# Community Based Diabetes Prevention

## Melanie Davies

# Professor of Diabetes Medicine

**NHS Trust** 

University Hospitals of Leicester MHS





# Outline

- NIHR Programme Grant proposal and update to progress
- The Vascular Check programme
- HbA1c debate
- Algorithm to detect undiagnosed T2DM and 'those at high risk'

# Background

- There is now unequivocal evidence from large long-term RCTs that effective lifestyle interventions can reduce the risk of diabetes by 40-60%.
- However, tested interventions to date have been resource-intensive and have proven ineffective at promoting long-term behaviour change or improved health in the UK.
- Therefore an effective intervention that is suitable for implementation with the resource and infrastructure limitations of the NHS is needed.

### Background: structured education

- Cost-effective method of promoting behaviour change
- Recommended for every individual with T2DM (NICE 2008)
- Has a track record of implementation within primary care for those with newly diagnosed T2DM

 Similar approach to implementation programmes used in Finland, Germany, USA and Australia



#### Diabetes Education and Self-Management for Ongoing and Newly Diagnosed

A collaborative group in the UK (predominantly England) with a Steering Group of 45+ individuals representing 13+ Diabetes Services, drawn from the whole of the spectrum of professions with an interest in diabetes, and including people with diabetes and patient representatives.





#### **DESMOND** Intervention



Skinner TC et al. Patient Education and Counselling 2006;64:369-377

No difference in HBA1c (-1.5%) Weight loss 1.1kg Smoking cessation (OR 3.6) Changes in health beliefs Reduced depression scores Reduced CVD Risk

Davies MJ, et al. Effectiveness of a structured group education programme on individuals newly diagnosed with Type 2 diabetes: a cluster randomised controlled trial of the DESMOND programme. *BMJ* published online 14 Feb 2008; doi:10.1136/bmj.39474.922025.BE.

BMJ	Effectiveness of the diabetes education and se management for ongoing and newly diagnosed (DESMOND) programme for people with newly diagnosed type 2 diabetes: cluster randomised controlled trial
	M J Davies, S Heller, T C Skinner, M J Campbell, M E Carey, S Cradock, H M Dallosso, H Daty, Y Doherty, S Eaton, C Fox, L Oliver, K Rantell, G Rayman, K Khunti and on behall of the Diabetes Education and Self Management for Ongoing and Newly Diagnosed Collaborative
	BMJ 2008;336;491-495; originally published online 14 Feb 2008; doi:10.1136/bmj.39474.922025.BE
	Updated information and services can be found at: http://bmj.com/cgi/content/full/336/7642/491
	These include:
References	This article cites 52 articles, 23 of which can be accessed free at: http://bmj.com/cgi/content/full/336/7642/491#BIBL
	5 online articles that cite this article can be accessed at: http://bmj.com/cgi/content/full/336/7642/491#otherarticles
Rapid responses	9 rapid responses have been posted to this article, which you can access for free at: http://bmj.com/cgi/content/full/336/7642/491#responses
	You can respond to this article at: http://bmj.com/cgi/eletter-submit/336/7642/491
Email alerting service	Receive free email alerts when new articles cite this article - sign up in the box at the top left of the article
Topic collections	Articles on similar topics can be found in the following collections
	Smoking and tobacco (2429 articles) Clinical triats (epidemiology) (3851 articles) General practice / family medicine (6910 articles) Hyperformation (2152 articles) Hyperformation (2152 articles) Metabolic disorders (1793 articles) Health ofucation (4584 articles) Health promotion (5500 articles) Health promotion (5500 articles) Sociology (2921 articles)

### **Cost Effectiveness**

Cost Effectiveness of Delivering the **DESMOND** Intervention (Diabetes Education and Self-Management for Ongoing and Newly Diagnosed) for People Newly Diagnosed with Type 2 diabetes

State of Landson

ad-me led

success Sciences, University of

afferents of results Dignates

Not And Areas

Averagy of Lang By, Likes Bar

ant of Cardwall

Delivering the diabetes education and self management for ongoing and newly diagnosed (DESMOND) programme for people with newly diagnosed type 2 diabetes: cost

CO jectives To assess the long tees clinical and core

effectiveness of the dubries education and say

Design we an derbook a cost of diry analysis that a sed

that a form a 12 month, multicentry, dust in randomized

tortholized total and, using the Shelffeld Agen's diaboted

model, modelled lies gram over on as in leavy of one of

Associated effect an outs and health misted guality of

Anapiles incidence of complications, mortality, and

lide a further other vessiby a fullytic was also, conducting

using survey "mal words" casts of delivering the

intervention estimated for a hip-othedical primary

Setting Primary care trusts in the 21milled Kingdom,

atternerden & sichour structured group education

Main Guttomy means and increase weld courts and quality

Results On the basis of the details of the statistical de estimated mages in concerned al falling on a court par paration decriment gifting

