CHAPTER 10

CANCER

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Overview

This year the cancer report has three components. Firstly, we revise the site-specific cancer risk for people undergoing dialysis or after their first kidney transplant. Secondly, we update the cumulative incidence of cancers in the dialysis and post-transplant populations compared to the general population. Thirdly we examine change in cancer risk over time.

Cancer risk for different cancer sites whilst on dialysis or after transplantation

This report summarises the relative cancer risk of patients treated for end stage kidney disease in Australia and New Zealand.

To compare the risk of a cancer at different sites we compared the observed number of incident cancer diagnoses notified to ANZDATA with the expected number of cancer diagnoses in the general population. We accounted for differences in age and sex distribution by using indirect standardisation, standardising for differences in age, sex, calendar year, and country (either Australia or New Zealand).

For ANZDATA registrants living in Australia we used the Australian general population data for comparison, and for ANZDATA registrants living in New Zealand, we used the New Zealand general population data for comparison. We have not included basal cell or squamous cell carcinomas of the skin, as these are not registrable cancers, and no population based data for these cancers exists.

For Australia, general population data about cancer incidence and general population distribution were obtained from the Australian Institute of Health and Welfare and the National Cancer Statistics Clearing House. For New Zealand, general population data about cancer incidence and general population distribution were obtained from New Zealand Health Information Service, the Ministry of Health and Statistics New Zealand. Although ANZDATA holds records from 1963, the general population comparison data was only available from 1980 - 2009 for New Zealand, and from 1982-2009 for Australia. For this reason, we limited these ANZDATA analyses to people receiving renal replacement therapy between 1982-2009, so that we reduced potential for bias in results. In practical terms this means that the analyses take into account change in risk that may occur through differences in the age and sex distribution between the ESKD population and that of the referent general population, and also differences that may have occurred over time, and so the final calculation is adjusted for these differences.

This is the first ANZDATA report that has used New Zealand general population data to compare with New Zealand ANZDATA registrants, thus any inter-country differences in cancer risk should be accounted for. There remain some potential sources of confounding. Cancer risk in Australian Indigenous and Torres Strait Island populations are different compared to the Australian general population, and similarly New Zealand Maori and Pacific Island populations have different cancer risks compared to other New Zealanders. All of these populations are over-represented in the ESKD population of Australia and New Zealand. We were not able to account for these potential differences, as general population cancer data for these groups are not available.

Results of the cancer risk analyses are presented as standardised incidence ratios (SIR) with 95% confidence intervals (CI), which can be interpreted like risk ratios or relative risk; a value of SIR = 1 is equivalent risk, SIR = 0.5 is half the risk, SIR = 2 is double the risk etc. The breadth of the 95% CI reflects the precision of the SIR estimates, and those with 95% CI which do not cross 1 can be regarded as statistically significant.

We examined cancer risk for people treated with dialysis and for kidney transplant recipients separately. Once people had received a transplant, all subsequent cancers were counted in the post transplant group even if there was a subsequent return to dialysis. All site cancer risk included the first cancer experienced by an ANZDATA registrant during either dialysis or after transplantation, but not any subsequent cancers. Site specific cancer risk included the first cancer at that cancer site experienced by an ANZDATA registrant, regardless of whether they had experienced an earlier cancer at a different site.

Risk of Cancer for People Undergoing Dialysis

Shows the risk of cancer experienced by the 50,635 people undergoing dialysis in Australia and New Zealand between 1982 and 2009, representing 145,043 years of observation. During this time 2,568 people on dialysis (5.1 %) had at least one cancer. The period of risk for a dialysis patient was calculated from the day of first dialysis treatment and ended at transplantation, death or last known follow-up, which ever occurred soonest. Time spent on dialysis after a failed transplant was not considered here. Incident cancers diagnosed at any time after the first month of dialysis are summed in the observed totals. Site specific cancers are reported according to International Classification of Diseases Oncology codes, and grouped to match the categories available for the available general population data.

