Improving survival disparities in cervical cancer between Māori and non-Māori women in New Zealand: a national retrospective cohort study

Melissa McLeod, Ricci Harris, Gordon Purdie, Donna Cormack, Bridget Robson

Eru Pōmare Māori Health Research Centre, Department of Public Health, University of Otago, Wellington, School of Medicine and Health Sciences, New Zealand

Peter Sykes

Department of Obstetrics and Gynaecology, University of Otago, New Zealand

Sue Crengle

Te Kupenga Hauora Māori, Department of Māori Health, University of Auckland, New Zealand

Douglas Iupati

Counties Manukau District Health Board, New Zealand

Nick Walker

Hawkes Bay District Health Board, New Zealand

Abstract

Objective: Māori women in New Zealand have higher incidence of and mortality from cervical cancer than non-Māori women, however limited research has examined differences in treatment and survival between these groups. This study aims to determine if ethnic disparities in treatment and survival exist among a cohort of Māori and non-Māori women with cervical cancer.

Methods: A retrospective cohort study of 1911 women (344 Māori and 1567 non-Māori) identified from the New Zealand Cancer Register with cervical cancer (adenocarcinoma, adenosquamous or squamous cell carcinoma) between 1 January 1996 and 31 December 2006.

Results: Māori women with cervical cancer had a higher receipt of total hysterectomies, and similar receipt of radical hysterectomies and brachytherapy as primary treatment, compared to non-Māori women (age and stage adjusted). Over the cohort period, Māori women had poorer cancer specific survival than non-Māori women (mortality hazard ratio (HR) 2.07, 95% confidence interval (CI): 1.63–2.62). From 1996 to 2005, the survival for Māori improved significantly relative to non-Māori.

Conclusion: Māori continue to have higher incidence and mortality than non-Māori from cervical cancer although disparities are improving. Survival disparities are also improving. Treatment (as measured) by ethnicity is similar.

Implications: Primary prevention and early detection remain key interventions for addressing Māori needs and reducing inequalities in cervical cancer in New Zealand.

Key words: Cervix neoplasms, cervical cancer, survival, survival analyses, ethnicity, treatment.

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The New Zealand health system provides free public hospital care, and subsidised primary care visits to New Zealanders. In 1990, the National Cervical Screening Programme was established, which recommends smears for women aged 20-69 years. The National Cervical Screening Programme in New Zealand has been successful in reducing the overall incidence of cervical cancer.[1] However, the program has been less successful in achieving access to smears for Māori than non-Māori women. Similar disparities are also found for indigenous peoples in Australia.[2,3] In 2006, Māori screening coverage was 46.6% (hysterectomy adjusted) compared to 75.7% for non-Māori non-Pacific women, with disparities in time to follow-up of abnormal smears also documented.[4,5] Despite an established screening program, cervical cancer remains a key health issue for Māori women, as the fourth leading cancer for this group. Compared to non-Māori, Māori women are almost twice as likely to be diagnosed with cervical cancer and three times as likely to die from this disease.[6]

Māori are the indigenous population of New Zealand, and comprise 14.6% of the four million total population (European 67.6%, Asian 9.2% and Pacific 6.9%).[7] As in other countries with similar histories of colonisation, ethnic inequalities in health exist and, in New Zealand, are most pronounced between Māori and the majority European (white) population. Māori have an eight to nine year lower life expectancy than non-Māori, with disparities in determinants of health and most health indicators (including most major chronic diseases, cancers, infectious diseases, and injuries).[8,9]

International literature shows mixed findings in regard to ethnic and racial disparities in survival from cervical cancer.

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Correspondence to:
Eru Pōmare Māori Health Research Centre, Department of Public Health, University of Otago, Wellington, School of Medicine and Health Sciences, PO Box 7343, Wellington.
Fax: (04) 385 5319; e-mail: ricci.harris@otago.ac.nz

Significant survival differences have been demonstrated in African American women, with poorer survival remaining after adjusting for age and stage at diagnosis.[10,11] Other studies demonstrated a continued survival difference by race or ethnicity despite controlling for a wide range of factors in: Pacific Island women in the US military controlled for age, stage, and grade,[12] and African American women once adjusted for histology and size[13] and lymph node status and location.[14] Other US studies have found no disparity by race or ethnicity in survival from cervical cancer.[15-21] Three of these were based in single treatment institutions,[17,19,21] and one on the US military population.[20]

In New Zealand, later stage at diagnosis has been suggested as a cause of relative survival disparity by ethnicity, but the evidence is inconsistent. In an analysis of cervical cancer cases registered in 2000-2004, Māori women's cancer specific survival was significantly lower than that observed among non-Māori women. However, the ethnic differences in survival were no longer significant after adjustment for stage at diagnosis.[6] In earlier studies (1994-2002), ethnic differences in stage did not fully account for differences in survival,[22,23] suggesting possible changes over time.

