

# Is **change** in body fatness important in (primary) cancer prevention?

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Scottish Cancer  
Prevention Network

UK Society for Behavioural Medicine  
**UKSBM**  
Biology, Behaviour & Environment



NIHR Cancer  
and Nutrition  
infrastructure

# Cancer - The Global Picture



Cancer is neither rare anywhere in the world, nor mainly confined to high resource countries.

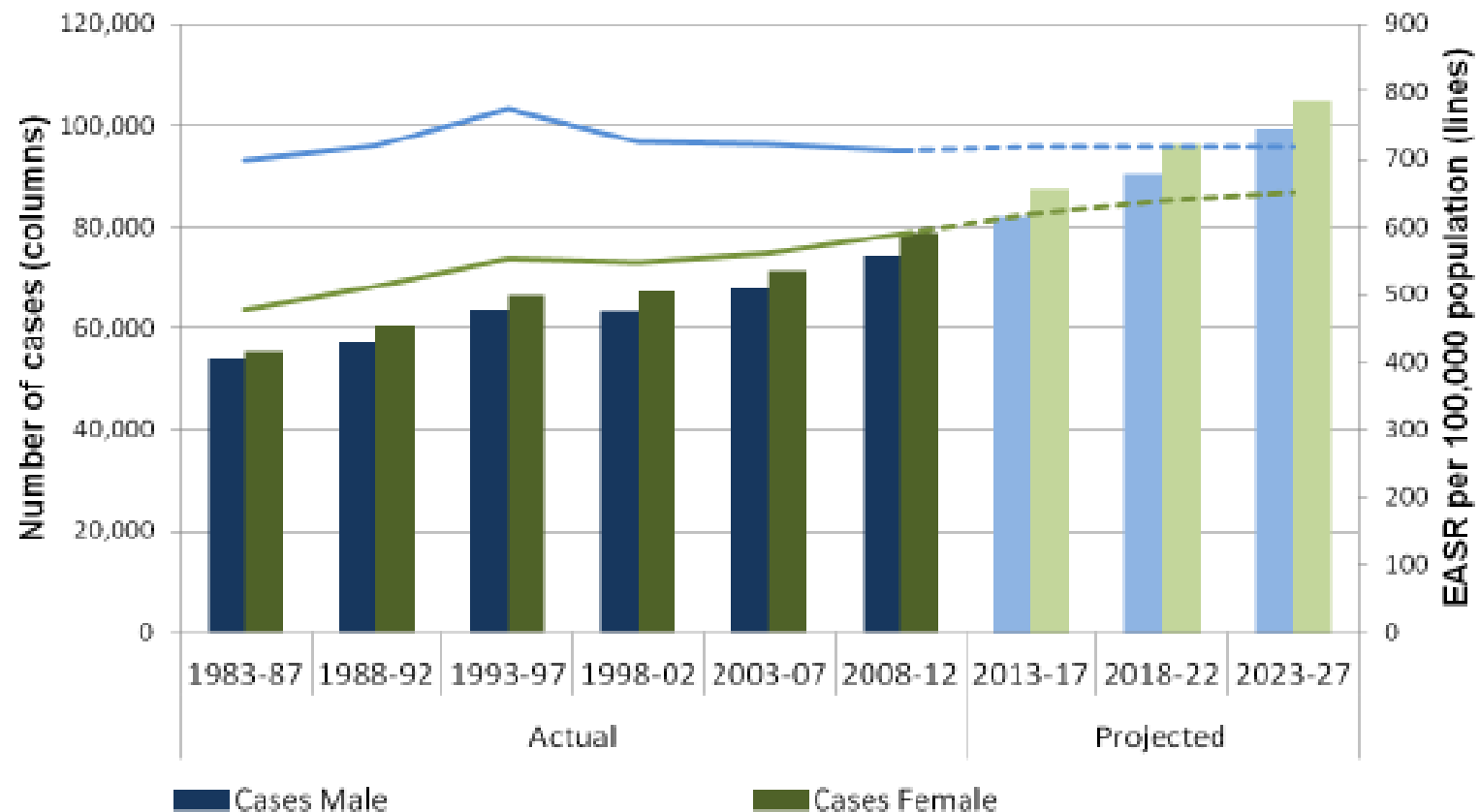
18.1 million new cases, 9.6 million deaths in 2016.

