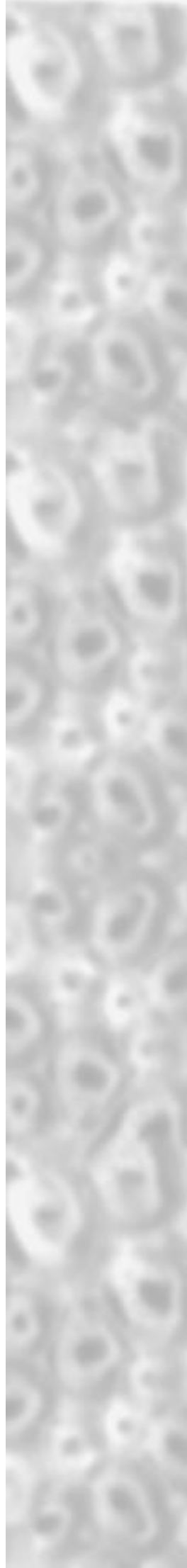


**CANCER TREATMENT POLICIES
& THEIR EFFECTS ON
SURVIVAL**

Malignant Melanoma





CANCER TREATMENT POLICIES & THEIR EFFECTS ON SURVIVAL

Malignant Melanoma

Report Produced by

NY *Northern and Yorkshire*
CRIS **Cancer Registry and Information Service**
within the **LEEDS** Teaching Hospitals NHS Trust

CANCER OUTCOMES MONITORING

in collaboration with the

Research School
of Medicine



University of Leeds

Key Sites Study Funded by the **NHS** R&D Program for Cancer

KEY SITES STUDY

KEY SITES STUDY

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2.1. FOREWORD

2.1.1. Malignant Melanoma

Incidence of melanoma is increasing in the UK. Prognosis of patients with malignant melanoma have been related to stage of disease, Breslow thickness of the lesion (the histologically measured thickness of the melanoma measured in millimetres) and lesion site. Sex and age of the patient are also important parameters (McGovern *et al.*, 1986).

Lesion thickness is known to determine risk of metastasis and death, time to recurrence and length of survival. The relationship between lesion thickness and survival is a progressive one; over 95% of the lesions under 0.76mm thick are curable, but over 5mm thick, most tumours are fatal.

Melanoma is the tumour in which gender most influences survival. In women, survival of Stage I is higher than for men by 8 - 10%, and in other stages by 10 - 15% (Kirkham *et al.*, 1992). Even after allowing for lesion site and thickness, a gender difference still persists.

Survival is significantly poorer for older patients, but this has often been shown to correlate with lesion thickness; older patients tending to present with thicker lesions. In most studies, age has not been shown to be an independent prognostic factor.

Prompt referral of patients with suspicious pigmented lesions is of paramount importance. Moles which have changed size, colour or shape, or any bleeding or crusting of moles should ideally be examined promptly by a dermatologist, so that melanomas may be diagnosed and treated as early as possible. Treatment is surgical and may be carried out by a dermatologist, a plastic surgeon or a general surgeon depending on stage, lesion thickness, site and organisation of local services. Melanomas may occasionally be excised inadvertently by a patient's GP. Adequate margins of excision influence subsequent risk of recurrence and metastases, and no adjuvant therapy has yet been shown to be of any benefit.

2.1.2. Key Sites Study

This report contains the results of a study of population-based data collected by the Northern and Yorkshire Cancer Registry and Information Service (NYCRIS). The aim of this work was to investigate, as far as possible, the degree of variation in the management of patients with malignant melanoma within the former Yorkshire region between 1986 and 1994, and to determine the impact of variation on survival, whilst allowing for casemix as far as possible. A combination of descriptive analysis of management and treatment patterns, along with survival and multivariate relative risk analyses have been performed. Lesion thickness is the most important prognostic factor for melanoma patients which may not only affect survival, but may also influence a patients referral to a dermatologist, plastic surgeon or a general surgeon. Lesion thickness data, were not routinely available for the entire time period studied, but were specifically extracted from the available pathology reports for the period 1992 to 1994. These data are presented separately in Chapter 8 of this report. The availability of local plastic surgical services may also affect a patients path of referral.

The melanoma study forms part of a larger project, funded by the NHS R&D programme for cancer, which investigates variation in the management and survival of a number of common cancers. The Calman-Hine report recommended a uniformly high standard of management for all patients with cancer. The establishment of cancer centres and units requires evidence upon which to base decision making regarding the optimal organisation and provision of cancer services. It is clear from the above that increased specialisation amongst those treating patients with cancer and the adoption of a truly multi-disciplinary approach to its management are central to improved standards of care. The results of a study such as this may provide both a valuable starting point for establishing standards to be achieved in cancer centres and units, and may contribute to the successful development of the process as a whole.

The formation of NYCRIS and the integration of the Northern and Yorkshire Cancer Registries occurred in 1997 but only data collected by the former Yorkshire Cancer Registry have been analysed in this report. Long term follow-up (survival up to five years from diagnosis) was an important component of the analysis, and retrospective methodologies were essential. The study period 1986 to 1994 was chosen to enable survival, up to five years from diagnosis, to be determined. At the beginning of this work, 1994 was the most recent year for which the cancer registry data set was complete. The research team acknowledge that some clinical practices may have changed since the end of the study period.

2.2. EXECUTIVE SUMMARY

2.2.1. Malignant Melanoma in Yorkshire 1986-94

In the nine year period 1986-1994 over 2,500 cases of malignant melanoma were registered in the former Yorkshire Region, with the recorded annual incidence increasing from 6 cases per 100,000 population in 1986, to 8 cases per 100,000 in 1994. Most melanomas (88.5%) were cutaneous (of the skin), while 9.0% were of the eye and 2.6% were of the mucosa of the head and neck, gastrointestinal tract or genitalia.

