NUFFIELD DEPARTMENT OF
PRIMARY CARE
HEALTH SCIENCES

UNIVERSITY OF OXFORD

Diabetes prevention policy: does the literature on cost-effectiveness support current policy?

Dr Samantha Roberts, Dawn Craig, Dr Mara Airoldi, Prof Gwyn Bevan, Prof Trish Greenhalgh

NHS
Newham
Clinical Commissioning Group

Diabetes prevention is a policy priority in a number of developed countries

English national policy

"It's time for the NHS to start practising what we preach…… for over a decade we've known that obesity prevention cuts diabetes and saves lives. if these results were from a pill we'd doubtless be popping it, but instead this programme succeeds by **supporting people to lose weight, exercise, and eat better**…..So today we commit to becoming **the most successful country on the planet at implementing this evidence-based national diabetes prevention programme**."

Simon Stevens, NHS England Chief Executive, Press release, 2015

US national guidance

"The Task Force recommends the use of **combined diet and physical activity promotion programs by health care systems, communities, and other implementers to provide counselling and support to clients identified as being at increased risk for type 2 diabetes.** Economic evidence indicates that these programs are cost-effective."

US Community Preventive Services Task Force, Annals of Internal Medicine, 2015

Today we'll look at the extent to which the literature on economic evaluations support existing diabetes prevention policy

1. Target population

Who is eligible for diabetes prevention programmes?

2. Interventions

What interventions are effective?

3. Cost-effectiveness

Are effective interventions cost-effective?

4. Other economic considerations

What is the impact on budgets, burden of disease and equity of diabetes prevention programmes?

Data is from a systematic review and meta-analysis that is currently undergoing peer review

Database search, citation tracking and screening of references identified 3856 peer-reviewed articles on pre-diabetes and diabetes prevention between 2004 and April 2016.

42 full papers were reviewed and 15 were excluded.

In total, **27 studies of diabetes prevention programmes with economic evaluations** have been published from 15 countries between 2004 and 2016:

- 6 within-trial cost-utility analyses
- 21 modelling studies (16 Markov models, two simulation models, two decision trees and one combination Markov model and decision tree)

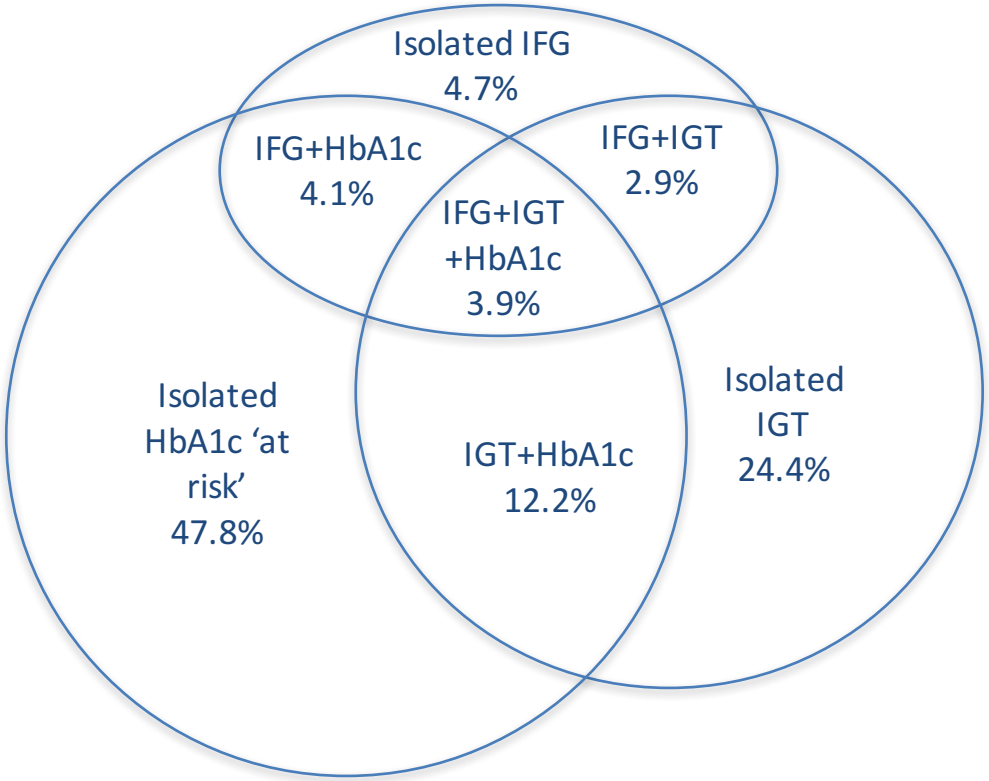
Within the modelling studies there were a **wide range of model structures, parameters and parameter values** which in part drive the variability observed in study results.

