THE BARBADOS DIABETES REVERSAL STUDY
PRELIMINARY RESULTS

Karen Bynoe[1], Maddy Murphy[2], Charles Taylor[2], Andre Greenidge[1], Melissa Abed[1], Nigel Unwin[1]
[1]Chronic Disease Research Centre, UWI, [2]Faculty of Medical Sciences, UWI, Cave Hill

Presented by:
Dr. Karen Bynoe MBBS, Study Clinical Investigator and Coordinator
Prof Nigel Unwin FRCP FFPH, Principal Investigator, Chronic Disease Research Centre, UWI

DECLARATIONS

- None

OVERVIEW

- Scientific basis and origin of the study
- Aim & Objectives
- Methods
- Results
- Discussion

BACKGROUND

- Known that in many obese individuals with type 2 diabetes bariatric surgery can lead to rapid normalisation of glucose

- Question: is the same effect possible without surgery, with diet alone?

NEWCASTLE (UK) DIABETES REVERSAL STUDY

- 11 with type 2 DM:
  - 9 men 2 women
  - Ages 35 to 65 yrs
  - Type 2 diabetes < 4 years
  - HBA1c 6.5 – 9.0%
  - BMI 25 – 45 kg/m^2
  - Not on insulin
- 9 'Controls'
  - Age, sex and BMI matched
  - Normal glucose tolerance

Lim et al, Diabetologia, 2011

Professor Roy Taylor lead scientist

NEWCASTLE STUDY - 8 WEEK INTERVENTION

- Liquid diet – 510 Kcal per day
- 3 portions of high fibre non-starch vegetables
- Encouraged to drink 2 liters a day of water
- Maintain physical activity

Lim et al, Diabetologia, 2011

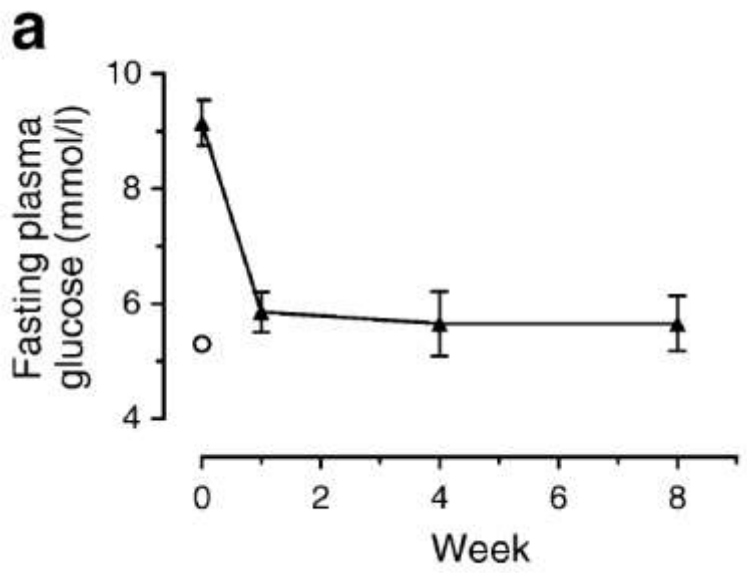
NEWCASTLE STUDY: CHANGE IN WEIGHT AND BMI

- Mean (SE) weight (Kg)
  - Baseline: 103.7 (4.5)
  - 8 weeks: 88.4 (4.3)

- Mean (SE) Body Mass Index (Kg/m^2)
  - Baseline: 33.6 (1.2)
  - 8 weeks: 28.7 (1.3)

Lim et al, Diabetologia, 2011

CHANGES IN GLUCOSE AND INSULIN



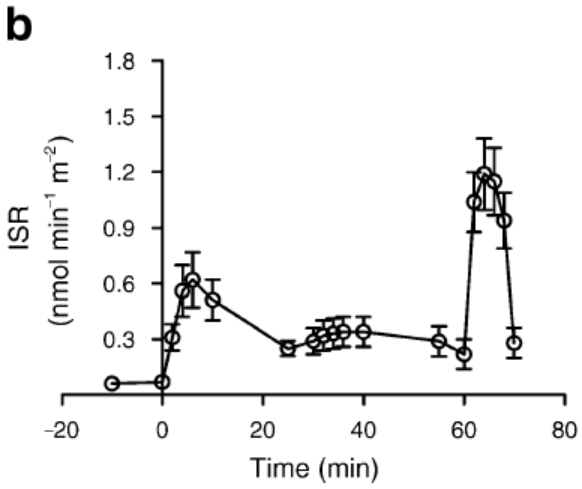
- Fasting insulin: pmol/l, mean (SE)
  - Baseline 151 (31)
  - Week 1 73 (10)
  - Week 4 57 (11)
  - Week 8 65 (15)
  - Value in controls at baseline: 115 (27)

