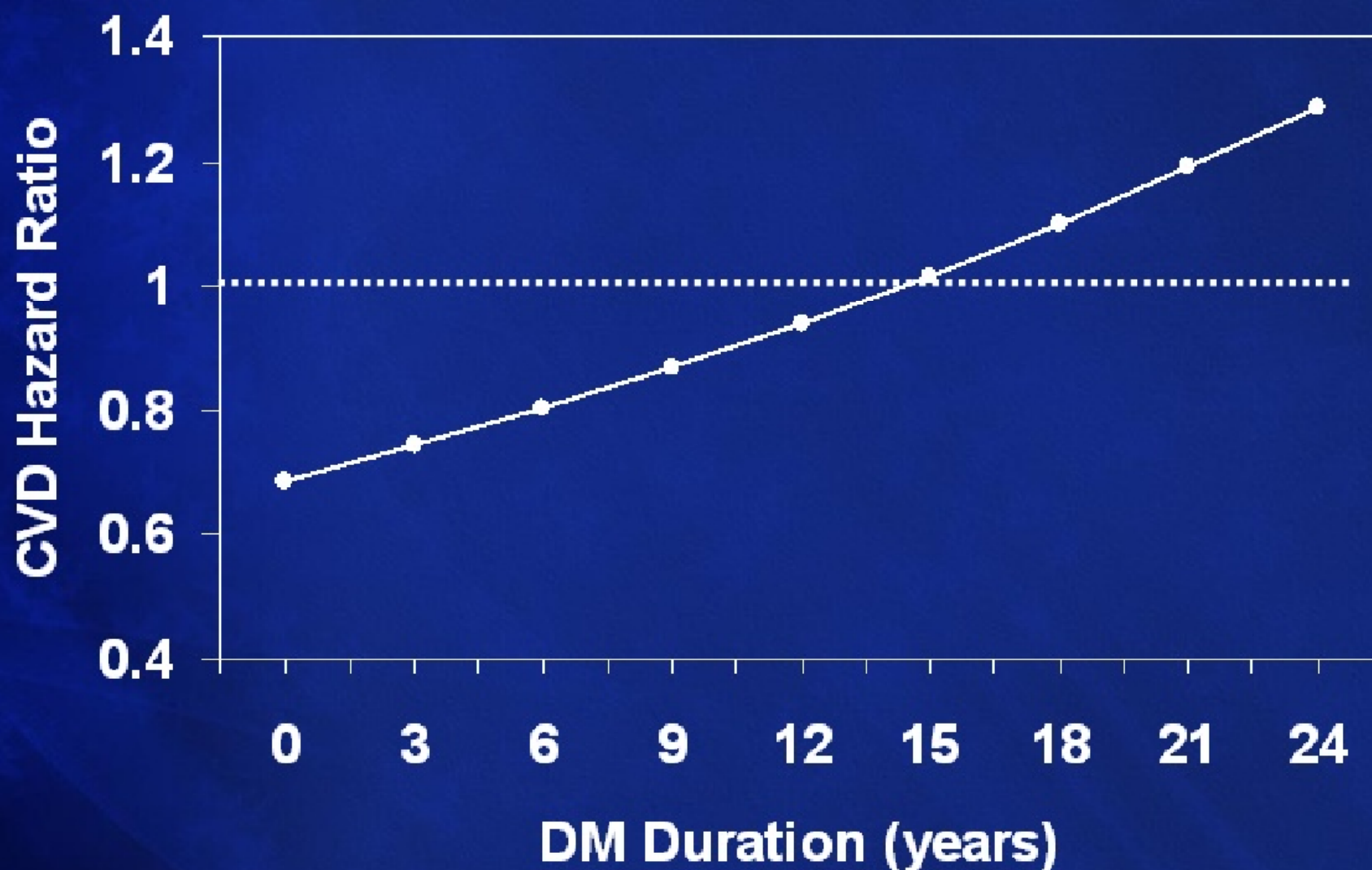
# Median HbA1c +/- IQR



# Median HbA1c

- Standard Arm: 8.4%
- Intensive Arm: 6.9%

# Relationship of DM Duration and HR for CVD Events with Intensive Therapy ( $p < 0.0001$ )

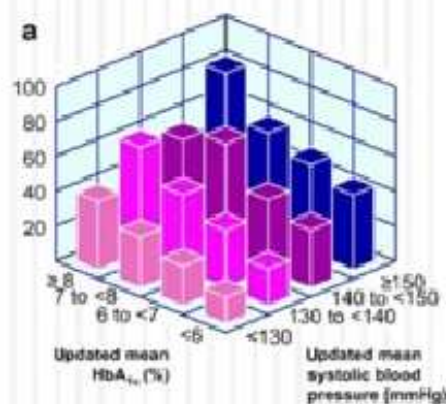




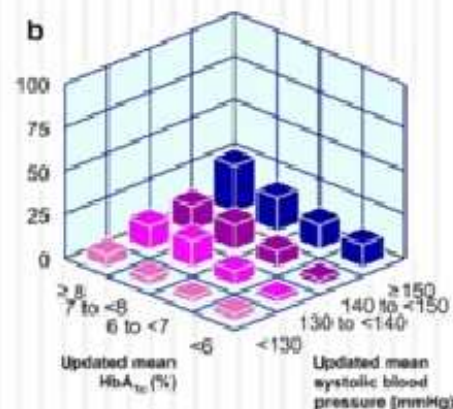
