



# Early Effects of Mammography Screening on Age- and Stage-Specific Breast Cancer Incidence in Germany

Klaus Kraywinkel, Benjamin Barnes, Joachim Bertz, Jörg Haberland, Ute Wolf  
German Centre for Cancer Registry Data at the Robert Koch Institute, Berlin

## Background

A national population-based mammography screening program for women between 50 and 69 years of age was established in Germany between 2005 and 2009 (figure 1), with overall participation rates between 50 and 55% [1]. During the same period, the coverage of population-based cancer registries became nationwide after the implementation of

cancer registries in the federal states of North Rhine-Westphalia (mid 2005), Hessen (2007) and Baden-Württemberg (2009) (figure 2). While first population-wide effects of the screening program were shown on a regional level [2], the effects on national incidence data have not been demonstrated systematically.

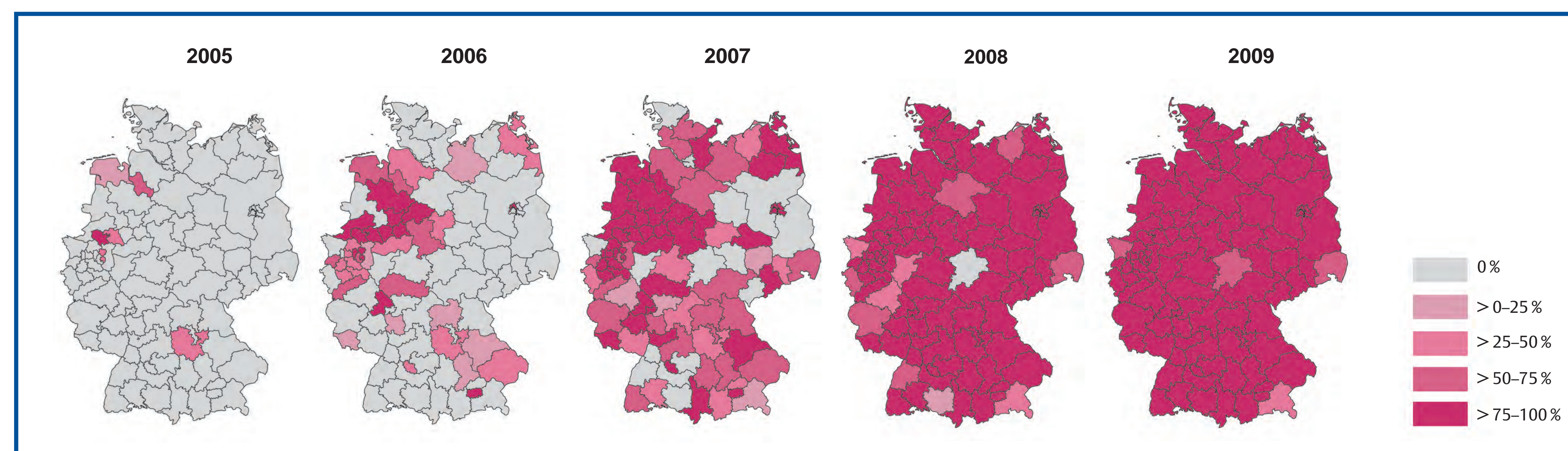


Figure 1: Regional coverage of screening units during the implementation of the German Mammography Screening Program (adapted from [1])

