# Ethnic variation in the contribution of Cardiorespiratory fitness and muscular strength to diabetes: crossectional study of 68,116 UK Biobank participants

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# Outline

- Background
- Study Aims
- Methods
- Result
- Discussion
- Strengths and Limitations
- Conclusion

# Background

- Type 2 diabetes is a major public health problem

- Diabetes prevalence
  - Black (2x White European)
  - South Asian (4x White European)

PUBLIC HEAI

NICE National Institute for Health and Care Excellence

Public health

# Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies

*WHO expert consultation**



Assessing body mass index and waist circumference thresholds for intervening to prevent ill health and premature death among adults from black, Asian and other minority ethnic groups in the UK

Issued: July 2013

American Diabetes Association. Diabetes Care



## Ethnic-Specific Obesity Cutoffs for Diabetes Risk: Cross-sectional Study of 490,288 UK Biobank Participants

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# Background (cont'd)

- Low cardiorespiratory fitness
  - involved in the progression from normal glucose metabolism to type 2 diabetes (T2D);
  - predictors of cardiovascular events and premature mortality in T2D individuals.

- Muscular strength is a predictor of all-cause mortality, as well as disability.

- No epidemiological studies on ethnic variation and diabetes prevalence

Rantanen T, et al; Sayer AA, et al; Ghouri N, et al; Wander PL, et al

# Study Aims

- To determine the associations of (a) cardiorespiratory fitness (b) muscular strength on diabetes risk in White European, Black and South Asian.

- To determine the extent to which ethnic differences in fitness and muscle strength might account for observed differences in diabetes prevalence

- Whether the strength of these relationships similar across ethnic groups

# Methods

## Data Source

### UK Biobank

- Large sample size data >500,000
- Aged between 40 and 70 years
- Representative of the UK population in terms of age-band, sex and ethnic structure
- Self-identified as White, South Asian or black background living in the UK

## Data Analysis

- Multivariate logistic regression model
- Adjusting for :
  - Age, Sex ,Deprivation quintile , Smoking ,Alcohol consumption, BMI and Percentage body fat

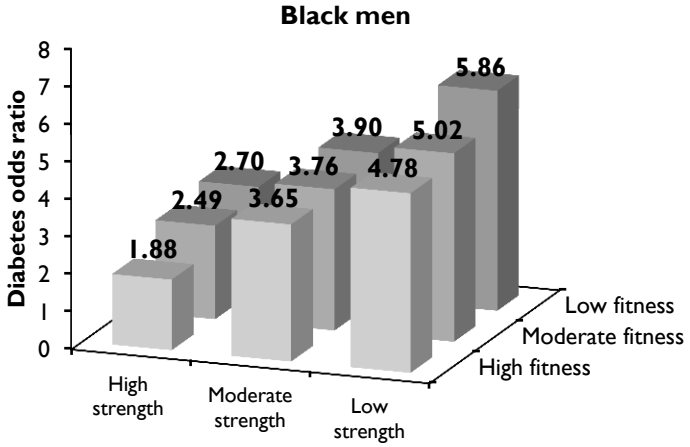
# Results

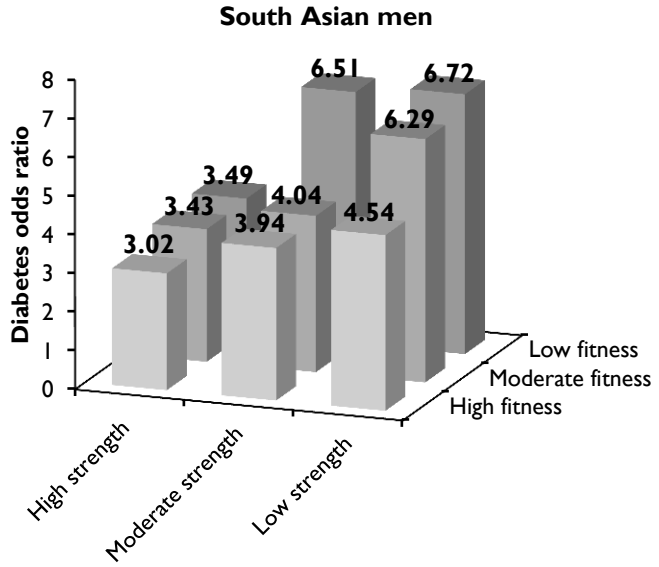
# Table 1.Characteristics of study participants by ethnic group and sex