Table 10.1

Standardised incidence ratio of cancer overall, and at different sites, for people on dialysis in Australia and New Zealand, 1982-2009

ICD-O code*	Cancer site	Observed cases	Expected cases	SIR (95%CI)
	All sites	2586	1794.66	1.44 (1.39 - 1.50)
C00	lip	2	15.91	0.13 (0.03 - 0.50)
C01-C14	head and neck	44	34.71	1.27 (0.94 - 1.70)
C15	oesophagus	41	25.5	1.61 (1.18 - 2.18)
C16	stomach	67	43.17	1.55 (1.22 - 1.97)
C17	small intestine	15	5.76	2.60 (1.57 - 4.32)
C18-C21	colorectal	281	272.61	1.03 (0.92 - 1.16)
C22	liver	47	19.51	2.41 (1.81 - 3.21)
C23-C24	gallbladder	17	12.1	1.40 (0.87 - 2.26)
C25	pancreas	48	42.25	1.14 (0.86 - 1.51)
C30-31	nasal cavity	6	2.65	2.26 (1.02 - 5.03)
C32	larynx	12	14.54	0.83 (0.47 - 1.45)
C33-C34	trachea, bronchus, lung	363	213.48	1.70 (1.53 - 1.88)
C37-C38	other thoracic	4	1.57	2.55 (0.96 - 6.78)
C40-C41	bone & articular cartilage	5	2.29	2.18 (0.91 - 5.24)
C43	melanoma	162	157.22	1.03 (0.88 - 1.2)
C45	mesothelioma	15	13.3	1.13 (0.68 - 1.87)
C46	kaposis sarcoma	9	1.01	8.88 (4.62 - 17.07)
C47-C49	connective & soft tissues	11	9.86	1.12 (0.62 - 2.01)
C50	breast	196	153.48	1.28 (1.11 - 1.47)
C53	cervix	26	9.26	2.81 (1.91 - 4.13)
C54-C55	uterus	35	25.74	1.36 (0.98 - 1.89)
C56	ovary	17	17.65	0.96 (0.60 - 1.55)
C51-C52, C57-C58	other female genital	14	5.16	2.71 (1.61 - 4.58)
C61	prostate	211	366.96	0.58 (0.5 - 0.66)
C62	testis	3	3.61	0.83 (0.27 - 2.58)
C60, C63	penis & male genital	3	2.14	1.40 (0.45 - 4.35)
C67	bladder	186	55.79	3.33 (2.89 - 3.85)
C64-C66, C68	kidney, ureter, urethra	300	50.12	5.99 (5.35 - 6.70)
C69	eye	0	4.36	Not calculable
C70-C72	brain & CNS	31	23.14	1.34 (0.94 - 1.91)
C73	thyroid	56	12.95	4.32 (3.33 - 5.62)
C74-75	other endocrine	10	0.9	11.06 (5.95 - 20.56)
C81-C85, C96	all lymphoma	82	72.57	1.13 (0.91 - 1.40)
C90	multiple myeloma	176	24.81	7.09 (6.12 - 8.22)
C91-C95	leukaemia	53	48.57	1.09 (0.83 - 1.43)
	Not specified or unknown primary	142	62.76	2.26 (1.92 - 2.67)

*International classification of diseases for oncology topography codes. See http://www.who.int/classifications/icd/adaptations/oncology/en/

Risk of Cancer in Recipients after First Kidney Transplant

Shows the risk of cancer experienced by the 17,150 people who underwent at least one kidney transplant in Australia and New Zealand between 1982 and 2009, representing 159,413 years of observation. During this time 2180 transplant recipients (12.7 %) had at least one cancer. For these calculations the period of risk for each patient started on the day of transplantation and continued until death or last known follow-up. People have not been removed from the analysis at the time of graft failure. Observed cancers are all those reported from 30 days after the date of 1st transplantation, and include those occurring after graft failure, and those that occurred after a subsequent transplant.