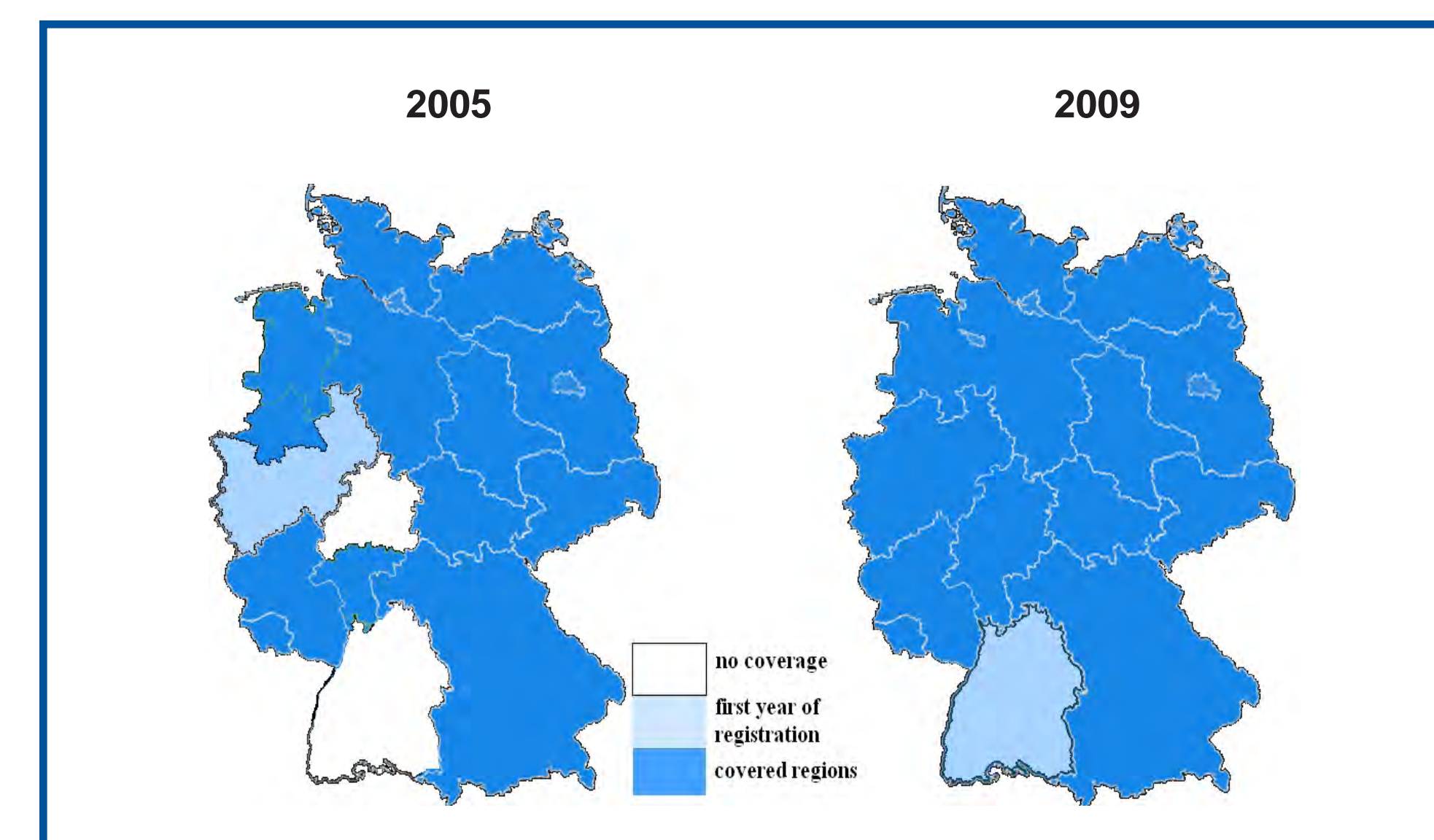


Figure 2: Coverage of population based cancer registries in Germany

## Methods

The Centre for Cancer Registry Data at the Robert Koch Institute [3] estimated age-specific breast cancer incidence in Germany for the years 1999 to 2009, using the methods developed for the estimation of national cancer incidence in Germany [4]. UICC stage distribution by age group was calculated using data from all registries with an estimated completeness of >90% for breast cancer and complete staging information in >80% of cases (12 out of 16 federal states and one region). Stage-specific incidence rates for three broad age groups (30-49, 50-69 and 70+ years) were calculated by multiplication of incidence and stage distribution figures.

## Results

Figure 3 shows a sharp increase in breast cancer incidence rates for the screening age group from 2005 to 2008, which seems to level off in 2009. The increase was almost completely attributable to early stage tumors (UICC I), although incidence of these tumors was already moderately increasing in the years before 2005 (figure 5b). Among women in age groups not targeted by the screening program, a small increase in incidence rates for all stages could be detected (figure 5a/c).