This retrospective study focuses mainly on cutaneous melanomas which, like all melanomas, increased in incidence with increasing age; however, unlike eye and mucosal melanomas, a relatively high proportion of cutaneous melanomas occurred in the under-50's (35.9% vs. 15.1% and 4.6%). The most important prognostic factor for stage I cutaneous melanoma is the thickness of the tumour; the thicker the tumour, the worse the prognosis. Cutaneous melanomas were more common in women than in men (2:1). Men tended to present with thicker melanomas but, even after adjusting for this, men had a greater relative risk of death than women. Older patients tended to present with thicker melanomas and, after adjusting for all other factors, patients aged 60 years or more also had a worse prognosis.

From 1986 to 1994 most patients were treated by plastic surgeons and dermatologists, and a decreasing proportion were treated by general surgeons (11% in 1994). There were no differences in survival according to managing specialty after adjusting for case mix, including tumour thickness, and consultant annual workload similarly had no effect on survival.

Surgery was the main treatment for all melanomas (for 97% of the cutaneous melanomas, 89% of the eye melanomas and 92% of the mucosal melanomas). Unfortunately, there are no other generally effective curative treatments for melanoma. These are clearly needed in the future because 5-year survival was 75% for cutaneous melanoma, 50% for eye melanoma and only 20% for mucosal melanoma. This study

showed that it was the pathology of the primary tumours and not variations in cancer management policies which had the greatest effect on survival.

The greatest delay in referral of cutaneous melanoma was the delay by patients presenting to their general practitioners (median 26 weeks) and not by GPs referring patients to hospital (median 20 days). This, along with the poorer prognosis for men and older patients, emphasise the importance of public education to improve survival from malignant melanoma.

M.J. Timmons
Consultant Plastic Surgeon, Bradford Royal Infirmary

2.2.2. Recommendations for Future Work

Future Monitoring of Cancer Services and Outcomes

The information contained within this report relates to the period 1986 to 1994 only, with lesion thickness data available for 1992, 1993 and 1994 (but not for all patients). This time period was selected on the basis of the most recent years for which the NYCRIS dataset was complete at the outset of the study, and to provide a cohort of patients with sufficient follow-up to enable an analysis of survival.

Since the implementation of the Calman-Hine recommendations, cancer services have undergone much restructuring, with a primary objective being the provision of a uniformly high standard of care. This study was not intended as an audit of current practice, but aimed to produce baseline data, quantifying the extent of variation in regional management of these patients, and to evaluate the potential impact on survival, whilst allowing for case mix. The current services provided for melanoma patients across the region, patients' referral details, their management and outcomes should be monitored periodically to ensure uniformity of high quality care, as far as possible.

The Northern and Yorkshire Cancer Registries merged in 1997 and variation in the management of patients in the Northern part of the region remains to be assessed. A new cancer registration system (CCRIS2), which was introduced at NYCRIS in 1999 should facilitate such studies in the future. CCRIS2 enables the recording of more detailed referral information for both Northern and Yorkshire patients. This system also allows all consultants involved in management, the treatments they administered, along with their individual hospitals to be linked together. Internal referrals to different specialties within hospitals may also be evaluated.

2.3. ACKNOWLEDGEMENTS

2.3.1. Researchers Involved in this Project:

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2.3.2. Other Acknowledgements

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POPULATION DESCRIPTION

3.1. ALL MELANOMA

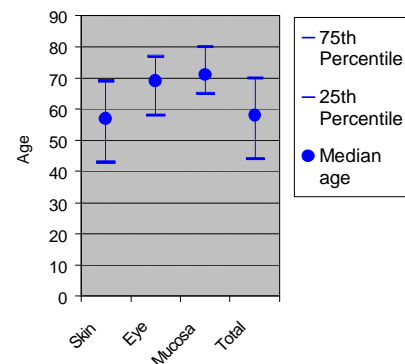
3.1.1. New Registrations

▼ Characteristics of all Melanoma Patients (1986-94)

Factor		Skin		Eye		Mucosa		All		
Sex	Male	855	36.4%	103	43.3%	17	25.0%	975	36.8%	
	Female	1491	63.6%	135	56.7%	51	75.0%	1677	63.2%	
Age Group	<20	25	1.0%	0	0.0%	0	0.0%	25	0.9%	
	20-29	156	6.6%	2	0.8%	0	0.0%	158	6.0%	
	30-39	272	11.6%	16	6.7%	1	1.5%	289	10.9%	
	40-49	392	16.7%	18	7.6%	3	4.4%	413	15.6%	
	50-59	457	19.5%	46	19.3%	3	4.4%	506	19.1%	
	60-69	456	19.4%	67	28.2%	21	30.9%	544	20.5%	
	70+	588	25.1%	89	37.4%	40	58.8%	717	27.0%	
Total		All	2346	100.0%	238	100.0%	68	100.0%	2652	100.0%

▼ Median age

Site	Median age	25th Percentile	75th Percentile
Skin	57 years	43	69
Eye	69 years	58	77
Mucosa	71 years	65	80
Total	58 years	44	70



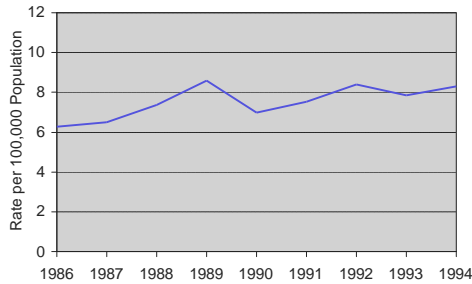
During the study period (1986 to 1994), a total of 2,652 patients were registered with a malignant melanoma (ICD9 172) in the former Yorkshire region, averaging approximately 300 new cases per annum. These figures do not include *in situ* lesions.