1 in 5 men and 1 in 6 women worldwide will develop cancer in their lifetime

43.8 million people alive after a 5 year diagnosis

Globocan, 2018

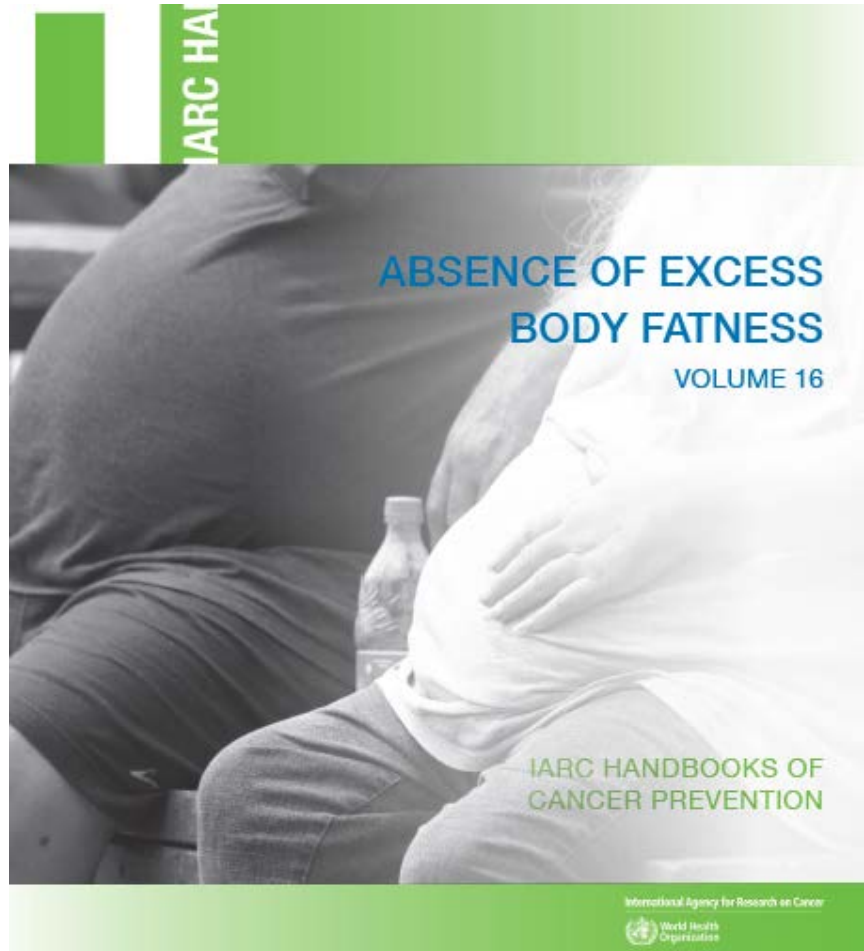
# Scotland's Projected Cancer Incidence



EASR European Age Standardised Rate

# WHO (IARC)

<http://publications.iarc.fr/570>



Absence  
of excess  
body  
fatness



## Body fatness and **weight gain** and the risk of cancer

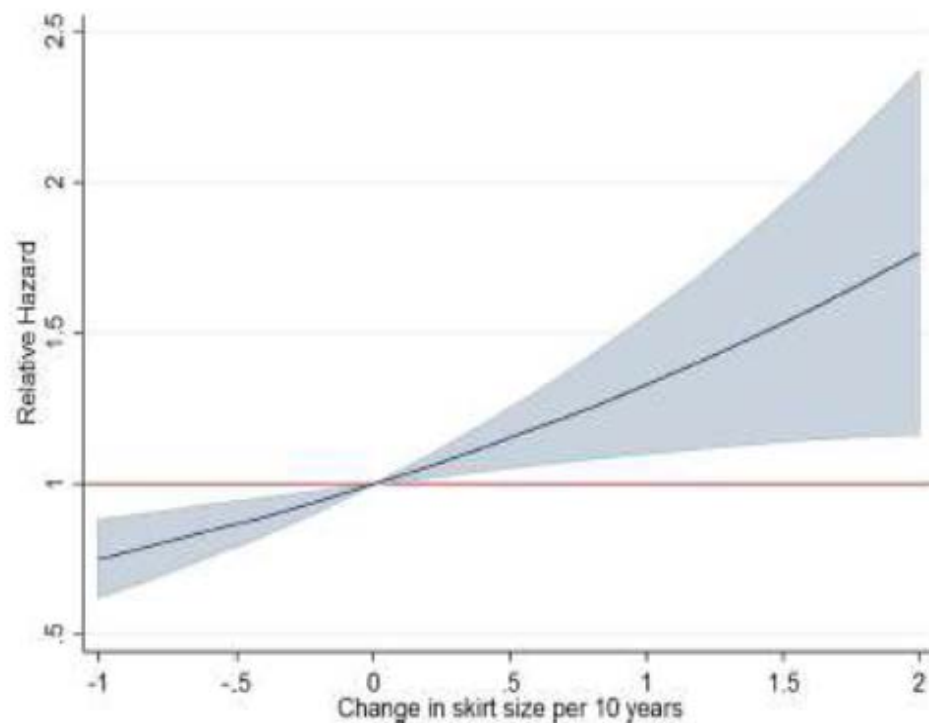
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## BMJ Open Association of skirt size and postmenopausal breast cancer risk in older women: a cohort study within the UK Collaborative Trial of Ovarian Cancer Screening (UKCTOCS)

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Evangelia-Ourania Fourkala,<sup>1</sup> Matthew Burnell,<sup>1</sup> Catherine Cox,<sup>1</sup> Andy Ryan,<sup>1</sup> Laura Currin Salter,<sup>2</sup> Aleksandra Gentry-Maharaj,<sup>1</sup> Mahesh Pamar,<sup>3</sup> Ian Jacobs,<sup>1,4</sup> Usha Menon<sup>1</sup>

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# Weight change in middle adulthood and breast cancer risk in the EPIC-PANACEA study

