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Original Paper

Cancer of the Prostate in Norway 1957–1991—A Descriptive Study

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The incidence and mortality of prostate cancer from 1957 to 1991 were studied in the Cancer Registry of Norway. The age-adjusted incidence rate increased from 26.3 to 46.6 per 100 000 person-years during the period, and more than 2000 cases are now registered yearly. The increase tends to be higher in the younger age groups, 50–59 years, and among the oldest, 90+ years. An increase was also found in cause-specific mortality, signifying a real increase in incidence over time. There is a slight urban dominance in incidence of prostate cancer. Autopsy findings account for less than 1.7% of the total. The histo- and cytological verification rate reached 94% in 1987–1991 and the percentage of localised cases was 68.4%. The median age at diagnosis in 1987–1991 was 75.1 years. Data on stage at time of diagnosis, histological differentiation and survival, reflect a small influence of earlier diagnosis. Model analysis revealed no particular birth cohort effect, either on incidence or on mortality.

Key words: prostate cancer, Cancer Registry data, incidence, mortality
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INTRODUCTION

In 1974, G.P. Murphy, Director of the Roswell Park Memorial Institute, summarised a broad presentation [1] of the diagnostic and therapeutic aspects of prostate cancer with the statement 'Prostatic carcinoma in man remains an enigma!'. Today, 20 years later and after continuous worldwide research, prostatic carcinoma is not far from still remaining an enigma. However, some descriptive epidemiological patterns have become widely known through several comprehensive reports [2–5]. Possibly the most marked epidemiological characteristic is the wide range of high to low incidence areas in the world: a 120-fold difference. High incidence areas include North America and Scandinavia, while a relatively low incidence is found in Asia, particularly in Japan.

Three negative characteristics of prostatic cancer are still valid: (1) in large parts of the world the frequency is high and is generally increasing; (2) little is known as yet about the aetiology of prostate cancer, and so far, it is not preventable; and (3) for most patients only palliative treatment has been available. In Norway, prostate cancer is the most frequent type of cancer. The fact that cancer of the prostate is such an important and at the same time problematic form of cancer, seems to warrant comprehensive epidemiological research, preferably linked with laboratory and clinical research.

The aim of this study is to present a broad descriptive epidemiological analysis of this disease. Important questions are whether there has been a real increase in prostatic cancer, whether survival is improving and is there a propensity of earlier diagnosis.

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MATERIALS AND METHODS

Cancer reporting to the Norwegian Cancer Registry (CR) has been compulsory since the registry was established in 1952. All hospitals and histopathological laboratories are independently required to report all newly diagnosed cases of cancer. A link to the National Office of Statistics ('Statistics Norway') has been established, matching all information on deaths with the files of the CR, and since 1964 also supplying the CR with causes of death. The first 5 years of registration were omitted from the analyses to allow some time to achieve satisfactory reporting, hence the data analysed in this study are based on 42 990 cases of prostate cancer registered from 1957 to 1991. The data elements on date of birth, the 11-digit personal identification number, place of residence, date of diagnosis, stage of disease, basis of diagnosis, histological type/differentiation, and date and cause of death have been used in the present study.

Regional analysis was performed on the basis of the residence of the cancer patient at time of diagnosis. The country is divided into five geographical regions. The urban/rural analysis of incidence was based on the urban/rural status defined by 'Statistics Norway' and allocated on the basis of administrative definitions.

The content and quality of the data on prostatic cancer in the CR are described in this issue (pp. 104–110).

Statistical methods

The direct method of age standardisation of rates was used. For international comparison, the national incidence and mortality rates were adjusted to the world standard population [6].

Trends in incidence rates for 1957–1991 were analysed by fitting a log linear function. For analysis of the effects of age, time of diagnosis and birth cohorts on incidence and deaths, data were organised by 5-year age groups and 5-year diagnostic periods (Table 1) and also by 5-year age groups and year of birth from 1875 to 1935. The number of cases by age, time of diagnosis and birth cohort were assumed to be Poisson distributed with mean $\exp(\xi+\alpha_i+\pi_j+\gamma_k+\log N_{ij})$*. The same type of analysis was carried out adding a parameter of residence.

