The prevention of diabetes and its complications

World Health Organization

Overview

- Primary prevention
  - Type 1 diabetes
  - Type 2 diabetes
    - Risk factors for Type 2 diabetes
    - Population based measures
    - Targeting high risk groups
- Prevention of complications

Prevention of Type 1 diabetes

- Possible to identify those at very high risk through:
  - Family history
  - Genetic background (HLA haplotypes)
  - Auto-antibodies to islet cells (insulin producing cells of the pancreas)

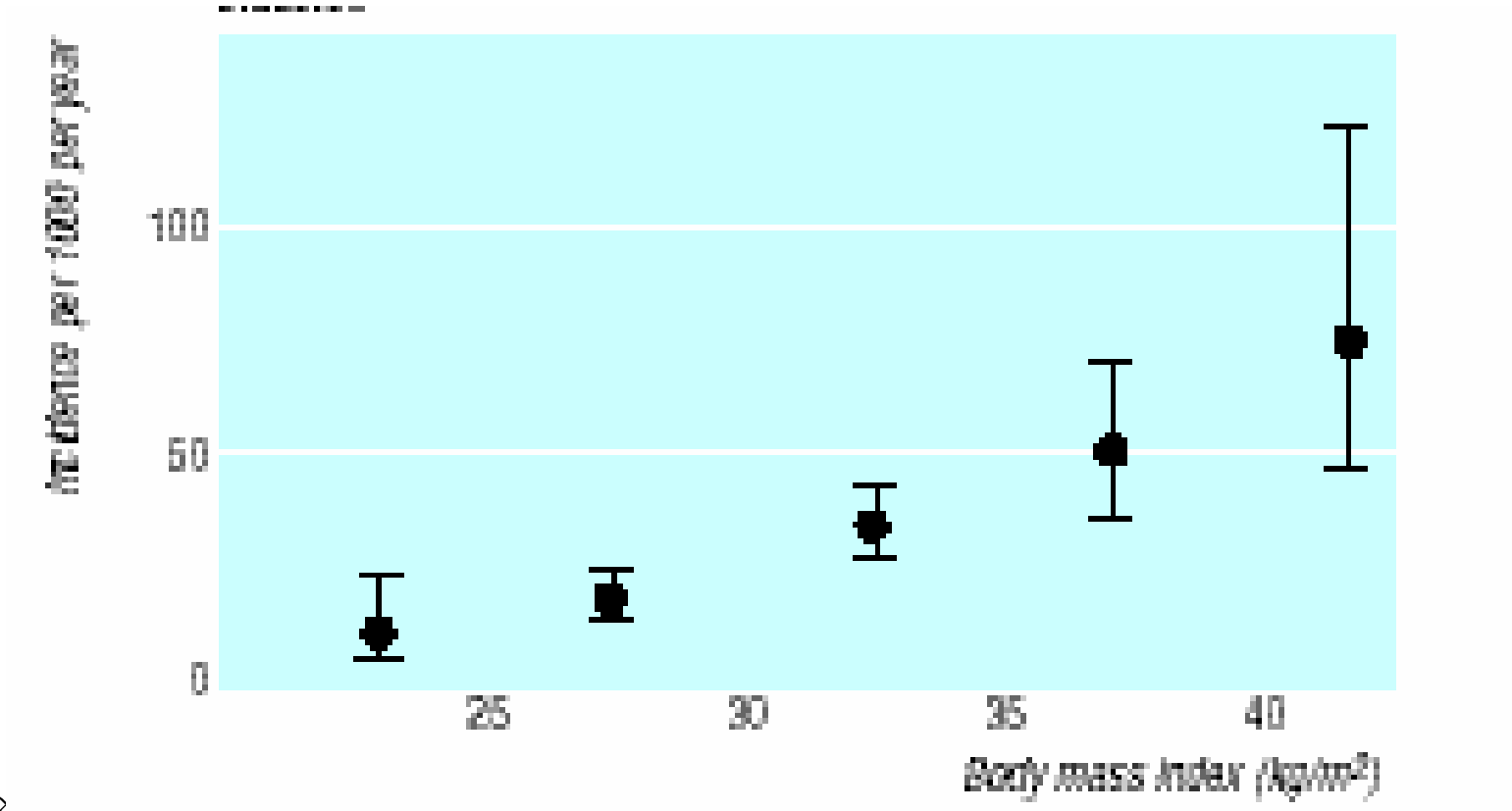
Prevention of Type 1 diabetes

- Interventions that have been tried in high risk individuals include:
  - Immuno-suppression
  - Antioxidant drugs e.g. nicotinamide
  - Insulin administration
  - Vaccination
- None of them shown to work