To date no research has been done in New Zealand to seek explanations (other than stage) for the disparity in cervical cancer survival between Māori and non-Māori. In particular, there has been no research to determine if there are disparities in treatment for cervical cancer. International studies have demonstrated treatment differences for cervical cancer by race or ethnicity. African American women have been found to be more likely to have insertion of a radioactive device[24] or radiotherapy[25] than non-African American women. African American women are also less likely to receive a hysterectomy for early stage cervical cancer,[19] early and late stage cancer;[26] and in women aged over 35yrs.[27]

This research aims to determine if ethnic disparities in treatment and survival exist among a cohort of Māori and non-Māori women with cervical cancer.

Methods

Study design and population

This is a retrospective cohort study of women diagnosed with cervical cancer over the time period 1996 to 2006. Data were obtained from the New Zealand Health Information Service (NZHIS). All women diagnosed with cervical cancer between 1 January 1996 and 31 December 2006 were identified from the New Zealand Cancer Register (a population-based register of all primary malignant diseases in New Zealand, excluding basal and squamous cell skin cancers). The study sample was limited to those diagnosed with adenocarcinoma, adenosquamous and squamous cell carcinomas, excluding 140 participants with rarer forms of cervical cancer. The cohort was stratified by ethnicity into Māori or non-Māori based upon the presence or absence of Māori ethnicity identification on the Cancer Register.

Data from all public hospital admissions, cancer registrations and mortality records for the cohort were linked using each individual's encrypted National Health Index (NHI) number. The cohort was followed until the end of 2006 to compare treatment differences and to the end of 2005 to compare survival differences.

Ethical approval for this study was granted by the Multi-Region Ethics Committee (MEC/05/07/085). A clinical reference group informed the study.

Cervical cancer survival

The survival outcomes in this study included a comparison of Māori and non-Māori cancer specific survival and survival disparity trends over time. Survival was measured as the number of days from the date of diagnosis to the date of death. Cases diagnosed at death were excluded from the analysis ($n = 1$). Deaths from other causes were assumed to be independent of cervical cancer, and were censored.

Primary treatment analyses

In order to capture only primary cervical cancer treatment, analysis was limited to treatment received within 12 months of cervical cancer diagnosis. Surgical treatments (radical and total hysterectomy) as well as radiotherapy (brachytherapy) were examined. External beam radiotherapy, chemotherapy and localised surgical treatments (loop excision and laser surgery) are primarily provided as outpatient procedures and are not captured in the NZHIS dataset, and therefore not included in the treatment analysis.

Hospital admission

Admissions to a public hospital with a primary discharge diagnosis of cervical cancer within three months of diagnosis were divided into three exclusive groups: admission to a cancer centre; other public hospital admissions; or no public hospital admission. In addition, limited private hospital admission data was available for the period 2001 to 2003.

Co-factors

Age, tumour stage, extent of disease and histology were extracted from the cancer register. Tumour stage was classified according to the International Federation of Gynaecology and Obstetrics (FIGO) Staging of Carcinoma of the Cervix, and grouped as Stage IA, IB, II, III, IV and unknown. Stage I was separated into IA and IB to allow analysis of treatment by stage, which differs for these two subgroups. Extent of disease was classified as localised, regional, distant or unknown according to the Surveillance, Epidemiology, and End Results (SEER) Program staging scheme.[28,29]

Statistical methods

Population rates were age standardised to the 2001 Māori population. P values <0.05 were deemed statistically significant. Poisson regression was used to model trends over time. The poisson errors were assumed to have autoregressive correlations between the years, within ethnic-age groups.