The melanomas fell into three main groups; melanomas of the skin, melanomas of the eye, and mucosal melanomas. The ratios of males to females were approximately 1:2 for patients with melanoma of the skin, 1:3 for patients with mucosal melanomas (mainly because there is no male counterpart for the vulvovaginal lesions in this group (DeMatos *et al.*, 1998)) and just less than 1:1 for patients with melanoma of the eye.

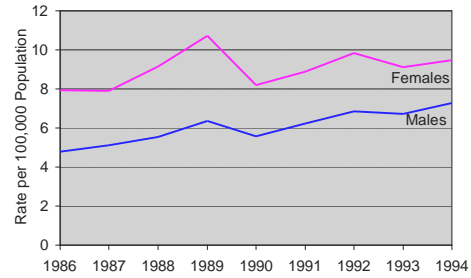
Generally, the overall incidence of melanoma rose with increasing age. The median age of all melanoma patients was 58 years. However, the median ages of patients with melanoma of the skin was younger; just 57 years compared with 69 years for patients with melanoma of the eye and 71 years for patients with mucosal melanomas.

3.1.2. Overall Age Standardised Incidence by Sex

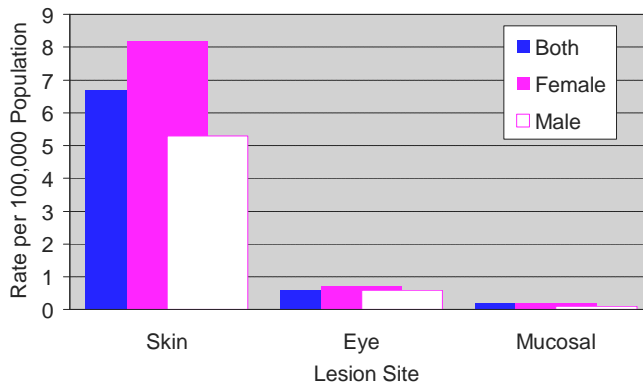
▼ Age Standardised Incidence Rate by Year 1986-94 (both sexes)



▼ Age Standardised Incidence Rate by Year 1986-94 – by sex



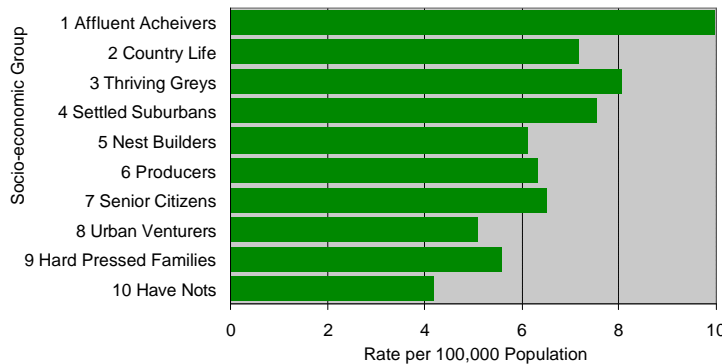
▼ Age Standardised Incidence Rate in Yorkshire by Lesion Site and Sex, 1986-94



Over the study period, the overall incidence of malignant melanoma increased by 33%, from just over 6 cases per 100,000 to over 8 cases per 100,000 with incidence being consistently higher in females than in males. Incidence of melanoma of the skin was much higher than that of the eye or mucosa, and the gender differences were more marked.

3.1.3. Age Standardised Incidence by Socio-economic Group

▼ Skin Melanoma- Age Standardised Rate by Socio-economic Group 1986-94 (n=2346)



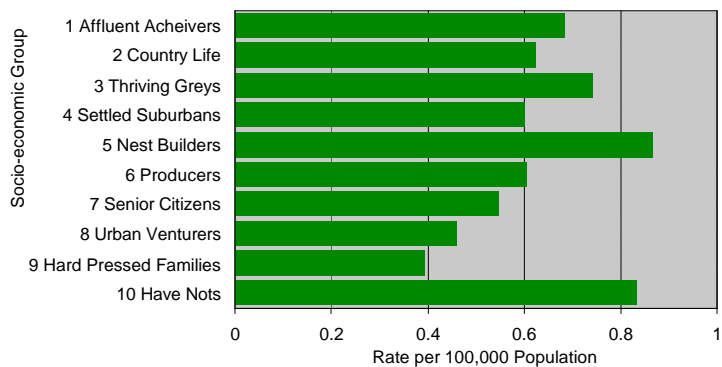
Socio-economic status has been shown to influence both incidence and prognosis (Lee and Strickland, 1980; Kirkpatrick *et al.*, 1990; MacKie and Hole, 1996).

Incidence has been shown to be highest

in the more affluent groups, whilst thinner lesions are more common and survival significantly better. The incidence of melanoma of the skin in the Yorkshire patients was also found to be strongly correlated with socio-economic status; highest incidence rates in the most affluent group being 10 cases per 100,000 population, and just over 4 cases per 100,000 population in the most deprived group.