Propriation of a contract of the state of the second state of the

\$2.77 IX ofly incremental gain in QALTs per person by

5.0 102 (-0.08 17 for 0 1/84), and the mean loc her force)

test propagy in \$33.07 Using headworld' intervention

to #s, the lifetime locker wald cost of the OCSM (NC)

Buildered Age the GESWOND programme is that effective

ma theshold of 270010 per GALY is so'th using trial

mids. Betuils from a one way sensitivity shafts in taggest

Descel intervention costs and Ay N using "real works"

Intervention is \$32 (-\$33 to \$30 10) and the rear

the remental cost per Qat Y galled in £20%2. A photodolicatic satisficieity analysis indicated that the

protessional heal decen reductions

adjusted life years (DauXe) Samed

Participants Patients with newly disproceed

man again set for on going and newly diagnosed DELANARY inservation compared with unital care in

peripte with newly disproved type I disjectes.

M Glast, research fellow,<sup>1</sup> H M Dalassio, serior research associate, <sup>1</sup> S Otron, reader in health economic, <sup>1</sup> A Bromart, projector of fealty economics and decision school. 'M E Cang, realizing (decision' M) Campbell, professor of medical statistics, 'S Heller, professor of clarical toxicities, 'K Khunt, professor of Galactics medicine \*7 C Striper, associate professor,\* M | Device, professor of dubries medicine\*

RESEARCH

that the DESMOND intervention is only affective many under more readest at sumptions that in to de the effects of the intervention being but after one year Conclusion Our results suggest that the DESMOND in surjection is dank to be to if affective Combured with usual care, agracially with respect to the real works control the intervention to being the choics with reductions in weight and tenching being the tests breaker delivered

#### (STROOTTON

Type 2 diabeters and lients alberts around 9% of propheter Reppen population and a responsible for a disputprovide and take of Sould services element, In the short terms diabethy can be accompanied by waterast symptoma such as bright and in dering wen a cun lead in artions completation such as backing a constitution. and anoptation.' Furthermore, datates a susceed with increased mortality and permature death from cardiovascular diseases, including shoke and myocardial and account. Calmityle advice on dues and extend to issi presse of for the management of diabetes, either time is with concentrate are of drags such to taethereine i Benever, patente And z differe to implement and an anti identyle advice gene by drakte

OCMOND intervention in EX19 D 5% confidence interval COND. CLEST, CS1, 48441041363, \$126, 430,00 p The national arr vice framework for diabeters and the 2009 Microsof Lastinue for Health and China al David leave diabeter grottedae" explicitly state that all primany case trans thread offer tractmed education programmes to people with type 2 dialetes from the point of diagnosis. The distance execution and will munigement for ongoing and newly disparsed (DCS MOND) intervention his people with people diagnosed type I distation wantion of the first programment out out the cruera for withhis education programmes had down by the National Dustrate for Health and Clinical Excellance and is commenty are added in an level 40 pc many care muss in Expland and Sciulinal. The programme, which is facilitated by registered brathcare

INTERNAL BIRT DIRECTOR

# Analysis using current cost to PCTs of delivering DESMOND

- 'Real world' cost per patient of delivering the DESMOND course for a typical PCT \* is £ 76 compared to £ 203 in the trial
- Training costs much lower than during the trial and economies of scale (eg more patients per course)

	Control Mean	Intervention Mean	Adjusted Incremental Mean (95% CI)
Intervention Cost	-	£76	£76
Combined Cost	£16,941	£17,032	£91 (-£321 to £631)
Combined long-term QALYs	10.2166	10.2572	0.0406 (-0.0283 to 0.1050)
Incremental Cost per QALY	-	-	£2,241

M. Gillett, H.M. Dallosso, S. Dixon, A. Brennan, M.E. Carey, M.J. Campbell, S. Heller, K. Khunti, M.J. Davies Diabetologia 2009 O13 and BMJ 2010

#### National Impact

Adding to the evidence •base prrpeopenewly diagnosed with T2D g the importante on to P training Educators Contributing to future dese preintsrigself management courses

**Ref Source: DESMOND** National Programme 2011

#### TYPE 2 DIABETES

onal dirtical guideline for manager In primary and secondary care lupid



DH) Department of Health

#### Structured Patient Education in Diabetes

Report from the Patient Education Working Group



#### **NIHR programme grant**

Community based primary prevention programme for T2DM integrating identification, lifestyle intervention and community services for prevention.