A multivariate analysis of the 5-year relative death rate among prostate cancer patients was also carried out using a model described by Hakulinen and Tenkanen in 1987 [7]. This model allows simultaneous analysis, in this case of the influence of age (A), period of diagnosis (P), stage of the disease (M), and place of residence (R).

The models were fitted using the GLIM statistical package [8] for computations. The goodness of fit of the various models was evaluated by the likelihood ratio statistics against the model where no structure was assumed (the deviance). A deviance of the same order as the number of degrees of freedom is taken to be an indication of a reasonable fit. When testing the models against each other the difference in deviance was assumed to have a χ^2 distribution.

The basic model included the variables A, P, M and R and first-order interaction terms. When the models were fitted to the data the results were expressed as estimates and standard deviations of the regression coefficients for the various categories, showing the contrasts in importance relative to the reference values of this variable. A value greater than 1 indicated an increased relative death rate. Each of the four variables and the interaction terms were removed in turn from the basic model to test the goodness of fit of the variables to the observed data.

All patients were followed up on mortality from all causes up to March 1992. Survival is given as relative survival which implies that observed survival is adjusted for expected survival based on life tables for the Norwegian population. Standard deviation of the relative survival rates was computed according to methods described by Greenwood [9].

RESULTS

Incidence

The average annual number of registered cases of prostatic cancer increased from 690 in the period 1957–1961 to 1898 in the period 1987–1991, which is more than a doubling (Table 1). Of the histologically examined cases, adenocarcinomas accounted for 94.2% of the cases, while 5.0% were classified as carcinoma n.o.s. (not otherwise specified). Only approximately 30% of the patients diagnosed were under the age of 70 years. The median age of the cases changed from 74.4 years in the first period to 75.1 years in the last. The age-adjusted incidence rate increased from 26.3 to 46.6 per 100 000 from 1957–1961 to 1987–1991. The large difference between the crude and adjusted rate (Table 1) reflects the fact that the Norwegian population is older than the world standard population and is growing 'older' over time.

Time trends in incidence and mortality

Trend analysis showed an annual increase in prostate cancer incidence rate of approximately 1.9% (Table 1). The increase tends to be higher in the younger age groups, 50–59 years, and in the oldest age group, 90+ years. Figure 1 shows the age-specific incidence rates for prostatic cancer for the first, middle and last 5-year periods.

Figure 2 shows age-specific incidence and mortality rates by time. A progressive increase with successive diagnostic periods is seen for practically all age groups, both for incidence and mortality. The lines for trends in age-adjusted incidence and mortality run almost parallel, and the ratio between total death and incidence rates has remained approximately the same over the last 25 years, around 0.5.

Table 1. *Incidence of prostate cancer per* 100 000 *person-years* 1957–1991 *by age and period of diagnosis*

Age groups	1957–1961	1962–1966	1967–1971	1972–1976	1977–1981	1982–1986	1987–1991	Estimated % annual increase
0–49	0.2	0.2	0.2	0.4	0.3	0.3	0.4	—
50–54	6.9	7.9	11.7	12.7	14.1	13.9	16.8	2.9
55–59	25.8	30.8	34.3	43.4	45.6	52.6	52.0	2.5
60–64	80.1	82.2	96.1	115.5	129.0	132.5	144.6	2.2
65–69	170.1	200.9	210.9	249.9	271.8	281.9	314.4	2.0
70–74	303.6	353.3	411.1	448.6	468.4	504.6	533.0	1.8
75–79	480.1	533.6	585.7	633.6	725.3	778.9	772.1	1.7
80–84	578.8	706.9	712.9	800.0	867.0	884.6	977.4	1.6
85–89	568.8	726.3	868.0	803.4	963.5	932.1	1025.0	1.8
90+	464.1	497.7	518.3	739.9	811.4	845.4	852.2	2.5
Crude rate	38.9	47.3	55.0	64.6	75.4	83.3	90.5	
Age-adjusted rate	26.3	30.4	33.8	38.0	41.7	43.7	46.6	1.9
Number of cases/year	690	871	1057	1282	1524	1708	1898	

* ξ is a constant; α_i is the age effect; π_j is the period effect; γ_k is the cohort effect and N_{ij} is the number of people at risk in the age group i and period j.