Marleen J. Emaus<sup>1</sup>, Carla H. van Gils<sup>1</sup>, Marije F. Bakker<sup>1</sup>, Charlotte N. Steins Bisschop<sup>1</sup>, Evelyn M. Monninkhof<sup>1</sup>, H. B(as) Bueno-de-Mesquita<sup>2,3,4</sup>, Noémie Travier<sup>5</sup>, Tina Landsvig Berentzen<sup>6</sup>, Kim Overvad<sup>7</sup>, Anne Tjønneland<sup>8</sup>, Isabelle Romieu<sup>9</sup>, Sabina Rinaldi<sup>9</sup>, Veronique Chajes<sup>9</sup>, Marc J. Gunter<sup>4</sup>, Françoise Clavel-Chapelon<sup>10,11,12</sup>, Guy Fagherazzi<sup>10,11,12</sup>, Sylvie Mesrine<sup>10,11,12</sup>, Jenny Chang-Claude<sup>13</sup>, Rudolf Kaaks<sup>13</sup>, Heiner Boeing<sup>14</sup>, Krasimira Aleksandrova<sup>14</sup>, Antonia Trichopoulou<sup>15,16</sup>, Androniki Naska<sup>15,16</sup>, Philippos Orfanos<sup>15,16</sup>, Domenico Palli<sup>17</sup>,

EPIC –PANACEA 205723 women, mean age 51.9 year,

Follow up – at 4.3 years  
mean weight gain 0.19kg/year

Incident breast cancer after a mean follow up of 7.5 year

- High weight gain (0.83 to 4.98 kg/year) was related to significantly higher breast cancer risk.
- More pronounced for breast cancers diagnosed before or at 50 years
- Weight loss not associated with breast cancer risk