Two types of survival analyses were performed to estimate cervical cancer specific survival by ethnicity: a Kaplan Meier survival curve; and proportional hazards modelling. Proportional hazards modelling was used to estimate the relative risk of death in the two years following diagnosis over the cohort period for Māori compared with non-Māori (mortality HR) and was adjusted for age, FIGO stage, and for treatment as a time-dependent covariate. Additionally, differential trends in two year survival/mortality over time were examined for Māori compared with non-Māori using proportional hazards modelling for moving averages of two year diagnostic periods.

Proportional hazards modelling was also used to estimate the Māori:non-Māori hazard ratio for procedure receipt (total or radical hysterectomy, and brachytherapy) and admission to a cancer centre, adjusted for age and FIGO stage.

All analyses were undertaken in SAS (version 9.1, SAS Institute Inc., Cary, NC).

Results

Included in the study were 1,911 women; 344 Māori and 1,567 non-Māori (Table 1). The median age at registration for Māori was 43 years, and 46 years for non-Māori (p<0.001 Wilcoxon rank-sum test).

In a cross tabulation of extent of disease and FIGO, FIGO I was well correlated with localised extent of disease (99%). FIGO IV was well correlated with distant extent of disease (96%). FIGO II was classified as regional extent of disease in 74% of cases, and FIGO III was distributed between regional (41%) and distant (57%) extent of disease.

The grouped FIGO stages show that Māori were more likely to have advanced stage (FIGO II & III and FIGO IV) at diagnosis than non-Māori women (Table 1). Māori were less likely to have FIGO IB at diagnosis. Similar proportions of Māori and non-Māori had FIGO IA and missing FIGO stage fields. For extent of disease, Māori were more likely to be registered with distant disease than non-Māori, and less likely to be registered with localised disease.

Māori women had proportionally fewer adenocarcinomas (p=0.0005) and more squamous cell carcinomas (p=0.006). Overall, there were no significant differences in survival between adenocarcinoma and squamous cell carcinoma (p=0.65, adjusted for age).

Table 1: Characteristics of women registered with invasive Cervical Cancer between 1 January 1996 – 31 December 2006, by ethnicity.

Characteristic	Māori (n=344)		Non-Māori (n=1567)		P-value[a]
	n	%	n	%	
Age at diagnosis					
<30	35	10.2	123	7.8	
30-39	94	27.3	395	25.2	
40-49	105	30.5	370	23.6	
50-59	66	19.2	243	15.5	
60+	44	12.8	436	27.8	<0.0001[b]
Histology					
Adenocarcinomas	35	10.2	281	17.9	0.0005
Adenosquamous	21	6.1	81	5.2	0.48
Squamous cell	288	83.7	1205	76.9	0.006
Extent of Disease					
Localised	144	41.9	792	50.5	0.004
Regional	36	10.5	179	11.4	0.61
Distant	37	10.8	76	4.9	<0.0001
Not known	127	36.9	520	33.2	0.19
FIGO stage					
IA	90	26.2	357	22.8	0.18
IB	72	20.9	468	29.9	0.0009
II & III	85	24.7	312	19.9	0.047
IV	12	3.5	26	1.7	0.028
Unknown	85	24.7	404	25.8	0.68
Treatment within 1 year of diagnosis[c]					
Total Hysterectomy	75	23.4	266	18.3	0.036
Radical Hysterectomy	54	16.9	338	23.3	0.013
Brachytherapy	96	30.0	399	27.5	0.36
Hospital admission within 3 months of diagnosis[d]					
Cancer Centre	192	57.1	893	58.1	0.75
Public hospital without a cancer centre admission	57	17.0	128	8.3	<0.0001
No admission to public hospital	87	25.9	516	33.6	0.006

Notes: *a) P value for differences between Māori and non-Māori*
b) P value for differences in age distribution
c) Restricted to those diagnosed before 2006 (320 Māori and 1,452 non-Māori)
d) Admission with a primary diagnosis of cervical cancer. Restricted to those diagnosed before October 2006 (336 Māori and 1,537 non-Māori)

From 1996 to 2006, there were significant declines in the rates of cervical cancer registrations and disparities between Māori and non-Māori women in New Zealand (Table 2). Māori registrations dropped 9% (95% CI: 6%–12%) per year over the cohort period, which was a significantly (p=0.020) greater decline than for non-Māori, 5% (95% CI: 3%–7%) per year.