Table 10.2

Standardised incidence ratio of cancer overall, and at different sites, for people after first transplant in Australia and New Zealand, 1982-2009

ICD-O code	Cancer site	Observed cases	Expected cases	SIR (95%CI)
	All site	2180	867.78	2.51 (2.41 - 2.62)
C00	lip	16	10.38	1.54 (0.94 - 2.52)
C01-C14	head and neck	82	22.97	3.57 (2.88 - 4.43)
C15	oesophagus	43	10.95	3.93 (2.91 - 5.29)
C16	stomach	27	18.8	1.44 (0.99 - 2.09)
C17	small intestine	7	3.04	2.30 (1.10 - 4.83)
C18-C21	colorectal	240	125.02	1.92 (1.69 - 2.18)
C22	liver	26	9.28	2.80 (1.91 - 4.12)
C23-C24	gallbladder	11	5.05	2.18 (1.21 - 3.93)
C25	pancreas	22	17.3	1.27 (0.84 - 1.93)
C30-31	nasal cavity	12	1.51	7.93 (4.50 - 13.96)
C32	larynx	12	8.01	1.50 (0.85 - 2.64)
C33-C34	trachea, bronchus, lung	158	89.64	1.76 (1.51 - 2.06)
C37-C38	other thoracic	7	1.01	6.91 (3.30 - 14.50)
C40-C41	bone & articular cartilage	7	1.88	3.72 (1.77 - 7.80)
C43	melanoma	276	100.66	2.74 (2.44 - 3.09)
C45	mesothelioma	11	5.12	2.15 (1.19 - 3.88)
C46	kaposis sarcoma	25	1.12	22.29 (15.06 - 32.98)
C47-C49	connective & soft tissues	22	5.92	3.72 (2.45 - 5.65)
C50	breast	139	113.96	1.22 (1.03 - 1.44)
C53	cervix	44	9.14	4.81 (3.58 - 6.47)
C54-C55	uterus	28	16.54	1.69 (1.17 - 2.45)
C56	ovary	14	11.44	1.22 (0.73 - 2.070)
C51-C52, C57-C58	other female genital	50	2.86	17.49 (13.26 - 23.08)
C61	prostate	120	146.8	0.82 (0.68 - 0.98)
C62	testis	11	7.1	1.55 (0.86 - 2.80)
C60, C63	penis & male genital	11	1.01	10.94 (6.06 - 19.75)
C67	bladder	113	20.38	5.54 (4.61 - 6.67)
C64-C66, C68	kidney, ureter, urethra	223	25.99	8.58 (7.52 - 9.78)
C69	eye	6	2.59	2.32 (1.04 - 5.16)
C70-C72	brain & CNS	24	15.41	1.56 (1.04 - 2.32)
C73	thyroid	50	12.13	4.12 (3.13 - 5.44)
C74-75	other endocrine	7	0.72	9.77 (4.66 - 20.50)
C81-C85, C96	all lymphoma	384	39.82	9.64 (8.73 - 10.66)
C90	multiple myeloma	24	10.78	2.23 (1.49 - 3.32)
C91-C95	leukaemia	41	22.6	1.81 (1.34 - 2.46)
	Not specified or unknown primary	89	25.04	3.56 (2.89 - 4.38)

*International classification of diseases for oncology topography codes. See http://www.who.int/classifications/icd/adaptations/oncology/en/