High weight gain in middle adulthood increases the risk of breast cancer

Importance of avoiding weight gain

# Cancer - how many cases in the UK could be prevented if everyone was a healthy weight?

Type of cancer	(%)	Number
Oesophagus (adenocarcinoma)	32	1,700
Pancreas	15	1,400
Gallbladder	17	300
Bowel	14	6,000
Breast	16	6,900
Womb	38	3,300
Kidney	19	2,100
Ovary	4	280
Prostate (advanced)	9	940
Liver	20	1,100
Stomach (cardia)	19	660
Total for 11 cancers combined	17	24,700



CRUK poster campaign

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**OB\_S\_Y**  
**is a cause of cancer**



Tweet



39.2K  
Followers



Sofie Hagen   
@SofieHagen



Right, is anyone currently working on getting this piece of shit CancerResearchUK advert removed from everywhere? Is there something I can sign? How the fucking fuck is this okay?

**OB\_S\_Y**  
**is a cause of cancer**

# Breast cancer patient

*Until there is a **definitive study** which shows incontrovertibly that something I did in my lifetime caused my breast cancer, I wish these people would just shut up. And if there was something I should have done or should not have done, it would have been better had they told me about it sooner.*

Anne Shirley Stage IA, Grade 2, 0/3 nodes, ER-/PR-, HER2+

<https://community.breastcancer.org/forum/7/topics/722692>

# Intentional weight loss and cancer prevention

# **Intentional** weight (body fat) loss and cancer risk reduction

Has the damage been done by becoming obese – is it too late to have an effect?

What magnitude of change is needed?

Is body fat change or physical activity more important?

Do men and women benefit equally?

# Bariatric surgery

## Changing cancer risk - bariatric surgery cohorts

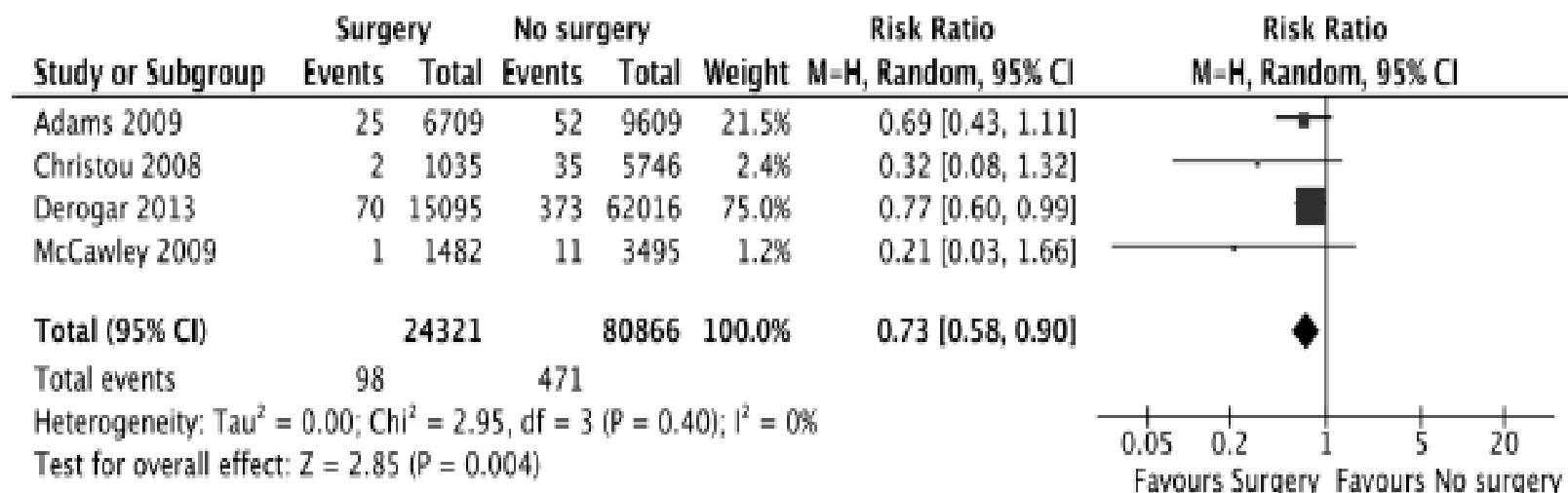
Studies	Site	Population	Body weight loss	Cancer risk reduction
Sjöström et al (2009)	All sites	Women Men	31.9% 19.3%	42% 3%
Adams et al (2009)	All sites	Women Men	31.0%	24% 2%
Christou et al (2008)	All sites	Men & Women	31.9%	78%