There were also significant declines in the death registration rates and cervical cancer mortality disparities between Māori and non-Māori for the period 1996 to 2005 (Table 2). Māori death rates dropped 14% (95% CI: 10%–18%) per year, a significantly (p=0.018) greater decline than for non-Māori, 8% (95% CI: 6%–11%) per year.

Survival

Māori in the cohort had poorer cancer specific survival compared to non-Māori (Figure 1) with an age adjusted HR 2.07 (95% CI: 1.63–2.62). The survival disparity between Māori and non-Māori differed depending on time from diagnosis (test for proportionality, p=0.019). The HR for survival in the first two years following diagnosis was 2.39 (95% CI: 1.83–3.13) compared with 1.27 (95% CI: 0.75–2.15) for survival after two years from diagnosis. All subsequent survival analyses were done for survival in the two years following diagnosis.

Over the cohort period, Māori cervical cancer survival (in the two years following diagnosis) improved compared to non-Māori (Table 3). The reduction in survival disparity in the two years following diagnosis was driven by improved survival for Māori HR 0.89 (95% CI: 0.81–0.97 per year), and a small non-significant reduction in survival for non-Māori HR 1.04 (95% CI: 0.98–1.10 per year) (Table 3). The mortality hazard ratios for Māori compared to non-Māori for moving averages of two year diagnostic period are presented in Table 4.

Among cancers with stage recorded, there was an improvement in stage at diagnosis over the cohort period (Kendall's Tau-b -0.09, p<0.0001) for both Māori and non-Māori. There were no significant differences in the changes to stage between the Māori (Kendall's Tau-b -0.11) and non-Māori (Kendall's Tau-b -0.08) groups (p=0.65). The reduction in survival disparity over time remained significant (interaction ethnicity*time, p=0.001) when stage was entered into the survival models (Table 3) with the pattern of reducing hazard ratios over time similar to the unadjusted model (Table 4).

Treatment

Within the first year following diagnosis, 341 women in the cohort received total hysterectomies, 392 radical hysterectomies and 495 received brachytherapy (Table 1). Compared to non-Māori women, Māori women were significantly less likely to receive a radical hysterectomy and more likely to receive brachytherapy (Table 5). Differences in treatment with radical hysterectomy or brachytherapy were not significant after adjusting for age and FIGO stage. Māori women with FIGO 1A disease were more likely to receive a total hysterectomy. Adjusting for treatment in the survival model had little impact on Māori:non-Māori hazard ratios (Table 3).

The improved survival for Māori is unlikely to be explained by changes in the quantity of treatment received by hysterectomy or brachytherapy over the time period. The proportion of radical hysterectomies (p<0.001) and brachytherapy (p=0.04) reduced significantly over the study period; however the reductions were similar for the Māori and non-Māori groups (p>0.05).

Figure 1: Māori and non-Māori cervical cancer survival, 1996-2005 (unadjusted).

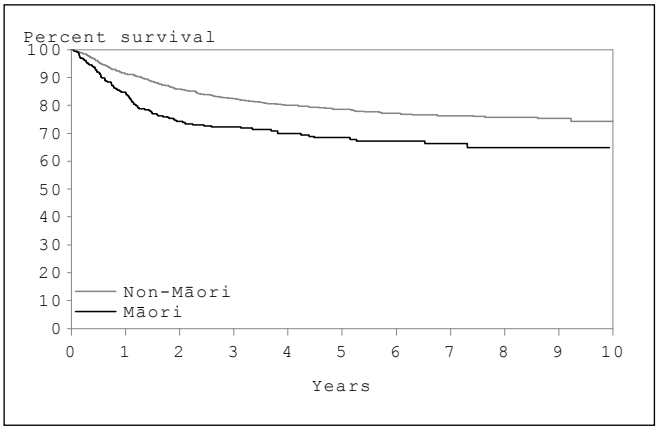

Table 2: Cervical cancer registrations and deaths by ethnicity, by year.