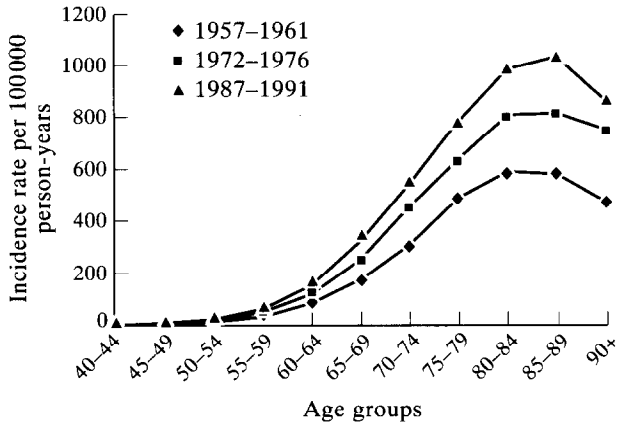

Figure 1. Age-specific incidence rates of prostate cancer in Norway in three periods.

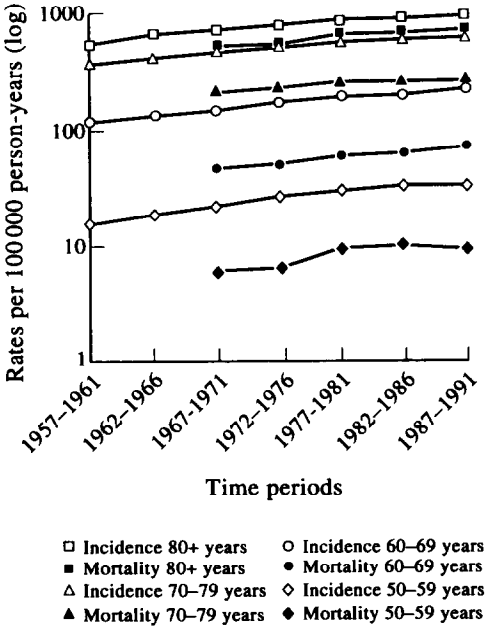

Figure 2. Age-specific incidence and mortality rates of prostate cancer in Norway by time of diagnosis.

Model analysis

The influence of age, year of birth, residence and period of diagnosis on incidence and mortality. Analyses were carried out to study simultaneously the effect of age, period of diagnosis and birth cohorts. Analysis using exact 5-year age and birth cohort groups and overlapping periods of diagnosis revealed that the variables age and period gave the best goodness of fit. Therefore, the model was changed so that age and period were stated in exact 5-year groups, but with overlapping birth cohorts. Table 2 shows that age, period, region and an interaction term between period and region made a significant contribution to the fit of the data. For mortality the interaction term was not really necessary. The influence of period and region on the incidence and mortality rates is demonstrated in Figure 3, where the level of incidence (1957–1961) and morotality (1967–1971) in Oslo are both set at 1. The need of an interaction term (Table 2) is caused by the special trend in Oslo, which represents about 10% of the country's population. Figure 3a shows an increasing trend in incidence in all regions except Oslo, where there has been a downward trend since the mid-1970s. Aside from Oslo, the relative difference in incidence between the regions is preserved over time. The difference between regions is less for mortality rates than for incidence rates. Mortality rates are increasing in all regions, but there is an estimated decline for Oslo after 1977–1981 (Figure 3b).

Figure 4 shows the effect of age on incidence and mortality in prostate cancer. The form of the curves shows that age is a more powerful predictor of mortality than of incidence, which is most probably a consequence of increasing case fatality by age. The rate ratio between mortality and incidence in the age group 50–54 years was approximately 0.2, but for the age group 85–89, it was approximately 0.85.