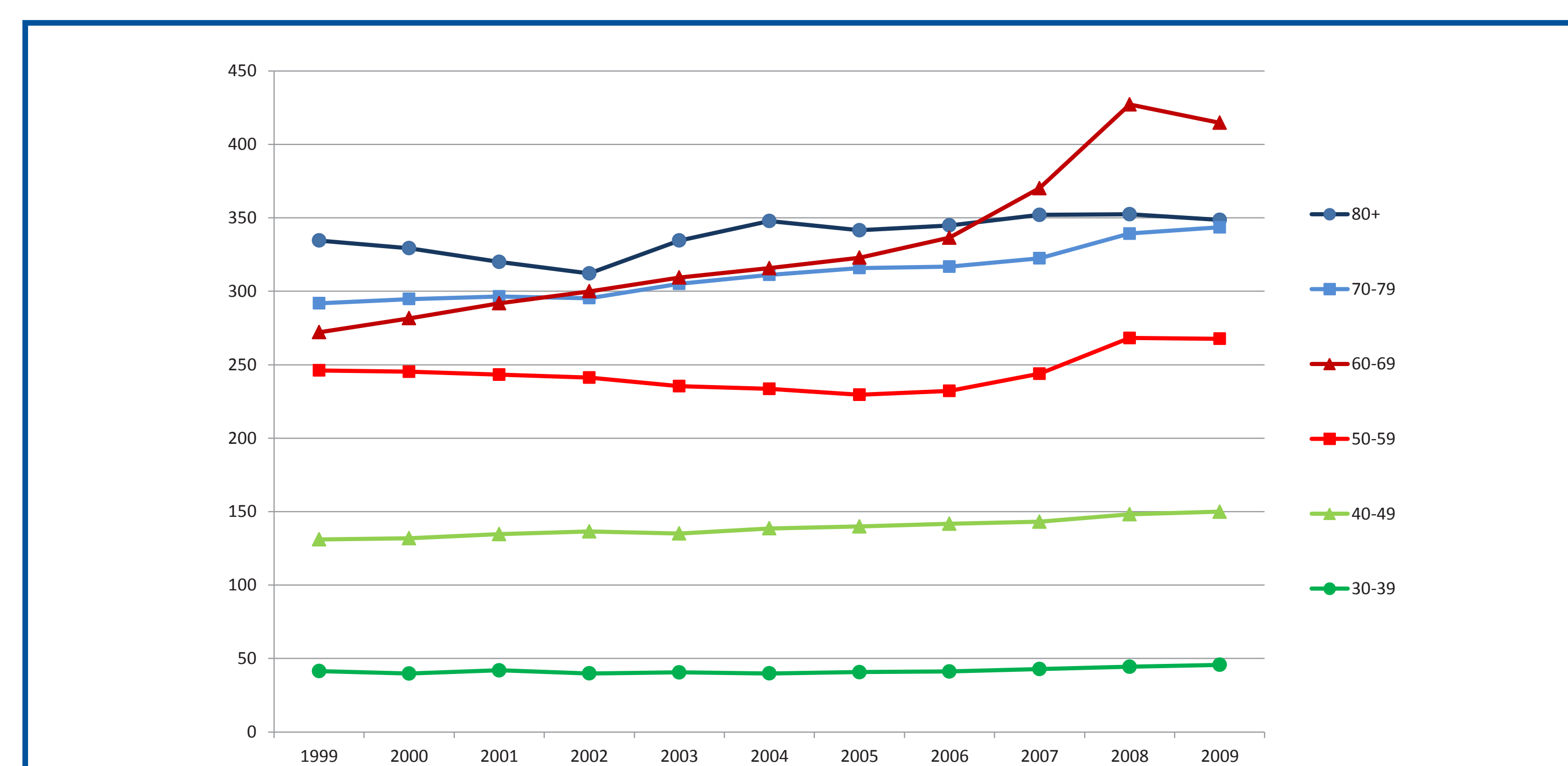


Figure 3: Estimates of age-specific incidence rates of female breast cancer in Germany, 1999-2009

