

Background

- Female breast cancer is the most commonly diagnosed cancer in the UK & the rate is increasing, with 23% more cases recorded between 2015 - 2017 than 1993 – 1995 (1).
- There are established links with adult weight gain and age of first pregnancy with breast cancer risk. The recent rise in adulthood obesity as well as the trend for women to give birth later in life may have contributed towards this increase in incidence.
- Previous research has established:
 - Weight gain throughout adulthood increases the risk of postmenopausal breast cancer.
 - An early first pregnancy can provide a protective effect against postmenopausal breast cancer development.
- There is limited evidence of whether an interaction between these factors exists, and what extent the adverse effects of weight gain are attenuated by an early first pregnancy.
- As pregnancy has been found to be the greatest risk factor for weight gain (2), this is particularly relevant.

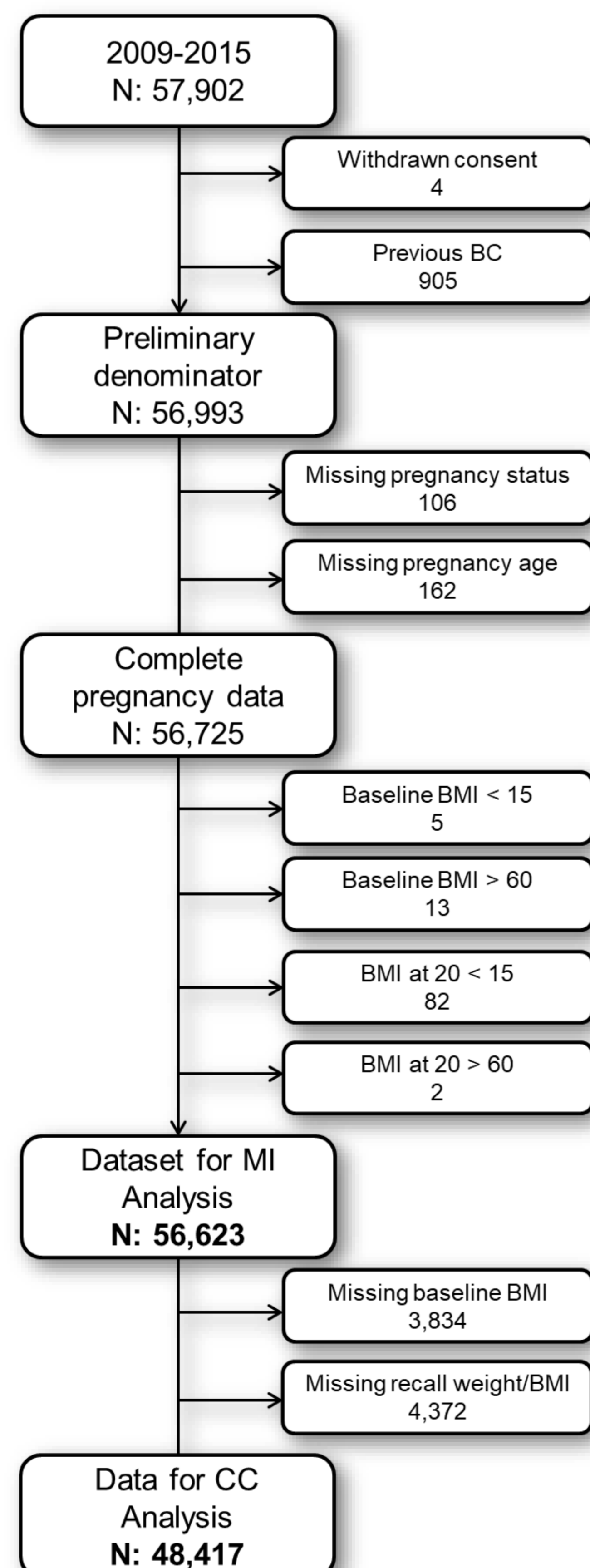
Aim

- To investigate whether adult weight gain increases the risk of breast cancer more for those who have a late pregnancy (≥ 30 yrs) or are nulliparous compared to those who have an early pregnancy. In that, is there an interaction effect of these two factors or is there only an additive effect of risk.

Methods

- The Predicting Risk of Breast Cancer at Screening (PROCAS) cohort study (3) dataset was used, which consists of 57,902 women recruited from the Greater Manchester Breast Screening Programme (Oct 2009 – June 2015).
- Each participant completed a questionnaire including information about their health, parity, Hormone Replacement Therapy (HRT), and current height and weight as well as recalling weight at age 20 so that early adulthood BMI could be approximated.
- The outcome was defined as the diagnosis of a new primary breast cancer, classed as either an invasive or ductal carcinoma in situ.
- Kaplan Meir Failure estimates & Cox regression models on the relationship of adult weight change and first pregnancy age on breast cancer risk were performed.
- Age, recruitment BMI and HRT use were included as co-variates.
- A Complete Case (CC) and Multiple Imputation (MI) analysis were used to allow for 8,206 additional participants with missing BMI data to be included
- The median follow-up time was 77 months with 1,974 (3.49% of participants) breast cancer diagnoses within the MI dataset.