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | White N=28,402 | Black N=904 | South Asian N=1,066 | White N=35,367 | Black N=1,293 | South Asian N=1,086 |
| Age(years) | 59 (51-64) | 51 (45-59) | 54 (45-61) | 58 (51-63) | 51 (46-58) | 53 (46-60) |
| BMI (kg/m2) | 27.2 (25.0-29.9) | 28.2 (25.9-30.9) | 26.5 (24.4-29.0) | 25.9 (23.3-29.4) | 29.5 (26.0-33.6) | 26.3 (23.6-29.3 |
| Hand grip strength (kg/kg body weight) | 0.45 (0.28-0.53) | 0.47 (0.37-0.55) | 0.43 (0.35-0.50) | 0.33 (0.26-0.39) | 0.32 (0.25-0.38) | 0.29 (0.23-0.36) |
| CRF (METS) | 10.02 (8.14-11.92) | 8.65 (6.85-10.27) | 9.20 (7.65-10.73) | 7.65 (6.09-9.31) | 6.49 (4.75-7.98) | 6.82 (5.31-8.21) |
| | N (%) | N (%) | N (%) | N (%) | N (%) | N (%) |
| Diabetes | 1,604 (5.64) | 134 (14.77) | 189 (17.68) | 1,122 (3.17) | 108 (8.34) | 126 (11.60) |

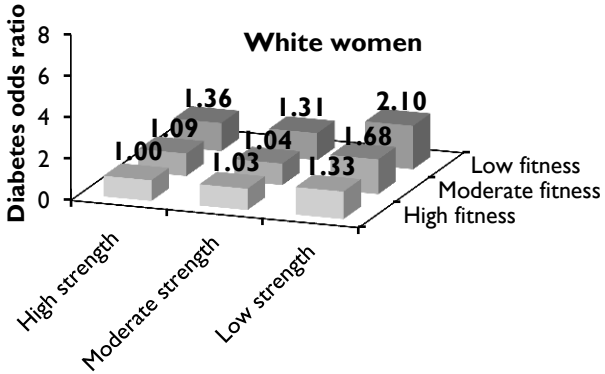
# Impact of fitness & strength on risk of diabetes (Men)