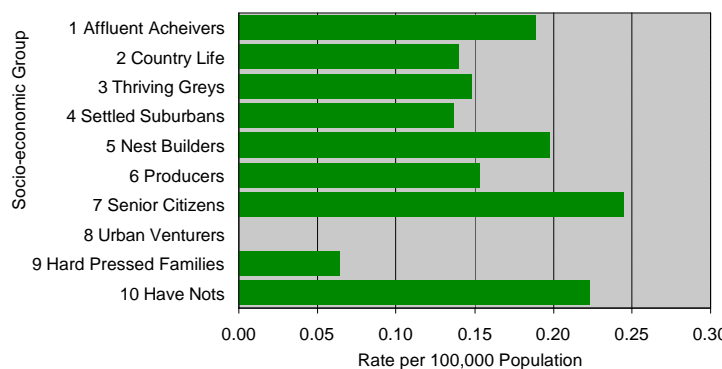
It has been suggested that this variation may be influenced by differences in the degree of exposure to intense sunlight between groups; those in the higher social groups being more likely to have travelled to hot climates more frequently than those of the more deprived groups (Nelemans *et al.*, 1993).

▼ Melanoma of the Eye - Age Standardised Rate by Socio-economic Group 1986-94 (n=238)



As with melanomas of the skin, there appeared to be some relationship between incidence of melanoma of the eye and socio-economic group. In general, there was a decreasing trend in incidence in more deprived groups.

▼ Mucosal Melanoma - Age Standardised Rate by Socio-economic Group 1986-94 (n=68)

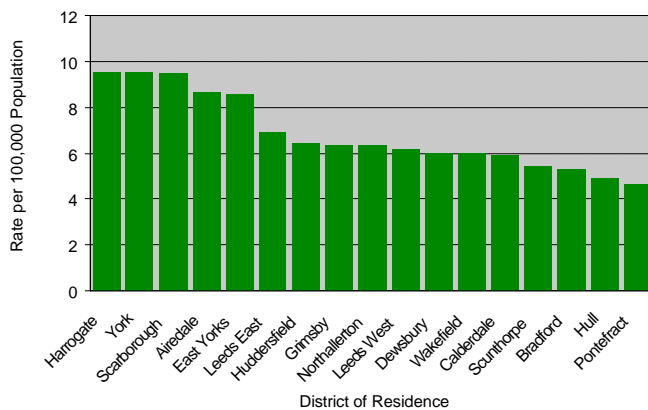


There was no clear relationship between the incidence of mucosal melanoma and socio-economic group.

However, numbers in each group were too small to be conclusive (n=68 in total).

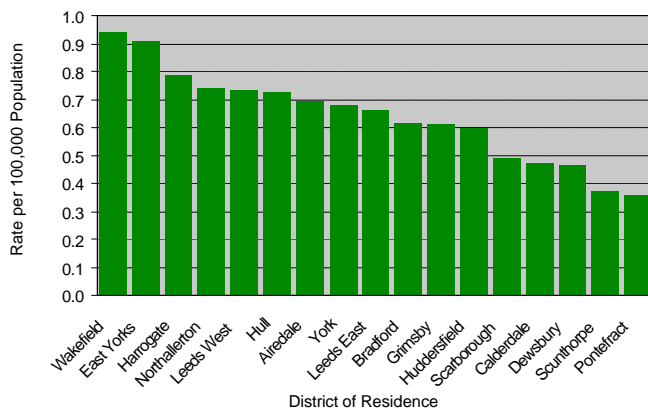
3.1.4. Age Standardised Incidence by District of Residence

▼ Skin Melanoma - Age Standardised Rate by District, 1986-94



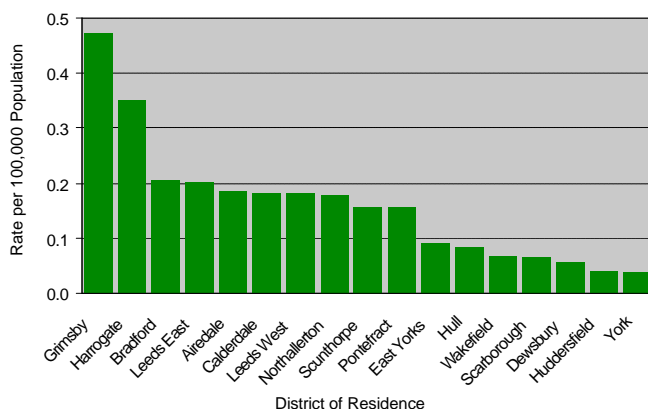
The highest incidence rates of melanoma of the skin were found in the districts of Harrogate, York and Scarborough, with 9.5 cases per 100,000 population. The lowest incidence rate of 4.5 cases per 100,000 was found in Pontefract. Differences in incidence between districts could be influenced by the proportion of residents from each socio-economic group (see below); higher incidence tending to be found in the more affluent districts.

▼ Melanoma of the Eye - Age Standardised Rate by District, 1986-94



Incidence of melanoma of the eye varied by district of residence from 0.9 cases per 100,000 population in East Yorkshire, Wakefield and Harrogate, down to 0.4 cases per 100,000 in Scunthorpe and Pontefract.

▼ Mucosal Melanoma - Age Standardised Rate by District, 1986-94



There was also considerable variation in the incidence of mucosal melanoma, according to district of residence, with the highest incidence of 0.5 per 100,000 in Grimsby and very low incidence of under 0.05 cases per 100,000 in York and Huddersfield. It is possible that this is random variation as the mucosal melanomas were the smallest study group, with just 65 cases registered within the study period making numbers per district very small.