# Additive effects of glycemia and blood pressure exposure on risk of complications in type 2 diabetes

Stratton IM, *Diabetologia* 2006; 49: 1761–1769

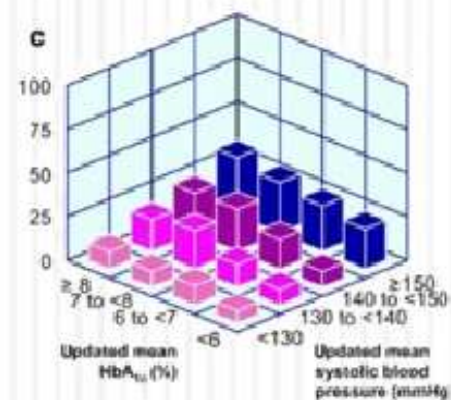
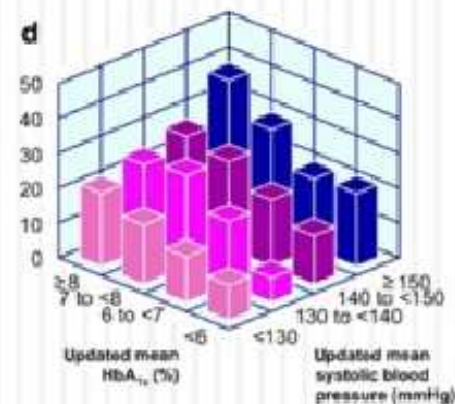
Any diabetes related end-point