1. Target population: Pre-diabetes can be diagnosed with three different blood tests

Three different blood tests can be used to identify a target population

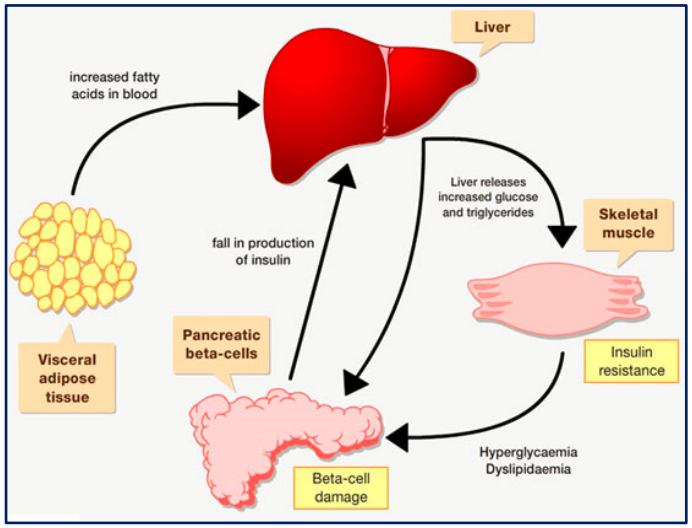
	Definition
IFG: impaired fasting glucose	High blood glucose following a period of fasting
IGT: impaired glucose tolerance	High blood glucose 2-hours after a drink containing 75g of sugar (e.g. Lucozade)
HbA1c in 'at risk' range	Glycated haemoglobin which estimates blood glucose levels over the previous 2-3 months

There is only partial overlap between the people identified with different diagnostic tests



1. Target population: Different types of pre-diabetes differ in terms of physiology and epidemiology

IFG and IGT indicate central and peripheral insulin sensitivity respectively



And differ in progression to type 2 diabetes and associated complications

	Progression to T2DM[1] (per person-year)	Risk of micro- and macrovascular disease
IFG	3.6-4.7%	? Microvascular ? Macrovascular
IGT	4.5%	↑ Microvascular ? Macrovascular
HbA1c	3.6%	? Microvascular ? Macrovascular
IFG/ IGT	7%	↑ Microvascular ? Macrovascular

1. Morris DH et al. Progression rates from HbA1c 6.0-6.4% and other prediabetes definitions to type 2 diabetes: a meta-analysis. Diabetologica. 2013; 56:1489-1493,

2. Interventions: Metformin and lifestyle programmes have been shown to be effective in delaying or preventing type 2 diabetes