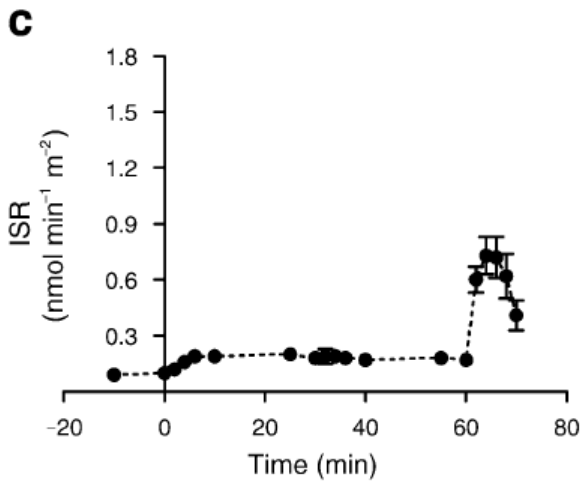
Lim et al, Diabetologia, 2011

BASELINE INSULIN SECRETION

Controls

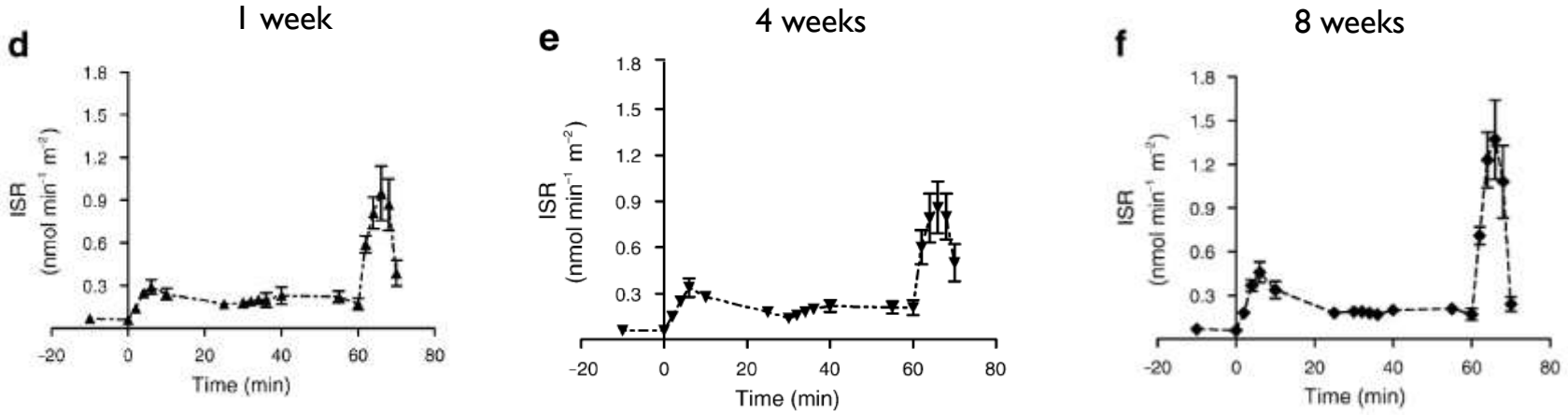
Diabetic group





Lim et al, Diabetologia, 2011

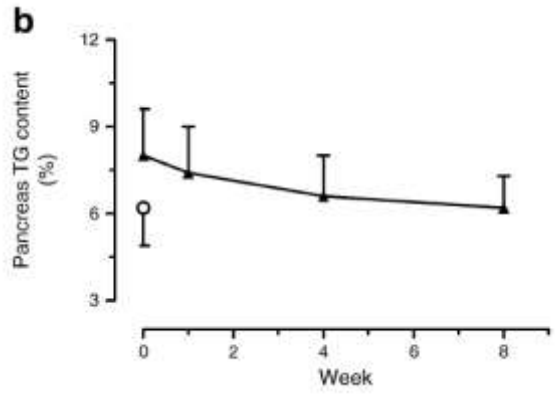
CHANGE IN INSULIN SECRETION IN DIABETIC GROUP