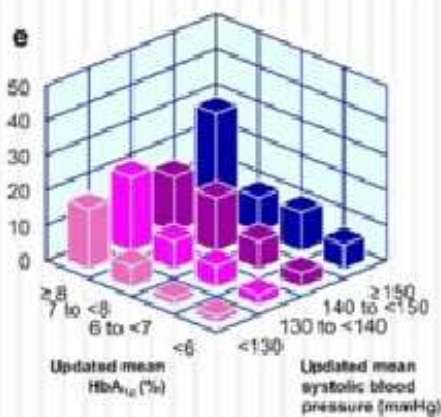
Diabetes related deaths



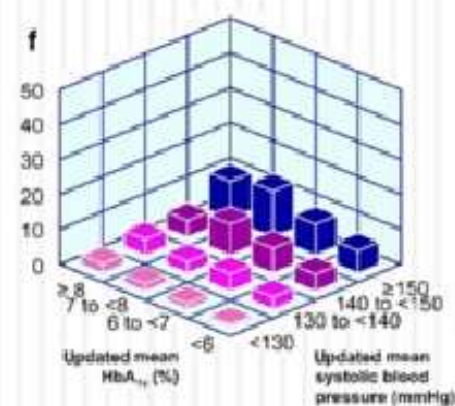
All-cause mortality



Myocardial infarction



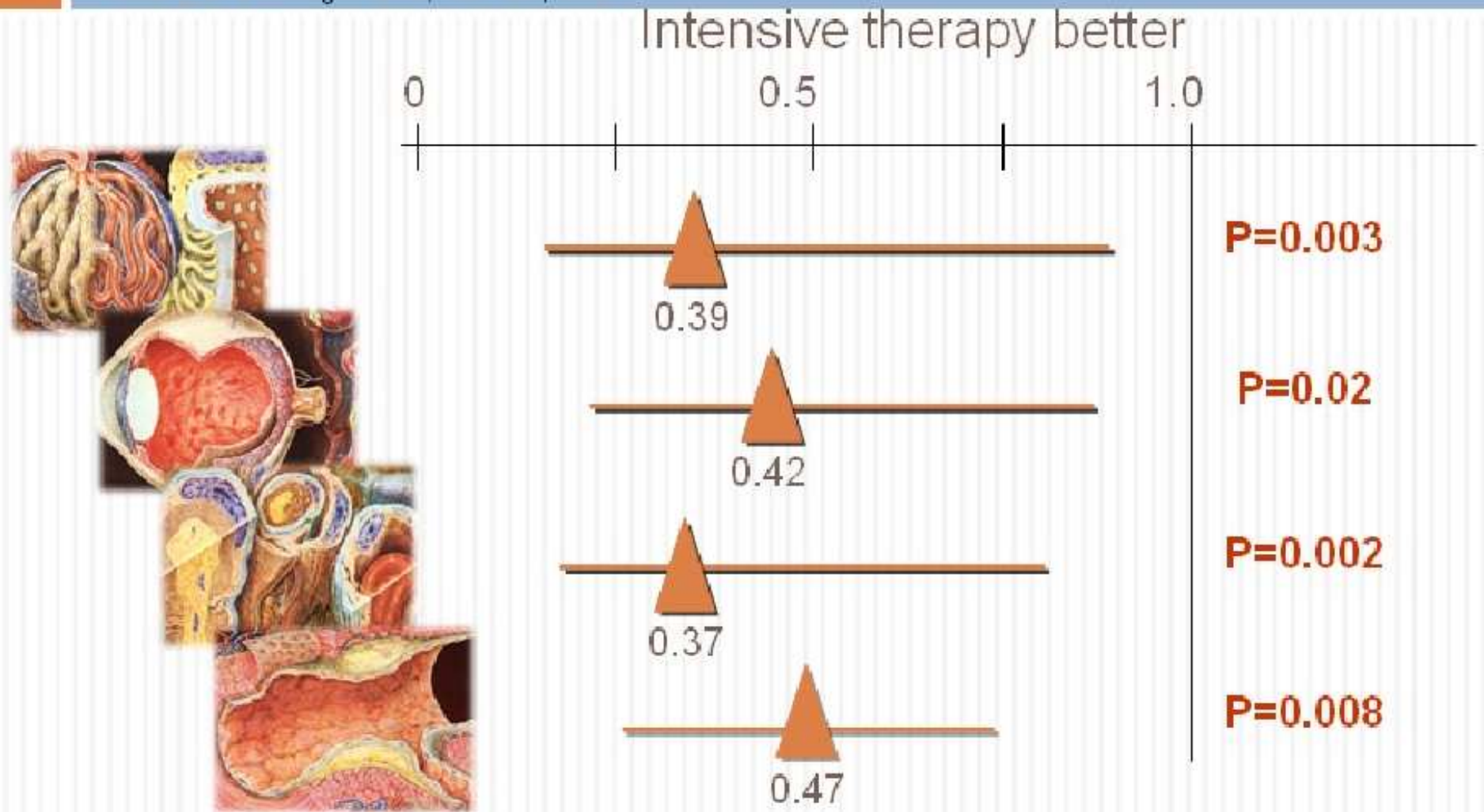
Microvascular disease



Stroke

# Multifactorial Intervention and Vascular Complications in Patients with Type 2 diabetes. The Steno 2

Gaede P et al *N Engl J Med*, 348: 383, 2003



# Conclusions

**Intensive glucose lowering to a mean HbA1c of 6.5% was safe and effective**

- Major benefits for microvascular disease
- Major benefits for kidney disease
- No excess mortality
- No weight gain
- No excess of serious sequelae from hypoglycaemia



# Le diabète en France

ENTRED 2007, 2485 patients diabétiques de type  
**2 % de patients dans la cible thérapeutique**