The influence of age, metastatic status, period of diagnosis and residence on 5-year relative death rate. The best fit of the model included a combined effect of the parameters and an interaction term between stage of disease and period of diagnosis (A+M+P+R+M*P) giving a deviance of 557 with 333 degrees of freedom (table not shown), but other first-order interaction terms were also significant. However, a closer study of the patterns of these interaction terms did not present any pattern of rationality. The lowest survival rates were found in the northern region, followed in order of improved survival by Oslo, east Norway, mid-Norway and west Norway (not shown). Figure 5 shows the changes in 5-year relative death rates by stage of disease and diagnostic periods as predicted by the model, when age, period and region are taken into account.

Urban/rural difference

The difference between urban and rural incidence rates was analysed by dividing the study period into two periods: 1957–1971 and 1972–1991. In all age groups and for both periods, there is an urban dominance in incidence. The urban/rural ratio for the age-adjusted incidence rate was 1.1 in the last period, which is slightly smaller than in the first period (1.2).

Severity of disease by period of diagnosis

A graphical distribution of the age-adjusted incidence rates per year of the various stages of prostatic cancer (Figure 6) displays approximately the same annual percentage increase for localised cancer as for distant metastases. In the last period, 1987–1991, the percentage of cases with localised disease, all age groups combined, was 68.4%, while 24.2% were diagnosed with distant metastases. The percentage of localised cancers with highly differentiated tumours was 72.3% in 1987–1991, while 19.3% were poorly differentiated (8.4% not classified). The similar distribution of highly and poorly differentiated tumours among metastatic prostate cancer was 47.2% and 38.1%, respectively (14.7% not classified). Among localised cancers of the prostate, the ratio of highly differentiated to poorly differentiated tumours is higher in later periods (not shown).

Basis of diagnosis

Table 3 shows the distribution of prostatic cancer, 1957–1991, by 'basis of diagnosis', age and three diagnostic periods. The most conspicuous changes over time were the increasing proportions of histologically and cytologically confirmed cases, and in 1987–1991 as much as 94% of the prostate cancer material was histologically or cytologically examined. There was an increasing proportion of patients by increasing age who were diagnosed without histological confirmation. The proportion of cases classi-

Table 2. Effects of age, diagnostic periods and region on diagnosis of prostate cancer—incidence and death rates

	Model	Model fit Deviance	df	Difference between models Deviance	df	*P* value
Incidence 1957–1991						
	Age (A)	2209.8	272			
	Age + period (P)	914.0	266	1295.8	6	< 0.005
	Age + period + region (R)	436.0	262	478.0	4	< 0.005
	A + P + R + P*R[a]	279.8	238	156.2	24	< 0.005
Death rate 1967–1991						
	Age (A)	382.4	192			
	Age + period (P)	274.4	188	108.0	4	< 0.005
	Age + period + region (R)	196.5	184	77.9	4	< 0.005
	A + P + R + P*R[a]	175.0	168	21.5	16	> 0.1

[a]P*R, interaction between period and region.
df, degrees of freedom.