Melanie J Davies, Kamlesh Khunti, Azhar Farooqi, Marian Carey Keith Abrams, Chas Skinner, Jaako Tuomilehto, Simon Heller Nilesh Samani, Bernie Stribling, Alastair Gray, Ken Jones

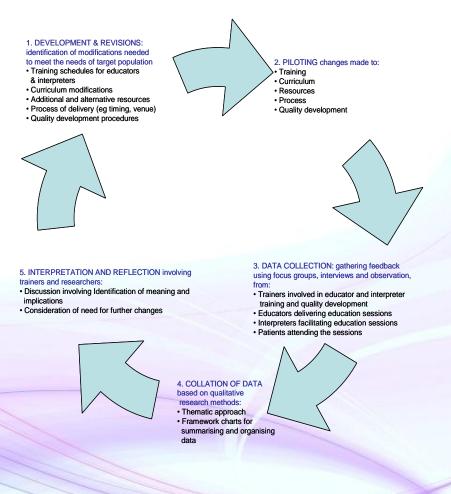
# Study aims

- Develop and validate a pathway for detecting those with prediabetes (PDM) based on risk score technology
- Develop and pilot a structured education programme aimed at promoting lifestyle change and reducing the risk of developing diabetes in those with PDM using the MRC's framework for complex interventions
- Evaluate the developed programme using a cluster RCT with progression to diabetes as the primary outcome

#### Development of a structure education programme

- Based on qualitative research in those with PDM and the PREPARE and DESMOND programmes, a multifactoral 6 hour structured education programme aimed at targeting body weight, diet and physical activity was developed; this included a version specifically tailored to South Asian communities
- The full educator training and quality assurance programme was also developed for both the standard and South Asian programmes.
- The education and educator training and quality assurance programmes were piloted extensively using the cyclical development process shown opposite.
- Pilot data revealed that the programme was effective at targeting illness perceptions, self-efficacy and promoting behaviour change

#### Programme development cycle

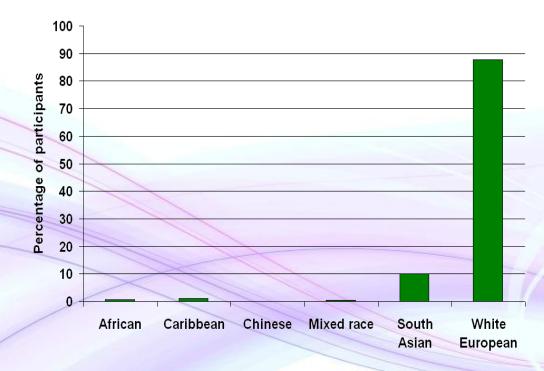


# Cluster RCT

- Aims to recruit 44 GP practices, of which 22 will receive intervention conditions
- Aims to screen around 3000 high risk individuals (defined through the automated Leicester Risk Score) to detect a total cohort of 748 with PDM, allowing for a 20% drop-out
- Intervention to consist of a 6-hour structured education programme followed by annual groupbased maintenance sessions and 3 telephone counselling sessions per year
- Study designed to detect a 40% reduction in the relative risk of developing diabetes over 3 years

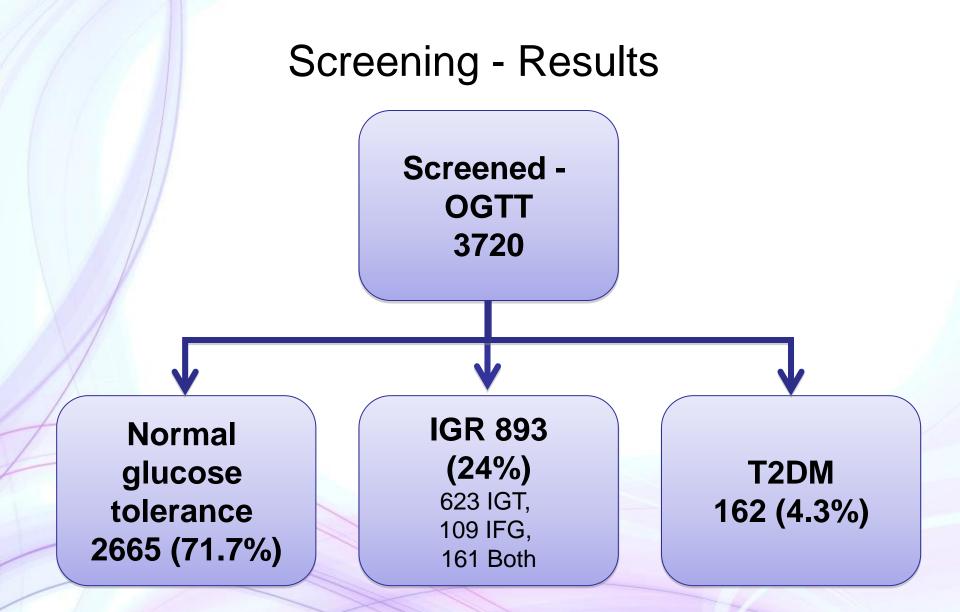
# Screening

- 3,720 people have been screened from 44 GP practices
- 61% male, mean age 63.6 years (SD 7.8), mean BMI 31.9 kg/m2 (SD 4.9)



