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## **Assessment of Risk Factors Influencing Trends in Incidence of Female Breast Carcinoma**

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### ***Project at a glance summary, July 2011***

Each year, 1 million new cases of breast cancer are diagnosed worldwide. Mortality rates in many countries are declining due to improvements in treatment. However, numbers of breast cancer registrations are increasing, partly due to ageing populations and the introduction of breast screening programmes. Breast cancer makes up over 28% of all new cancer cases in European women and rates are particularly high in postmenopausal women in the 50-69 age group. In this report, we consider the factors underlying age and menopausal status that may be responsible for the increase in female breast cancer registrations.

In our review of published breast cancer literature, we identified four broad categories of risk for breast cancer:

- Genetics and family history;
- Reproductive history and hormonal;
- Lifestyle;
- Environmental and occupational.

Genetics and family history are the most well studied of the breast cancer risks, with a number of rare genetic mutations increasing risk more than 4-fold in premenopausal women (aged <40 years). Family history of breast cancer, such as having two or more first-degree relatives diagnosed with premenopausal breast cancer, is also known to increase risk. It has been estimated that genetics and family history may be responsible for 27% of all breast cancers.

A woman's reproductive history can affect her risk of developing postmenopausal breast cancer (aged >40 years). Earlier age at puberty, later age at first birth, having no children, not breastfeeding and older age at menopause have all been associated with increased risk of postmenopausal breast cancer. Conversely, later age at puberty, earlier age at first birth, having several children, long periods of breastfeeding and younger age at menopause can combine to reduce breast cancer risk. Current use of oral contraceptives and particularly use of hormone replacement therapies have also been shown to increase risk of breast cancer. The percentage of breast cancers due to reproductive factors is uncertain with estimates ranging from 15 to 50%.

Well established lifestyle factors that are associated with increased breast cancer include postmenopausal obesity and increased alcohol drinking. Smoking and some foods, such as saturated fats, have also been associated with increased risk. Exercise has been reported to reduce risk of breast cancer. It is estimated that 10-20% of breast cancers may be attributable to lifestyle factors but much more work is needed in this area to understand the interaction of the various lifestyle factors with each other and with other categories such as reproductive history and environmental exposures.

Risks from substances in the general environment are perhaps the least well-studied due to the complexities of the low levels exposures involved and potential overlaps with other categories, particularly lifestyle exposures. It is therefore difficult to draw firm conclusions about their effects on breast cancer. However, a number of chemicals and products have been implicated in relation to breast cancer including organochlorines, polycyclic aromatic hydrocarbons (PAHs), dioxins, bisphenol-A (BPA), radiation, pesticides, heavy metals and endocrine disruptors. In addition, some medicines and drugs have been associated with increased risk of breast cancer. Occupational risk factors are included in our environmental category and provide stronger evidence of associations with some chemicals and agents including environmental tobacco smoke (passive smoke), organic solvents, specific chemicals (dioxins and ethylene oxide), electromagnetic fields and certain job types (flight personnel and night shift workers). Although higher levels of exposure tend to occur in some occupations breast cancer risks tend to be of a similar magnitude to many of the individual lifestyle and reproductive risk factors (i.e. 2-fold or less increased risk). Shift work, in particular including night work, has been shown in several large studies to increase the risk of breast cancer, with risk increasing as the length of time working night shifts increases; this potentially affects many millions of women worldwide. The percentage of breast cancers caused by exposures in the general environment is uncertain with a range of 1-50%. However, we can be more specific with occupational factors and provide evidence to suggest that occupation may be responsible for about 7% of all breast cancers. Shift work at night appears to be a particularly important causal factor, and may explain over 4% of breast cancer burden.

We are still a long way from fully understanding the role of different agents or circumstances in breast cancer initiation although risk factors that influence hormone levels such as oestrogens appear to be most important. Further work is needed to investigate the relative importance of each factor in cancer causation and provide more tailor-made advice to help individuals to minimise their exposures to risks or better focus community health programmes.