Year	Cervical cancer registrations					Cervical cancer deaths				
	Māori		Non-Māori		Rate ratio	Māori		Non-Māori		Rate ratio
	n	Rate[a] (95% CI)	n	Rate[a] (95% CI)	(95% CI)	n	Rate[a] (95% CI)	n	Rate[a] (95% CI)	(95% CI)
1996	39	15.5 (11.3, 21.3)	156	6.7 (5.7, 7.9)	2.3 (1.6, 3.3)	22	8.9 (5.8, 13.5)	61	1.9 (1.4, 2.5)	4.7 (2.8, 7.7)
1997	42	16.3 (12.0, 22.0)	154	6.0 (5.0, 7.1)	2.7 (1.9, 3.9)	19	7.5 (4.8, 11.8)	54	1.5 (1.1, 2.1)	5.0 (2.9, 8.6)
1998	27	9.8 (6.7, 14.3)	161	6.2 (5.2, 7.3)	1.6 (1.1, 2.4)	18	6.5 (4.1, 10.4)	59	1.6 (1.2, 2.2)	4.1 (2.3, 7.0)
1999	40	13.8 (10.1, 18.9)	169	6.7 (5.7, 7.9)	2.1 (1.5, 2.9)	20	7.1 (4.6, 11.0)	51	1.5 (1.1, 2.0)	4.8 (2.8, 8.3)
2000	43	14.4 (10.7, 19.4)	156	6.4 (5.4, 7.6)	2.3 (1.6, 3.2)	17	5.8 (3.6, 9.3)	49	1.3 (1.0, 1.9)	4.3 (2.4, 7.7)
2001	30	9.8 (6.9, 14.1)	152	6.2 (5.2, 7.4)	1.6 (1.1, 2.3)	13	4.2 (2.4, 7.2)	50	1.1 (0.8, 1.6)	3.7 (2.0, 7.0)
2002	29	9.0 (6.3, 13.0)	140	5.7 (4.7, 6.8)	1.6 (1.1, 2.4)	12	3.7 (2.1, 6.5)	53	1.3 (1.0, 1.8)	2.8 (1.4, 5.3)
2003	28	8.6 (5.9, 12.5)	136	5.4 (4.5, 6.4)	1.6 (1.1, 2.4)	8	2.3 (1.2, 4.7)	50	1.3 (0.9, 1.8)	1.8 (0.8, 4.0)
2004	26	7.5 (5.1, 11.0)	117	4.5 (3.7, 5.5)	1.7 (1.1, 2.6)	15	4.3 (2.6, 7.1)	56	1.4 (1.0, 1.9)	3.0 (1.7, 5.5)
2005	16	4.6 (2.8, 7.5)	111	4.2 (3.4, 5.2)	1.1 (0.6, 1.8)	13	3.5 (2.1, 6.1)	41	1.0 (0.7, 1.5)	3.5 (1.8, 6.9)
2006[b]	24	6.5 (4.4, 9.7)	115	4.7 (3.8, 5.7)	1.4 (0.9, 2.2)	-	-	-	-	-

Notes: *a) Age standardised (to 2001 Māori population) per 100,000 population*
b) Deaths not available for 2006

From January 2000 to the end of September 2003, there were 11 admissions to private hospitals within three months of diagnosis, with a primary discharge diagnosis of cervical cancer. One admission was for a Māori patient, who along with one non-Māori patient was also admitted to a public hospital in the three months following diagnosis. These 11 admissions were for a mix of FIGO stages; three for FIGO IA, five for FIGO IB, one for FIGO IV and two with unknown stage.

Discussion

The incidence and mortality from cervical cancer in New Zealand is decreasing for both Māori and non-Māori with improving disparities. However, Māori women remain at higher risk of cervical cancer and continue to be diagnosed with more advanced disease. Disparities in cancer specific survival between Māori and non-Māori are also decreasing. In this cohort study we found that stage at diagnosis accounted for some but not all of the difference in cancer specific survival between Māori and non-Māori. There were no differences in treatment with radical hysterectomy or brachytherapy between Māori and non-Māori in the first year following diagnosis, once adjusted for age and stage of disease. The higher receipt of total hysterectomies for Māori may reflect differences in: tumour size; the receipt of localised treatment; or the impact of private treatment for non-Māori, none of which could be examined in the dataset. Treatment (as

Table 4: Māori:non-Māori hazard ratios by grouped two years of registration (age adjusted).