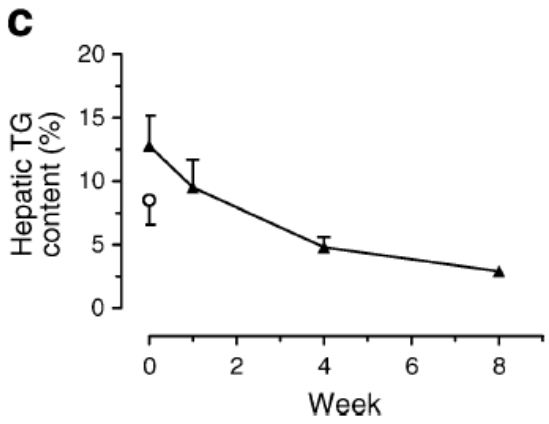
Lim et al, Diabetologia, 2011

CHANGES IN LIVER AND PANCREATIC TRIGLYCERIDE CONTENT

Pancreas



Liver



Lim et al, Diabetologia, 2011

Fat content measured by nuclear magnetic resonance spectroscopy

DIABETES REMISSION CLINICAL TRIAL (DIRECT)

- Evaluate the very low calorie diet intervention in a primary care setting
- Assess sustainability over a minimum of 2 years
- Cluster randomised controlled trial
  - GP practice is unit of intervention
  - 30 to 35 practices with 280 participants
- Detailed metabolic assessments on around 50%
- Funded by Diabetes - UK

THE BARBADOS DIABETES REVERSAL STUDY

AIM

- To evaluate the feasibility in Barbados of implementing a very low calorie diet to reverse type 2 diabetes

OBJECTIVES

- **In men and women with Type 2 diabetes in Barbados:**
  - To evaluate a low calorie liquid meal replacement as a means of achieving substantial weight loss
  - Measure effect on blood glucose, beta cell function, insulin sensitivity, and HbA1c
  - Monitor the maintenance of reversal of diabetes by 6 months follow up during a structured support programme
  - Investigate the acceptability and challenges of complying with the intervention

- **Use the results from this study to help design a larger, pragmatic, trial of diabetes reversal in Barbados and other parts of the Caribbean**

STUDY DESIGN

'Before and after'

25 participants

- **Inclusion criteria**:
  - 20-70 years
  - T2DM duration 0-6 years
  - BMI >27 kg/m^2
- **Exclusion criteria include**:
  - Insulin use
  - Known serious illness
  - HbA1c ≥12%,
  - Pregnant/ considering pregnancy

Recruitment

- Media
- Public Sector – Ministry of Health
- Private Physicians
- Patient Membership of
  - Barbados Diabetes Foundation
  - Diabetes Association of Barbados

LOW CALORIE LIQUID DIET (WEIGHT LOSS) PHASE

- All Diabetes Medication Stopped
- < 1000 kcal/day
- 4 GLUCERNA SHAKES/day (760kcal)
- 3 portions of non-starchy vegetables (~200 kcal)
- 3 Litres water/calorie-free beverages
- Weekly Measuring of
  - Blood Pressure
  - Weight
  - Fasting Blood Glucose using Hemocue Glucose 201 Machine
  - Waist Circumference
  - Hip Circumference

- Standardized Meal Tests
  - Baseline & 8 weeks
  - Measurement of metabolic response over 2 hours
  - Glucose, Insulin, C-Peptide, NEFA
  - Baseline LIPIDS
  - Glucerna Shakes were given to participants

PARTICIPANT SUPPORT

- Comprehensive Support Package
  - Written personal guide
  - Non-starchy vegetable guide
  - Expectations of participant
  - Expected side effects
- Weekly support calls

