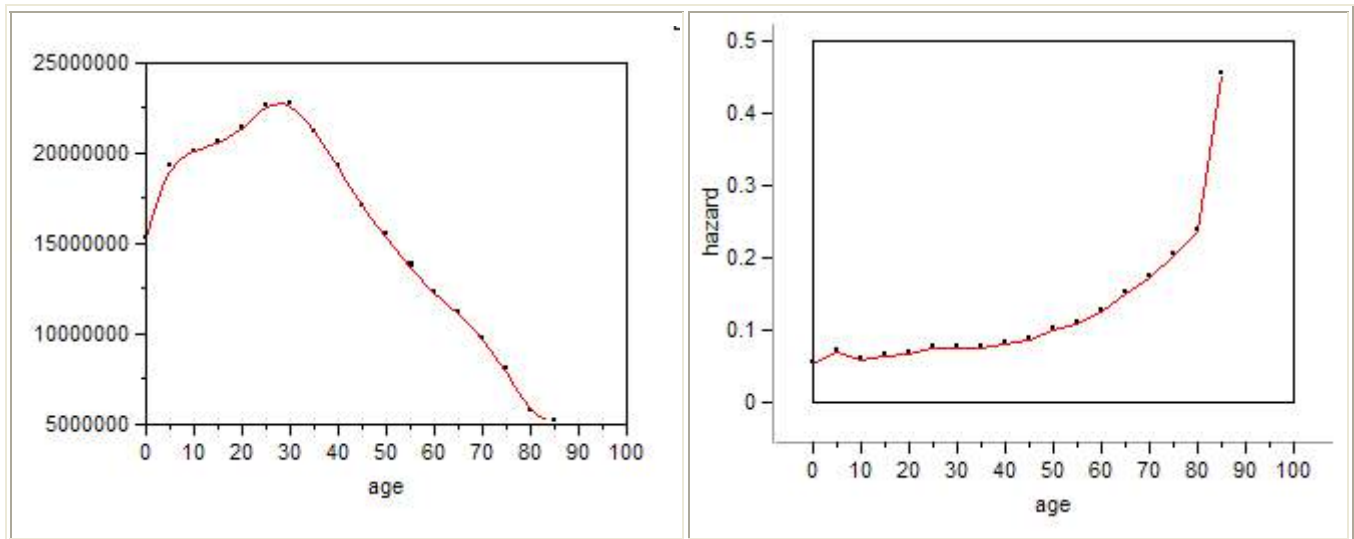A New Kind of Medicine
Epidemiology of breast cancer

If you wonder how I got the idea about the **vital role of the tumor in cancer** join me for this brief epidemiological analysis.
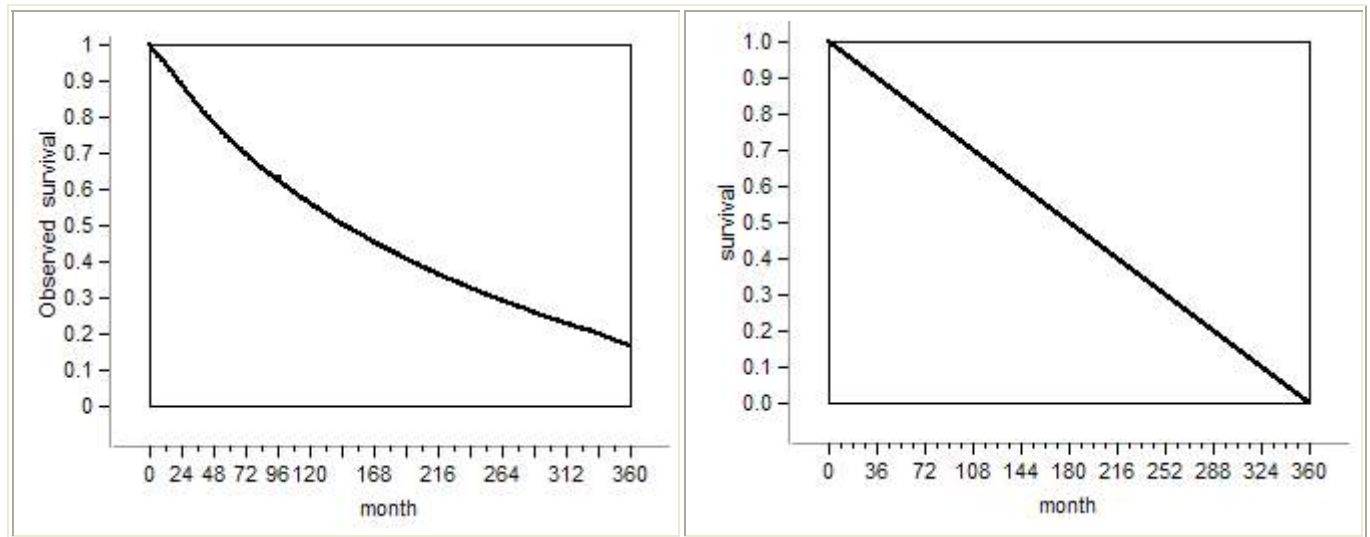