**HbA1c  $\leq$  7 %**

**52,1 %**

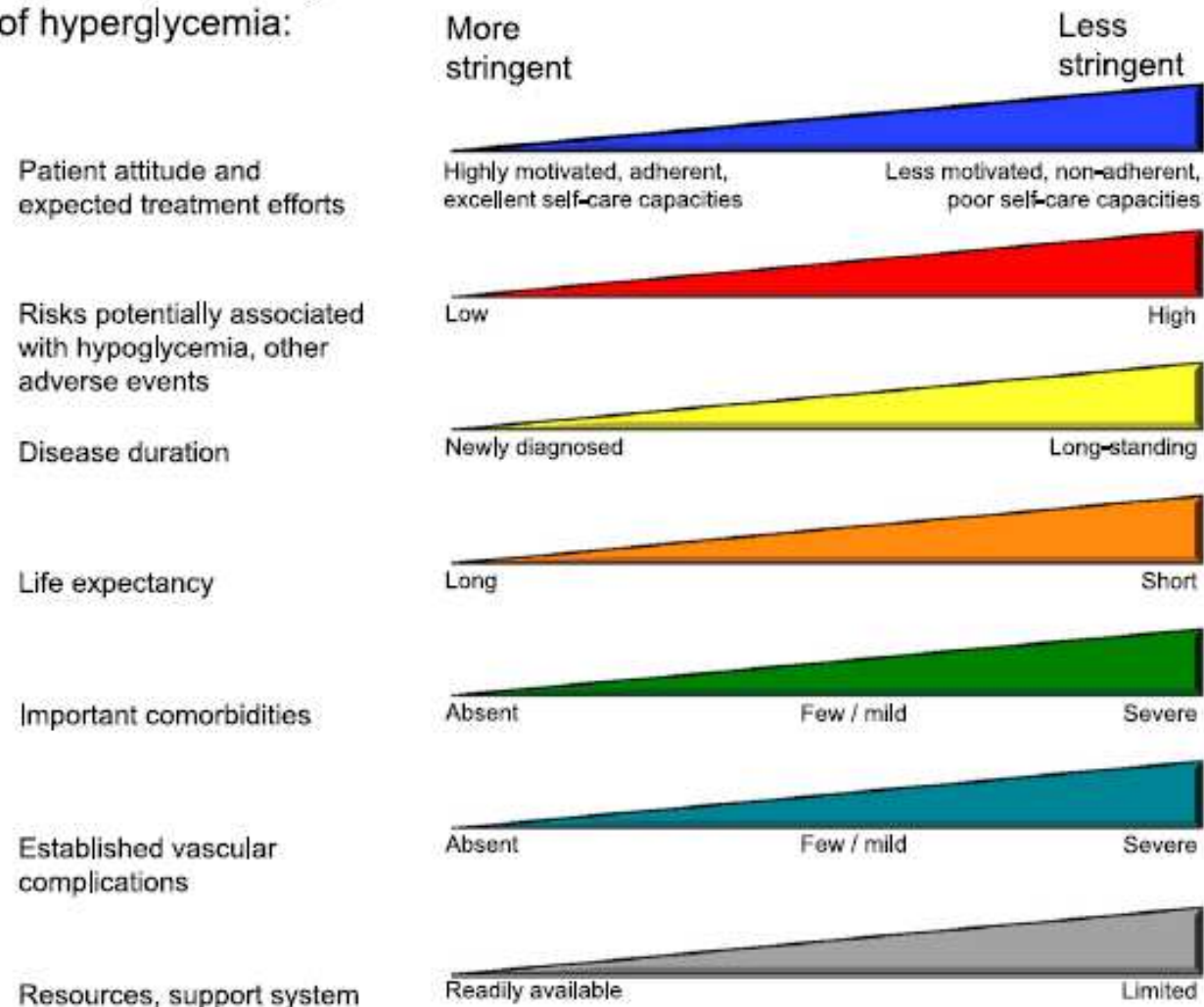
Ndong JR et al., Caractéristiques, risque vasculaire, complications et qualité des soins des personnes diabétiques dans les départements d'outre-mer et comparaison à la métropole : Entred 2007-2010, France. *BEH* 2010; 42-43: 432-436



## Quelle est la cause de ces échecs ?

- 1. Les médicaments sont insuffisamment efficaces
- 2. Les médicaments ne sont pas pris (« **non-observance** » des patients)
- 3. Les médicaments ne sont pas prescrits (« **inertie clinique** » des soignants)
- 4. *Combinaison* de ces causes

## Approach to management of hyperglycemia:



**Figure 1**—Depiction of the elements of decision making used to determine appropriate efforts to achieve glycemic targets. Greater concerns about a particular domain are represented by increasing height of the ramp. Thus, characteristics/predicaments toward the left justify more stringent efforts to lower HbA<sub>1c</sub>, whereas those toward the right are compatible with less stringent efforts. Where possible, such decisions should be made in conjunction with the patient, reflecting his or her preferences, needs, and values. This “scale” is not designed to be applied rigidly but to be used as a broad construct to help guide clinical decisions. Adapted with permission from Ismail-Beigi et al. (20).