Prevention of Type 2 Diabetes
The Major Modifiable Risk Factors

- Overweight and obesity
- Abdominal/central obesity
- Physical inactivity
- Elevated fasting and 2 hr glucose levels - usually precedes the development of diabetes by several years

Body mass index and incident diabetes



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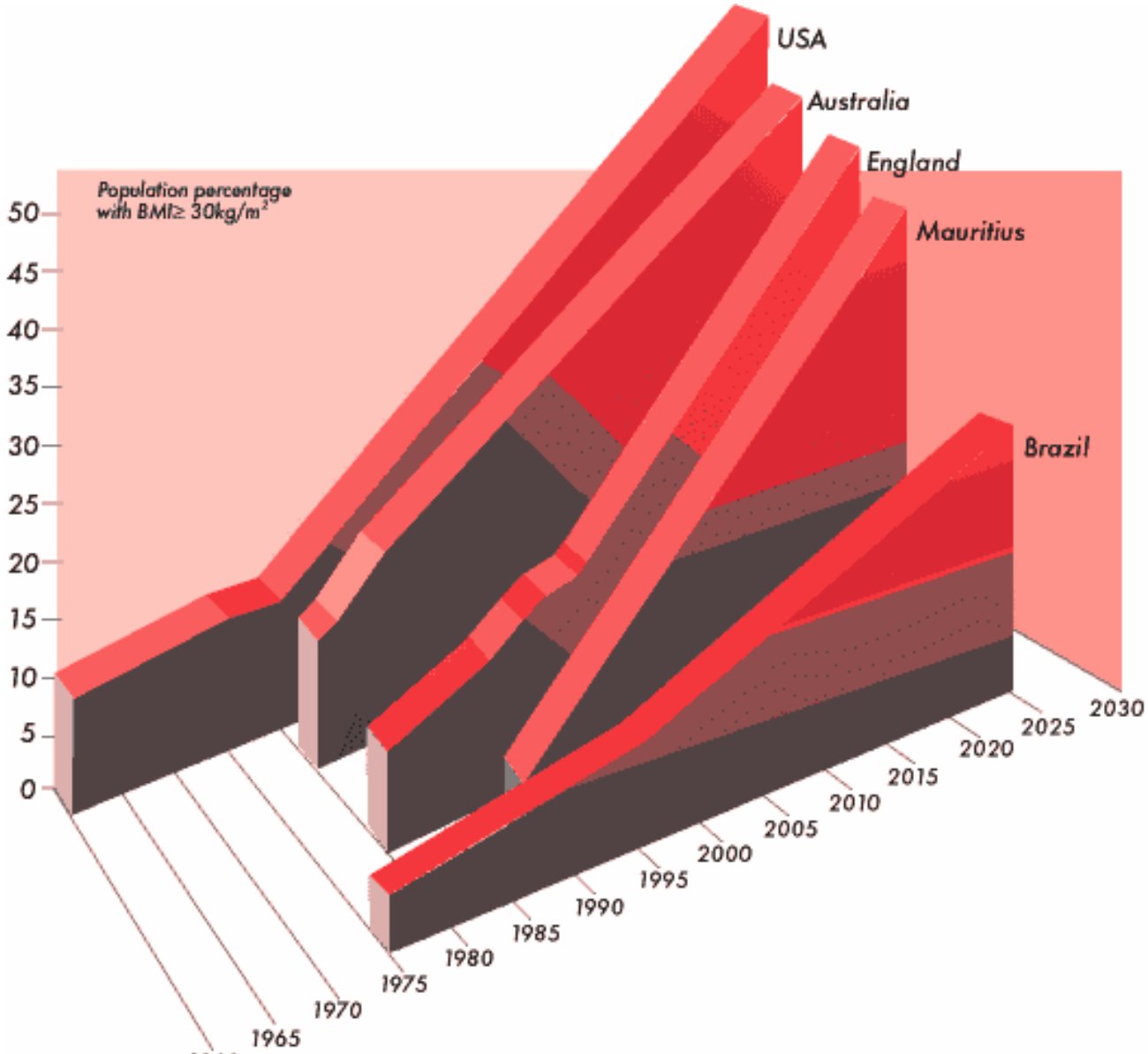
Source: BMJ 2002; 324:1570
(Based on data from the Pima Indians)