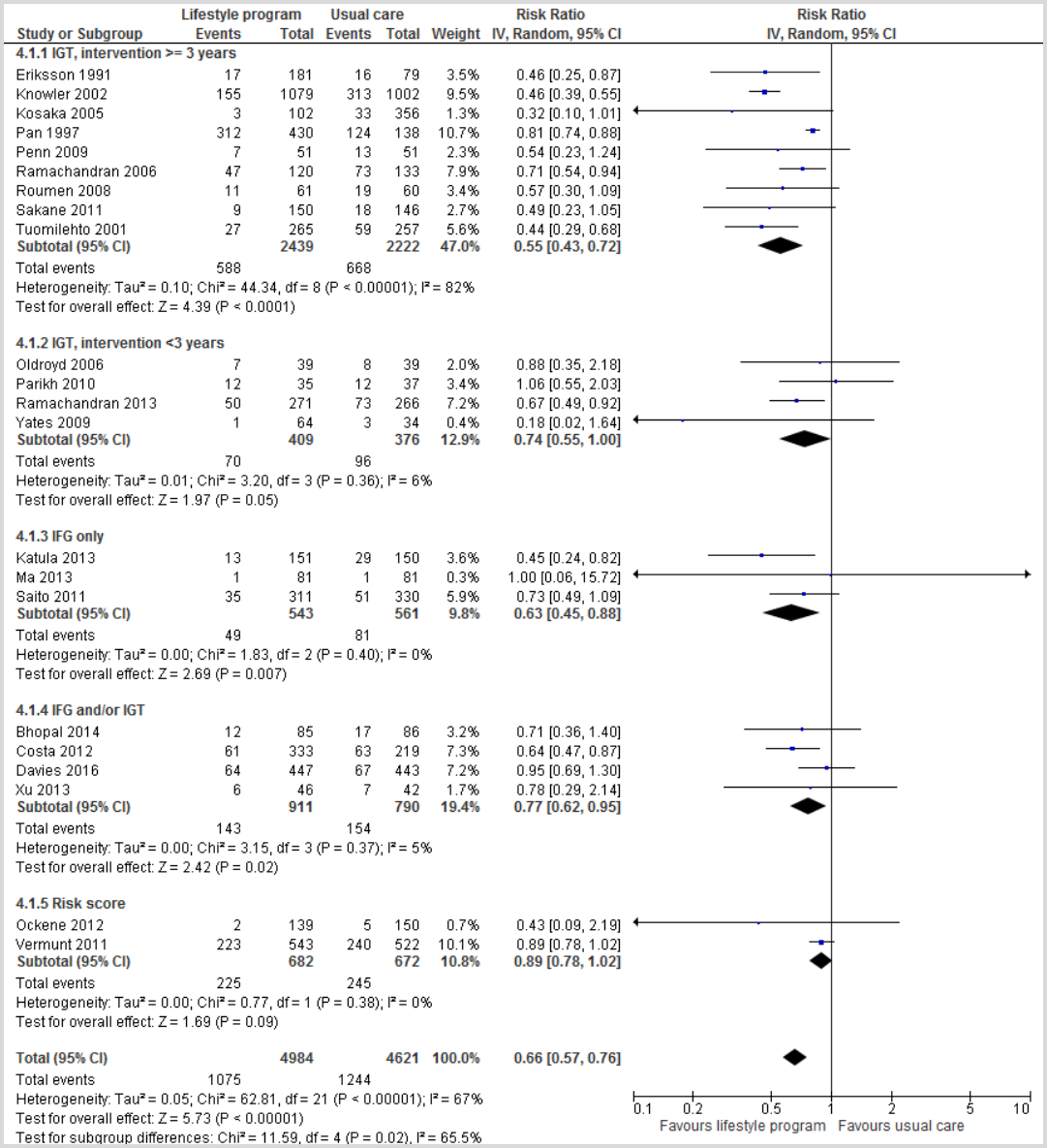
Metformin

Lifestyle programmes

Intensive interventions: 10 years duration, individual and group classes, provided by dietician and exercise physiologist (e.g. DPPOS)

'Pragmatic interventions': 7 months, group sessions, provided by diabetes prevention facilitator (e.g. Irvine)

1&2: The type of pre-diabetes and type of lifestyle intervention have a substantial impact on the effectiveness of the intervention



Risk ratios:

- IGT, intervention >= 3 years: 0.55
- IGT, intervention <3 years: 0.74
- IFG, all interventions: 0.63
- IFG and/or IGT: 0.77
- No intervention studies use HbA1c as primary method of diagnosis

3. Cost-effectiveness: incremental cost effectiveness ratios compare change in cost divided by change in effect

Definitions

Incremental cost-effectiveness ratios (ICER): compare change in cost associated with a new treatment divided by the change in effect (e.g. quality adjusted life years gained)