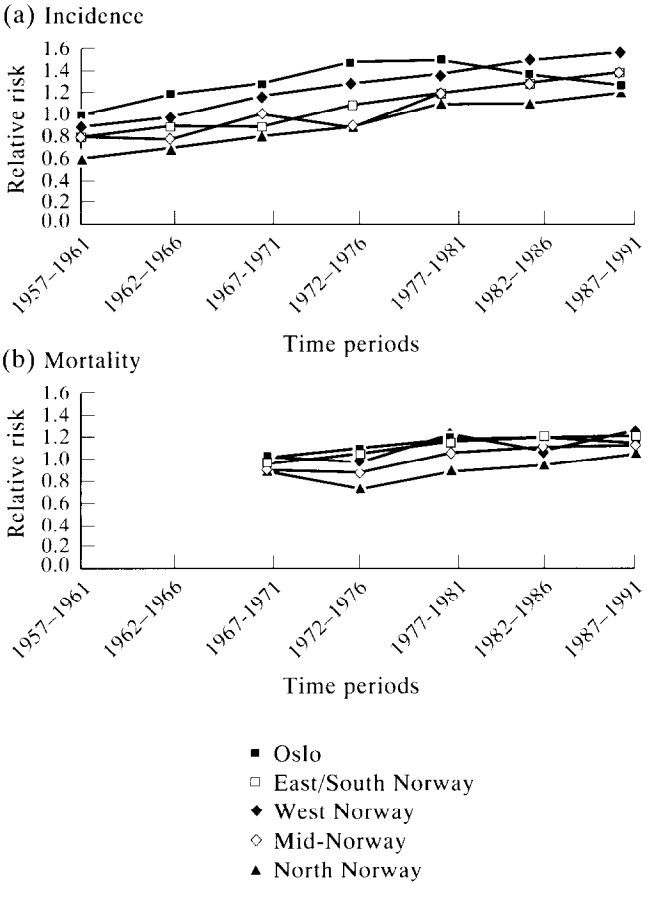

Figure 3. The relative risk of prostate cancer incidence and mortality by time in five regions in Norway.

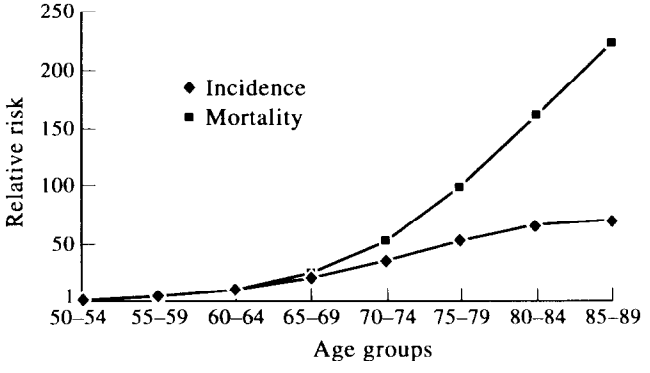

Figure 4. The relative risk of incidence and mortality of prostate cancer in Norway by age (reference category: age group 50–54 years).

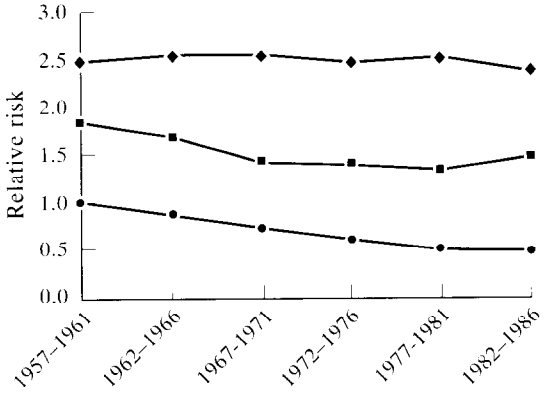

Figure 5. The relative risk of 5-year excess death rate for prostate cancer in Norway by stage and diagnostic periods (reference category: Oslo, localised cancer, 1957–1961).

fied as 'autopsy findings' has remained low, varying between 1.6 and 2.3 per cent. The lower percentage of autopsy findings in the last period was consistent with a declining frequency of autopsies in Norwegian hospitals. The age distribution of autopsy findings revealed the highest frequency among the older age group, and so was the frequency of diagnosis based on death certificate or cytological examination alone.

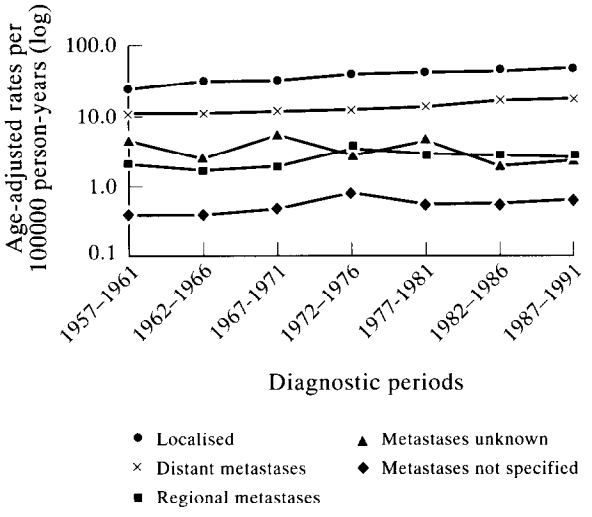

Figure 6. Incidence rates of prostate cancer in Norway 1957–1991 by stage.