- 2002 World Health Report estimated that around 60% of Type 2 diabetes could be attributed to BMI > 21 kg/m^2



Source: International Obesity Task Force

Trends in obesity from selected countries

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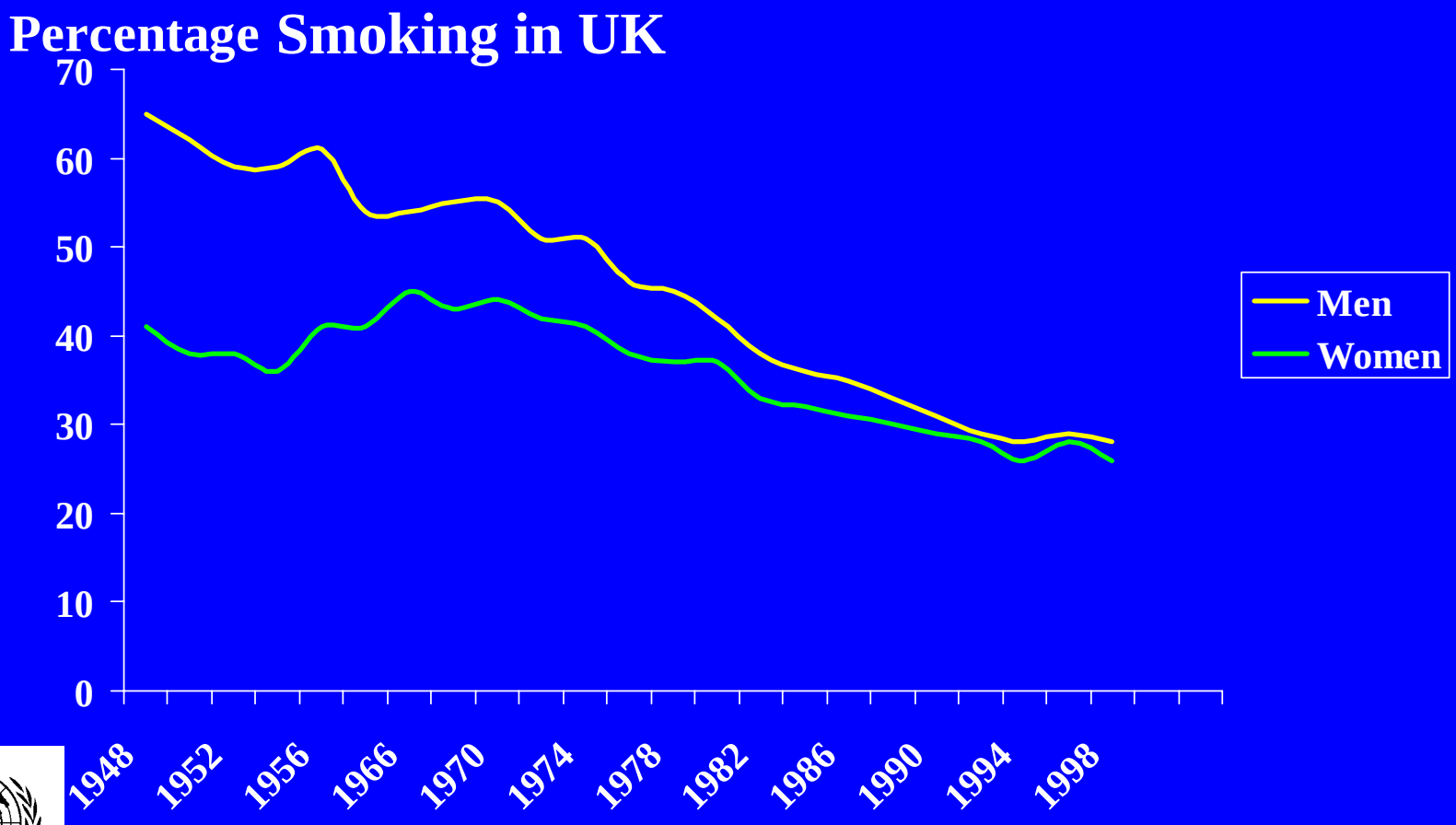
Approaches to population wide prevention of obesity and diabetes - lessons from smoking?