REVIEW

# The Effects of Bariatric Surgery on Colorectal Cancer Risk: Systematic Review and Meta-analysis

Sorena Afshar • Seamus B. Kelly • Keith Seymour •  
Jose Lara • Sean Woodcock • John C. Mathers



**Bariatric surgery is associated with a 27% lower risk of colorectal cancer**

# Bariatric Surgery and the Risk of Cancer in a Large Multisite Cohort

*Daniel P. Schauer, MD, MSc,\* Heather Spencer Feigelson, PhD, MPH,† Corinna Koebnick, MSc, PhD,‡  
Bette Caan, DrPH,§ Sheila Weinmann, PhD, MPH,¶ Anthony C. Leonard, PhD,|| J. David Powers, MS,†  
Panduranga R. Yenumula, MD,§ and David E. Arterburn, MD, MPH\*\**

- Average weight loss 27% ; body weight (mean BMI 44.8 kg/m<sup>2</sup>)
- 80% female 61% gastric bypass
- Mean 3.5. year follow up

Compared to matched controls:

Patients undergoing bariatric surgery had a 33% lower risk of developing any cancer (HR 0.67, CI 0.60 to 0.74, p<0.001).

Post menopausal breast ca	HR 0.58 (CI 0.44 to 0.77)	p<0.001
Colon cancer	HR 0.59 (CI 0.37 to 0.97)	p = 0.04
Endometrial cancer	HR 0.50 (CI 0.37 to 0.67)	p< 0.001

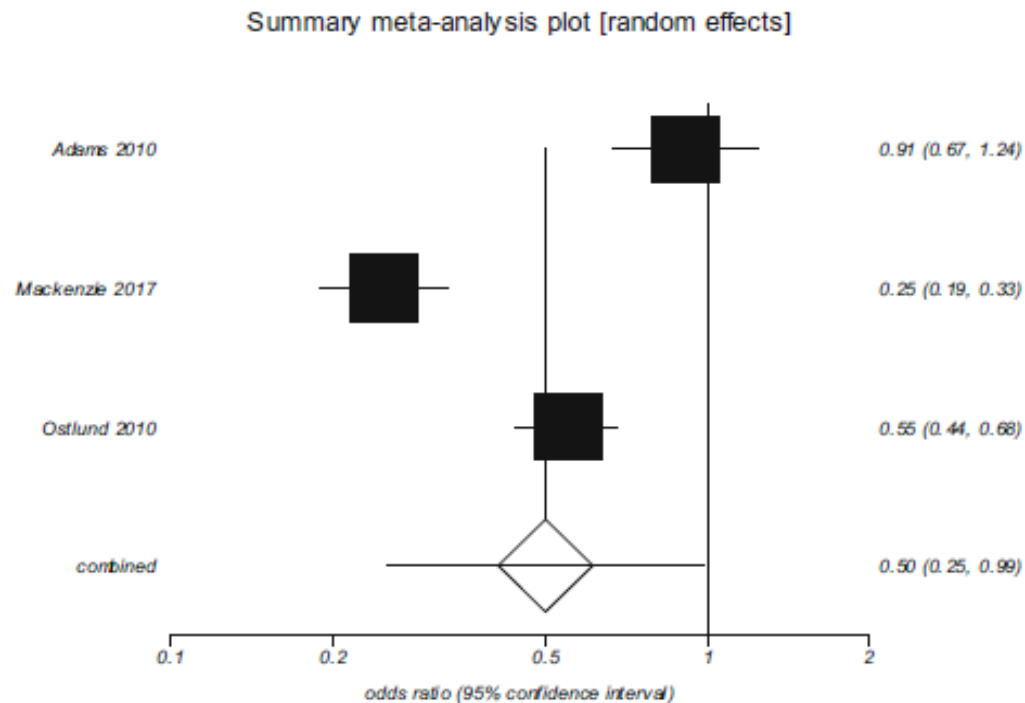
# Cancer Risk Following Bariatric Surgery—Systematic Review and Meta-analysis of National Population-Based Cohort Studies

