Control and Prevention. Some authors from this publication are employed by the CDC.

**Conflicts of interest**: None declared.

### Key points

- Kenya Ministry of Health recently deployed a case-based national electronic surveillance system for tuberculosis.
- Overall the new electronic surveillance system is robust but improvement in concordance and completeness of data is needed.
- Additional oversight and training in data entry and record management may strengthen TB surveillance data quality in Kenya.

### References


---

### Short Report

**Effect of Human Papillomavirus vaccination of daughters on the cervical screening uptake of their non-vaccinated mothers**

Angela M. Spencer¹, Stephen A. Roberts², Arpana Verma¹, Julietta Patnick³, Peter Elton⁴, Loretta Brabin⁵

¹ Manchester Urban Collaboration on Health Centre for Epidemiology, Institute of Population Health, Manchester Academic Health Sciences Centre, University of Manchester, Stopford Building, Oxford Road, Manchester M13 9PT, UK

² Centre for Biostatistics, Institute of Population Health, Manchester Academic Health Sciences Centre, Jean McFarlane Building, University of Manchester, Oxford Road, Manchester, M13 9PL, UK

³ Public Health England/NHS Cancer Screening Programmes, Fulwood House, Old Fulwood Road, Sheffield S10 3TH, UK

⁴ Greater Manchester, Lancashire, South Cumbria Strategic Clinical Network, 4th Floor, 3 Piccadilly Place, Manchester, M1 3BN, UK

⁵ Women’s Cancer Centre, Institute of Cancer Sciences, Manchester Academic Health Sciences Centre, St Mary’s Hospital, University of Manchester, Manchester M13 OJH, UK

**Correspondence**: Angela M. Spencer, Manchester Urban Collaboration on Health, University of Manchester, Stopford Building, Oxford Road, Manchester M13 9PT, UK. Tel: +40161 275 5198, e-mail: angela.spencer@manchester.ac.uk

**Aim**: This study investigated return to cervical screening rates for 112 451 under-screened mothers of daughters offered Human Papillomavirus (HPV) vaccination over two school academic years and a comparator group of women with no vaccine-eligible daughter. **Results**: Mothers returned to screening more often than the comparator group: odds ratio (OR) 1.04 (95% confidence intervals 1.02–1.07) for lapsed and 1.57 (1.48–1.67) for never screened. Screening return was significantly higher in the year prior to HPV vaccination for lapsed mothers (OR = 1.06) and in the current vaccination year for lapsed and never screened mothers (OR = 1.05 and 1.16 respectively). **Conclusion**: The modest increase in screening attendance indicates a potential for the HPV vaccine programme to increase screening uptake of mothers.

**Introduction**

In the UK, routine vaccination of 12- to 13-year-old girls against Human Papillomavirus (HPV) was introduced in September 2008, with a time-limited catch up campaign for girls 14–18 years. Girls should receive information on cervical cancer, HPV as the viral agent and the protection offered by the vaccine, so that parents and girls can together reach an informed decision about participation. Although many mothers will previously have attended cervical screening they may still have little knowledge about the HPV virus or cervical cancer. Previous studies have suggested that misunderstanding of cervical cancer risk and the purpose of screening can be major barriers to women’s participation in the cervical screening programme. The HPV vaccination literature presents an opportunity...
for mothers to learn more about cervical cancer and may encourage them to attend for screening.

A number of studies demonstrated that women who attend for cervical screening are more likely to encourage their daughters’ vaccination. The present work addresses the reverse scenario—i.e. whether a daughter’s involvement in the HPV vaccination programme stimulates cervical screening attendance of mothers. The aim was to investigate whether under-screened mothers of girls eligible for the HPV vaccination were more likely to return to the cervical screening programme than a comparator group of women without a daughter of vaccination age.

**Methods**

**Setting**

Within the UK women are invited for free cervical screening every 3 years from age 25 to 49 years, and every 5 years from 50 to 64 years. A dataset created for a previously described study in the North West of England was utilised and is described in Spencer et al. This comprised 112,451 mother–daughter pairs. It included three distinct cohorts: (i) girls scheduled for HPV vaccine in the school year 2008/09 as part of the routine programme (aged 12–13 years in September 2008); (ii) girls scheduled for vaccination in 2009/10 as part of the routine programme (aged 12–13 years in September 2009) and (iii) those scheduled as part of the catch up programme 2009/10 (aged 14–16 years). Mothers were matched to daughters eligible for the HPV vaccination by address. Analysis was restricted to addresses at which only one adult female and one vaccine eligible girl within a particular vaccination cohort were living. Similar size comparator groups of women who were not linked to girls eligible for vaccination were selected randomly with the groups stratified by age, deprivation, ethnicity and geographical area. Further details are included in the online Supplementary material.