#### Screening (data from first 2556 subjects)

- 804 (31%) had high blood pressure
  - of which 30% were not taking antihypertensive medication
  - 1,407 (55%) had high cholesterol ( $\geq$ 5)
    - of which 77% were not taking lipid lowering medication.
- 202 (8%) were current smokers



Any abnormal glucose tolerance 1055 (28.3%)

#### **NHS Health Check model**

THE HANDBOOK FOR VASCULAR RISK ASSESSMENT, RISK REDUCTION AND RISK MANAGEMENT

A REPORT PREPARED FOR THE UK NATIONAL SCREENING COMMITTEE

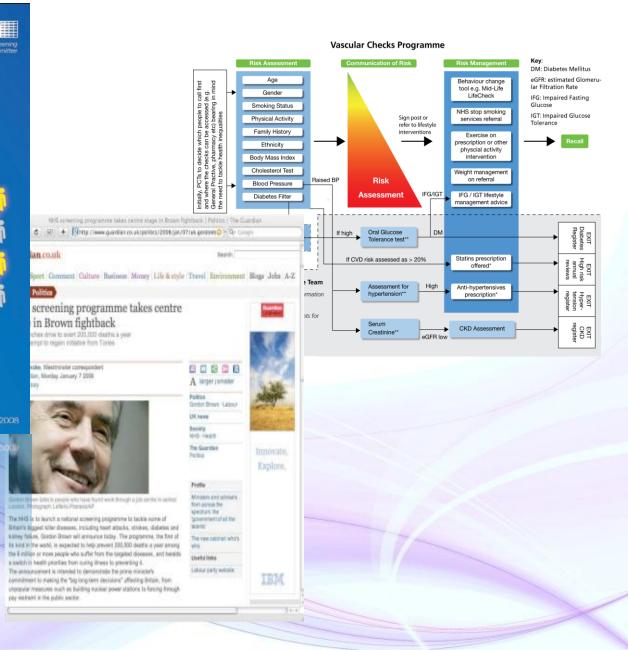
D

University of Leicester

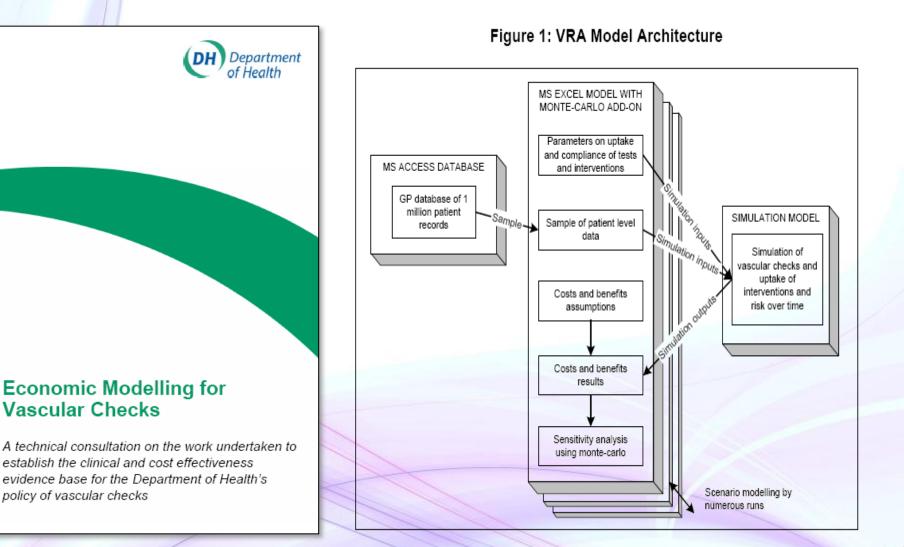
University of Leicester

B

A REPORT PREPARED FOR THE UK NATIONAL SCREENING COMMITTLE



#### Vascular Check programme – Economic Evaluation



### Vascular Check programme – Economic Evaluation

Table 6 – Lifetime costs and QALYs for each intervention

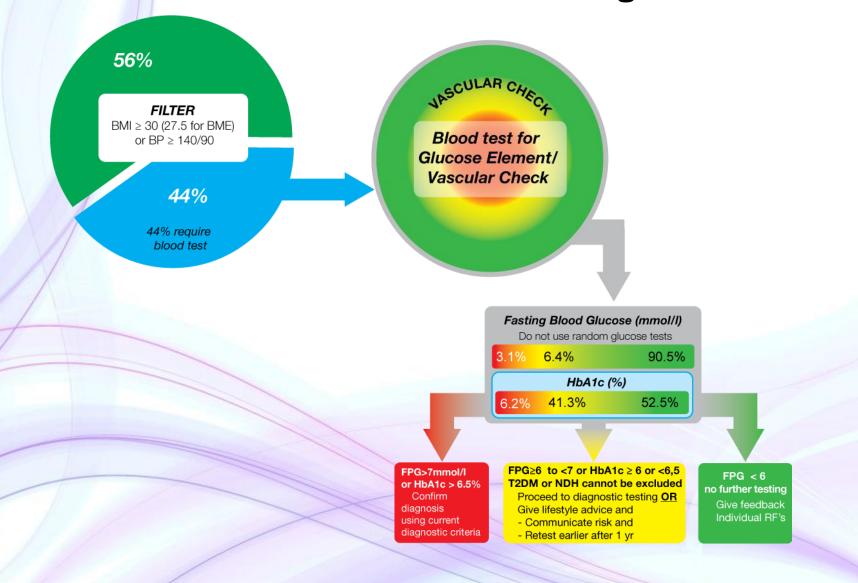
Intervention	Age	Gender	Lifetime cost (£)	Lifetime QALYs
IGR lifestyle	25-44	All	-398	0.63
