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"LIFESTYLE" AND CANCER RATES IN FORMER EAST AND WEST GERMANY: THE POSSIBLE CONTRIBUTION OF DIAGNOSTIC RADIATION EXPOSURES

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Abstract
Purpose: Breast and prostatic cancer as well as leukaemia in childhood have remarkably increased over some decades in the Federal Republic of Germany as well as in several other highly developed industrial nations. Such increase was much less or not observable in East Germany between 1960 and 1989 where diagnostic exposures were applied to a lesser extent. Low level radiation can cause these diseases and the difference of cancer rates gives rise for renewed evaluation of current risk estimates.
Method: Risk factors for radiation-induced childhood leukaemia and breast cancer are derived from the literature considering a higher Relative Biological Effectiveness of diagnostic x-rays in comparison to the A-bomb gamma rays in Hiroshima and Nagasaki. The prostate is not considered as radiation-sensitive by the ICRP. But following a variety of low level findings in the last two decades it was shown by Myles and coworkers in the UK that prostatic cancer is inducable by diagnostic x-ray procedures. From their study in men below the age of 60, a doubling dose of about 20 mSv can be estimated. Medical exposures of the considered tissues are taken from published data for East and West Germany.
Results: The difference in breast cancer mortality can be explained by diagnostic exposures. The contribution of these to prostatic cancer and childhood leukaemia must be regarded as relevant in current incidences
Conclusions: Reduction of diagnostic exposures would be an important measure for prevention of several prominent cancer diseases.

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INTRODUCTION

A continuous increase of cancer incidence has been observed in the highly developed countries of Europe and in the U.S. since the second world war. Epidemiologists explain it by "life style" (obesity and unknown factors).

The increase correlates somehow with the rising exposures by X-ray diagnostics and nuclear medicine. Current risk estimates about this influence are usually leading to radiation-induced numbers which are statistically not observable.

In contradiction to the official evaluation there are, however, numerous results of case-control studies in the literature which show measurable contributions of diagnostic exposures.

The risk figures recommended by the ICRP may be too low for several reasons:

1) Unjustified use of a DDREF = 2 (Dose and Dose Rate Effectiveness Factor)
2) Uncritical use of the Japanese A-bomb survivor data as a reference.

Some of the cancers which increased remarkably in the Federal Republic of Germany (FRG) remained much lower in East Germany (GDR) between 1960 and 1989 where diagnostic ex-

posures were applied to a lesser extent because of the national health care system. Low level radiation can cause these diseases and the difference of cancer rates gives rise for renewed evaluation of current risk estimates.

BREAST CANCER IN GERMANY

Breast cancer in women is predominantly a problem in highly developed countries and in populations of high socioeconomic status. The incidence in Germany rised continuously until the year 2000 and reached a constant level up to now. The mortality is slowly declining since 1993 which can be explained by improved therapy. From the 50-ies until the German unification the mortality was about 20 % lower in the GDR (Fig.1).

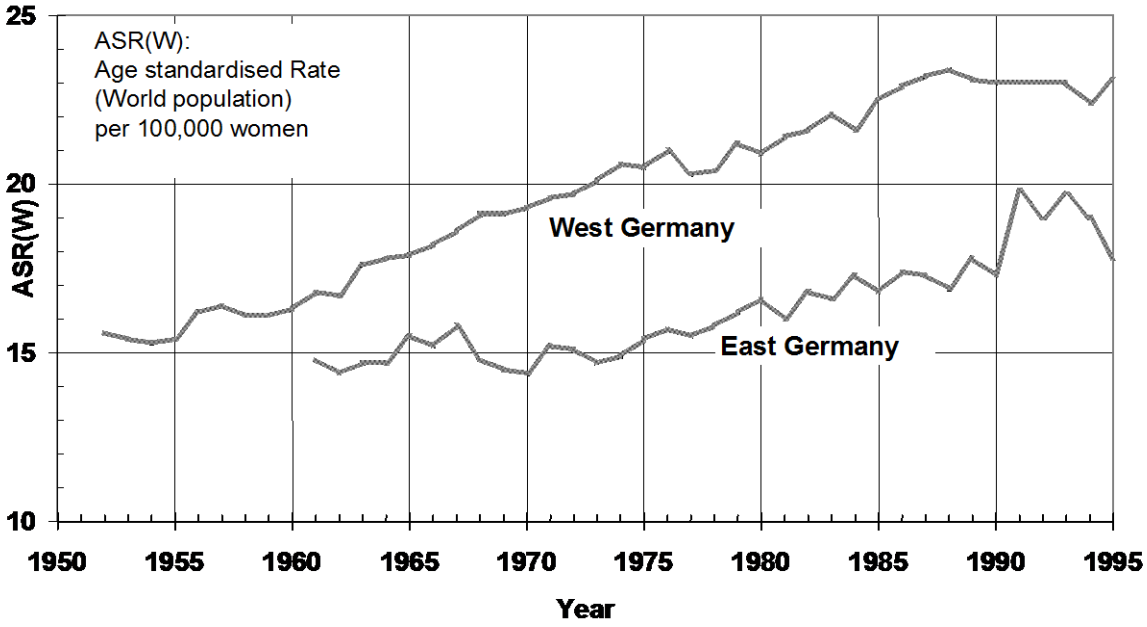

Figure 1. Breast cancer mortality in Germany[1].

The female breast is most sensitive for cancer induction by ionising radiation which was confirmed by findings after diagnostic X-raying for scoliosis etc., in stewardesses, and in populations affected by the Chernobyl accident[2-5].