Tom Wiggins<sup>1</sup> · Stefan S Antonowicz<sup>1</sup> · Sheraz R Markar<sup>1</sup> 

Obesity Surgery (2019) 29:1031–1039

8 population studies, 635,642 people

## Overall breast cancer incidence



Reduction in

- Overall cancer incidence
- Obesity related cancers

Protective for breast cancer

# Observational cohort studies

## Changing cancer risk – observational cohorts

Studies	Site	Population	Body weight loss	Cancer risk reduction
Parker & Folsom (2003)	All sites	Women	$\geq 16.4\%$	11%
Elassien et al (2006)	Breast	Nurses	$\geq 14.5\%$	57%
Harvie et al (2005)	Breast	Women	$\geq 5\%$	64%

# Weight loss

## Breast cancer risk with weight change after menopause



Eliassen et al. JAMA 296:193-201 (2006)

# Womens Health Initiative Observational Study



## Intentional Weight Loss and Endometrial Cancer Risk

Juhua Luo , Rowan T. Chlebowski, Michael Hendryx, Thomas Rohan, Jean Wactawski-Wende, Cynthia A. Thomson,

[Show More](#)

<https://doi.org/10.1200/JCO.2016.70.5822>

2017

- Post menopausal women (WHI) who lost at least 5% of their body weight in the 3 year observational study (followed up 11.5 years for cancer risk) (n=36,794)
- Weight loss (especially in the obese) compared with women of stable weight was associated with a decrease in endometrial cancer esp in Obese women with intentional weight loss  
(HR 0.44; 95% CI 0.25 to 0.78)
- Weight gain of >10% increased the risk.

# Weight Loss and Breast Cancer Incidence in Postmenopausal Women

Rowan T. Chlebowski, MD, PhD<sup>1</sup>; Juhua Luo, PhD<sup>2</sup>; Garnet L. Anderson, PhD<sup>3</sup>; Wendy Barrington, PhD<sup>4</sup>; Kerry Reding, PhD<sup>5</sup>; Michael S. Simon, MD<sup>6</sup>; JoAnn E. Manson, MD, DrPh<sup>7</sup>; Thomas E. Rohan, MBBS, PhD<sup>8</sup>; Jean Wactawski-Wende, PhD<sup>9</sup>; Dorothy Lane, MD<sup>10</sup>; Howard Strickler, MD<sup>8</sup>; Yasmin Mosaver-Rahmani, PhD<sup>8</sup>; Jo L. Freudenheim, PhD<sup>9</sup>; Nazmus Saquib, MBBS, PhD<sup>11</sup>; and Marcia L. Stefanick, PhD<sup>12</sup>

- Post menopausal women (WHI) who lost at least 5% of their body weight in the 3 year observational study (followed up 11.5 years for cancer risk) (n=61,335)
- Weight loss (n=8175) had a significantly lower risk of breast cancer compared to women who remained stable (n=41,139)  
**HR 0.88 95% CI 1.16-2.05**
- Weight gain (n=12,021) not associated with breast cancer risk but associated with higher triple negative breast cancer

# Effects of weight loss interventions for adults who are obese on mortality, cardiovascular disease, and cancer: systematic review and meta-analysis