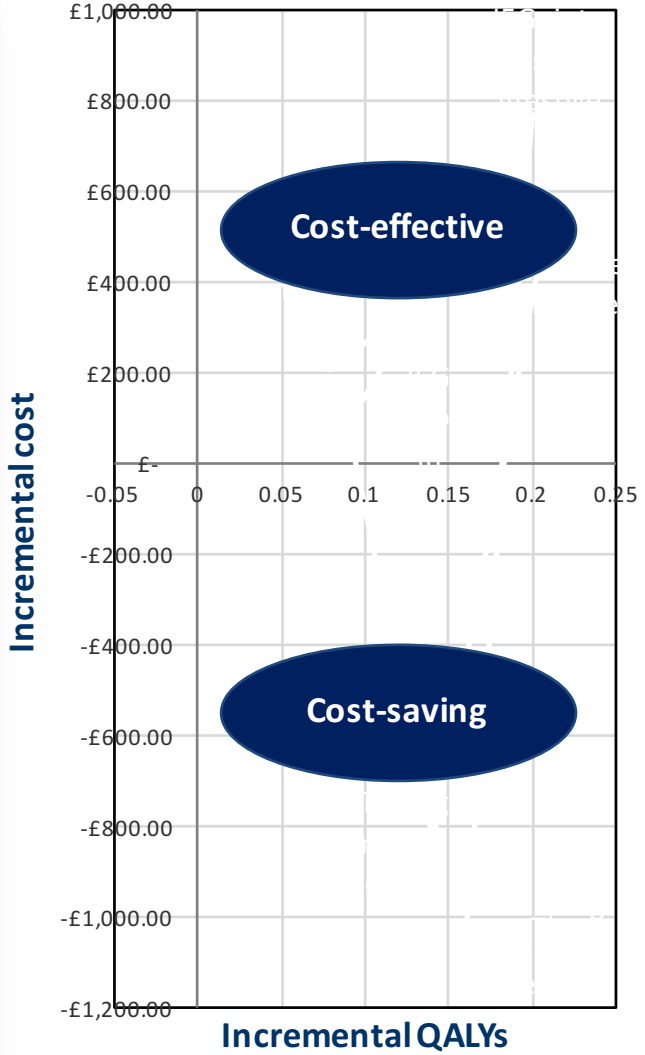
Cost effective interventions: Interventions where the increase in total costs of prevention (including savings from reduced treatment costs) are less than a pre-determined threshold (e.g. £20,000 per Quality Adjusted Life Year gained)

Cost saving interventions: Total prevention and treatment costs are reduced. Costs of the prevention programme are less than the amount by which future treatment costs are reduced.

Example:

- 100 people enrolled in a lifestyle programme at a cost of £200 each. Total intervention cost: £20,000.
- 5 people benefit with savings in average costs of treatment per person of £1,000 and gains of 5 QALYs. Total cost reduction: £5,000
- Net cost of £15,000 for 5 QALYs
- Cost-effectiveness ratio of £3,000/QALY

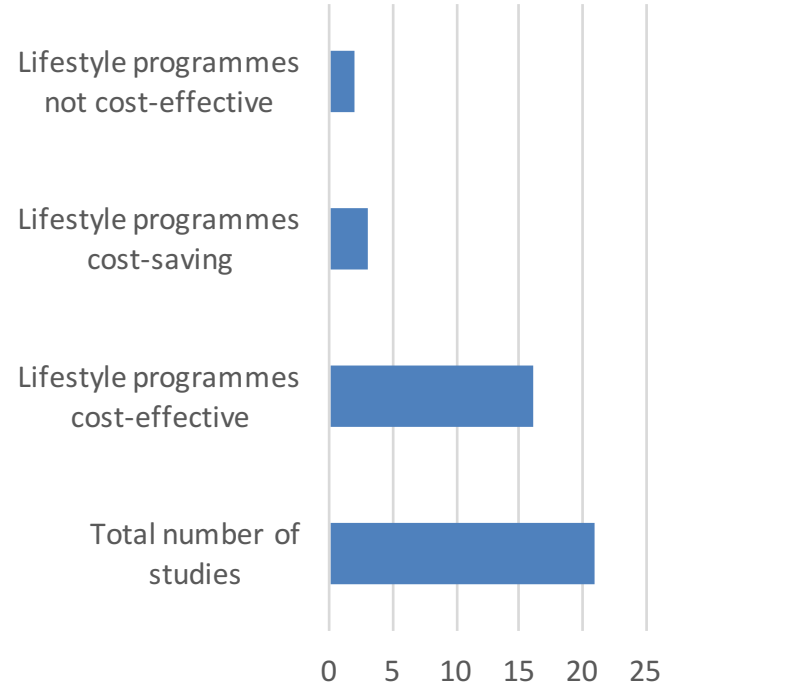
Cost effective but not cost saving



3. Cost effectiveness: Lifestyle programmes and metformin are cost-effective , but with a wide range

Lifestyle programmes are cost-effective
(but with a wide range in results)