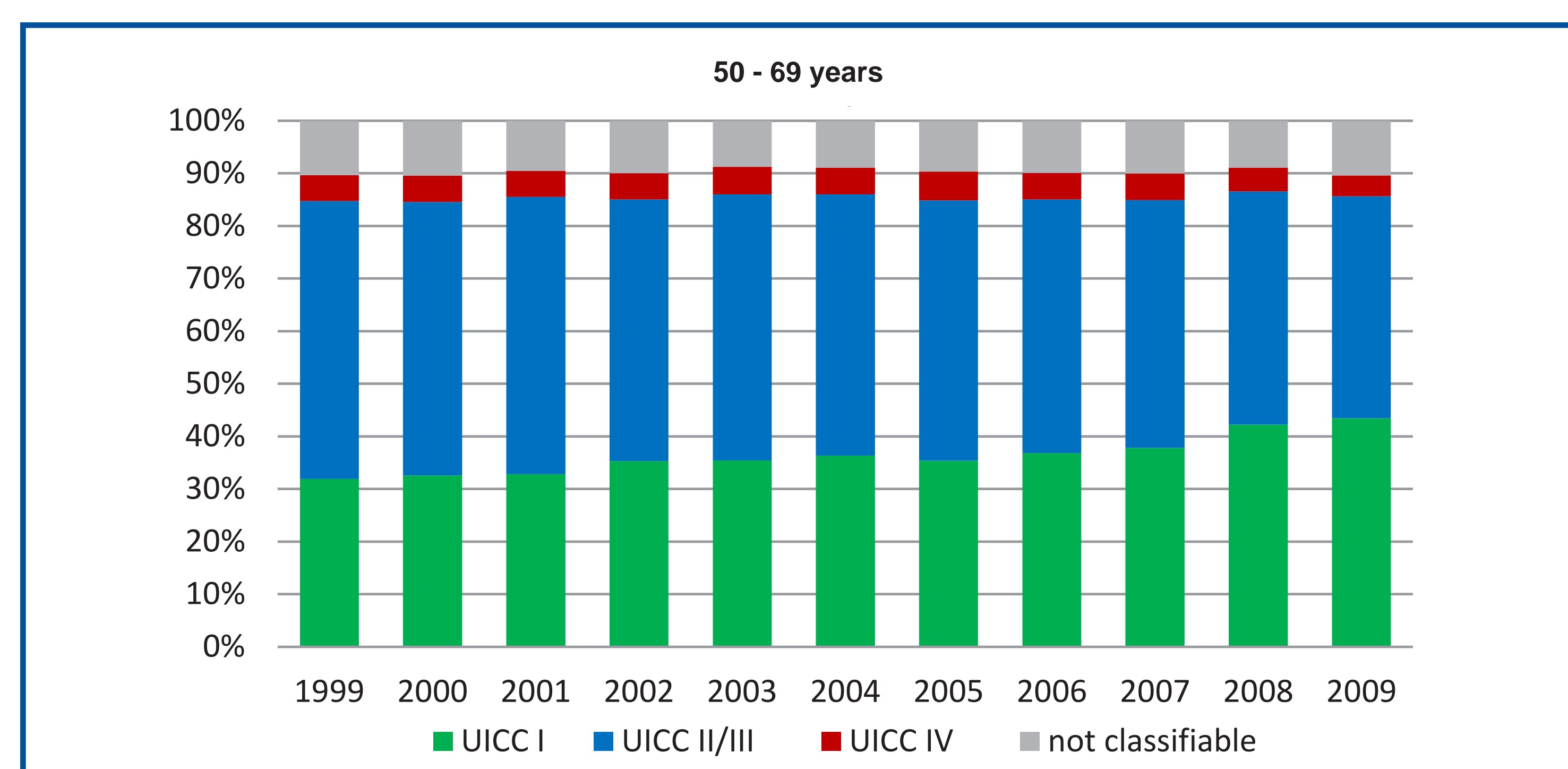


Figure 4: Trends in UICC tumor stage distribution of female breast cancer in Germany, ages 50 to 69 years