intervention	45-54	All	493	0.63
	55-64	All	1821	0.53
	65-74	All	2637	0.39
Statins	40-49	Male	2374	0.47
	50-59	Male	2241	0.30
	60-69	Male	2092	0.18
	70-79	Male	1695	0.08

### Vascular Check programme – Economic Evaluation

#### Table 14: Average total costs per annum by intervention

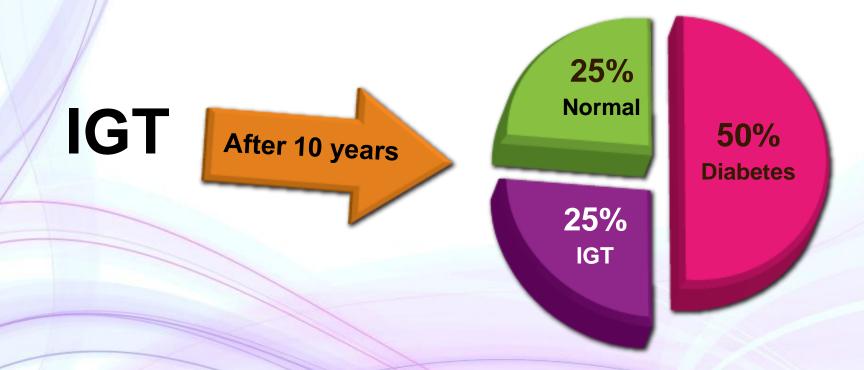
Cost component	£m p.a.	%
IGT lifestyle intervention	67.8	42%
Statins – drugs and lab costs	28.3	18%
Anti-hypertensives – drugs and lab costs	20.9	13%
Exercise chat	4.7	3%
Stop Smoking Services	4.3	3%
Diabetes management	3.4	2%
Weight loss programme	2.1	1%
Intervention costs: nurse time	1.9	1%
Intervention costs: GP time	27.6	17%
Intervention costs: Healthcare Assistant time	0.1	0%
TOTAL	161.1	100%

#### **'Pragmatic Approach' to 'glucose' assessment in the Vascular Check Programme**



#### IGT as a target for Diabetes and CVD Prevention

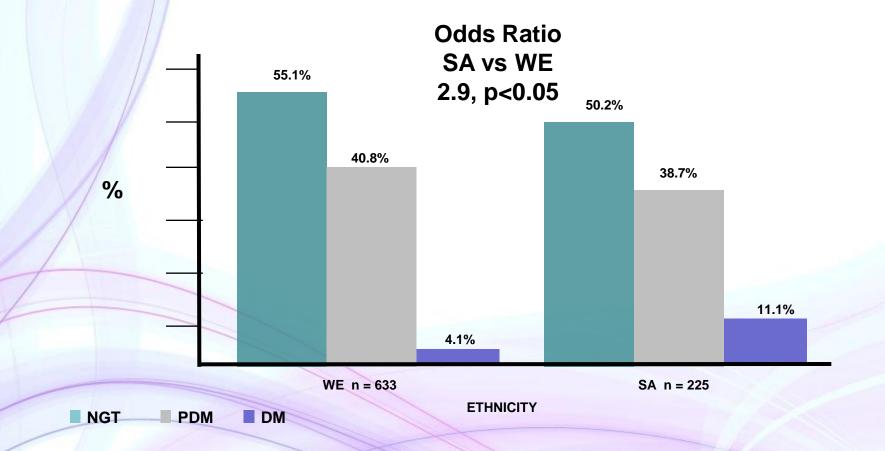
The prevalence of IGT: 16% of the US subjects aged 40–74 years 13% in the DECODE study 15% in the DECODA study