![Figure 1](image-url)
Analysis

Logistic regression models were formulated to formally test for differences between groups of women whilst adjusting for demographics and temporal trends, with the outcome being a woman’s return to screening within each given month. Details can be found in the online Supplementary material. Under-screened women (unscreened for 5 years or more, subdivided into lapsed or never screened) were selected at the start of each month, and whether or not they returned to the programme during that month was then determined.

The models included calendar time (to adjust for temporal trend), residence in areas with high proportions of minority ethnic populations, Index of Multiple Deprivation quintile, cohort, year of birth (categorised into 5 year age bands) and time since last screen as covariates. Odds ratios (ORs) and 95% confidence intervals (CI) are presented for being a mother (compared with the comparator women) and for the school year when the HPV vaccine was offered, and the year prior to vaccination (when information on vaccination was often first provided).

Results

Full details of demographic characteristics, screening attendance and return rates can be found in Supplementary tables S1, S2 and S3 in the Supplementary material.

Figure 1 shows the monthly return rates for the three cohorts of under-screened women linked to a girl eligible for HPV vaccination alongside the comparator group. A large, but temporary increase in screening returners was seen in 2009, although this was not as apparent in those who had never been screened. Screening return rates were consistently higher in mothers compared with the comparator groups across all time periods but in particular, for those women who had never previously attended for screening over the two 2008/09 and 2009/10 HPV vaccination time periods.

The logistic regression models are provided in Supplementary table S4. The difference in the return to screening rate between mothers of girls eligible for vaccination and the comparator groups gave ORs of 1.04 (95% CI 1.02–1.07) for lapsed and 1.57 (1.48–1.67) for never screened (both \( P < 0.001 \)). There was a significant additional return in the vaccination year (OR 1.05: 1.00–1.10) and 1.16: 1.02–1.31) in the lapsed and never screened respectively) and for the lapsed mothers a modest effect during the year prior to vaccination (OR = 1.06: 1.01–1.10). Screening return rates were somewhat higher in areas with high ethnic minority populations (OR 1.05–1.10) but decreased with increasing deprivation (OR most deprived quintile; 0.81: 0.78–0.84).

Discussion

The results showed under-screened women living with a girl eligible for the HPV vaccination to be significantly more likely to return to the cervical screening programme following a period of absence than those women who were not linked to a girl in this age group.

The rate of return to screening significantly increased when the HPV vaccination programme was first introduced in 2008/09. Vaccine introduction may account for the improvement, although it was observed for women both linked to a girl of vaccination age and those not. Another plausible explanation is the publicity brought about by the diagnosis in August 2008 and death in March 2009, of the British reality television star Jade Goody from cervical cancer, a phenomenon that translated into an increased cervical screening uptake that was evident in national datasets.8 Our results demonstrate that, whether due to HPV vaccination and/or the Jade Goody effect, by July 2009 screening attendance nationally returned to previous levels. Taking these temporal trends into consideration we were still able to demonstrate a small but significant impact of the HPV vaccination programme specific to women who had been exposed to the vaccination programme through their daughters’ participation. The screening return rate was significantly higher in both the year of, and the year prior to, vaccination. This was especially evident in the vaccination year for those who had never attended for screening previously. One interpretation of our results is that the local and national literature and media coverage that accompanied HPV vaccination reached, and increased, awareness in an important sub-group of non-attending mothers, including those from ethnic minority backgrounds.

Several studies have described the importance of a mother’s screening history on her daughter’s HPV vaccination uptake.1–6 The present analysis extends these observations and shows for the first time that, stimulated by the vaccine programme, some mothers were prompted to take up a screening offer. The 5% increase in screening returners identified in both the year of, and year prior to, the vaccination programme through the logistic regression model, although small, does indicate the potential for synergy between cervical screening and HPV vaccination programmes. This could be further exploited to effectively promote awareness, knowledge, understanding and ultimately, uptake of both programmes.

Supplementary data

Supplementary data are available at EURPUB online.

Acknowledgement

We would like acknowledge Suzanne Milward, LaSCA for her role in creating the database and thank Annie Harrison of the Manchester Urban Collaboration on Health for her help. Some of this work has been presented orally at the International Conference on Urban Health, Manchester, 7 March 2014.

Funding

The running costs of the study were funded by the NHS Cancer Screening Programme. A.M.S. was funded by NHS Bury. Dr L.B. was funded by the Max Elstein Trust. Researchers at the University of Manchester receive support from the Manchester Academic Health Science Centre and the Central Manchester University Hospital NHS Trust.