What led to this……?



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Source of figures: General Household Surveys

Not properly known but likely to be…..

A combination of:

- Health education - schools, workplaces, mass media etc
- Health protection - taxation, control of supply, regulation/banning of advertising
- Targeted, cost-effective behaviour change interventions - reminders to smokers, nicotine replacement

And probably none would work in isolation

“what has been demonstrated…is that approaches that are firmly based on the principle of personal education and behaviour change are unlikely to succeed in an environment in which there are plentiful inducements to engage in opposing behaviours…It would therefore seem appropriate to devote resources to programmes which focus on reducing the exposure of the population to obesity promoting agents by addressing the environmental factors such as transportation, urban design, advertising and food pricing…”

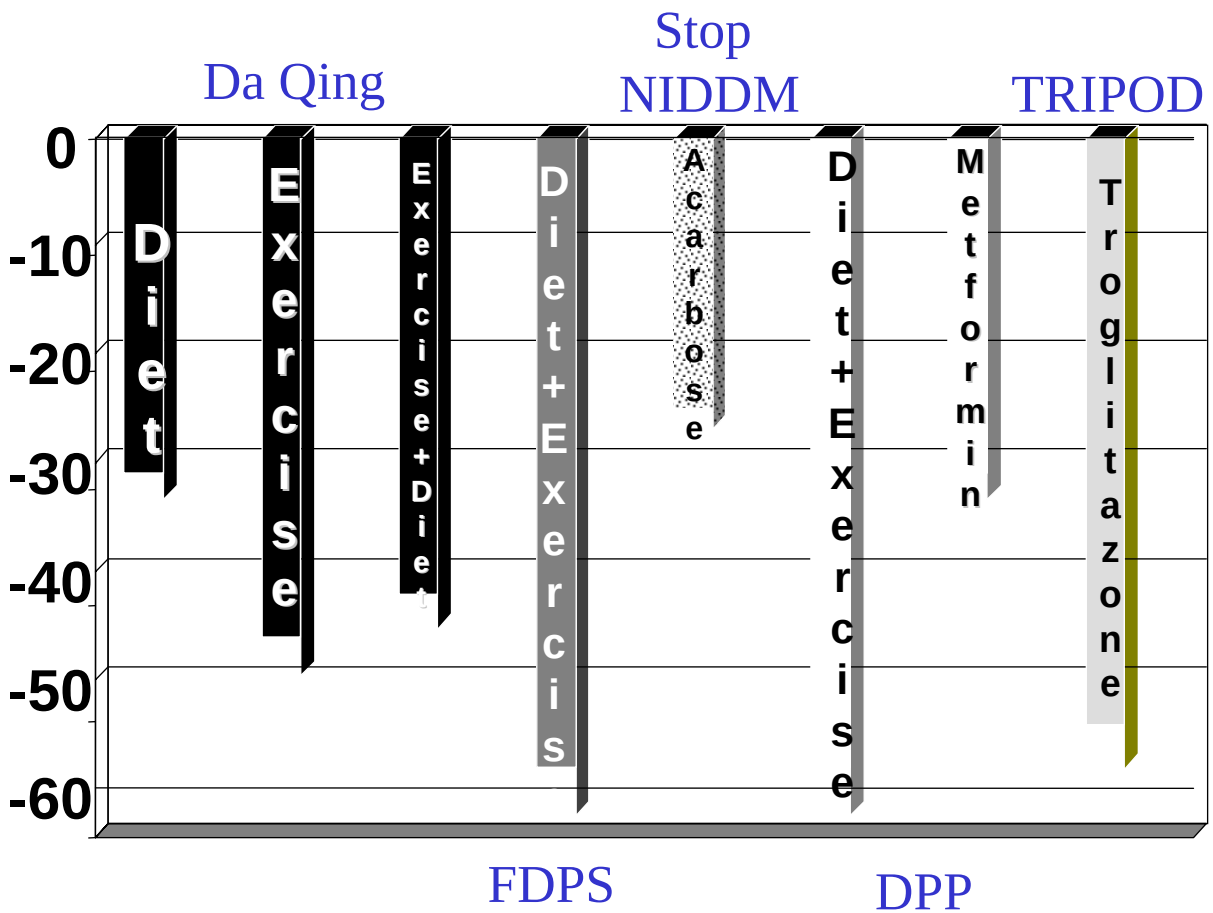
From WHO 1997 Global Obesity Report

High risk approaches to the prevention of Type 2 diabetes

Prevention studies in high risk populations

Study	Population	Number	Age	Initial BMI
DaQing	Chinese with IGT(WHO)	530	45	26
FDPS	Finnish with IGT (WHO)	522	55	31
STOP-NIDDM	Europids with IGT	429	54	31
DPP	Americans with IGT	3234	51	34
TRIPOD	Hispanic-American with GDM in previous 4 yrs	23634	31	

% reduction in the incidence of Type 2 diabetes



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Slide from Prof D Nathan

Diabetes Prevention Programme

Eligible participants

Randomized

Standard lifestyle recommendations

Intensive Lifestyle (n = 1079)

Metformin (n = 1073)

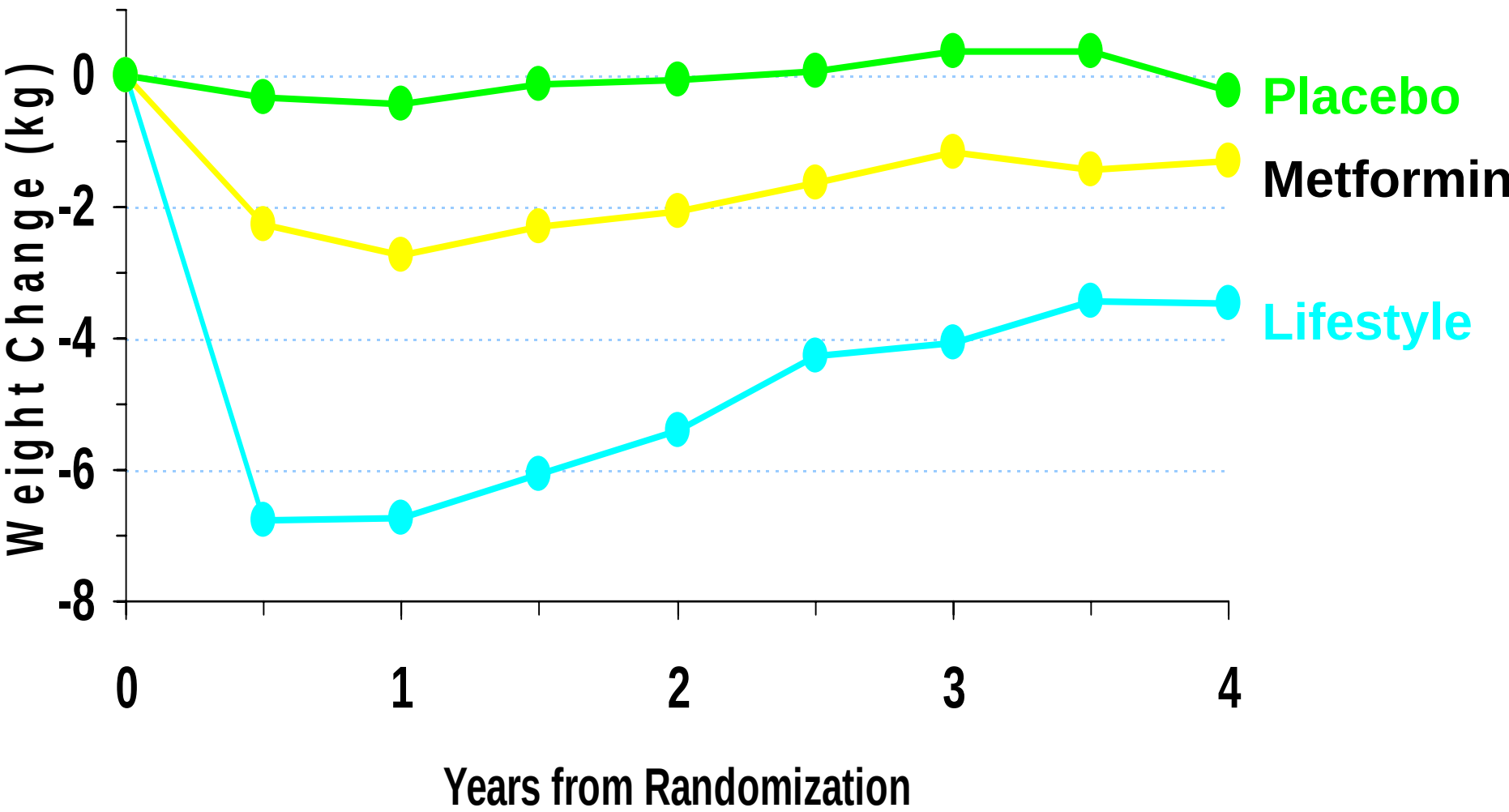
Placebo (n = 1082)