The first figure depicts a typical US population. Each point stands for the number of people alive at a certain age. From the age of 30y and onward people start dying and curve declines. From this curve it is possible to estimate the probability to die at each age, which is called hazard rate and depicted in the right figure. As we grow older our hazard rate (chance to die) continually rises. I computed similar statistics for breast cancer and discovered that **the hazard rate of cancer behaves in a different way.** It declines.

The data source

Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 9 Regs Public-Use, Nov 2004 Sub (1973-2002), National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2005, based on the November 2004 submission.

The next figure depicts the relative survival of 313303 white females with breast cancer along 30 years. The ordinate stands for the probability to live. At the time of diagnosis the probability is one or 100%.
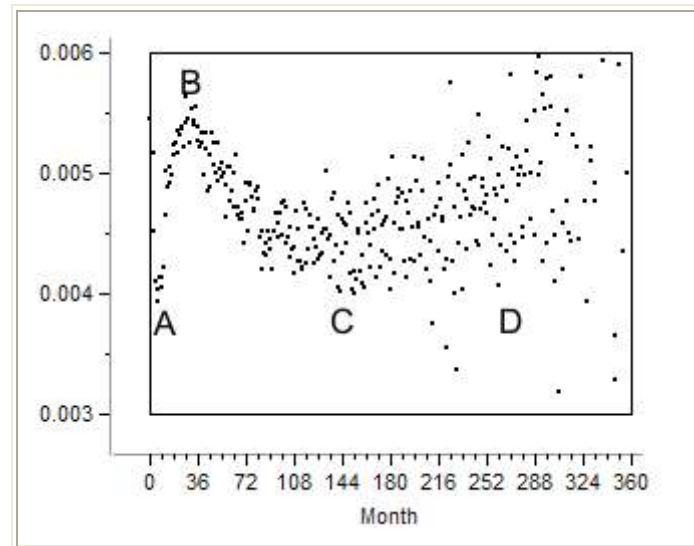
Cancer is a chronic disease

The declining curve illustrates that from the time of diagnosis and onward women continue dying from cancer. However we ought to turn our attention to the **60% which live with their cancer for about 25 years**. Consider a hypothetical woman who died 25 years after the diagnosis. Since dying from cancer she obviously carried the disease for 25 years. What was her secret?

The survival curve tells us yet another interesting story. From year to year its **yearly decline becomes smaller**. Compare it with a linearly declining survival curve on the right whose rate of decline over the years rises. In order to appreciate its significance we have to compute the hazard rate involved in the survival curvs.