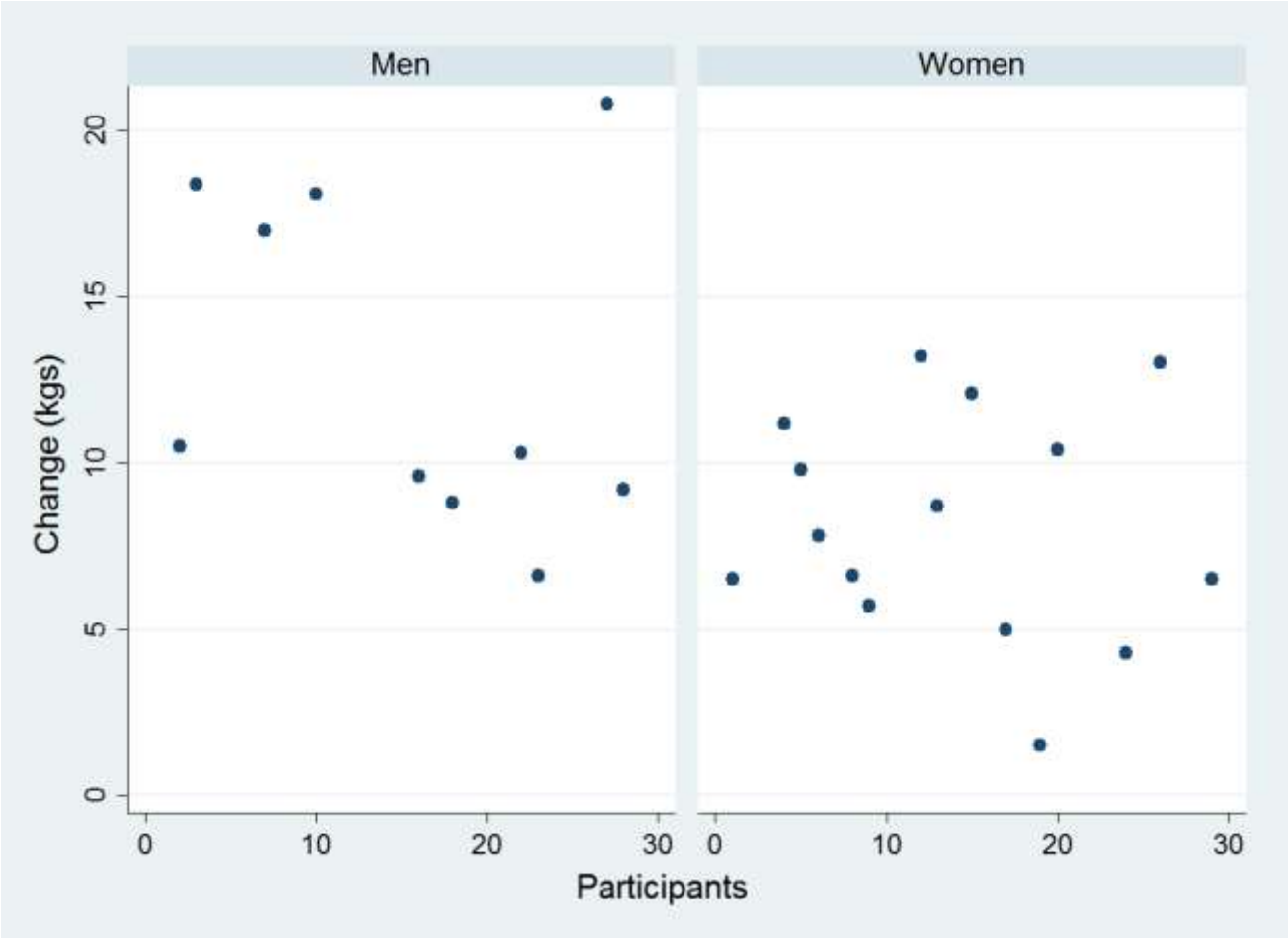
BASELINE CHARACTERISTICS

	Men	Women	Total
Age (yrs)	50.9 (11.7)	46 (9.2)	48.0 (10.3)
BMI (Kgm^{-2})	33.9 (5.5)	34.3 (6.6)	34.2 (6.0)
Waist (cm)	110.4 (14.7)	102.0 (15.1)	105.4 (15.2)
Systolic BP (mmHg)	134 (15.6)	126 (11.3)	129 (13.7)
FPG ($mmoll^{-1}$)	9.2 (2.2)	9.3 (2.2)	9.2 (2.2)
HbA1c %	8.1 (2.0)	8.2 (1.5)	8.1 (1.7)