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Vers des gesondheets  
recommandations  
individualisées zentrum

**Le consensus  
européen-américain  
2012**

Inzuchi SE et al.,  
Management of Hyperglycemia  
in Type 2 Diabetes: A Patient-  
Centered Approach  
Position Statement of the  
American Diabetes Association  
(ADA) and the European  
Association for the Study of  
Diabetes (EASD)  
*Diabetes Care* 19 April 2012

## Diabétologues inertes

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## Conclusion

- Try to lower **all** the risk factors
- « The lower the better »
  - mais pas chez tout le monde
  - et pas à n'importe quelle vitesse
  - mais surtout **le plus tôt possible**

# Recommendations: Glycemic, Blood Pressure, Lipid Control in Adults

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A1C

<7.0%\*

Blood pressure

<130/80 mmHg†

Lipids

LDL cholesterol

<100 mg/dL (<2.6 mmol/L)‡

\*More or less stringent glycemic goals may be appropriate for individual patients. Goals should be individualized based on: duration of diabetes, age/life expectancy, comorbid conditions, known CVD or advanced microvascular complications, hypoglycemia unawareness, and individual patient considerations.

†Based on patient characteristics and response to therapy, higher or lower systolic blood pressure targets may be appropriate.

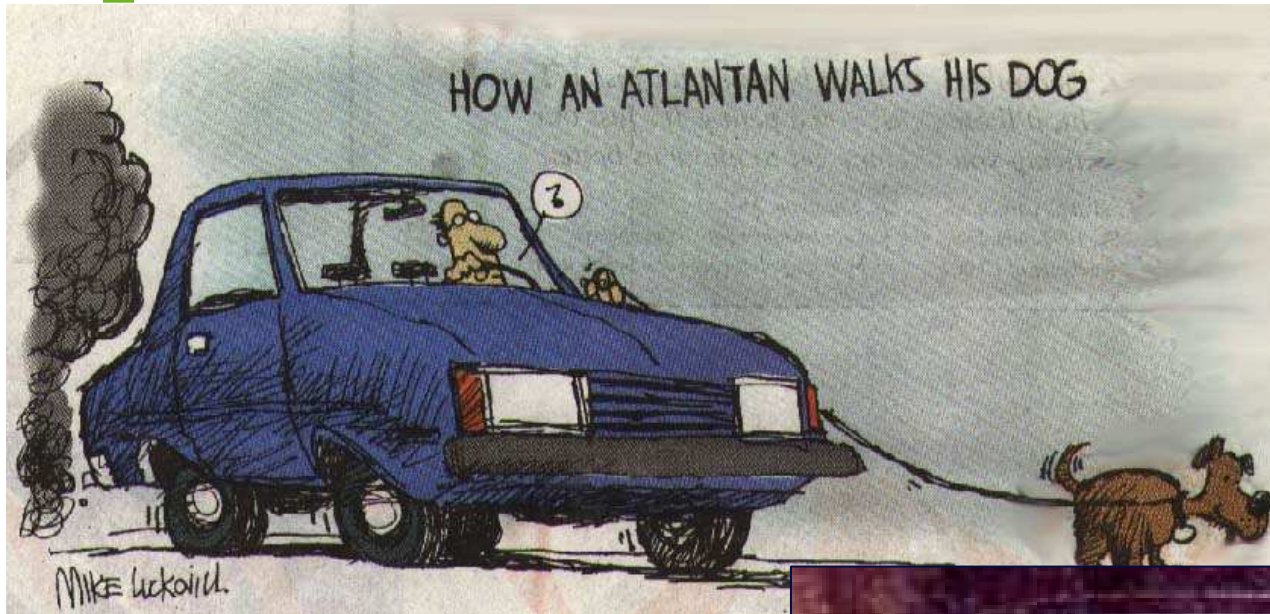
‡In individuals with overt CVD, a lower LDL cholesterol goal of <70 mg/dL (1.8 mmol/L), using a high dose of statin, is an option.



# Modern times



# Manque d'exercice physique : ... une plaisanterie ou la réalité?



E groussen merci fir ärt Nolauschteren

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**Table 1 Summary of the 15 loci identified in the KORA population**