Year	Two year mortality		Two year mortality adjusted for FIGO stage	
	HR	95% CI	HR	95% CI
1996-1997	3.61	2.19, 5.96	3.51	2.08, 5.91
1997-1998	2.44	1.37, 4.36	1.75	0.93, 3.28
1998-1999	3.50	1.98, 6.20	2.25	1.22, 4.14
1999-2000	3.25	1.82, 5.82	2.52	1.37, 4.63
2000-2001	1.64	0.87, 3.08	1.37	0.71, 2.64
2001-2002	1.14	0.58, 2.26	0.82	0.41, 1.65
2002-2003	1.60	0.84, 3.05	1.24	0.64, 2.43
2003-2004	1.80	0.90, 3.62	1.81	0.88, 3.70
2004-2005	1.30	0.52, 3.25	1.77	0.69, 4.54

Table 3: Hazard ratios, 1996-2005 for cervical cancer specific mortality (in the first two years following diagnosis).

	Age adjusted HR (95% CI)	Age and stage adjusted HR (95% CI)	Age, stage and treatment adjusted HR (95% CI)
Māori per year[a]	0.89 (0.81–0.97)	0.88 (0.80–0.96)	0.87 (0.79–0.95)
Non-Māori per year	1.04 (0.98–1.10)	1.05 (0.99–1.10)	1.04 (0.99–1.10)
Māori:non-Māori at 1/1/1996	4.54 (2.77–7.43)	4.31 (2.59–5.18)	4.40 (2.64–7.36)
Proportional reduction in Māori:non-Māori HR per year	0.86 (0.77–0.95)	0.84 (0.75–0.93)	0.83 (0.75–0.93)
Age <40	1.00	1.00	1.00
Age 40<50	2.83 (1.87–4.27)	1.68 (1.11–2.57)	1.76 (1.16–2.69)
Age 50<60	3.86 (2.52–5.91)	2.26 (1.46–3.49)	2.31 (1.50–3.57)
Age 60+	6.08 (4.12–8.90)	2.77 (1.84–4.16)	2.73 (1.81–4.11)
FIGO staging IA		1.00	1.00
FIGO staging IB		7.12 (2.17–23.41)	10.96 (3.29–36.51)
FIGO staging II		17.35 (5.29–56.84)	19.11 (5.75–63.46)
FIGO staging III		55.59 (17.42–177.38)	58.56 (18.18–188.56)
FIGO staging IV		180.27 (54.56–595.57)	173.59 (52.47–574.31)
FIGO staging unknown		30.43 (9.60–96.51)	31.09 (9.79–98.71)
Radical hysterectomy			0.31 (0.17–0.59)
Brachytherapy			0.80 (0.60–1.06)

Note: a) Māori x year interactions p=0.004, p=0.001 and p=0.0008 for the respective models

Table 5: Māori:non-Māori hazard ratios for procedure receipt (within one year of diagnosis) and admission to Cancer centre (within three months of diagnosis), 1996-2006.

Adjustors	Total Hysterectomy		Radical Hysterectomy		Brachytherapy		Cancer centre admission	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Age	1.20	0.90, 1.61	0.60	0.45, 0.81	1.29	1.00, 1.65	1.03	0.87, 1.23
Age and FIGO	1.36	1.05, 1.75	0.79	0.59, 1.04	1.23	0.99, 1.54	1.01	0.85, 1.21
Age and FIGO[a]	1.32	0.99, 1.77	0.81	0.61, 1.09	1.17	0.90, 1.50	0.96	0.79, 1.17
By FIGO stage[b]								
IA	1.42	1.01, 2.00	1.11	0.57, 2.16	0.59	0.07, 4.78	0.87	0.54, 1.42
IB	1.09	0.59, 2.00	0.81	0.57, 1.13	1.11	0.70, 1.76	0.83	0.59, 1.16
II-IV	0.93	0.20, 4.40	0.29	0.07, 1.26	1.17	0.86, 1.58	1.16	0.89, 1.52
Unknown	1.55	0.92, 2.60	0.63	0.25, 1.62	1.38	0.85, 2.23	1.16	0.78, 1.72

Notes: a) Excluding unknown FIGO
*b) Age adjusted from model with Māori*FIGO stage interaction term*

measured) had little impact on survival differences between Māori and non-Māori.

The relative disparity in two year survival between Māori and non-Māori decreased over the study period and was not explained by stage. Stage improvements for Māori and non-Māori were similar. There was a reduction in the proportion of radical hysterectomies and brachytherapy received over time for both Māori and non-Māori. This reduction in procedures was also similar between the two groups, and is highly unlikely to contribute to the improved survival for Māori over the same period.