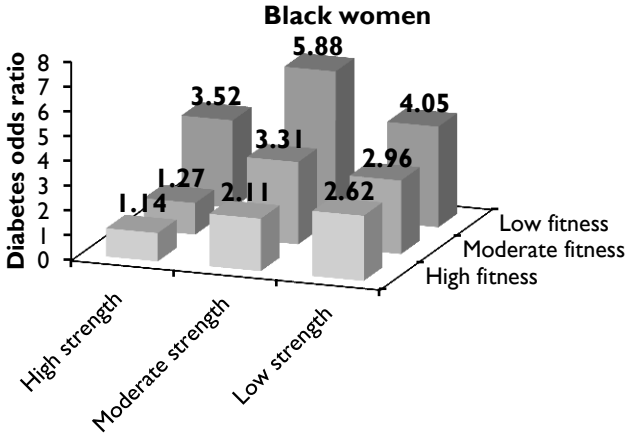


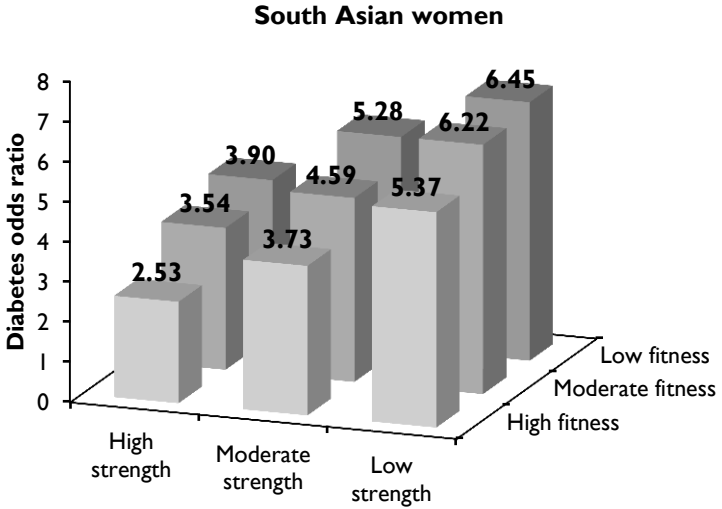



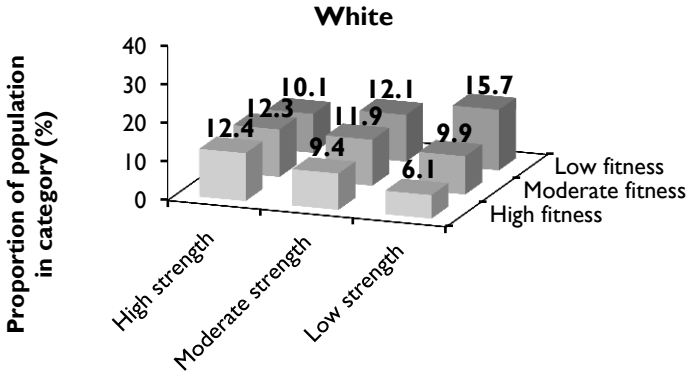
# Impact of fitness & strength on risk of diabetes (Women)

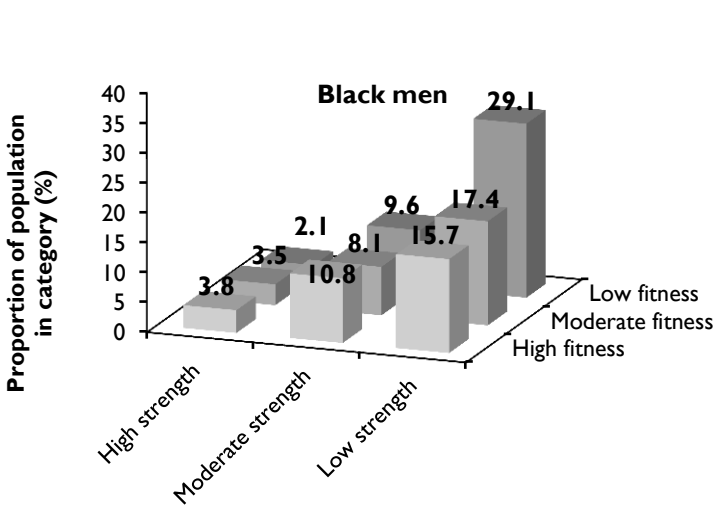


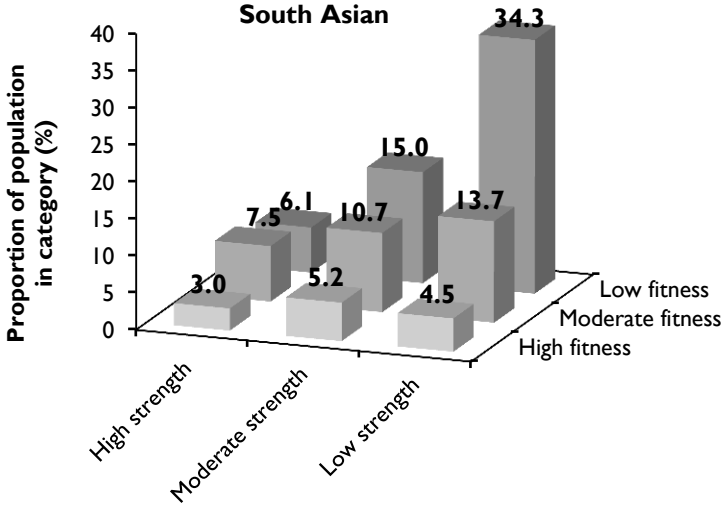



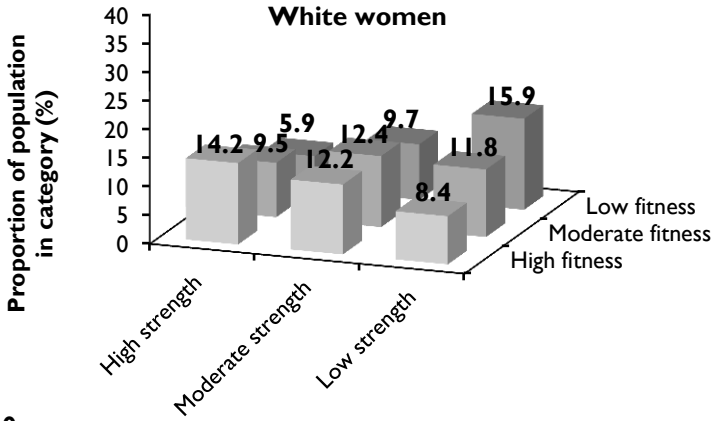
# Breakdown of participantsby fitness & strength (men)