Table shows mean (SD) for all characteristics

Individual changes in weight

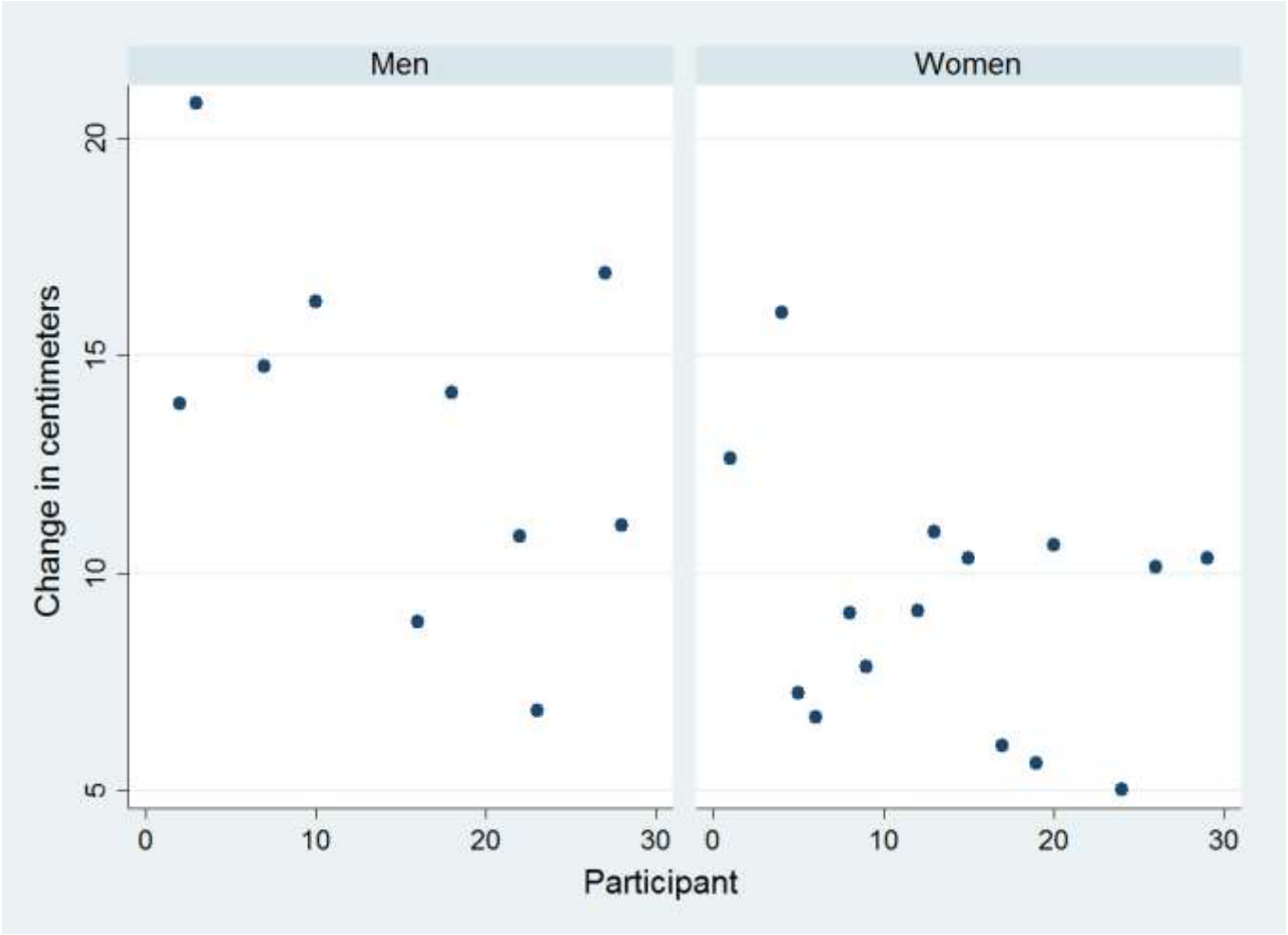
Between baseline and week 8



Mean weight loss 10.1(4.7) kg (range 1.5-20.8)