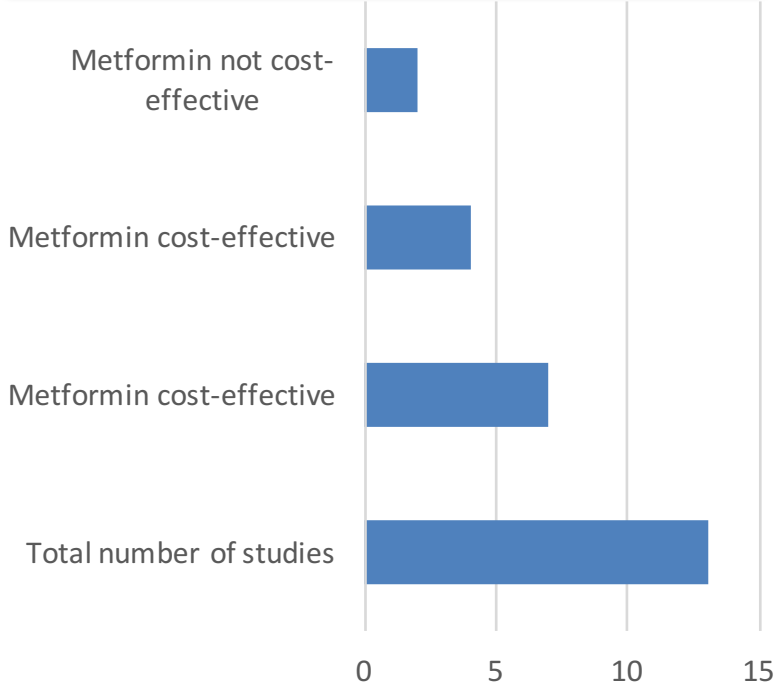
Number of studies
(cost-utility studies from health system perspective)



Median incremental cost-effectiveness ratio: £7,490/QALY
Range of incremental cost-effectiveness ratios: Cost saving to £143,000/QALY

Metformin is cost-effective
(but with a wide range in results)

Number of studies
(cost-utility studies from health system perspective)



Median incremental cost-effectiveness ratio: £8,428/QALY
Range of incremental cost-effectiveness ratios: Cost saving to £32,420/QALY

3. Cost effectiveness: But most studies are intensive lifestyle programmes in people with IGT

Current NICE guidance	Number of studies included in the review (total=27)		
	IFG or HbA1c	IGT	Other
IFG or HbA1c for diagnosis	3	17	7
	Lifestyle programme <3 years	Lifestyle programme >3 years	Not reported
Lifestyle programme: Groups for 16 hours, 2 years follow up	3	22	2