Hazard rate = (number of women dying during a particular year) / (number of women alive at the beginning of this year)
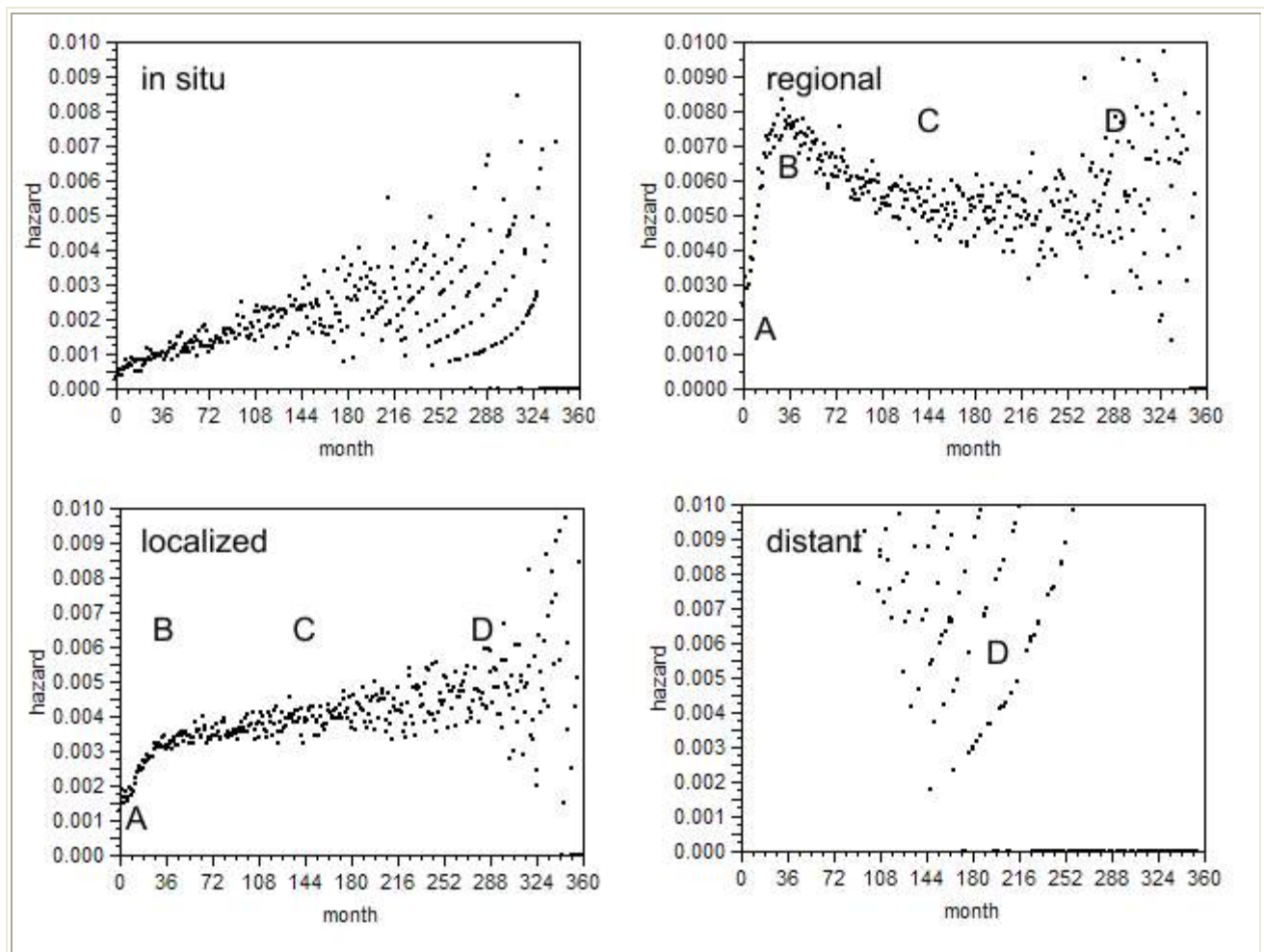
The figure depicts the hazard rate with time of 313303 white women with breast cancer
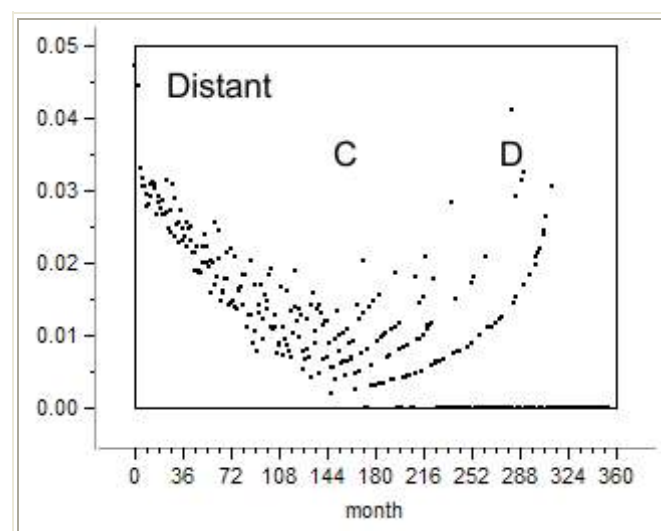
At diagnosis the hazard rate is about 0.004 (A). Then it rises and in the third year it reaches its peak of about 0.0055 (B). Then it declines to a mean of about 0.045 (C) whereupon it rises again. When diagnosed (A) breast cancer hazard rate **is higher than that of the healthy population**. This bimodal curve clearly differs from that of the population above which continually rises. Its steep ascent **is associated with the treatment** which the patients received. From the third year and onward (B) the patients lived with cancer better and better. However since the disease progresses, it finally overpowers the patient and the hazard rate rises again.