Impaired glucose tolerance and impaired fasting glycaemia: the current status on definition and intervention. Unwin N, Shaw J, Zimmet P, Alberti KG. Diabetic Medicine 19:708-723 2002

Diagnosis, prognosis, and treatment of impaired glucose tolerance and impaired fasting glucose.Santaguida,P.L.; Balion,C.; Hunt,D.; Morrison,K.; Gerstein,H.; Raina,P.; Booker,L.; Yazdi,H. Evidence Report Technology Assessment (Summary) 128 1-11 2005

### Progression to diabetes in a multi ethnic population with PDM in the UK



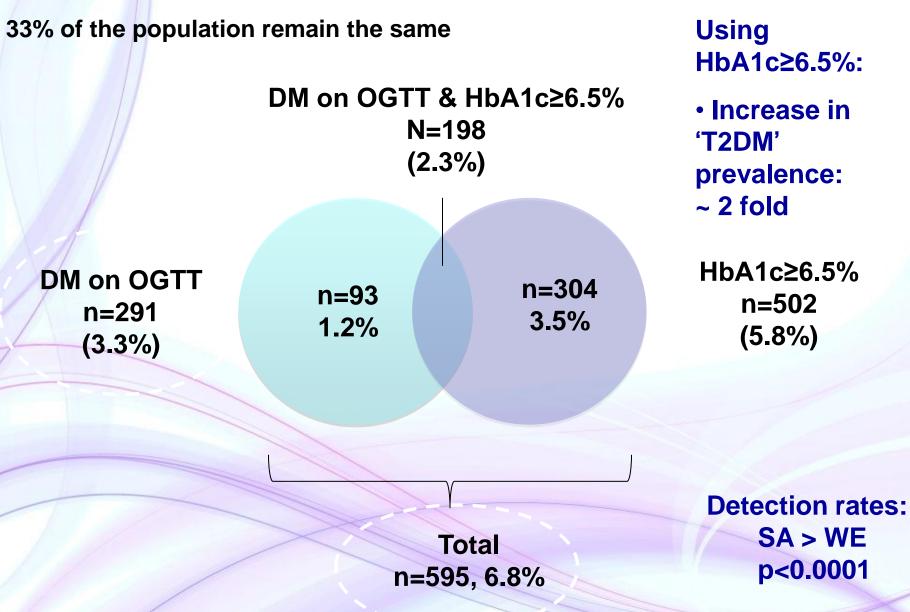
Srinivasan BT, Davies MJ, Webb DR, Gray LJ, Gosai B, Khunti K. Diabetes; Vol 58; S 1; A273; 1033P and University of Leicester MD Thesis 2011 submitted

### HBA1c for Diagnosis of diabetes

- Cohort size: n = 8696
- Mean cohort age: 57.3 years (SD 9.7)
- Mean cohort HbA1c: 5.71% (SD 0.61)
- White Europeans (WE) 74.7%, South Asians (SA) 22.8%
- Mean HbA1c: WE: 5.66% vs. SA: 5.86%, p<0.0001</li>

Mostafa S et al. Diabetic Medicine 2010

#### **Prevalence of HbA1c vs. OGTT**



Mostafa S et al. Diabetic Medicine 2010

#### T2DM on OGTT vs. 'Additional people' detected

		DM on OGTT	HbA1c ≥ 6.5%, No DM on OGTT	р
	Age (years)	59.9 (9.3)	59.1 (9.5)	0.248
	% Male	57.0	56.6	0.909
Ethnicity	% White Europeans	63.6	48.6	0.001
	% South Asians	33.2	46.2	-
l l	Waist Circumference (cm)		100.7 (14.1)	0.025
1	Waist: Hip Ratio		0.928 (0.09)	0.025
-	Systolic BP (mmHg)		138.9 (19.6)	<0.0001
	Diastolic BP (mmHg)		84.5 (10.8)	0.004
Mean Triglycerides (mmol/l)		2.15 (1.57)	1.66 (0.82)	<0.0001
% Tota	% Total Cholesterol > 5.0mmol/l		58.6	0.025
% Microalbuminuria		17.4	11.3	0.034

Mostafa S et al. Diabetic Medicine 2010

### Prevalence of IGR on OGTT vs. HbA1c

18.8% of the population remain the same

IGTT on OGTT & HbA1c 6.0-6.4% N=477 (5.5%)