Chenhan Ma,<sup>1</sup> Alison Avenell,<sup>1</sup> Mark Bolland,<sup>2</sup> Jemma Hudson,<sup>1</sup> Fiona Stewart,<sup>1</sup> Clare Robertson,<sup>1</sup> Pawana Sharma,<sup>1</sup> Cynthia Fraser,<sup>1</sup> Graeme MacLennan<sup>3</sup>

BMJ 2017;359:j4849

<http://dx.doi.org/10.1136/bmj.j4849>

**High quality evidence** showed that weight loss interventions decrease all cause mortality  
(34 trials, 685 events; risk ratio 0.82, 95% confidence interval 0.71 to 0.95)

## **Indicative evidence** on

- reduced cancer mortality  
(8 trials, 34 events; 0.58 95% confidence interval 0.30 to 1.11)
- developing new cancers  
(19 trials, 103 events; risk ratio 0.92, 95% confidence interval 0.63 to 1.36)

# Intentional weight (body fat) loss and cancer risk reduction

Has the damage been done by becoming obese – is it too late to have an effect?

Observational data suggests intentional weight loss in adulthood is associated with cancer risk reduction

What magnitude of change is needed?

Large change is associated with large effect

Is body fat change or physical activity more important?

Cancer risk reduction happens without physical activity interventions

Do men and women benefit equally?

Probably not

# Intentional weight (body fat) loss and cancer risk reduction

Is weight reduction associated with harm?

- Possible increase in colorectal cancer (gut microbiota)
- Possible decrease muscle mass
- ?

Is weight loss (per se) without weight loss maintenance associated with reduced cancer incidence?

- Implications of weight gain

Can we undertake obesity (non –surgical) intervention trials to explore cancer risk reduction?

- Who would fund expensive non-drug trials
- Long term commitment to changes in diet and physical activity when living in our obesogenic world

Isn't the size of study and length of follow up prohibitive?

- Learning from high risk model?

Obesity, Aspirin, and Risk of Colorectal Cancer in Carriers of Hereditary Colorectal Cancer: A Prospective Investigation in the CAPP2 Study

*Mohammad Movahedi, D. Timothy Bishop, Fintlay Macrae, Jukka-Pekka Mecklin, Gabriela Moeslein, Sylviane Olschwang, Diana Eccles, D. Gareth Evans, Eamonn R. Maher, Lucio Bertario, Marie-Luise Bigaard, Malcolm G. Dunlop, Judy W.C. Ho, Shirley V. Hodgson, Annika Lindblom, Jan Lubinski, Patrick J. Morrison, Victoria Murday, Raj S. Ramesar, Lucy Side, Rodney J. Scott, Huw J.W. Thomas, Hans E. Vasen, John Burn.*

- Obese patients CRC risk was 2.41 greater than the reference group
- CRC risk increased by 7% for each 1kg/m<sup>2</sup>
- The risk of all LS related cancers in obese people was 1.77 greater than the reference group

## People at increased risk of colorectal cancer (family history, adenoma bearers, symptomatic) attending for colonoscopy in NHS Tayside (n=208)

Recommendation	Fails to meet recommendation	Had received advice	Would find information useful
<b>Smoking:</b> Avoid	9%	17%	14%
<b>Red meat:</b> Limit intake	20%	15%	27%
<b>Physical Activity:</b> Be Physically active	26%	30%	38%
<b>Alcohol:</b> limit alcoholic drinks to CMO recommendations	38%	14%	21%
<b>Body fatness:</b> Be as lean as possible within the normal range of body weight	72%	33%	43%
<b>Fibre:</b> Eat mostly foods of plant based origin	89%	26%	33%
<b>Processed meat:</b> Avoid	91%	14%	28%



# BMJ Open Feasibility study to assess the impact of a lifestyle intervention ('LivingWELL') in people having an assessment of their family history of colorectal or breast cancer