Cancer proceeds through four stages:
1. In situ: Regarded also as pre-cancer. 59578 patients
2. Localized: Tumor is confined to the breast. 249447 patients
3. Regional: Tumor has invaded local lymph nodes 134295 patients
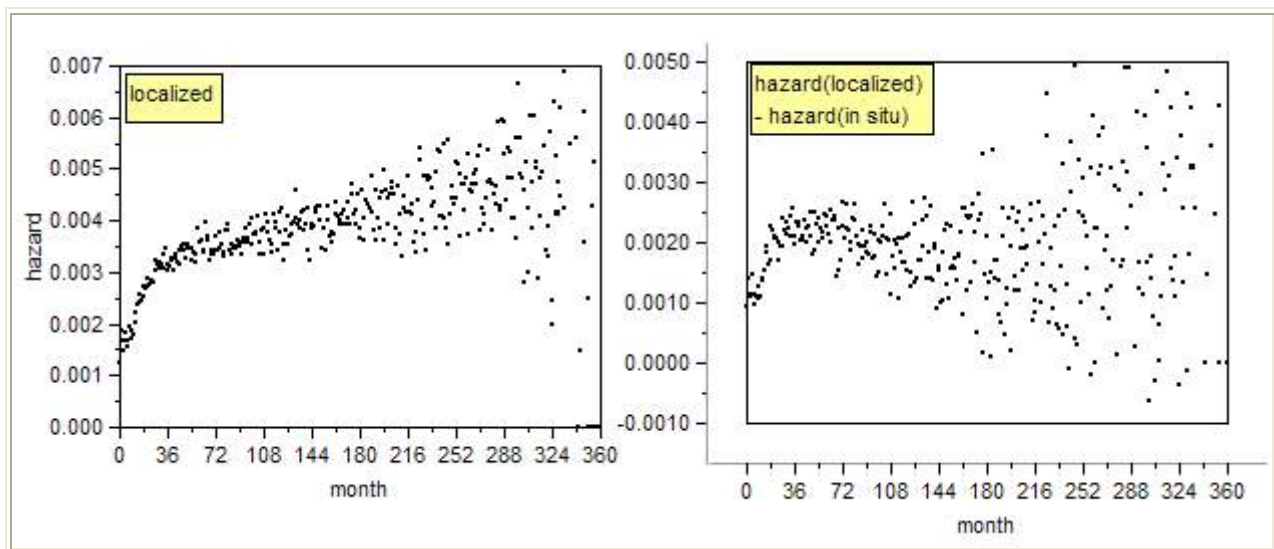4. Distant: Overt metastasis. 24870 patients

The hazard rate of females with **in situ cancer** rises linearly in the same way as in the healthy population. After all **in situ cancer does not kill**. Localized cancer starts with a hazard rate = 0.0015 (A) which is higher than that of in situ cancer (0.0005). In the coming years it rises steeply and from the third year and onward (B) it rises **slower than the hazard of in situ cancer**. In regional cancer the bi modality is most pronounced. Since distant cancer hazard rates are relatively high it is depicted again.

When distant cancer is first diagnosed it is decompensated and its hazard rate = 0.035. Its decline is attributed to treatment. After reaching a minimum at C it rises, mainly because the disease became resistant to treatment (D).

Localized cancer

A more refined analysis reveals the bi-modal pattern even in localized breast cancer. The hazard of in situ cancer rises linearly. In localized cancer the hazard starts ascending steeply and after the third year the slope declines (left curve). In the right curve, in situ hazard was subtracted from the localized and the bimodal pattern becomes somewhat clearer.

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Hypothesis

The patient **depends somehow on her tumor** and its removal raises the hazard rate (A   B) which is most pronounced in **compensated** cancers e.g., localized and regional. Initially the localized tumor is small and by itself **does not harm vital functions** yet following its removal the hazard rate rises steeply. From the third year (B) and onward the slope of its hazard rate is slightly higher than that that of in situ cancers which obviously do not harm vital functions. Many cancers diagnosed as regional actually carry **micrometastases which protect the patient from therapy induced total tumor ablation**. These patients survive after the third year (B) and their hazard rate declines.

Cancer is caused by a **deficiency of a yet unknown metabolite A**. In order to replenish the missing metabolite the organism grows a **tumor which produces a substitute B**. Since the deficiency **continually aggravates,** the tumor has to grow more and more in order to replenish the missing metabolite. In advanced deficiency it destroys vital functions and finally kills the patient. **Tumor ablation aggravates the deficiency** and the hazard rises which is most pronounced in regional cancers. Patients with micro metastases are protected from therapy induced total ablation and

their hazard rate declines.

Clinically this deficiency is manifested by a wasting disease which gradually turns into overt cachexia and was named as **pernicious cachexia.** The tumor is regarded here as a protective measure against cachexia.

Treatment objectives: Do not treat unless the tumor causes pain and distress or destroys vital functions. Wait as long as cancer is compensated and treat only during decompensation.

Further reading
Pernicious cachexia
Hazard rates of other cancers
A model of this metabolic deficiency
Farewell my breast

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