There has been no complete registration of X-ray procedures in the FRG and also not in the GDR, and definitely not of the exposures. The number of investigations in the GDR has been estimated to 1 per year per inhabitant for 1983-1980 – without dental ones[6]. The FRG estimate is 1.1 for 1978 and 1.3 for 1990-1992[7].

This difference seems to be not very important. But since 1975 there were rising applications of CT in the FRG with no equivalent in the GDR. Furthermore, the latter used much less nuclear medicine (I-131 thyroid studies with breast exposures). A relevant difference between exposures must also have been caused by many ”grey” mammographies in the FRG with doses of some 10 mGy.

The very low X-ray energies used in mammography must be considered to be 2-6 fold more effective in inducing cancer than the extremely high energetic gamma radiation which exposed the Japanese A-bomb survivors[8,9].

PROSTATE CANCER

Myles and coworkers (UK) presented a case-control study in 2008 which showed a remarkable effect to the prostate by diagnostic X-rays[10]. After barium enema the risk was elevated by a factor of 2.1 and after hip X-rays by 2.2. They estimated that about 20 % of the current prostate cancer incidence in British males < 60 years are caused by X-raying. The doubling dose can be derived to about 20 mSv from their data.

Other low level effects to the prostate were observed in occupationally exposed British nuclear workers, in pilots, and after the Chernobyl accident[11-13].

In Germany, prostate cancer has become the most prevalent cancer disease in men. While the mortality in the GDR was rather constant between 1960 and 1980, it rose at the same time by 50 % in the FRG (Fig.2).

LEUKEMIA IN CHILDREN

Leukemia in childhood has increased in the FRG by about 50 % between 1960 and 2004 while the GDR showed no elevation (Fig.3). CTs of the head are supposed to have contributed predominantly to this difference because in childhood up to 30 % of the bone marrow is situated in the skull[15].

CONCLUSIONS

There is evidence from the literature that X-ray diagnostics causes significant contributions to current cancer incidences in the developed countries. This is confirmed by the observed differences between FRG and GDR.

Reduction of diagnostic exposures would be a relevant means for prevention of several prominent cancer diseases.

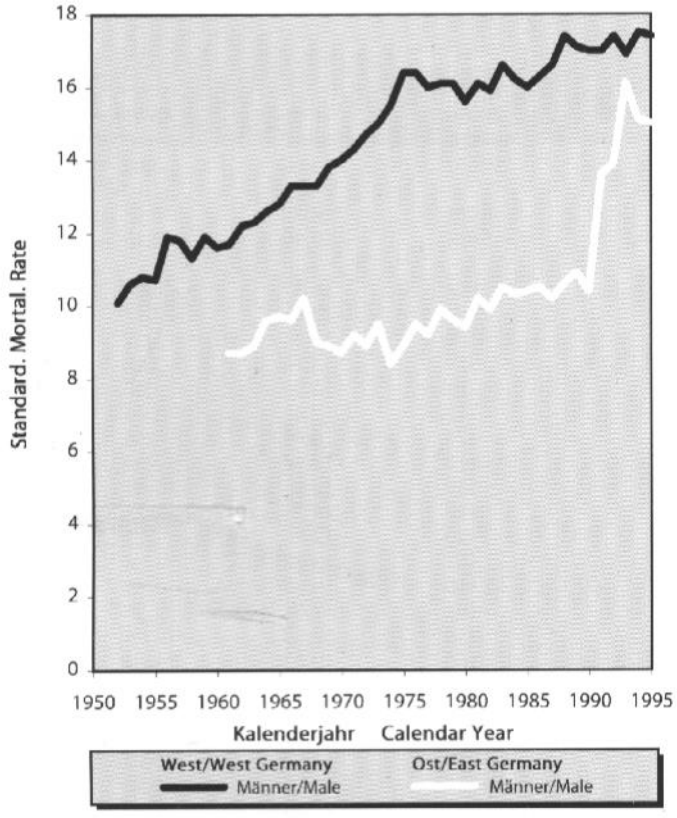

Figure 2. Prostate cancer mortality in Germany[1].

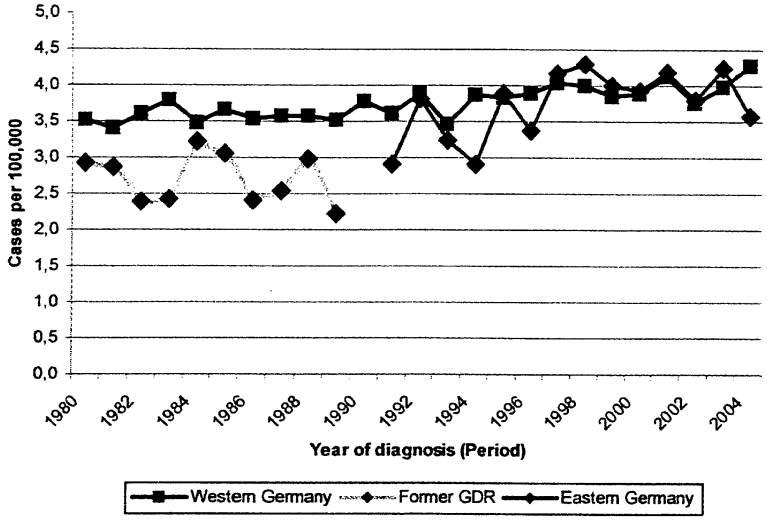

Figure 3. Leukemia in German children[14].

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