Annie S Anderson,<sup>1</sup> Jacqueline Dunlop,<sup>2</sup> Stephanie Gallant,<sup>1</sup> Maureen Macleod,<sup>1</sup> Zosia Miodzybrodzka,<sup>3</sup> Nanette Mutrie,<sup>4</sup> Ronan E O'Carroll,<sup>5</sup> Martina Stead,<sup>6</sup> Robert J C Steola,<sup>1</sup> Rod S Taylor,<sup>7</sup> Sarah Vinnicombe,<sup>1</sup> Jonathan Bore<sup>1</sup>

To cite: Anderson AS, Dunlop J, Gallant S, et al. Feasibility study to assess the impact of a lifestyle intervention ('LivingWELL') in people having an assessment of their family history of colorectal or breast cancer. *BMJ Open* 2017;0:e019410. doi:10.1136/bmjopen-2017-019410

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2017-019410>).

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Accepted 7 December 2017

## ABSTRACT

**Objectives:** To assess the feasibility of delivering and evaluating a weight management (WM) programme for overweight patients with a family history (FH) of breast cancer (BC) or colorectal cancer (CRC).

**Study design:** A two-arm (intervention vs usual care) randomised controlled trial.

**Setting:** National Health Service (NHS) Tayside and NHS Forth Valley.

**Participants:** People with a FH of BC or CRC aged ≥18 years and body mass index of ≥25 kg/m<sup>2</sup> referred to NHS genetic services.

**Intervention:** Participants were randomised to a control (lifestyle booklet) or 12-week intervention arm where they were given one face-to-face counselling session, four telephone consultations and web-based support. A goal of 5% reduction in body weight was set, and a personalised diet and physical activity (PA) programme was provided. Behavioural change techniques (motivational interviewing, action and coping plans and implementation intentions) were used.

**Primary outcome:** Feasibility measures: recruitment, programme implementation, fidelity measures, achieved measurements and retention, participant satisfaction assessed by questionnaire and qualitative interviews.

**Secondary outcomes:** Measured changes in weight and PA and reported diet and psychosocial measures between baseline and 12-week follow-up.

**Results:** Of 480 patients approached, 196 (41%) expressed interest in the study, and of those, 78 (40%) patients were randomised. Implementation of the programme was challenging within the time allotted and fidelity to the intervention modest (62%). Qualitative findings indicated the programme was well received. Questionnaire and anthropometric data were completed by >98%. Accelerometer data were obtained by 84% and 54% at baseline and follow-up, respectively. Retention at 12 weeks was 70%. Overall, 36% of the intervention group (vs 0% in control) achieved 5% weight loss. Favourable increases in PA and reduction in dietary fat were also reported.

## Strengths and limitations of this study

- This feasibility study is the first attempt to offer and assess a structured, comprehensive lifestyle programme (diet, alcohol, physical activity and body weight) for people referred to family history clinics for colorectal and breast cancer risk assessment.
- The study design is a randomised, two-control, lifestyle intervention study with subjective and objective assessment measures.
- Participants were all attendees at the National Health Service Family History clinics due to a family history of breast cancer (BC) or colorectal cancer (CRC) and are not representative of the general population.
- The lifestyle intervention was not fully implemented, recruitment was lower than anticipated and indicative findings suggest favourable effects of the intervention on physiological measures.
- The primary and secondary outcome data provide sufficient information to inform a definitive trial.

**Conclusions:** A lifestyle programme for people with a family history of cancer is feasible to conduct and acceptable to participants, and indicative results suggest favourable outcomes.

**Trial registration number:** ISRCTN13125470; Pre-results.

## INTRODUCTION

It is recognised that cancer arises from an interaction between genetic and environmental factors (nature and nurture), although there may be more emphasis given to genetics and family history in the National Health Service (NHS) rather than health behaviour profiles. Clearly, it is desirable that people who are at greater risk of cancer due to a family history of the disease (which may reflect shared genetic and behavioural profiles) are supported to follow recommendations for



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# Conclusions

- There are significant observational data that indicate that intentional weight loss in adulthood is associated with cancer risk reduction
- The strongest data is for female cancers notably post menopausal breast cancer
- There is an absence of trial data available to support clinical guidelines and public advice