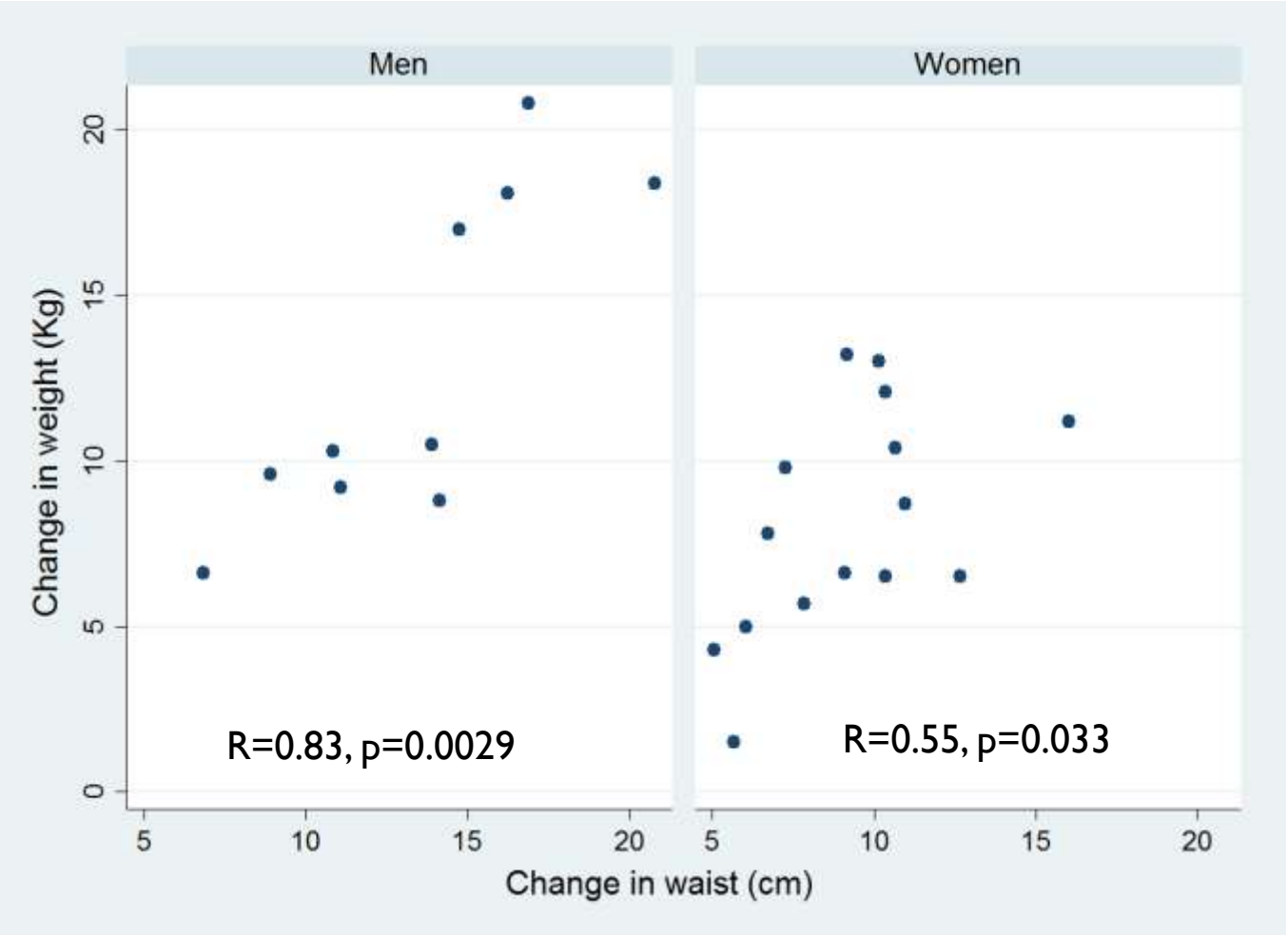
Individual changes in waist circumference