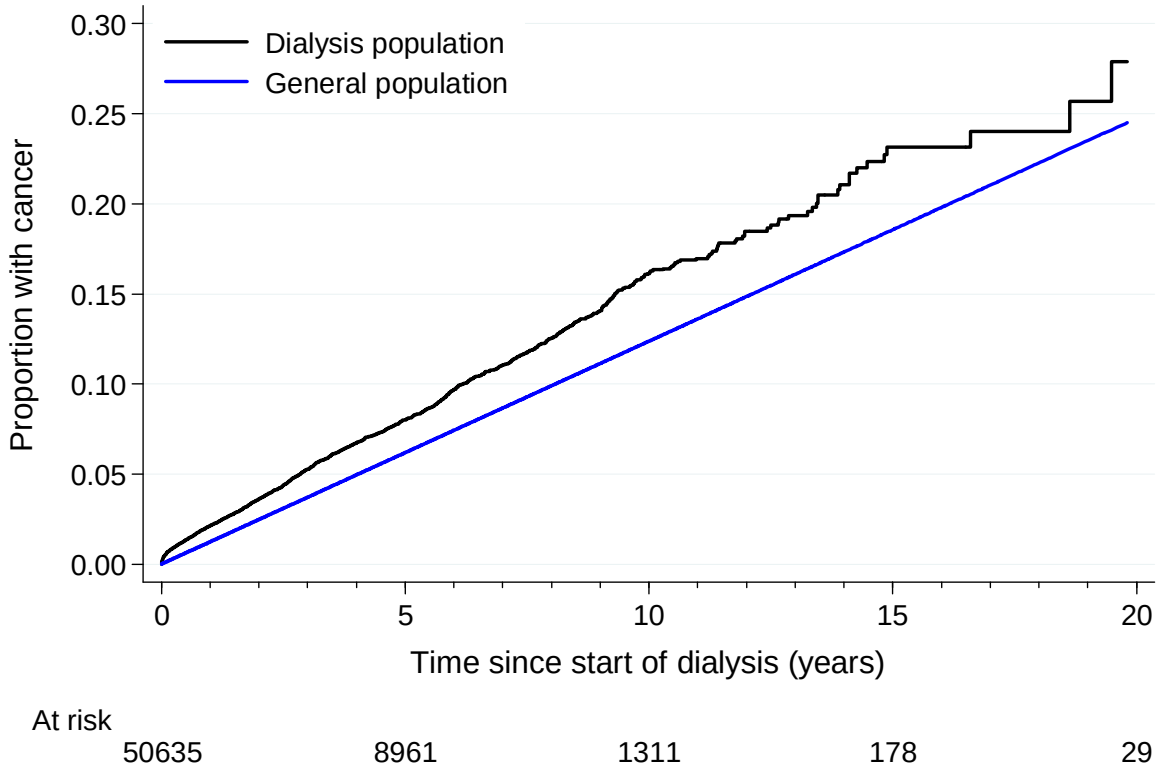
Cumulative Risk (of cancer on dialysis or after transplantation)

The second section of this report examines the cumulative risk of a cancer over time for people in Australia and New Zealand on dialysis or after receiving a kidney transplant. Although the relative risk of cancer after receiving a kidney transplant is much greater than whilst on dialysis, in absolute terms the cumulative incidence is similar overall. This is because the dialysis population is older than the transplanted population, and cancer risk increases with age.

Figure 10.1 shows the cumulative risk of at least 1 cancer for those on dialysis. The numbers tabulated below the graph shows the number of patients remaining at risk as time progresses. Dialysis patients cease to be at risk from the day of 1st transplant, death or last known follow-up, whichever occurs first. After 5 years on dialysis 8.0% of people will have developed a cancer, 16.1% at 10 years, 23.1% at 15 years, and long term dialysis survivors 27.9% by 20 years.

Figure 10.1 Cumulative risk of at least 1 cancer after starting dialysis, for people in Australian and New Zealand 1982-2009

Figure 10.1



Similarly **figure 10.2** shows the cumulative risk of at least 1 cancer following kidney transplantation. Risk of cancer increase more steeply over time than for people on dialysis, and continues to diverge from the general population risk.

After 5 years post transplantation 5.0% of people will have developed a cancer, 11.8% at 10 years, 19.1% at 15 years, and for long term transplant survivors 26.3% by 20 years.

Figure 10.2 Cumulative risk of at least 1 cancer after receiving first kidney transplant, for people in Australian and New Zealand 1982-2009