▼ Proportion of Patients in the Most Affluent Socio-economic Groups (1-3), by District of Residence

District	Groups 1-3
Northallerton	78.8%
Harrogate	55.3%
East Yorkshire	48.0%
Airedale	47.4%
Scarborough	46.9%
York	40.2%
Leeds West	25.6%
Leeds East	24.7%
Wakefield	24.1%
Grimsby	22.3%
Scunthorpe	21.0%
Calderdale	18.8%
Huddersfield	17.8%
Dewsbury	17.6%
Hull	13.7%
Bradford	9.9%
Pontefract	9.9%
Yorkshire	30.7%

Incidence and prognosis of cutaneous melanoma has been shown to be strongly correlated with socio-economic status (Lee and Strickland, 1980; Kirkpatrick *et al.*, 1990; MacKie and Hole, 1996); incidence being highest and prognosis being better in the more affluent groups. The age-standardised district data shown above demonstrate a wide variation in incidence according to district of residence.

In those districts with the higher incidence of melanoma of the skin, there was generally a high proportion of patients from the more affluent socio-economic groups, suggesting that differences in underlying socio-economic make-up of the populations in each district might indeed affect the incidence in each district.

3.2. STUDY POPULATION

3.2.1. Exclusions

A total of 2652 melanoma patients were registered in the former Yorkshire region, over the period 1986-94. Since one of the primary aims of this study was to assess variation in management, all groups for which management data were known to be either absent or incomplete were excluded from the data set. A total of 129 patients were excluded (details are given in the table below). These included one rare ovarian melanoma, patients managed outside of the region and registrations made from the death certificate only (DCO registrations):

Extra-regionally Managed Patients: In districts such as Northallerton, which are on the border of the study region, some patients may have been diagnosed, referred and managed outside the region. These Yorkshire residents would still have their disease registered in Yorkshire and could therefore be included in the incidence data presented in Section 3.1. However, since the Cancer Registration Officers only extracted management and treatment information from the casenotes of Yorkshire hospitals at that time, information was not available for study, if management was at a non-Yorkshire hospital. Instead, management was generally recorded by the cancer registry simply as “extra-regional”. These cases were excluded from study. Of the 114 extra regionally managed patients, 85 (74.6%) had a melanoma of the eyeball. This was because a number of these patients would have been referred south of the region, to Sheffield, or north of the regions to Glasgow, for specialist management.

Death Certificate Only Registrations (DCO's): These are patients for whom, the only information registered, was that given on their death certificate. No other details were available for these patients and they were excluded from the study.

▼ Summary of Exclusions

Exclusion Type	n	Notes
Cases registered by death certificate only (DCO's)*	14	* DCO Rate = 0.5%
Extra-regionally managed **	114	**84 of these were melanoma of the eye
Rare ovarian	1	
Total Excluded***	129	***Out of a total of 2652 melanoma patients

Total number of patients eligible for study = 2, 523

3.2.2. Specific Lesion Sites

As described in Section 3.1.1, melanomas were found in 3 main groups; skin, eye and mucosa. More precise details of the lesion sites recorded are given below. The descriptions of site given are those which are found in the classification ICD9.

▼ Lesion Site Registered (described according to ICD9 coding)

Group	Site Recorded	No
1 Skin	Skin Of Lower Limb	877
	Skin Of Trunk	484
	Skin Of Upper Limb	360
	Other/Unspecified	286
	Skin NOS	182
	Skin Of Scalp	59
	Skin Of Ear	31
	Eyelid	16
	Skin Of Lip	5
	Skin, Uncertain	4
	Breast NOS	1
		2305
	2 Eye	Choroid Of Eye
Eye NOS		63
Eyeball		13
Eye		3
Orbital Neoplasm		2
	153	
1-3	Total	2523

Group	Site Recorded	No	
3 Mucosal	Genito-Urinary (n=28)	Vulva	16
		Labia Majora	3
		Penis NOS	3
		Vagina	2
		Clitoris	1
		Labia Minora	1
		Glans Penis	1
		Genital NOS	1
	Head & Neck (n=18)	Nasal Cavities	13
		Hard Palate	1
		Soft Palate	1
		Accessory Sinus NOS	1
		Ethmoidal Sinus	1
	Maxillary Sinus	1	
	Lower GI (n=19)	Anus NOS	10
		Anal Canal	4
		Oesophagus NOS	2
		Oesophagus Lower Third	1
		Rectum NOS	1
		Rectum/Anus	1
			65

NOS =
Not otherwise
specified

3.2.3. Melanoma of the Skin - Specific Site by Sex

Site of Melanoma	All		Female		Male	
Lower limb	877	38.0%	714	48.7%	163	19.5%
Trunk	484	21.0%	188	12.8%	296	35.3%
Upper limb	360	15.6%	237	16.2%	123	14.7%
Face	286	12.4%	169	11.5%	117	14.0%
Skin Unspecified	186	8.1%	112	7.7%	74	8.9%
Scalp/Neck	59	2.6%	23	1.6%	36	4.3%
Ear	31	1.3%	10	0.7%	21	2.5%
Eyelid	16	0.7%	9	0.6%	7	0.8%
Lip	5	0.2%	4	0.3%	1	0.1%
Breast	1	0.0%	1	0.1%	0	0.0%

Overall, the most common site for a cutaneous melanoma was the lower limb. However, the frequency of melanomas of each site varied by gender. As seen in the published literature, melanomas of the trunk were most common in men, and melanomas of the leg most common in women (Tersmette *et al*, 1996). Almost half of the skin melanomas in women were found on the lower limbs (48.7% compared with just 19.5% in men). In men, the highest proportion of lesions were found to be on the trunk (35.3% compared with 12.8% in women). Melanomas of the trunk have been shown to carry a generally poorer prognosis than those of other sites (Weidner, 1981).