Improvements in actual and relative cervical cancer specific survival for Māori are likely to be multifactorial. Health system changes have occurred over the study period, which may have contributed. Regional cancer centres have played an increasing role in driving national protocols for treatment, providing FIGO staging for cases, and management advice to other public hospitals. There have also been increases in the numbers of community and Māori health workers, which may have led to increased support of women with cervical cancer.

Other possible explanations, for the reduction in survival disparity not explored in this study include: differential improvements in co-morbid conditions for Māori; differential changes in socio-economic status; changes in the public/private provision of treatment; within stage changes in tumour characteristics (e.g. tumour size) and other aspects of service quality (e.g. adherence to best practice protocols and guidelines, improved cultural competence).

It is likely that the screening program has made a major contribution to the decreasing incidence of cervical cancer in New Zealand, although its impact on reducing inequalities between Māori and non-Māori is difficult to assess as screening coverage by ethnicity is only publicly available from 2002.[30] While persistent human papillomavirus (HPV) infection is necessary for the development of cervical cancer, there is no evidence of differences in HPV infection between Māori and non-Māori women.[31]

There are a number of limitations of this study. Firstly, small numbers limited our study power and the ability to detect significant differences and interactions by ethnicity. Secondly, ethnicity was based upon that recorded on the New Zealand Cancer Register. This has been estimated in previous research to undercount Māori ethnicity by 5-15%.[8] The undercount of Māori is likely to underestimate Māori population incidence rates and ratios with non-Māori. In the cohort analysis, ethnicity misclassification occurs in both the numerator and denominator. Some Māori may be included in the non-Māori group although the proportion and effect on this group is likely to be small.

Thirdly, the adjustment for FIGO staging was limited by the changing proportion of unknown FIGO stage data over time. Over the cohort period, an average of 25% of registrations had unknown FIGO stage, with better recording of FIGO on the cancer register during a national cervical cancer audit between 2000 and 2002, and worse recording in the latter years of this cohort study. The inconsistent recording of FIGO stage data over time limited our ability to adjust completely for stage. It is important to note that this may not reflect the accuracy of clinical coding of individual women at the local level, but may be an issue with the transfer of stage information onto the cancer register.

Limited private hospital data was available. Private hospital admissions for cervical cancer in 2000 and 2003 accounted for an average of 4% of all cervical cancer hospital admissions (public and private). Although an analysis of trends in private hospital admissions over time was not possible, the small number of admissions suggests that private hospital treatment was unlikely to play a major role in the improvement in survival for Māori.

This study focused on a comparison of cervical cancer survival and treatment for Māori with non-Māori. The primary intention was to quantify any disparities between these groups, and any changes over time. The study did not assess all aspects of treatment or treatment of these groups against best practice.

Treatment of cervical cancer represents only a part of the disease pathway; disparities between Māori and non-Māori have been documented in screening and diagnosis of cervical cancer. Māori have lower enrolment, coverage and participation in the National Cervical Screening Programme,[4] which is reflected in the higher proportions of adenocarcinoma and lower proportions of squamous cell carcinomas in non-Māori than Māori women. Māori women are also more likely to wait longer for investigation and diagnosis of abnormal smears.[4,5] Primary prevention and early diagnosis strategies remain critical to address disparities in incidence and stage at diagnosis for Māori. This will require improvements in the responsiveness of the National Cervical Screening Programme to Māori, as well as ensuring the HPV vaccination program (beginning 2008) reaches Māori equitably.

Further research is required to investigate the reasons for continuing disparities for Māori women in cervical cancer. This should include qualitative research involving health providers, Māori patients and whānau, as well as an examination of the reasons for delays to diagnosis.

Conclusions

Disparities in cervical cancer incidence, mortality and survival have improved substantially over the past decade between Māori and non-Māori women. However, Māori women are still at higher risk of cervical cancer and continue to be diagnosed at a later stage than non-Māori women. Primary prevention and early diagnosis, including immunisation and screening, remain key interventions for addressing Māori needs and reducing inequalities in cervical cancer in New Zealand.

Conflict of Interest statement

The authors declare that there are no conflicts of interest.

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