Survival

The national 5-year relative survival rates, all ages and stages combined, have risen significantly from 42.0% in 1957–1961 to 59.4% in 1982–1986 (Table 4) (see also Figure 5, model predictions). A similar trend was found for 10-year rates. A significant improvement in survival was found among localised cases, while there was borderline significance for cases diagnosed with regional spread/metastasis ($P = 0.05$). No significant changes in survival were observed for patients with distant metastases.

DISCUSSION

Before discussing the patterns of incidence and mortality, it is worth noting that the country has had no organised screening programme for prostate cancer. Moreover, transrectal ultrasound in biopsy taking and staging of the disease, and the use of computerised tomography (CT) and prostate-specific antigen (PSA) in diagnosis, were first introduced at the end of the study period. There have been no principal changes in the classification of morbidity or mortality in the period studied, either in the CR or in the National Office of Statistics.

The median age of prostate cancer patients in the period 1987–1991 was 75.1 years, which is higher than shown by most of the reported data from other cancer registries [4]. The rise in incidence and mortality agrees well with time trends found by examining cancer registry data and international mortality statistics [4, 10, 11], although in a few cases, approximately one in 10 registries, the increase in incidence of prostatic cancer has stabilised. The average annual percentage increase was higher for cause-specific mortality rates for prostate cancer than for incidence rates in the last part of the study period. We interpret this as an indication of no real improvement in overall survival. Moreover, it reveals a real increase in incidence over time.

The SEER data from U.S.A. [12] shows that the relative increase in incidence rates over time lessened with age (analysed up to the age of 85 years). The same relative change by age was found in our data, except for patient group 90+ years, where the increase was continuous, and may reflect higher detection rates in the oldest age groups.

The fact that the annual percentage increase was greater in the first part of the study period for both incidence and mortality may be due to the downward trend in incidence in Oslo since the late 1970s (Figure 3). The reason for these changes in the rates for Oslo has not been fully explored as yet.

The annual percentage increase in incidence in Europe has been greatest in countries with low incidence [10]. Among high incidence countries in the world, a 2–4 times higher increase is observed in Canada and in the U.S.A. than among the Nordic countries for the period 1973–1987 [11]. The incidence is somewhat higher and the increase steeper in Sweden than in Norway probably due to more intensive diagnostics (Sweden has

Table 3. Basis of diagnosis for prostate cancer by age and three selected diagnostic periods

	Year	Age (years) ≥49	50–59	60–69	70–74	75–79	80–84	85+	Total
Number of registered prostate cancer patients	1957–1961	12	163	907	730	779	563	292	3446
	1977–1981	20	344	1942	1644	1737	1196	712	7595
	1987–1991	33	324	2245	2119	2201	1598	972	9492
Based on histology (%)	1957–1961	75.0	69.9	62.3	56.7	53.0	48.1	39.0	55.1
	1977–1981	85.0	89.5	89.6	87.0	81.8	76.8	63.3	82.5
	1987–1991	87.9	91.4	89.3	87.4	86.0	82.0	69.8	85.0
Based on cytology (%)	1957–1961	0.0	0.0	0.2	0.1	0.1	0.0	0.3	0.1
	1977–1981	10.0	7.6	4.6	4.9	4.9	5.8	6.0	5.2
	1987–1991	6.1	7.1	7.7	8.7	8.0	9.1	10.1	8.5
Based on death certificate only (%)	1957–1961	0.0	0.0	0.3	1.2	1.9	2.5	3.8	1.5
	1977–1981	0.0	0.0	0.3	0.5	0.9	1.4	3.7	0.9
	1987–1991	0.0	0.0	0.4	0.9	1.2	2.3	4.8	1.4
Clinical examinations only (%) (in hospital, but no histology, X-ray, etc)	1957–1961	25.0	28.8	34.8	39.3	41.1	42.8	41.1	38.7
	1977–1981	5.0	2.6	4.0	5.3	9.3	11.6	19.5	8.1
	1987–1991	3.0	0.0	1.1	1.5	2.9	5.2	13.3	3.5
Autopsy findings (%)	1957–1961	0.0	0.6	2.0	1.5	1.8	2.8	6.5	2.3
	1977–1981	0.0	1.2	2.1	2.4	2.9	3.7	4.8	2.8
	1987–1991	3.0	1.5	1.5	1.5	1.9	1.4	2.0	1.6