For 8.1% of patients, the exact lesion site was not specified.

4.1.1. Management of Melanoma

The following sections, except where indicated, focus primarily upon the management of the cutaneous melanomas.

In the UK, there is increasing public awareness of the potential dangers of mole changes and pigmented lesions. The number of patients presenting early, with smaller, relatively thin lesions has also risen. The majority of melanomas are good prognosis tumours, and early stage melanoma is highly curable. Many of these lesions may now be managed entirely within a cancer unit, in accordance with agreed policy (Yorkshire Guidelines, 1997). Clinical policy should involve a multidisciplinary team; dermatology, histopathology and surgery. Patients should have access to a diagnostic service, usually provided by dermatologists. Diagnostic and therapeutic surgery should be performed by those with a specialist interest in melanoma, with recommended excision margins varying according to lesion thickness, and patients with the thickest lesions being considered for entry into clinical trials (Holmstrom, 1992; Guidelines for Yorkshire, 1997).

Surgery for tumours in difficult sites and subungual melanomas should be performed by plastic surgeons, preferably in cancer centres. For patients with poor prognosis lesions and those with metastatic disease, there should be a co-ordinated policy between cancer units and a cancer centre providing medical and clinical oncology. There is yet no proven adjuvant therapy, but some clinical trials have shown encouraging results (Kirkwood *et al.*, 1996)

No role for elective lymph node dissection has been established in the management of melanoma (Balch *et al.*, 1992; Balch, 1995) but it may be acceptable to excise lymph nodes underlying advancing tumours in certain areas such as inguinal tumours. Clinically detectable node metastases should be treated with radical node dissection. Metastases in the limb may be treated by simple excision, CO₂ laser, limb perfusion or isolated limb perfusion with cytotoxic drugs. Radiotherapy may be used, in high doses, to cause tumour shrinkage and palliation. This modality may also be applied to palliate cerebral metastases.

4.1.2. NYCRIS Management Data

To facilitate understanding of the following analyses of management, the reader should consider the notes given below regarding the NYCRIS data set.

Histology

When a histological diagnosis of malignant melanoma is made for a resident of the Northern & Yorkshire region, a copy of the pathology report is sent to NYCRIS, and the histological details recorded for that patient. Lesion thickness data were not routinely available for the entire time period. However, where specifically stated, thickness data were obtained from the pathology reports for the period 1992-94 and this period is studied separately in Chapter 8.

Managing Hospitals and Consultants

The trust analyses in Section 4.4 were based upon the hospital of primary management. During the study period, up to three hospitals could be recorded for each patient. The hospital of primary management (which for melanoma patients is defined as the hospital of surgery, otherwise the hospital where the primary treatment decision was made) was available for the majority of patients. Any attendance at a radiotherapy centre was also recorded. Hospitals were not recorded if a patient was referred, for example, for an assessment only without formal transfer of management.

This was also true of the recorded managing consultants. A consultant would only be recorded by NYCRIS if management of a patient was actually transferred to that consultant. Only those consultants performing therapeutic surgery for melanoma were recorded. Consultants (usually dermatologists) who made the diagnosis, but refer a patient on to a plastic surgeon for treatment, would not be recorded. Up to three managing consultants per patient could be recorded.

Treatment

With respect to treatment, all surgery administered to the primary tumour (whether diagnostic or therapeutic) was recorded, but details regarding the margins of excision were not known. Surgery for metastases and lymph node dissections were not recorded.

Any radiotherapy given, regardless of its intent, was recorded, but details of courses and doses were not available. Chemotherapy was recorded, but details of the agents used and the doses administered were not. Details of investigations such as CT scanning and chest X-ray were not routinely recorded.

The availability of potentially relevant data items is summarised in Section 9.2.2

Treatment of Patients Residing on the Border of the Region

In Section 3.2.1, it was noted that in Northallerton, which is on the border of the study region, some patients may have been diagnosed, referred or managed outside the region. These Yorkshire residents would have their disease registered in Yorkshire. However, the management details of extra-regionally treated patients were not available for study, and these patients were excluded from study. If for example, a relatively high proportion of patients from such a district were referred to a plastic surgeon outside the region then this would affect the figures for that district. It is important that the potential effects of this are considered when drawing conclusions from the treatment rates, referral, management and outcome data of the Northallerton patients in particular.

4.2. TREATMENT

4.2.1. Treatment by Study Group

▼ Frequency of Treatment Modalities

Specialty	n=2305	Skin	n=153	Eye	n=65	Mucosa
Surgery	2246	97.4%	136	88.9%	60	92.3%
Radiotherapy	48	2.1%	11	7.2%	12	18.5%
Chemotherapy	75	3.3%	6	3.9%	7	10.8%

Over 97% of the skin melanoma patients had their tumour excised surgically, although, as mentioned above, the excision margins could not be determined from the available data. The relatively small number of patients in this group who had no surgery recorded were generally found to be those of poor prognosis, either elderly patients and/or those with more advanced metastatic disease, many of whom received non-surgical therapy or palliative care which was not recorded by the registry.

Surgery rates were slightly lower for the patients with melanoma of the eye or mucosa (88.9% and 92.3% of cases respectively). However, a number of the patients with melanoma of the eye had been referred outside of the region for specialist management and subsequently excluded from the study (see exclusions in Section 3.2.1), thus lowering the rates of surgery for the remainder of this group. Relatively few patients with melanoma of the skin or eye were given additional non-surgical therapy; chemotherapy and radiotherapy rates being highest for those patients with mucosal melanoma (10.8% and 18.5% respectively).