DPP Lifestyle Intervention

An intensive program with the following specific goals:

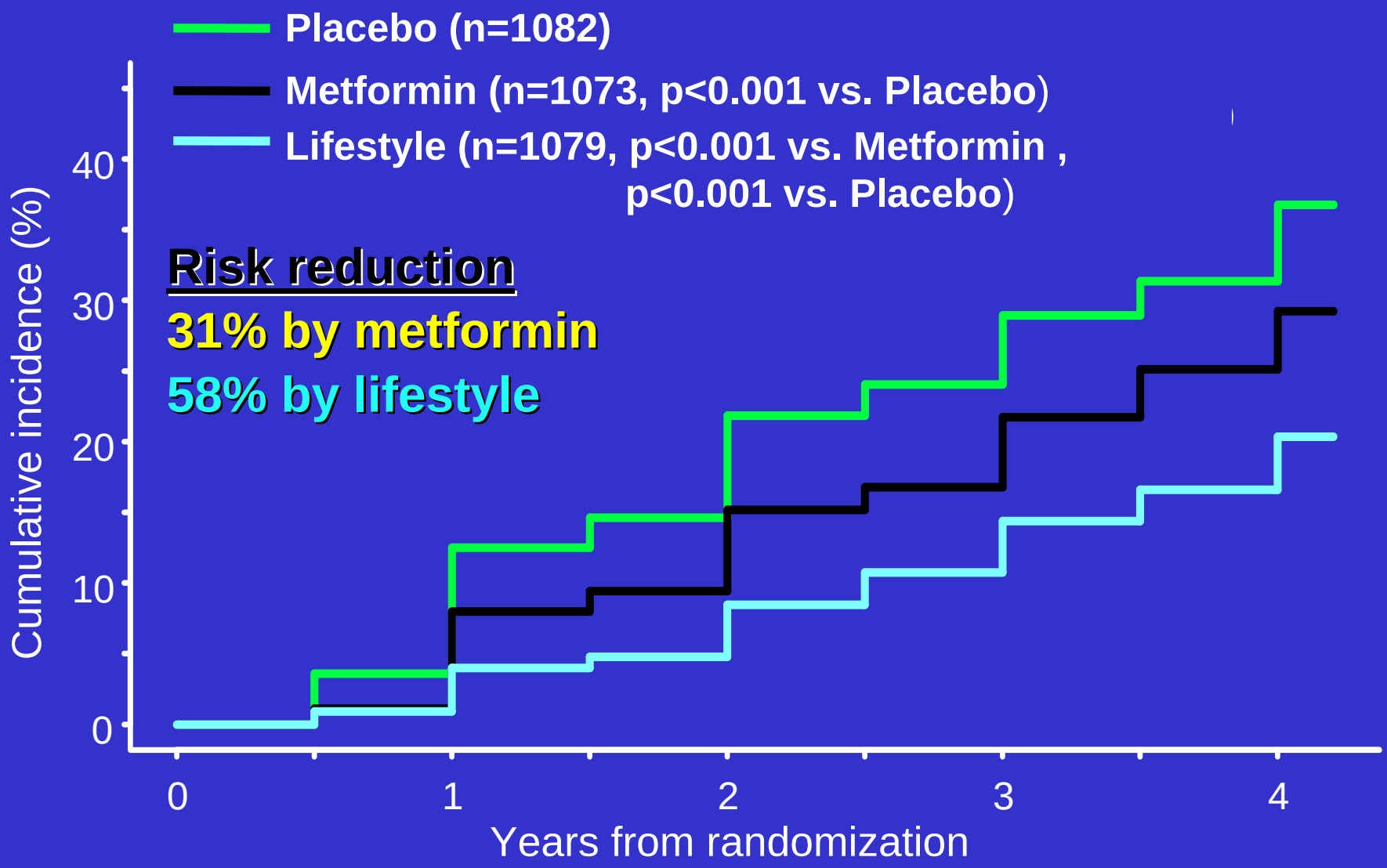
- **≥ 7% loss of body weight and maintenance of weight loss**
  - **Dietary fat goal -- <25% of calories from fat**
  - **Calorie intake goal -- 1200-1800 kcal/day**
- **≥ 150 minutes per week of physical activity**