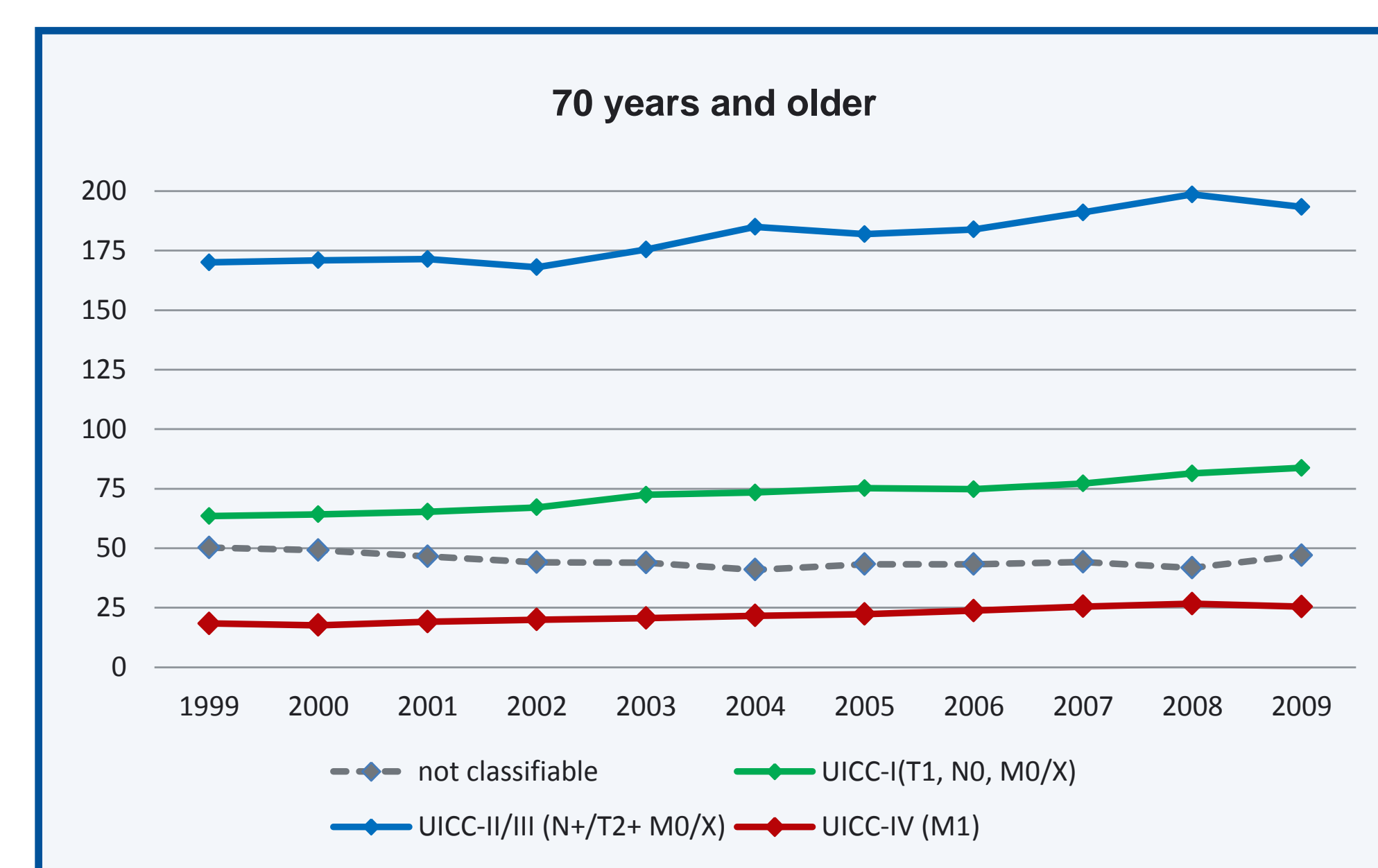
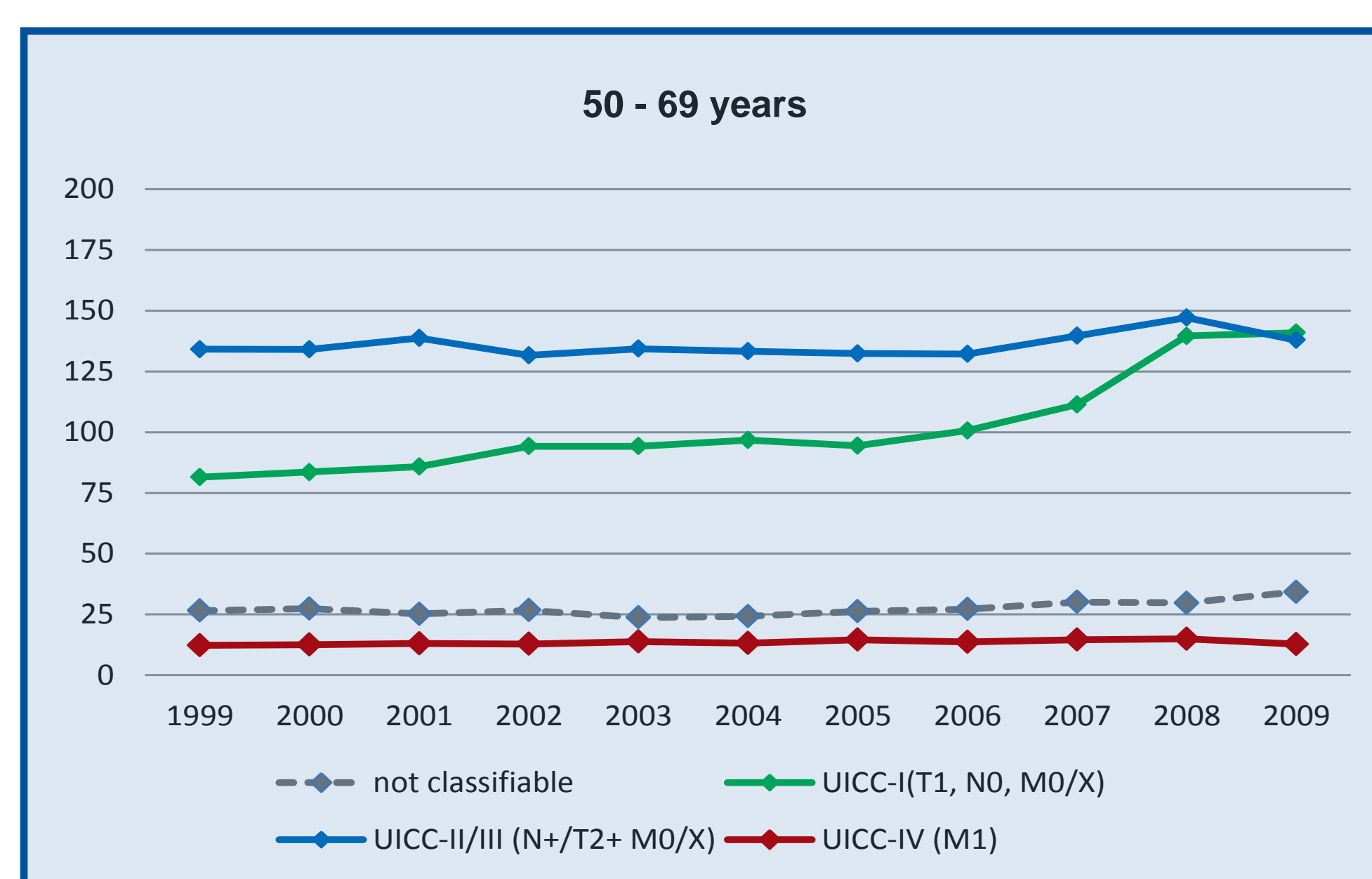