Between baseline and week 8



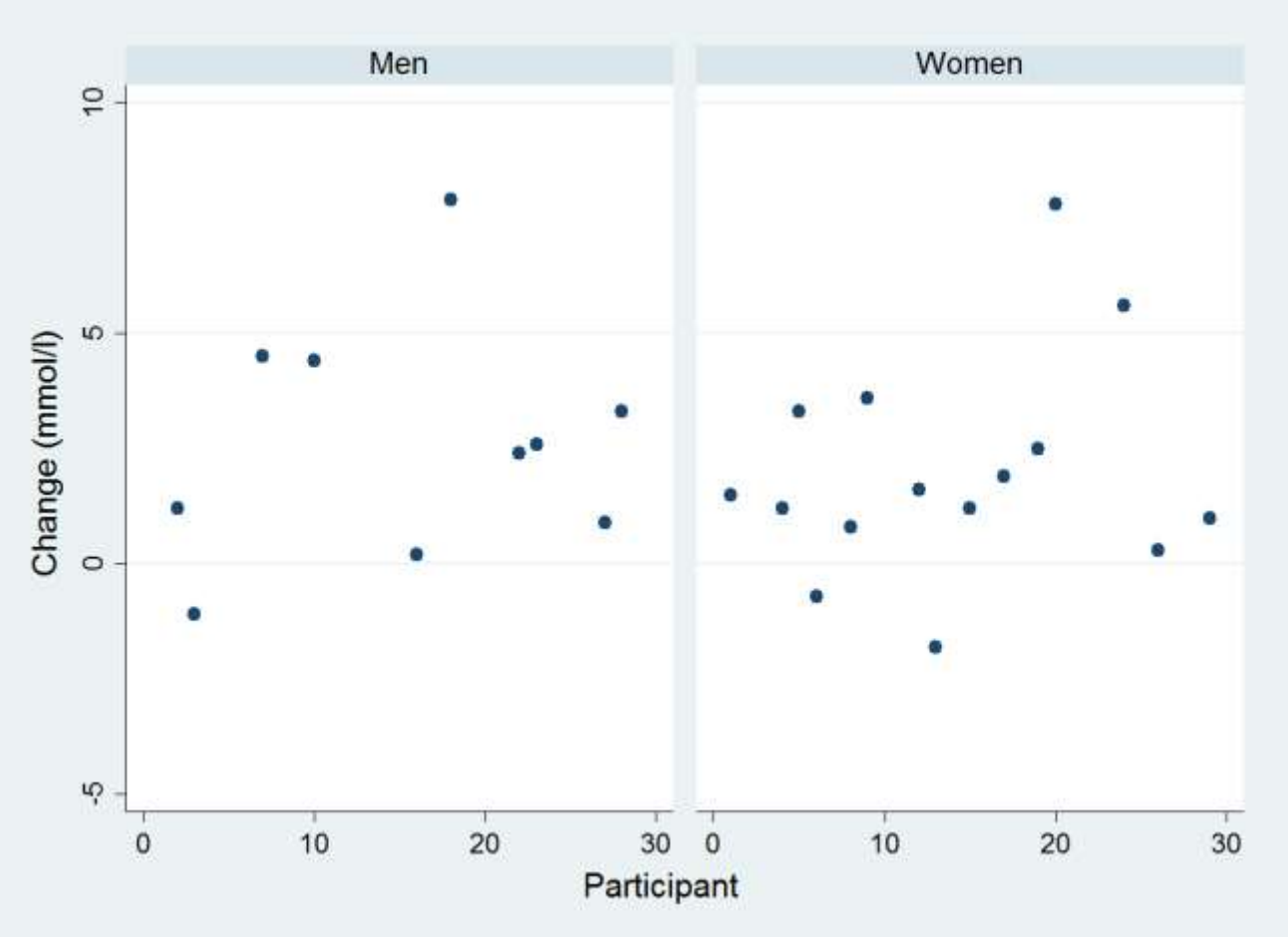
Mean waist circumference loss 10.9 (4.0) cm (range: 5.1-20.8)