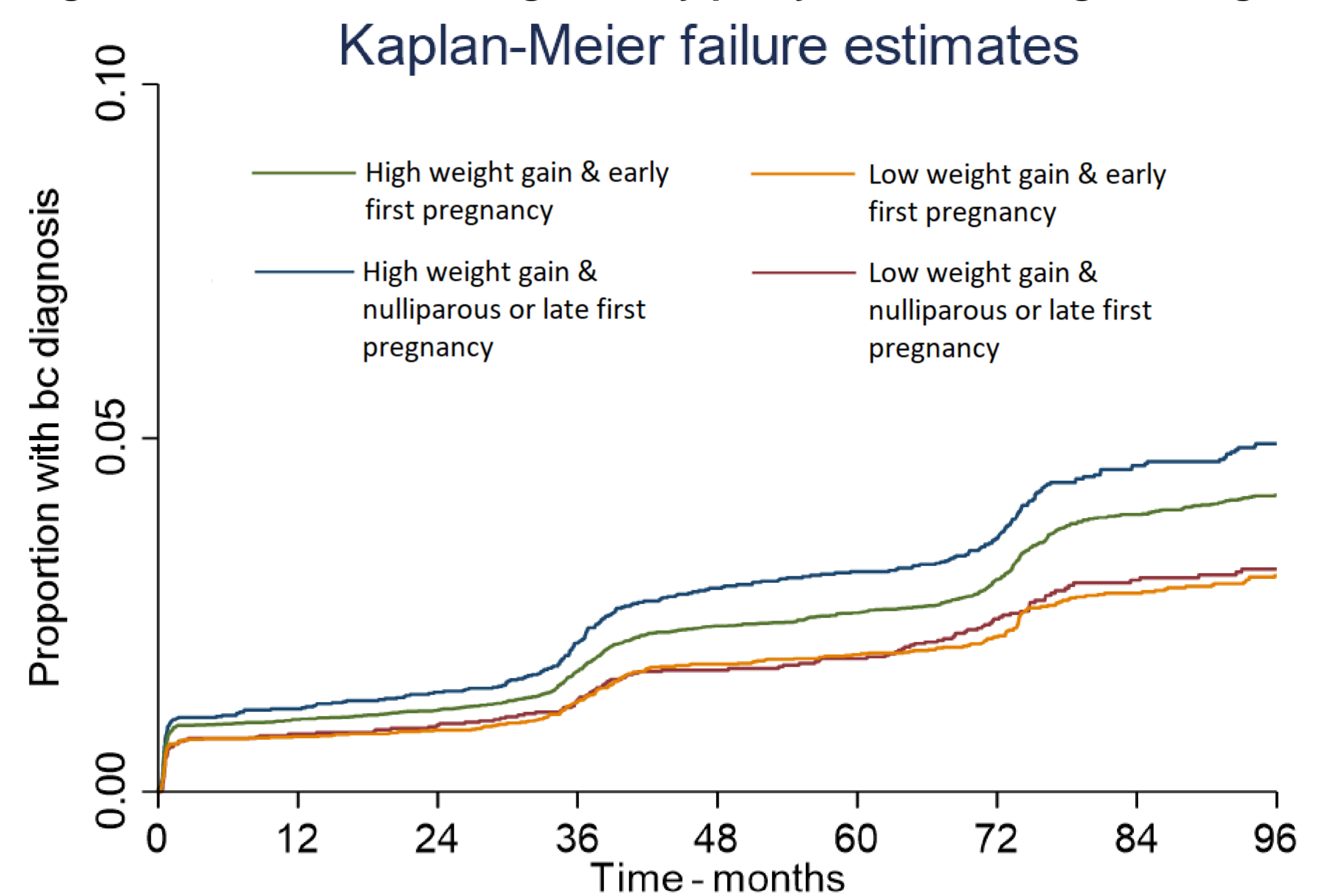
Figure 1: Study data flow diagram



Results

- Figure 2 shows that those who have a low level of adult weight gain appear to have some protection against breast cancer compared to those with higher levels of weight gain regardless of their parity status.

Figure 2: Breast cancer diagnosis by parity and adult weight change



*Low weight gain: <15%, high weight gain: $\geq 15\%$

- Conversely, amongst those who have a high level of weight gain, it appears those who are nulliparous or have a late pregnancy are at greater risk than those who have an early pregnancy.

Table 1: Cox Proportional Hazard Model for Breast Cancer Diagnosis

Adult weight change	Early (<30 yrs) first pregnancy		Late (≥ 30 yrs) first pregnancy / Nulliparous	
	BC / N (%)	HR (95% CI)	BC / N (%)	HR (95% CI)
Stable & Loss: $\leq 5\%$	97 / 4,507 (2.15%)	1.00 (reference)	67 / 2,298 (2.92%)	1.44 (1.05 – 1.97)
Gain 5 to <15%	234 / 7,374 (3.17%)	1.50 (1.19 – 1.91)	98 / 3,074 (3.19%)	1.61 (1.21 – 2.13)
Gain 15 to <30%	369 / 10,890 (3.39%)	1.64 (1.30 – 2.06)	155 / 3,767 (4.11%)	2.09 (1.62 – 2.72)
Gain $\geq 30\%$	498 / 12,820 (3.88%)	2.04 (1.60 – 2.60)	184 / 3,687 (4.99%)	2.73 (2.09 – 3.56)

BC – Breast Cancer, HR – Hazard Ratio, CI – Confidence Intervals

Model 1: Recruitment age + HRT use * BMI at 20 + parity category * relative weight change

- Table 1 shows those with adult weight gain $>30\%$ and a late first pregnancy or were nulliparous were at between 2 and 3.5 times higher risk of developing breast cancer (HR: 2.73, 95% CI: 2.09 - 3.56) compared with those who had an early first pregnancy without adult weight gain.
- However, no evidence of an interaction effect between parity and adult weight gain was identified (HR: 1.001, 95% CI: 0.997–1.006, $p=0.553$).

Conclusion

- Although no interaction effect of parity and weight gain was found, findings from this study highlight the importance of these risk factors.
- The substantial increase in risk for those with high weight gain and a late first pregnancy or nulliparous status could be considered when targeting health behaviour advice in a cancer prevention setting.

References

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