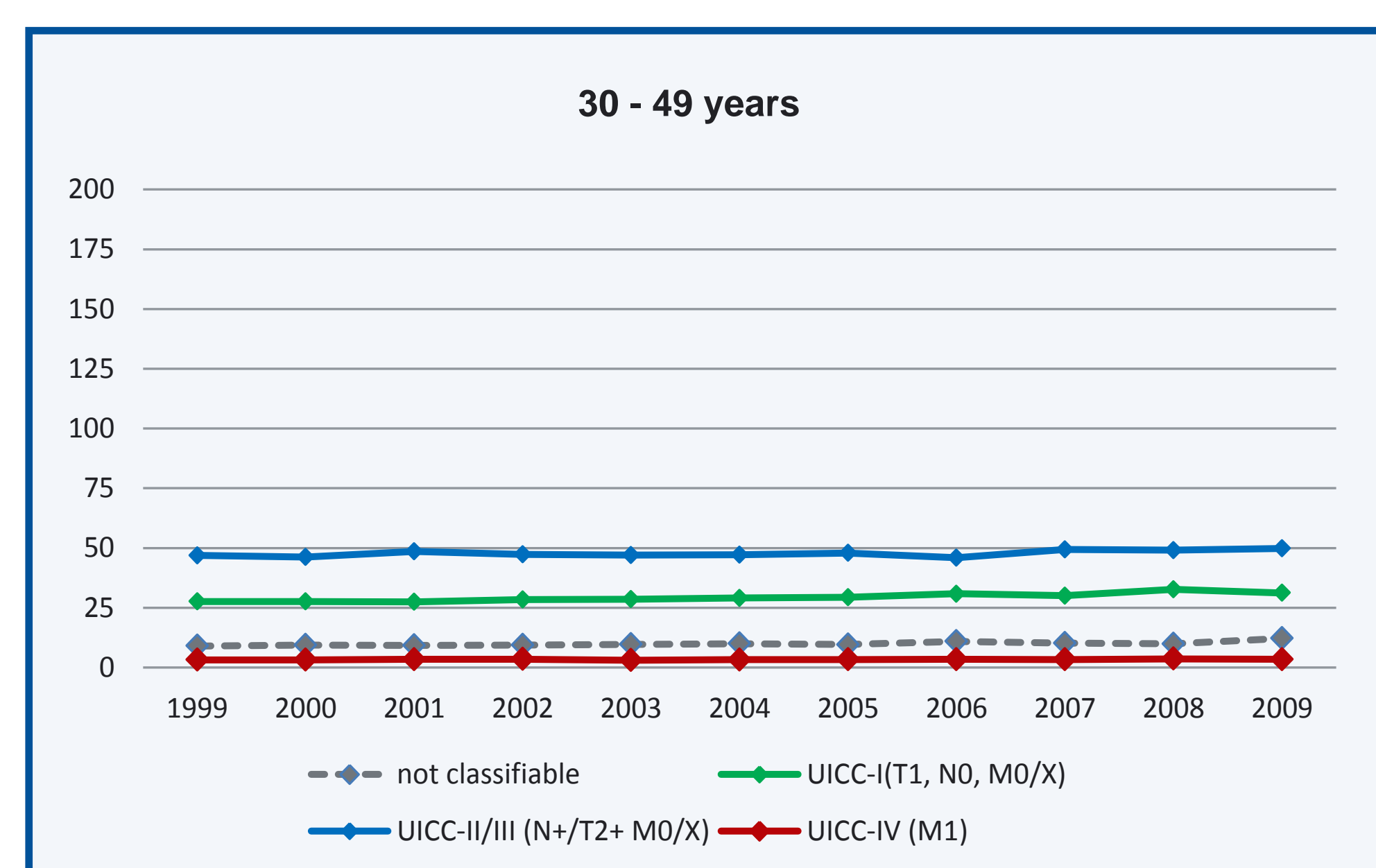