4.3. CLINICAL SPECIALTIES

As mentioned in Section 4.1.1, the management of melanoma should, in many cases, involve a multidisciplinary team including dermatology, histopathology and surgery, and both diagnostic and therapeutic surgery should be performed by those with a specialist interest in melanoma.

Optimal care of cancer patients and improved outcomes are thought to be most likely achieved by specialist consultants (Stiller, 1988; Selby *et al.*, 1996). The following section focuses upon the variation in main managing clinical specialties involved in the management of melanoma patients during the study period. The specialties of consultants managing patients with melanoma may, of course, vary appropriately according to the lesion thickness, site and stage. However, management may also vary according to availability of local cancer services. For example, patients residing in certain districts might be more likely to be managed by a plastic surgeon than patients of other districts where plastic surgical services were less conveniently available. Managing specialties according to place of residence and various case mix factors are investigated below, and also in Chapter 8 (which allows for variation in lesion thickness for the period 1992 to 1994 only).

As described in Section 4.1.2, up to three managing consultants could be recorded for each patient, but this did not include consultants performing diagnosis only. Hospital and consultant workloads, i.e. the volume of melanoma patients managed by consultants and at individual hospitals are investigated in Section 4.4.

4.3.1. Frequency of Clinical Specialties Involved in Management

▼ Frequency of Clinical Specialties Involved in Management

	Specialty	n=2305	Skin	N=153	Eye	N=65	Mucosal
Main Specialties Involved in Management	Plastic Surgeon	1156	50.2%	0	0.0%	0	0.0%
	Dermatologist	864	37.5%	1	0.7%	1	1.5%
	General Surgeon	404	17.5%	3	2.0%	19	29.2%
	General Surgery Only (no other)	262	11.4%	2	1.3%	12	18.5%
	Clinical Oncology	222	9.6%	31	20.3%	27	41.5%
	Medical Oncology	17	0.7%	3	2.0%	3	4.6%
	GP Only (no other)	82	3.6%	0	0.0%	0	0.0%
Privately Managed Patients	103	4.5%	2	1.3%	0	0.0%	
Other Specialties	ENT	-	-	1	0.7%	16	24.6%
	Gynaecology	-	-	0	0.0%	23	35.4%
	Ophthalmology	-	-	142	92.8%	0	0.0%
	Urology	-	-	0	0.0%	5	7.7%

Just over half (50.2%) of the patients with a melanoma of the skin were managed by a plastic surgeon (either with or without additional management by a consultant from another specialty). 37.5% were managed by a dermatologist. 17.5% were managed by a general surgeon; 11.4% being managed solely by a general surgeon. Many of the patients managed by general surgeons may not have had their melanoma diagnosed previously. These figures do not include those consultants making the diagnosis only.

The variation observed in the managing specialties is likely to have been influenced, for example, by availability of local services; patients residing in a particular district where there was limited local plastic surgical services may have been managed alternatively by a dermatologist or a general surgeon. Managing specialty would also have been influenced by the extent of a patient's disease; thinner lesions being managed by dermatologists and the thicker lesions, or lesions at difficult sites more likely to have been excised by a plastic surgeon. General surgeons may have been involved in management in instances where either melanoma had not yet been confirmed or where disease was particularly advanced (Williams *et al.*, 1991) or, as mentioned above, where there were no plastic surgical services available locally. The relationship between lesion thickness and managing specialty (for the period 1992 to 1994) is investigated further in Chapter 8. Lesion thickness data were not available for the whole study period, but the specialties involved in the management of patients with advanced disease, involving positive nodes and metastases (where known) is described in Section 4.3.2.

In Section 4.2.1, only 48 (2.1%) of the patients with melanoma of the skin received radiotherapy, yet as many as 222 (9.6%) were recorded as having being managed at some point by a clinical oncologist. This is probably partly due to the fact that radiotherapy is often given to treat metastases. NYCRIS would not have recorded treatment of metastases during the study period, however management by a clinical oncologist may have been recorded. Of the patients with melanoma of the eye, 92.8% were managed by an ophthalmologist and 20.3% were managed by a clinical oncologist. Of the mucosal melanomas, 24.6% were managed by ENT, 7.7% by urology and 35.4% by gynaecology; specialties which reflect the multi-site nature of the mucosal disease.

4.3.2. Managing Specialties and Extent of Disease (Skin Only)

▼ Lymph Node Involvement and Metastases

Managing Specialties	n	Nodes Recorded Positive		Metastases Recorded	
Plastic Surgeon only	939	26	2.8%	52	5.5%
Dermatologist Only	647	3	0.5%	10	1.5%
General Surgeon	366	11	3.0%	43	11.7%
Plastic Surgeon & Dermatologist	217	2	0.9%	10	4.6%
GP Only	82	0	0.0%	1	1.2%

As mentioned above, lesion thickness data were only available for the years 1992 to 1994 (Chapter 8). However, in attempting to investigate disease stage and the effects on managing specialty for the whole time period, we have explored the available data on lymph nodes and metastases. Data on lymph nodes status and metastases were not consistently available for the whole data set, and for the majority of patients, the nodes status and metastases data were unknown. However, of those patients for whom this information was known, a slightly higher proportion of the patients managed by a general surgeon did appear to have more advanced disease, with positive lymph nodes and metastases recorded more frequently than for those managed by plastic surgeons and/or dermatologists. This implies that in many cases, the degree of management by a general surgeon was indeed linked with disease stage.