Mean Weight Change



The DPP Research Group, *NEJM 346*:393-403, 2002

Incidence of Diabetes



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DPP - Lifestyle Intervention

- 16 session core curriculum (over 24 weeks)
- Long-term maintenance program
- Supervised by a case manager
- Access to lifestyle support staff
  - Dietitian
  - Behavior counselor
  - Exercise specialist

Diabetes related complications - macrovascular

- Macrovascular - majority of deaths in people with diabetes are from CVD, especially ischaemic heart disease.
- Risk factors for macrovascular disease are similar to those in people without diabetes e.g.
  - Dyslipidaemia, hypertension, smoking, plus ? hyperglycaemia

Diabetes related complications - microvascular

- Retinopathy
- Nephropathy
- Neuropathy (along with peripheral vascular disease, major cause of diabetic foot disease)

Prevention of complications in Type 2 diabetes - Glucose Control, UKPDS

The intensive glucose control policy maintained a lower HbA_{1c} by mean 0.9 % over a median follow up of 10 years from diagnosis of type 2 diabetes with reduction in risk of:

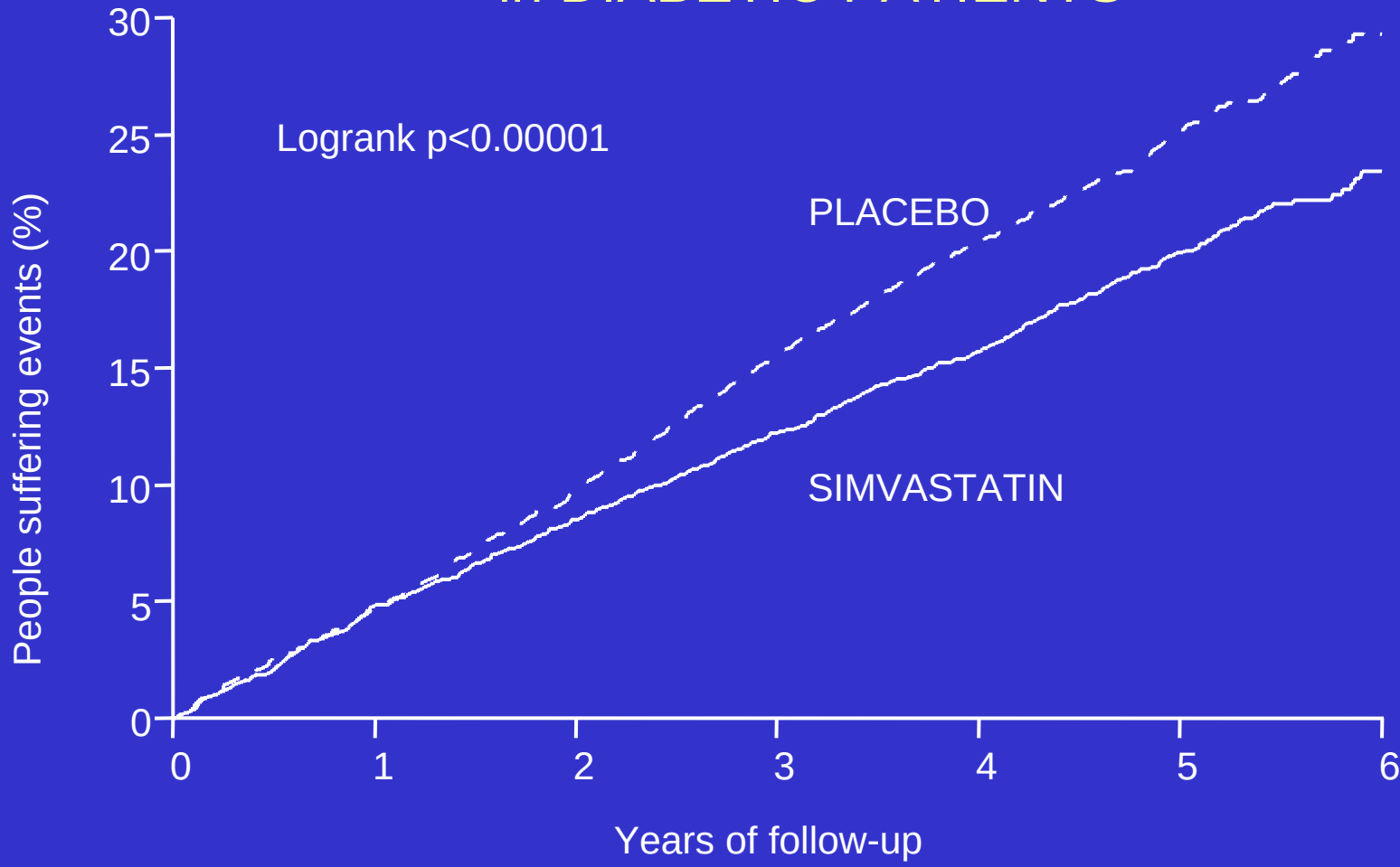
12%	for any diabetes related endpoint	p=0.029
25%	for microvascular endpoints	p=0.0099
16%	for myocardial infarction	p=0.052
24%	for cataract extraction	p=0.046
21%	for retinopathy at twelve years	p=0.015
33%	for albuminuria at twelve years	p=0.000054