Figure 10.2

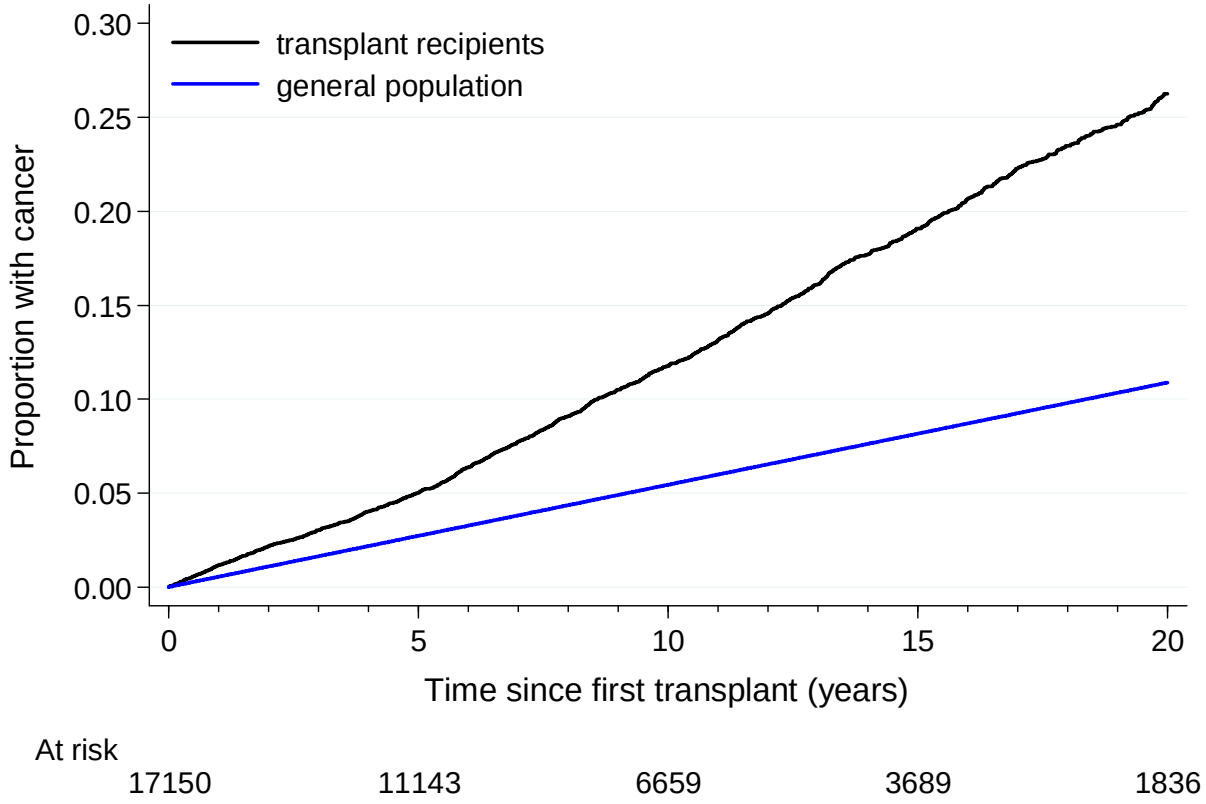
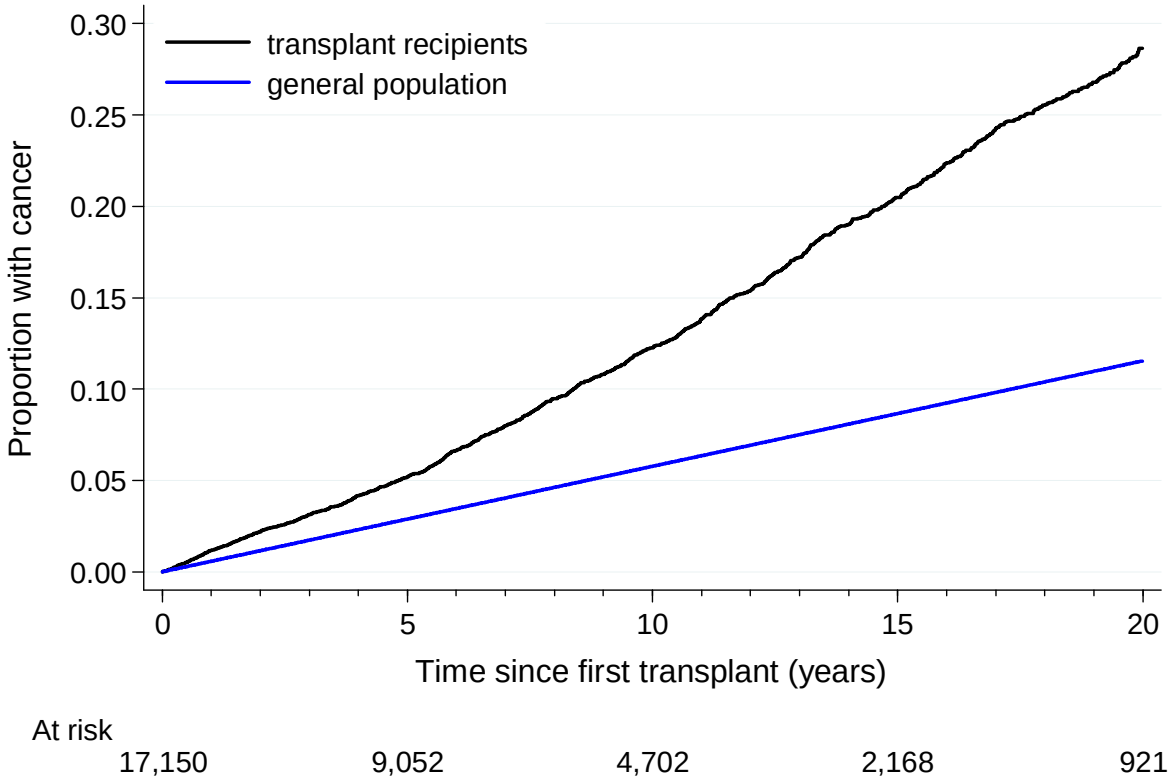