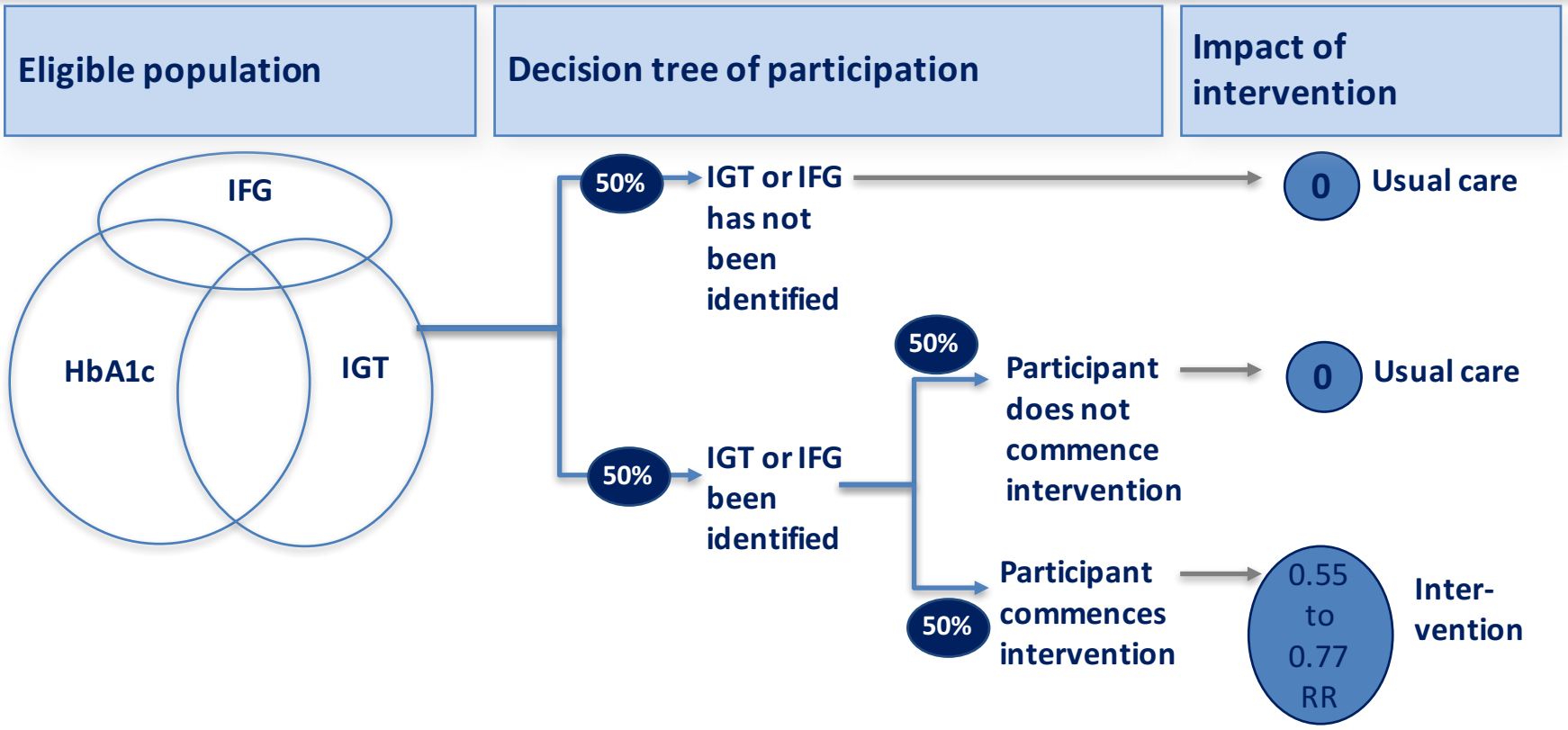
Duration of reduced incidence T2DM:
Range from no effect after intervention to indefinite effect

3. Cost effectiveness: there are a number of unanswered questions

- **Screening plus intervention studies tended to be less cost-effective than intervention-only studies on average**, but both approaches were associated with a wide range of cost-effectiveness ratios, highlighting current uncertainties.
- In general, **the longer the period evaluated the more cost-effective the interventions appeared**. Studies that measured cost-effectiveness over a period of 25 years or more appeared more cost effective than studies that measured cost effectiveness over 10 years or less.

- There is insufficient evidence to suggest:
  - **Real-world pragmatic community based lifestyle interventions are more cost-effective than intensive trial-based interventions.** No studies compare these strategies within a single evaluation
  - **Certain types of pre-diabetes are more cost-effective to target than others**

4. Other economic considerations: target population, participation in screening blood tests and interventions all have an impact



- **Budget impact of prevention programmes was moderate** (0.13-0.2% of respective countries total healthcare budget)
- **Financial payoffs were delayed** (net expenditure on treatment and prevention of diabetes declined after 9-14 years)
- **Impact on incident cases of diabetes was limited** (0.1-1.6% reduction).

Conclusions

1. Target population

There are different types of pre-diabetes which differ in prevalence, progression to T2DM, micro and macro-vascular disease and potentially response to interventions

2. Interventions

Lifestyle programmes (intensive and pragmatic) reduce the incidence of T2DM in those people that participate, as does metformin

3. Cost-effectiveness

Lifestyle programmes and metformin are cost effective. The evidence does not suggest that pragmatic lifestyle programmes are more cost-effective than intensive programmes or that lifestyle programmes are more cost effective than metformin

4. Other economic considerations

Population-wide diabetes prevention programmes have a moderate budget impact but a limited effect on incident cases of T2DM. Equity of healthcare expenditure was not considered in the included studies

NUFFIELD DEPARTMENT OF
PRIMARY CARE
HEALTH SCIENCES

UNIVERSITY OF OXFORD

Questions?

Samantha Roberts

Candidate for DPhil

Samantha.roberts@gtc.ox.ac.uk