Relationship between change in weight and waist



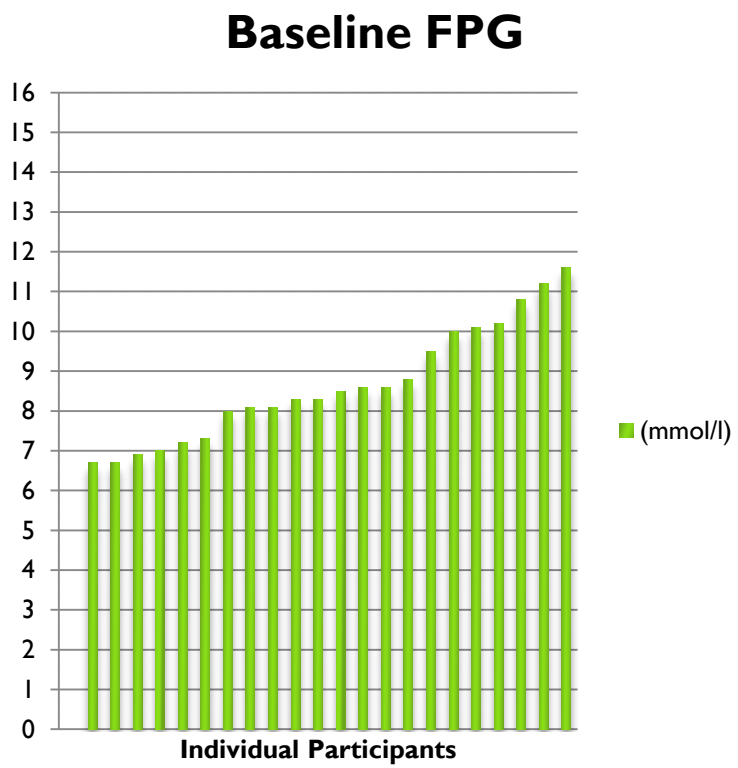
Individual changes in fasting glucose

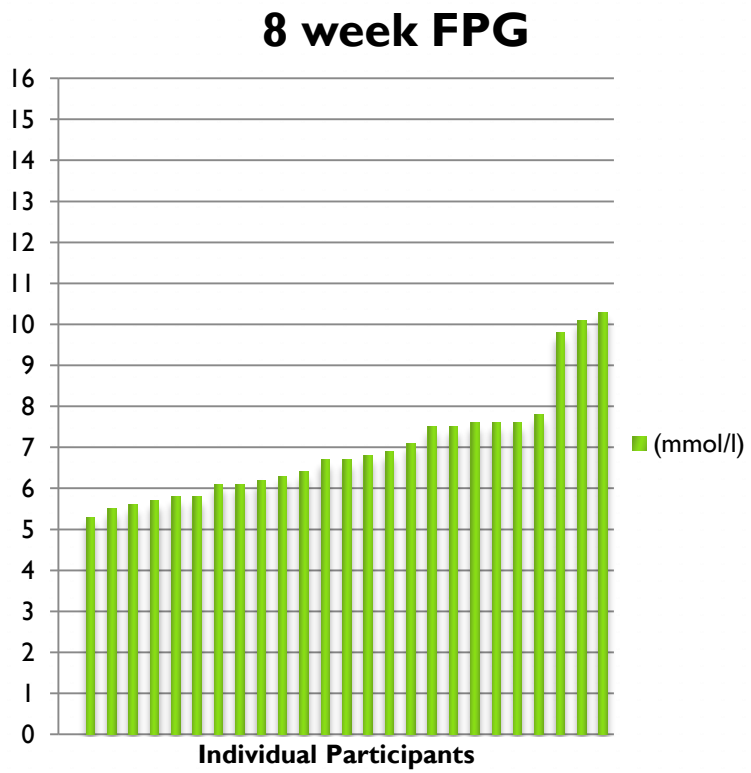
Between baseline and week 8



Mean change in FPG 2.2mmoll^{-1} (range -1.5 to 7.9)

Fasting plasma glucose
Baseline and 8 weeks





THERE WERE 15 PERSONS WITH A FPG <7.0mmol/l AT 8 WEEKS COMPARED TO 3 BASELINE, p=0.004

Summary of mean changes between baseline and 8 weeks

	Baseline	8 weeks	Change* (95% CI)
BMI (Kgm^{-2})	34.2	31.1	3.1 (2.1 – 3.9)
Waist (cm)	105.4	94.5	10.9 (9.3 – 12.5)
FPG ($mmoll^{-1}$)	9.2	7.0	2.2 (1.2 – 3.2)
HbA1c %	8.1	7.3	0.8 (0.3 – 1.4)

*Baseline minus 8 week value, all changes statistically significant at least $p<0.003$

GENERAL FINDINGS

- All participants reported feeling more energetic
- Most persons felt full while on diet
- Constipation – most common side effect
- Motivation with reduced blood glucose readings
- All participants wanted to continue to lose weight

CONCLUSION

- Significant reduction in FPG and weight achieved
- Significant reduction in HbA1c without medication
- Could be maintained with support and close follow-up

FURTHER ANALYSES

- Qualitative Data – learning from the experience
- Pancreatic analyses – insulin, insulin secretion
- Weight Maintenance Phase
- Future larger research study

FURTHER READING

- Lim, E.L., et al., *Reversal of type 2 diabetes: normalisation of beta cell function in association with decreased pancreas and liver triacylglycerol.* Diabetologia, 2011. **54**(10): p. 2506-14.
- Taylor, R., *Type 2 Diabetes: Etiology and reversibility.* Diabetes Care, 2013. **36**(4): p. 1047-1055.

CORE STUDY TEAM

- Prof. Nigel Unwin
- Dr. Charles Taylor
- Dr. Madhurvanti Murphy
- Ms. Melissa Abed
- Ms. Latoya Bartholomew
- Ms. Krystal Boyea
- Mr. Andre Greenidge
- Dr. Karen Bynoe
- Prof. Roy Taylor (UK)

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THANK YOU!