Table 4. Five-year relative survival rate (%) by age and stage of prostate cancer 1957–1961 and 1982–1986

	1957–1961				1982–1986			
Age (years)	Localised	Regional metastases	Distant metastases	All stages	Localised	Regional metastases	Distant metastases	All stages
50–64	61.4 (3.5)	35.1 (9.2)	23.4 (3.5)	46.3 (2.5)	76.7 (2.0)	38.8 (7.4)	18.7 (2.8)	60.0 (1.8)
65–79	56.4 (2.0)	25.8 (6.0)	19.0 (2.1)	43.7 (1.4)	73.4 (1.2)	39.9 (5.1)	20.9 (1.6)	60.2 (1.0)
80+	35.1 (3.9)	34.2 (16.0)	13.5 (4.0)	27.5 (2.8)	68.5 (2.9)	17.8 (9.9)	18.4 (3.2)	55.0 (2.3)
All ages	54.3 (1.6)	29.2 (4.9)	19.2 (1.6)	42.0 (1.2)	73.1 (1.0)	37.6 (4.0)	20.1 (1.3)	59.4 (0.8)

(Standard deviation of rate in parentheses).

lower mortality). The latest publication of *Cancer Incidence in Five Continents* [4], indicates a lower increase for many of the countries, in line with the findings in Norway.

There was no specific birth cohort effect, either for incidence or mortality. Few international analyses have been carried out on the effect of birth cohort on prostate cancer incidence. After 1986, publications from the Nordic cancer registries analysed trends in incidence for all types of cancer, and included cohort analyses for prostate cancer [13, 14]. Aside from minor fluctuations, there seemed to be a trend of almost regular increase in incidence by successive birth cohorts or subsequent diagnostic periods. Data from Spain [15], Australia, and England and Wales [16], and U.S.A. non-whites [17] have demonstrated a birth cohort effect in prostatic cancer mortality, culminating with a top mortality among cohorts born varying from 1865 to 1895. Thereafter, a relative stability was shown or even a slight decline for some cohorts. No clear explanation is given for these patterns of cohort effect.

In a recent publication on *Trends in Cancer Incidence and Mortality* from the International Agency on Research on Cancer 1993 [11], an increase in both incidence and mortality trends (age 30–74 years) in most European countries and in the Americas by time (1960–1987) and increasing year of birth (1910–1940) was noted. The few deviations from this trend are mainly found in regional registries. Quite often changes in rates were seen in incidence only, indicating diagnostic changes rather than real changes in risk of getting prostate cancer.

During the whole study period, incidence and mortality were significantly lowest in the north of Norway. This region has some immigration of Finnish blood and a certain proportion of Lapps in the population. Both groups are known to have a low incidence of prostatic cancer [18, 19].

The urban/rural incidence ratio was 1.1 in the last period, which is similar to the mean value found in an analysis by Doll [20]. Analyses of stage at diagnosis and the degree of histological verification revealed no difference between the regions.

Survival after diagnosis of prostate cancer

Overall survival has continued to improve up to the present time (Table 4). The improvement applies to all age groups, with the most marked increase in survival among the older patients (> 80 years).