IG	R on OGTT
1	N=1407
	(16.2%)

n=930 10.7% N=1133 13.0% HbA1c 6.0-6.4% N=1610 (18.5%)

Total N=2540, 29.9%

Mostafa et al Dia Res Clin Pract 90 (2010) 100-108

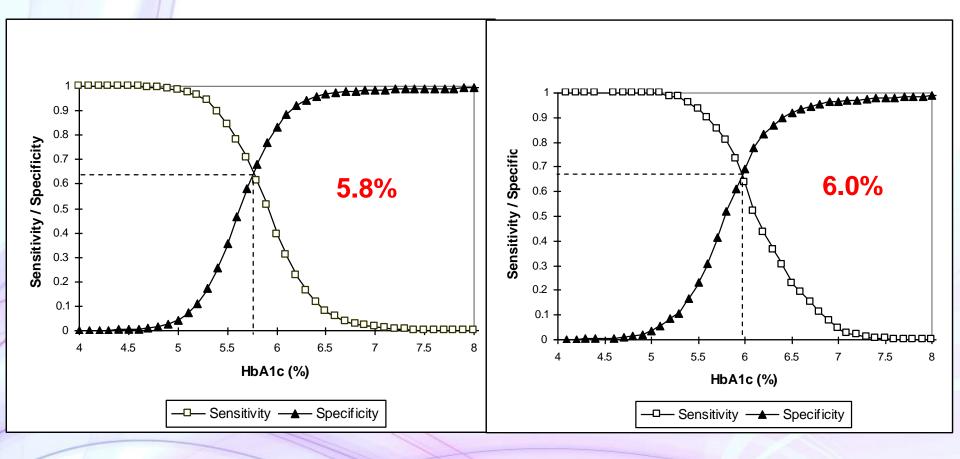
#### Comparison of clinical characteristics

			IGR on OGTT without 6.0-6.4%	HbA1c 6.0-6.4%, No IGR	р
		Age (years)	59.9	59.2	0.099
		, igo (jouro)	09.9	59.2	0.099
		% Female	49.7	51.5	0.421
	Ethnicity	% WE	73.0	64.1	<0.0001
		% SA	24.4	32.0	-
	Waist	Circumference(cm)	98.1	95.9	<0.0001
1		Mean BMI (kg/m <sup>2</sup> )	29.4	28.5	<0.0001
	Mean S	Systolic BP (mmHg)	142.1	137.7	<0.0001
1	Mean Diastolic BP (mmHg)		85.7	83.7	<0.0001
	Mean Tri	glycerides (mmol/l)	1.6	1.52	0.018

Mutually exclusive groups analysed

Mostafa et al Dia Res Clin Pract 90 (2010) 100-108

The relationship between HbA1c level and sensitivity/specificity for detecting IGR detected using WHO 1999 criteria) in (a) white Europeans and (b) south Asians.



(a) white Europeans

(b) south Asians

The dotted line represents the optimal balance between sensitivity and specificity (HbA1c $\geq$  5.8% for white Europeans and  $\geq$  6.0% for south Asians).

Mostafa et al Dia Res Clin Pract 90 (2010) 100-108

#### **Risk Scores**

- Pre-existing databases involving over 10,000 patients (ADDITION and STAR) were used to develop and validate two diabetes-specific risk scores.
- A self-assessment score that can be used as a method of engaging people with their diabetes risk status (Gray et al. 2010, Diabetic Medicine)

 A practice-based automated risk score that uses MIQUEST technology to rank risk status using data routinely coded within primary care (Taub et al. Diabetologia. 2009;52[suppl. 1]:S325-6).

#### **Self-Assessment based Strategies**

- To increase individuals' awareness and understanding of how their lifestyles and health behaviour impact upon their quality and length of life.
- To challenge, motivate and empower individuals
- To provide individuals with personalised information, practical advice and signposting to relevant services.

### **FINDRISC**

The original FINDRISC included only 7 questions. Using the original 7 questions showed that the score was reliable in predicting future DM over a 10 year period, in two cohorts Using this original score with a value of 9 or above was associated with an increased risk of future DM with a sensitivity of 78% and a specificity of 77%

The final FINDRISC has been amended in two ways; the age categories have been changed, with the addition of an age category of >64 years with a score value of 4, and the addition of a question regarding family history. Not validated in a UK multi-ethnic population

#### **TYPE 2 DIABETES RISK ASSESSMENT FORM**

Circle the right alternative and add up your points.