Figure 5a to 5c: Estimated incidence rates of female breast cancer in Germany by age group and UICC tumor stage, 1999-2009, age standardized to the European standard population

## Conclusions

Similar to published results from the Netherlands [5], the implementation of mammography screening in Germany resulted in a sharp increase in the incidence of early stage breast cancer in the screening population. A moderate increase could be detected even before the program began in 2005, presumably as a result of opportunistic screening. So far, no reduction in the incidence of advanced stages can be observed on the national level, probably due to the still early phase of the program and its stepwise implementation. Although

coverage by population-based cancer registries in Germany was not complete at the start of the program and data on tumor stage are missing for around 10% of cases, the available data seem to lead to plausible estimates of the time trends in stage-specific incidence on the national level. While the main objective of the mammography screening program, the reduction of breast cancer mortality, will probably not be visible before 2015, a reduction of the incidence of advanced stage tumors would give a first indication of a success of the program.

## References

- [1] Kooperationsgemeinschaft Mammographie: Evaluationsbericht 2008-2009, Ergebnisse des Mammografie-Screening-Programms in Deutschland (2012).
- [2] Weigel S, Batzler WU, Decker T, Hense HW, Heindel W: First epidemiological analysis of breast cancer incidence and tumor characteristics after implementation of population-based digital mammography screening. *Rofo*. 2009 Dec;181(12):1144-50. Epub 2009 Oct 26.
- [3] Wolf U, Barnes B, Bertz J et al. (2011) The (German) Center for Cancer Registry Data (ZfKD) at the Robert Koch Institute (RKI) in Berlin. *Bundesgesundheitsblatt* 54: 1229-1234 (Article in German).
- [4] Robert Koch-Institute, GEKID (editors): *Cancer in Germany 2007/2008* [English version in press].
- [5] Fracheboud J, Otto SJ, van Dijck JA, Broeders MJ, Verbeek AL, de Koning HJ. Decreased rates of advanced breast cancer due to mammography screening in The Netherlands. *Br J Cancer*. 2004 Aug 31;91(5):861-7.