Conflicts of interest: None declared.

Key points

- Mothers whose daughters have been offered the HPV vaccine are more likely to return to cervical screening following a period of absence than women without eligible daughters.
- Mothers screening return rate was seen to be significantly higher in both the year of and the year prior to the HPV vaccination.
- Information sent to mothers as part of the HPV vaccination programme has the potential to be used to promote cervical screening attendance.

References

Multiple anthropometric measures in relation to incidence of diabetes: a Swedish population-based cohort study

Yan Borneé, Peter M. Nilsson, Olle Melander, Bo Hedblad, Gunnar Engström

Department of Clinical Sciences in Malmö, Lund University, Sweden

Correspondence: Yan Borneé, Department of Clinical Sciences, Lund University, CRC 60:13, Jan Waldenström's gata 35, 20502 Malmö, Sweden. Tel.: +46 40391327, Fax: +46 40391322, e-mail: yan.borne@med.lu.se

Background: Obesity is the major modifiable risk factor for diabetes. This study investigated the incidence of diabetes in relation to multiple anthropometric measures. Methods: Body mass index (BMI), waist circumference (WC), waist-height ratio (WHtR), waist-hip ratio (WHR) and body fat percentage (BF%) were measured among 26,604 subjects (aged 45–73 years) without history of diabetes from the Malmö Diet and Cancer cohort. Results: During 14 years of follow-up, 2,935 subjects (1,519 men, 1,416 women) were diagnosed with diabetes. In men, incidence of diabetes was 24.1 and 4.0 per 1000 person-years comparing the fourth vs. first quartile of WHtR. The multivariate adjusted hazard ratios (HR; fourth vs first quartile) were 6.00 [95% confidence interval (CI): 4.58–7.80] for WHtR, 5.95 (CI: 4.96–7.14) for WC, 5.19 (CI: 4.38–6.15) for BMI, 4.71 (CI: 3.96–5.60) for WHR and 3.21 (CI: 2.75–3.76) for BF%. For women, incidence of diabetes was 15.1 and 1.4 per 1000 person-years for fourth vs fourth quartile of WHtR. The multivariate adjusted hazard ratios (HR; fourth vs first quartile) were 9.16 (CI: 6.05–13.91) for BMI, 6.57 (CI: 4.52–9.43) for WHR and 5.39 (CI: 4.42–6.57) for BF%. Model discrimination was marginally increased when WC, WHtR or WHR was used in combination with BMI. Conclusion: All measures of obesity were associated with substantially increased incidence of diabetes. Abdominal obesity was associated with higher incidence rates in men than in women, but in terms of relative risks the relationships were stronger in women. The combination of BMI and abdominal obesity measures had stronger association with diabetes than BMI alone.

Introduction

Type 2 diabetes is an increasing health problem in most countries.1 Age, sex and genetic factors play key roles for diabetes onset; however, diabetes is a preventable disease and obesity is the major modifiable risk factor in the population.2–5 The relationships between obesity and blood glucose or diabetes have been demonstrated both in cross-sectional6–8 and prospective studies.9–12

Body mass index (BMI) is the most practical and commonly used anthropometric measure for general fat.9,10 However, the body fat (BF) distribution, especially abdominal obesity has been proposed to be a stronger risk factor for diabetes.13,14 A recent meta-analysis found that waist/height ratio (WHtR) is a better screening tool for cardiometabolic risk factors compared with waist circumference (WC) and BMI.15 Other studies suggested that both general fat and abdominal fat are risk factor for diabetes.7,11 Prospective data on anthropometry and incidence of self-reported diabetes have been reported in a study from Germany. WC was a better predictor than other measures among men and women; WHtR improved the prediction most for men and WHtR and WC were similar predictors for women.12 Most studies of obesity and incidence of diabetes have been performed in populations from Europe9,11,12 or USA.6,6 However, cross-sectional analyses from the Obesity in Asia Collaboration, including more than 263,000 individuals from 21 studies, reported stronger relationships for WC and type 2 diabetes than for BMI.8

The aim of this prospective study was to explore the relationship between different anthropometric measures, i.e., BMI, WC, WHtR, waist-hip ratio (WHR) or percent BF (BF%), and incidence of diabetes in a large population-based cohort study.

Methods

Study population

Malmö Diet and Cancer (MDC) cohort, from the city of Malmö in southern Sweden, was used for the present study. All women born between 1923 and 1950 and men born between 1923 and 1945 living in Malmö city were invited to the MDC study during the period