Prevention of complications in Type 2 diabetes - Blood Pressure Control, UKPDS

A tight blood pressure control policy which achieved blood pressure of 144 / 82 mmHg gave reduced risk of

24%	for any diabetes-related endpoint	p=0.0046
32%	for diabetes-related deaths	p=0.019
44%	for stroke	p=0.013
37%	for microvascular disease	p=0.0092
56%	for heart failure	p=0.0043

SIMVASTATIN: MAJOR VASCULAR EVENTS by YEAR in DIABETIC PATIENTS



Data from over 5000 people with diabetes in the Heart Protection Study

Prevention of complications in established disease

- Retinal - retinal screening and laser therapy for proliferative retinopathy
- Renal - reduced progression to end stage renal disease through blood pressure lowering
- Diabetic foot - identification, education and responsive health care for people with at risk feet.

The complications of diabetes are not an inevitable outcome, and the risk can be reduced substantially by appropriate therapy. Diabetes therapy is no longer mainly about glucose lowering per se, but about overall reduction in the risk factors for diabetic complications.

In conclusion

- The evidence base for the prevention of Type 2 diabetes and for a substantial proportion of diabetes related complications is strong.
- We know what to do - we lack knowledge on how to translate it into practice; and knowledge on the most cost effective interventions where resources are scarce