	-	e and add up your points.		
1. Age				e you ever taken medication for high
0 p.	Under 45 years		blood p	pressure on regular basis?
2 р.	45–54 years			
3 p.	55–64 years		0 p.	No
4 p.	Over 64 years		2 p.	Yes
2. Bod	ly-mass index		7. Have	e you ever been found to have high bl
(See re	verse of form)		glucose (eg in a health examination, during	
0 p.	Lower than 25 kg	/m²	illness,	during pregnancy)?
1 p.	25-30 kg/m <sup>2</sup>			
3 p.	Higher than 30 kg	g/m²	0 p.	No
			5 p.	Yes
		easured below the ribs		
(usual	ly at the level of th		8. Have	e any of the members of your immedia
	MEN	WOMEN		or other relatives been diagnosed wit
	Less than 94 cm	Less than 80 cm	diabete	es (type 1 or type 2)?
	94–102 cm	80–88 cm		
4 р.	More than 102 cm	More than 88 cm	0 p.	No
			3 p.	Yes: grandparent, aunt, uncle or first
				cousin (but no own parent, brother, sis
				or child)
			5 p.	Yes: parent, brother, sister or own child
			Total R	isk Score
				The risk of developing
			: 📖	type 2 diabetes within 10 years is
				then 7 I are estimated t in 100
			Lower	
4. Do	you usually have da	ily at least 30 minutes	÷	will develop disease
		rk and/or during leisure	7-11	Slightly elevated:
	including normal da			estimated 1 in 25
0 p.	Yes	,,,,		will develop disease
2 p.	No		12-14	Moderate: estimated 1 in 6
			45.30	will develop disease
5. Hov	v often do you eat v	vegetables, fruit or	15-20	High: estimated 1 in 3
berrie	-			will develop disease
0 p.	Every day		Higher	
1 p.	Not every day		than 20	
	,,			will develop disease
				Please turn

Lindstrom J, Tuomilehto J. The diabetes risk score: a practical tool to predict type 2 diabetes risk. Diabetes Care;26:725-31 2003

#### Leicester Self Assessment (LSA)



#### Gray et al. 2010, Diabetic Medicine

#### **Leicester Practice Risk Score**

- Automated tool for identifying those at high risk of either IGR or T2DM
- Uses routine data from GP practice databases

The **Leicester Practice Risk Score** is calculated as follows:

**LPRS** =  $0.0407 \times age (years)$ 

- + 0.296 (if male, no change if female)
- + 0.934 (ethnicity, as practice proportion SA)
- + 0.0859 × BMI (kg/m2)
- + 0.440 (if family history of DM, no change otherwise)

+ 0.374 (if on antihypertensive medication, no change otherwise)

Taub et al. Diabetologia. 2009;52[suppl. 1]:S325-6

#### Practice data in GP computers

- Age & Gender
- Body Mass Index
- Ethnicity (as proportion of practice)
- Family History of DM
- Smoking Status
- Use of hypertensives
- Socio-economic status

Taub et al. Diabetologia. 2009;52[suppl. 1]:S325-6

### Cost per Case : screening for diabetes and PDM; potential strategies

Strategy 1	All subjects undergo OGTT.
Strategy 2	All subjects undergo fasting glucose. Those above a certain threshold undergo OGTT.
Strategy 3	All subjects undergo HbA1c. Those above a certain threshold for HbA1c undergo OGT.
Strategy 4	All subjects undergo fasting glucose and HBA1c. Those above a certain threshold undergo OGTT.
Strategy 5	All subjects undergo self-assessment using a modified ethnic specific FINDRISK score. Those above a certain threshold undergo OGTT.
Strategy 6	All subjects undergo self-assessment using a modified ethnic specific FINDRISK score. Those above a certain threshold for FINDRISK undergo fasting glucose. Those above a certain threshold for fasting glucose undergo an OGTT.
Strategy 7	All subjects undergo self-assessment using a modified ethnic specific FINDRISK score. Those above a certain threshold for FINDRISK undergo an HbA1c. Those above a certain threshold for HBA1c undergo an OGTT.
Strategy 8	All subjects are invited on basis of a risk cut-off using routine practice data including age, sex, ethnicity and BMI. Those above a certain threshold undergo an OGTT.

# Summary

- Use of glycaemic measures and risk scores allows accurate risk calculation for future diabetes but needs validation in the local population in which they will be used
- Cost effectiveness for the identification of those at risk and interventions and the 'combined' pathway have been undertaken but there are gaps in the literature
- Evidence for a more intensive intervention in those at higher risk (> 50% 10 yr future DM risk) is proven lower levels need further evaluation
- Most of the cost lies with the intervention costs and strategies for identification even those confirmed with OGTT are relatively modest
- A stepwise screening strategy using self-assessment or practice routine data followed by HBA1c appears an efficient screening strategy for detecting T2DM and T2DM/IGR in a community setting.
- Remain some questions re the use of HbA1c in those with 'IGR' for example effectiveness of interventions compared to those with traditional IGT