SNP	SNP type	Locus	Chr	Coded/ noncoded	Position	MAF	Strongest association
				allele			
rs174547	Intronic	<i>FADS1</i>	11	T/C	61,327,359	30.4%	PC aa C36:3 / PC aa C36:4
rs2014355	Intronic	<i>ACADS</i>	12	T/C	119,659,907	27.7%	C3 / C4
rs211718	Upstream	<i>ACADM</i>	1	C/T	75,879,263	30.5%	C12 / C10
rs2286963	Coding	<i>ACADL</i>	2	T/G	210,768,295	36.5%	C9 / C10:2
rs9393903	Intronic	<i>ELOVL2</i>	6	G/A	11,150,895	24.6%	PC aa C40:3 / PC aa C42:5
rs2216405	Downstream	<i>CPS1</i>	2	A/G	211,325,139	18.5%	Glycine / PC ae C38:2
rs7156144	Upstream	<i>PLEKHH1</i>	14	G/A	67,049,466	41.4%	PC ae C32:1 / PC ae C34:1
rs11158519	Intronic	<i>SYNE2</i>	14	G/A	63,434,338	14.5%	PC ae C38:1 / PC aa C28:1
rs168622	Upstream	<i>SPTLC3</i>	20	G/T	12,914,089	37.5%	SM (OH) C24:1 / SM C16:0
rs8396	Downstream	<i>ETFDH</i>	4	T/C	159,850,267	29.8%	C14:1-OH / C10
rs7094971	Intronic	<i>SLC16A9</i>	10	A/G	61,119,570	13.5%	C0
rs2046813	Upstream	<i>ACSL1</i>	4	T/C	186,006,153	32.2%	PC ae C44:5 / PC ae C42:5
rs603424	Upstream	<i>SCD</i>	10	G/A	102,065,469	19.4%	C14 / C16:1

MODY 1 (5-10%)	HNF1 $\alpha$	Loss of function mutation in the HNF4 gene	
MODY 2 70%)	GCK	Several mutations in the Glucokinase gene	MILD (30- treatment
MODY3 70%)	HNF1 $\alpha$ p	Mutations of HNF1a gene	Sulfonylurea (30-
MODY 4 (<1 %)	IPF-1	Mutation of insulin Promotor Factor1 (agenesis) pancreas agenesis	
MODY 5 (5-10%)	HNF1b	defect in HNF1b gene pancreas atrophy and renal disease	
MODY 6	neurogenic differentiation	Mutation of transcription Factor NF 1	
MODY 7	Kruppel like factor 11		
MODY 8 5 families Mody 9 , 10 etc Neonatal diabetes	Bile salt dependent lipase with exocrine pancreas failure		
	KCNJ11 ABCC8	mutation in the K Atp	Sulfonyl urea

# Clinical Features Associated with PCOS

- **Menstrual dysfunction-as early as age 12**
  - 15-30% have regular menses
  - Infertility and /or miscarriage
- **Facial and upper back acne**
- **Obesity in ~ 60%**
- **Excessive hair growth**
- **Androgenetic alopecia**
- **Acanthosis Nigricans in ~ 30%**
- **Ovarian cortex containing multiple atretic follicles in ~ 80%**

# Metabolic Aberrations in PCOS

**Most significant**  
**is**  
***Insulin Resistance (IR)***  
**with compensatory**  
***Hyperinsulinemia***



# Endocrinopathy with PCOS

- Chronically elevated Luteinizing hormone to FSH (LH:FSH = 3:1)
- ↑ Levels free testosterone (usually ovarian source but can also be adrenal)
- ↓ Sex hormone-binding globulin
- Normal prolactin except for ~15% who have slight elevations

## Insulin Sensitizers to Treat Insulin Resistance and Secondary Infertility

- Multinational study: Metformin vs. placebo for obese women with PCOS
  - 34% ovulation vs. 4 % in placebo group
  - 90% Metformin plus clomid vs. 8% in placebo group
  - 8 fold increase in conception when taking Metformin *(Nestler et al. 2002)*

# PCOS and Type 2 DM

- 35 % of women with PCOS have clinical IGT and do not know it.
- 10 % of women with PCOS are diagnosed with Type 2 DM by age 40 (*Ehrman et al. Diabetes Care, Jan 1999*)



# PCOS and GDM



- Hypothesized that all have insulin resistance with compensatory hyperinsulinemia
- ~ 40% PCOS develop GDM
- 40 -52% GDM's have PCOS ovarian morphology