International data on survival are rather heterogeneous, covering different time periods, different categories, and some giving overall survival, some giving relative survival rates. The best comparable data come from the Nordic cancer registries in 1955 [21]. Age-adjusted 5-year relative survival rates for prostate cancer diagnosed between 1983–1987 for Sweden, Finland, Norway and Denmark are 61.6, 60.2, 54.7 and 37.9%, respectively. The country with the highest incidence is also the country with the highest survival rates. The 5-year relative survival rate for cancer of the prostate, all stages combined, from the SEER programme in the U.S.A. 1979–1986 was 73% [22]. Therefore, survival seems to be better in the U.S.A. than in Norway. The effect of the fact that the composition of the cancer population is younger in the U.S.A. has not been analysed. It is also known that the ratio of mortality to incidence is much lower in the U.S.A. than in Norway [10], indicating a difference in diagnostics with a larger proportion of incidental and latent prostate cancer in the U.S.A. In material from the U.S.A. in 1991 [23], the proportion of localised cases is reported to be 60%, which is lower than in the Norwegian material. The high survival rates in the U.S.A. are, therefore, probably a compound result of more intensive diagnostics, younger age of the prostate cancer population and better results of treatment. The interpretation of the low survival figures in Denmark must be based partly on the fact that, of all the Nordic countries, Denmark has the least intensive diagnostic and therapeutic activities for prostate cancer [24]. Characteristic is that the difference in the proportion of localised disease at the time of diagnosis is 67.0% in Norway and 40% in Denmark.

The improvement in survival among localised cases probably indicates a certain influence of earlier diagnosis and hence a prolonged survival after diagnosis ('lead time' bias), since there is no significant improvement in mortality [the ratio of mortality to incidence rates for localised prostatic cancer remained relatively constant (0.37–0.39)].

The changes in the state of diagnostics of prostate cancer

Changes in diagnostic intensity over time may in themselves influence incidence, prevalence, and stage- and age-distribution as well as survival. Since the period of registration studied here covers 35 years, it can be expected to include marked changes in diagnostic procedures and in delivery of health services. The elements of change may include differences in diagnosis between various regions, earlier diagnosis in general and intensified diagnostic services, particularly among the elderly. Earlier diagnosis and improved histopathological diagnostics could easily result in spuriously higher incidence figures. Higher survival figures, not reflecting real improvements in mortality, could be a result of the phenomenon of lead-time bias alone.

What indicators do our data give of better and intensified diagnostic procedures? As discussed under survival results, there are indications of earlier diagnosis. Based on the proportional distribution of stages of disease, the main impression is that the influence of intensified diagnostics has been distributed over all

stages. A relative decrease in the risk rates of prostate cancer with regional metastasis at diagnosis may reflect the low frequency of 'staging operations' in Norway and a low frequency of the use of transrectal ultrasound in T-staging in the period [24]. The proportional increase in localised cases among patients above 85 years of age is not very different from the increase in the 60–69 year group (not illustrated). However, the same proportional changes in the older age groups have a much greater influence on the total incidence, owing to the exponential increase in incidence rate by age. Eight to nine per cent of prostate cancer patients belong to age groups above 85 years.

The quality of diagnostics appears to be lower among the oldest patients (Table 3). On the other hand, the observation of the lowest percentage of localised disease and highest proportion of metastasised disease in the 50–59 year age group, may reflect a situation of late diagnosis among these patients or a different biology of prostate cancer. This observation is consistent with the lower survival rates among these patients.

A proportional increase of highly differentiated tumours over time probably reflects improved diagnostics in all age groups. Autopsy findings of prostate cancer account for 2.2% among the age groups 85+ years, which probably depicts a high prevalence of non-symptomatic histological prostate cancer by increasing age. These circumstances must be remembered when discussing prostate cancer at high age.

Whittemore [25] discusses the difficulties in international comparisons of prostate cancer incidence in a recent publication, particularly the incidentally discovered prostate cancer. In Norway, without any organised screening for prostate cancer and with a very low autopsy rate, and with the large majority of patients referred to hospitals with symptoms of prostatism, the problem of incidentally discovered prostate cancer is much less than in many other countries (e.g. U.S.A.). A communication to the CR in 1991 from the Norwegian Institute of Hospital Research [26] showed that in the national hospital discharge statistics, the ratio of operations on the prostate for cancer to hyperplasia for the year 1989 was 1:3. Only 4% of the operations on the prostate for cancer did have an additional diagnosis of hyperplasia, and there is no reason to believe that even all of these were incidental cancers. In summary, therefore, our opinion is that the increase in incidence of prostate cancer in Norway is caused mainly by a general increase in risk, and only to a small extent influenced by intensified diagnostics in the period studied.

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