

Supplementary Table S1. Overview of variables, categorization, and scientific rationale for inclusion in the breast cancer risk model.

Variable	Categorization in the Model	Rationale for Inclusion (Scientific Justification)
Age at menarche	Continuous (years)	Early menarche is associated with longer lifetime exposure to endogenous estrogens, a well-established risk factor for BC [15, 17].
Body Mass Index (BMI)	<25, 25–29, ≥30 kg/m ²	Adiposity, particularly in postmenopausal women, increases BC risk due to higher levels of estrogen produced by adipose tissue and chronic inflammation [15, 18].
Family history of BC	Yes / No	A family history reflects genetic predisposition, which is one of the strongest non-modifiable risk factors for BC [8, 12].
Age at first full-term pregnancy	Nulliparous, <22, ≥22 years	Early full-term pregnancy promotes early differentiation of breast cells, which is known to have a long-term protective effect against BC [9].
Parity and Breastfeeding	Never, >0–<24, ≥24 months	Breastfeeding reduces BC risk by delaying the re-establishment of ovulatory cycles and reducing lifetime estrogen exposure [18].
Menopausal status / Age	Premenopausal, <50, ≥50 years	The risk profile of BC changes significantly after menopause due to the shift from ovarian to peripheral estrogen production [17].
Oral contraceptive use	Ever / Never	Exogenous hormone use is associated with a slight but significant increase in BC risk during the period of use [9].
Education and Wealth Score	Categorical (levels)	These variables serve as proxies for Socio-Economic Status (SES), which influences lifestyle choices, diet, and access to healthcare [5].
Daily energy intake	Continuous (kcal/day)	High caloric intake is related to metabolic health and obesity, both of which are linked to cancer development [24].
Occupation	Housewife, Employed, Previously employed	Professional status can influence physical activity levels, stress, and exposure to environmental factors [21].