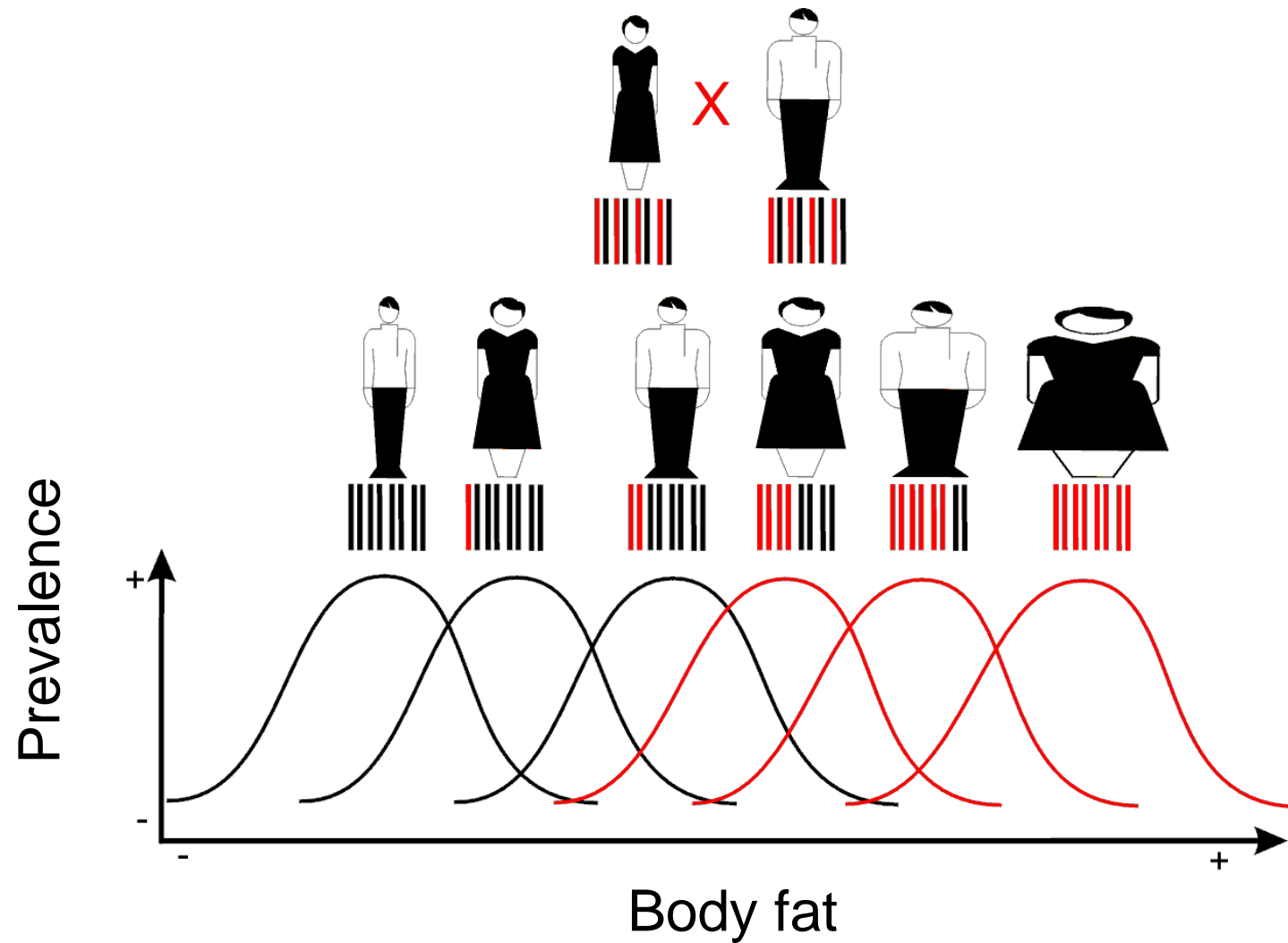


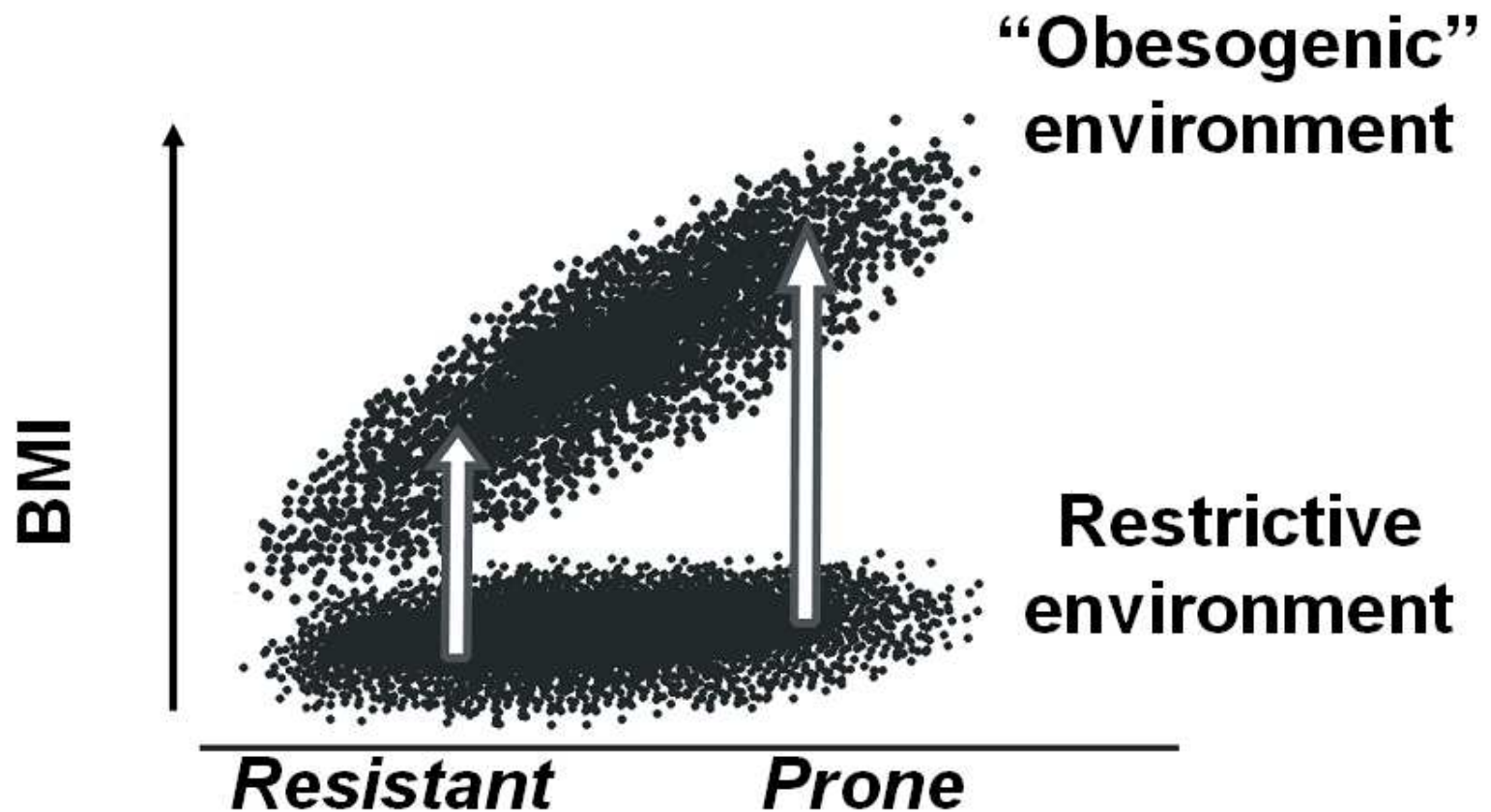
## Body fat according to age and gender

Age	Hommes	Femmes
20-29 ans	11,8-19,9%	18,5-25,2%
30-39 ans	15,3-22,1%	20,3-27,0%
40-49 ans	18,0-24,0%	23,4-30,1%
50-60 ans	19,8-25,6%	26,6-33,1%
> 60 ans	20,2-26,2%	27,4-34,0%



## Le scenario actuellement accepté





**Obesity Predisposition**

Adapted from Ravussin and Bouchard, 2000

# Take Home messages

## Prevention

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# Diabetic Ketoacidosis (DKA) vs Hyperosmolar Hyperglycemic State (HHS)

- DKA is seen most frequently in type 1 diabetes
- HHS is seen most frequently in type 2 diabetes
- Ketosis is also seen in alcoholism, starvation, very low carbohydrate diets, and up to 30% of first morning urine samples during pregnancy

# Diabetic Ketoacidosis vs Hyperosmolar, Hyperglycemic State

	Diabetic Ketoacidosis	Hyperosmolar, Hyperglycemic State
Hyperglycemia	Plasma glucose >250 mg/dL	Plasma glucose >600 mg/dL
Ketosis (ketones in urine or blood)	Positive (plasma ketones +++)	Small (plasma ketones +/-)
Metabolic acidosis	Arterial pH $\leq$ 7.25-7.3 Serum bicarbonate low ( 15-18 $\leq$ mEq/L)	pH > 7.3 Serum bicarbonate normal to slightly low (>15 mEq/L)



# Diabetic Ketoacidosis vs Hyperosmolar, Hyperglycemic State

	Diabetic Ketoacidosis	Hyperosmolar, Hyperglycemic State
Electrolyte abnormalities	Serum K <sup>+</sup> is initially normal to ↑; then ↓ rapidly with correction of acidosis; insulin tx; volume expansion	Normal serum K <sup>+</sup>
Dehydration with ↑ serum osmolality	Variable	>320 mOsm/kg water