Figure 10.2 shows cumulative risk of at least 1 cancer for transplant recipients whilst their 1st graft continues to function. Cancer risk while a kidney transplant continues to function is slightly higher than for those people who have lost their transplant and have returned to dialysis (**figure 10.2**), but the difference is not striking.

For these calculation patients cease to be at risk at graft failure, death or last known follow-up, whichever occurs first.

Figure 10.3 Cumulative risk of at least 1 cancer during kidney transplant function, for people in Australian and New Zealand 1982-2009

Figure 10.3



Cumulative Incidence by Cancer Site

Shows the cumulative incidence of cancers of the renal tract – kidney, ureter and urethra for people during dialysis or after kidney transplantation. Although the relative risk of cancers at these sites is higher for transplant recipients (SIR 8.58, 95% CI 7.52 - 9.78) than for people on dialysis (SIR 5.99, 95%CI 5.35 - 6.70), in absolute terms, the cumulative incidence of these cancers is higher for people on dialysis. This is because of the differences in age and sex between the dialysis population and those with a transplant.

For **figures 10.1-10.4**, the curve for the expected number of cancers is calculated using general population data, for people of the same age and sex, over the same time period.

Figure 10.4 Cumulative risk of cancer of the renal tract (C64-C66, C68; kidney, ureter, urethra), for people in Australian and New Zealand 1982-2009