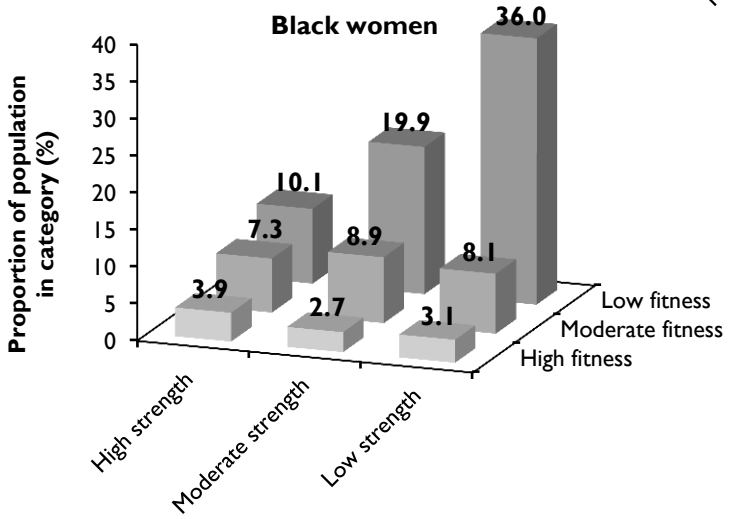


# Breakdown of participantsby fitness & strength (women)



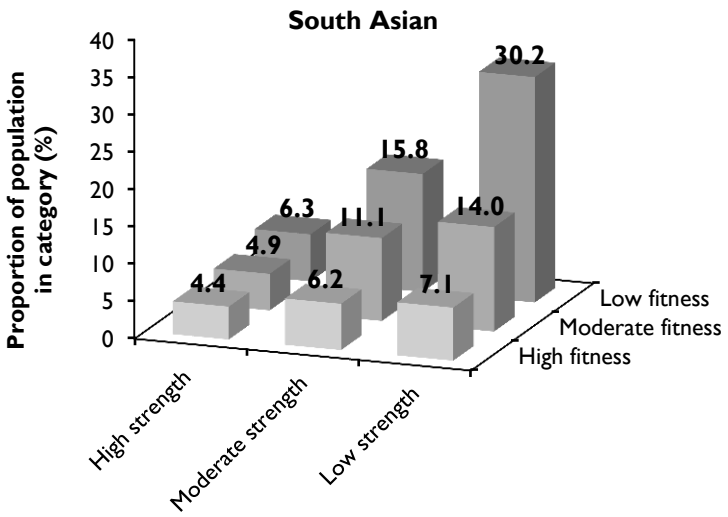



**Table 2. Attributable risk and attributable fraction of low-to-moderate cardiorespiratory fitness and low-to-moderate muscular strength for diabetes in White, Black and South Asian men and women**

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | White | Black | South Asian | White | Black | South Asian |
| Attributable risk (diabetes cases per 100 people) | 1.4 (0.5-2.3) | 4.1 (3.5-10.9) | 8.2 (2.3-18.6) | 1.0 (0.5-1.5) | 4.3 (2.2-7.8) | 5.0 (2.8-12.5) |
| Attributable fraction for diabetes risk (%) | 24.5 (6.3-39.1) | 28.1 (22.5-60.4) | 45.7 (18.8-81.2) | 27.3 (5.1-44.3) | 42.6 (20.1-79.9) | 47.2 (20.8-86.6) |

# Discussion

- Findings suggest a graded association between weaker muscular strength, low cardiorespiratory fitness and diabetes risk, particularly in South Asian and Black ethnic groups.
  - remained significant after adjustment for adiposity (BMI and %body fat).
- Need to include strength-training exercises, as well as aerobic physical activity, in future lifestyle interventions trials for diabetes prevention.
- Need to target black and south Asian adults for interventions to increase strength and fitness.

# Strengths and Limitations

- **Strength of study:**
  - Primary predictors objectively measured
  - Large sample size
  - Ethnic diversity

- **Limitations:**
  - Cross sectional study
  - Can not determine causal association
  - Selection bias?

# Conclusion

- Independent associations between fitness and muscular strength on diabetes risk in white European, south Asian and black adults
- Low-to-moderate fitness and strength could importantly contribute to a disproportionately large proportion of diabetes cases in the south Asian and black groups
- A clear case for future randomised controlled trials of interventions to improve both strength and fitness in non-white populations

# Translating research into practice ……





# The rest of the team …..

- Jason M.R. Gill,
- Daniel F. Mackay,
- Naveed Sattar,
- Jill P. Pell

# Thank you


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