Figure 10.4 - A: during dialysis

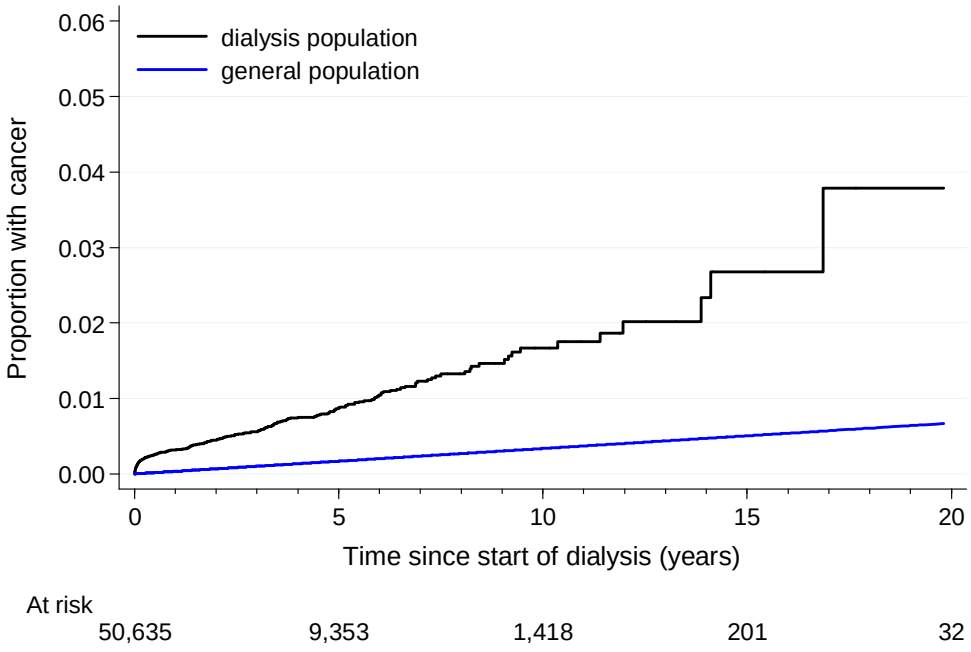
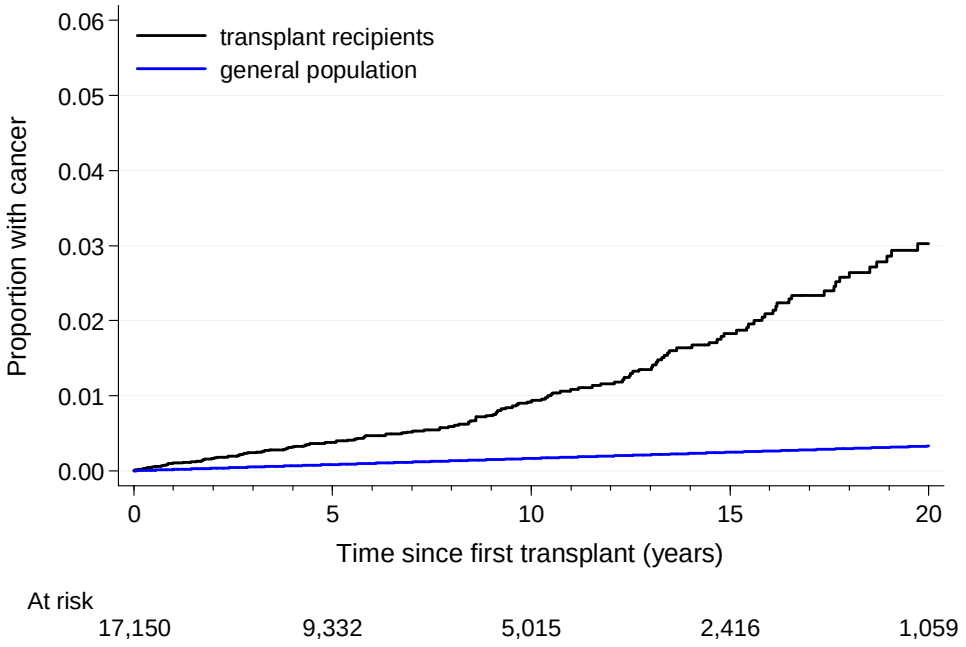


Figure 10.4 - B: after receiving first transplant



Change in Risk of Cancer Over Time

The third part of this year's cancer report describes changes in risk of cancer over time.

Figure 10.5 shows the relative risk of cancer for people on dialysis and after kidney transplantation for different eras, compared to the general population. Relative risk of cancer compared to the general population is now lower than it was in the 1980s.

Differences in the age and sex distribution of the ESKD population has changed over time, but the estimates in figure 10.5 compare the ESKD population with the general population of the same age and sex. The reason for the observation of decreased relative risk of cancer may be that the overall general health of the ESKD population has changed over the years, and people with a greater burden of co-morbidity now receive dialysis or kidney transplants compared to 30 years ago, where the overall burden of co-morbidity in the general population has not changed, or changed at a slower pace.

Thus, overall the greater co-morbidity of the ESKD population might cause people to die of other causes, such as cardiovascular disease rather than to survive and develop cancer. The cancer working group plan on investigating this finding more thoroughly over the coming year.

Figure 10.5 Change in cancer risk over time, all cancers