4.3.3. Managing Specialties by Age (Skin Only)

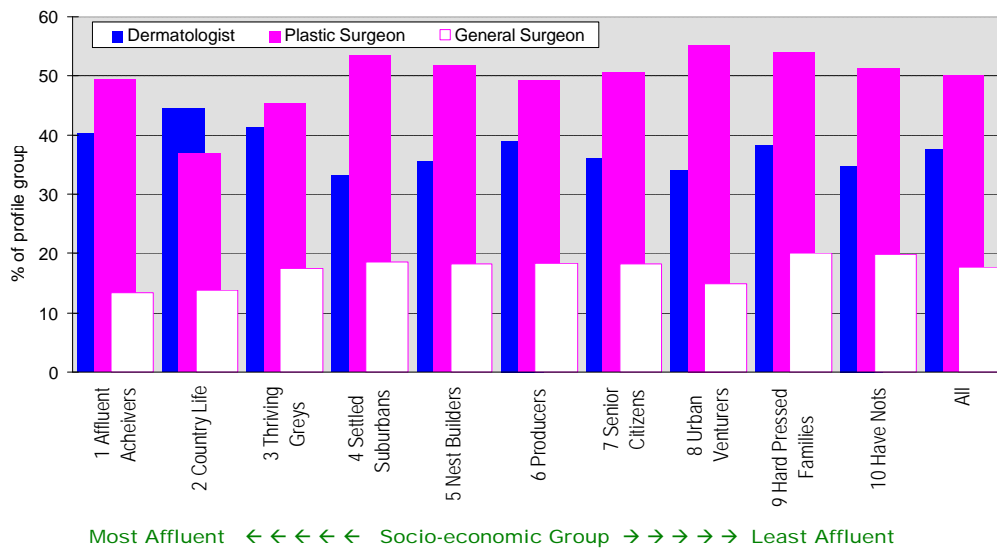
▼ Variation in Managing Specialty by Age Group

Age Group (yrs)	n	Plastic Surgeon		Dermatologist		Gen. Surgeon	
0-9	1	1	100.0%	1	100.0%	0	0.0%
10-19	22	12	54.5%	9	40.9%	1	4.5%
20-29	155	77	49.7%	64	41.3%	22	14.2%
30-39	268	123	45.9%	120	44.8%	43	16.0%
40-49	383	173	45.2%	157	41.0%	64	16.7%
50-59	452	228	50.4%	170	37.6%	79	17.5%
60-69	449	251	55.9%	148	33.0%	84	18.7%
70+	575	291	50.6%	195	33.9%	111	19.3%
Total	2305	1156	50.2%	864	37.5%	404	17.5%

The proportion of patients managed by a plastic surgeon was not significantly affected by age. However, from the age of 30 upwards, there was a slight decline in the proportion of patients managed by a dermatologist. The proportion of patients managed by a general surgeon increased in the older age groups. This is likely to be related to the extent of disease in these older groups; the more elderly patients being most likely to present with more advanced disease (see Section 8.1.3) and a higher proportion of patients with more advanced disease being managed by a general surgeon (see Sections 4.3.2 & 8.2.1).

4.3.4. Managing Specialties by Socio-economic Status (Skin)

▼ Managing Specialties by Socio-economic Group



▼ Variation in Managing Specialties by Socio-economic Group

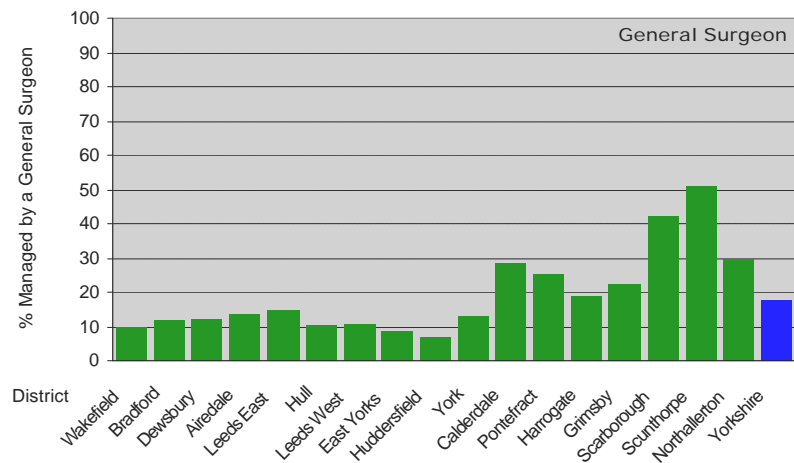
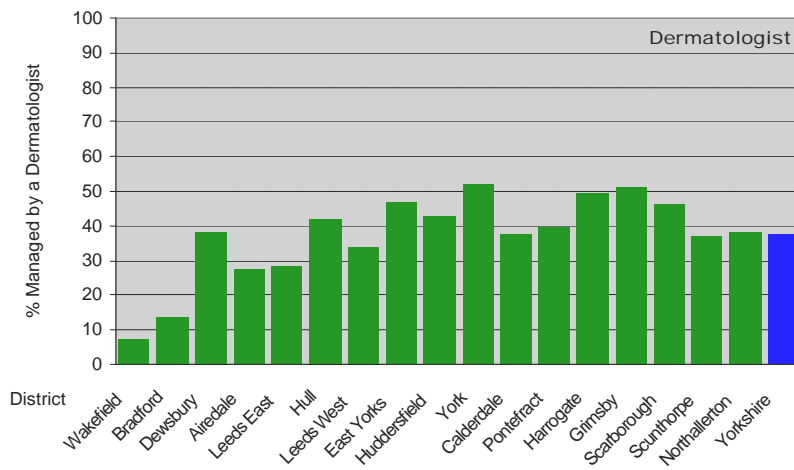
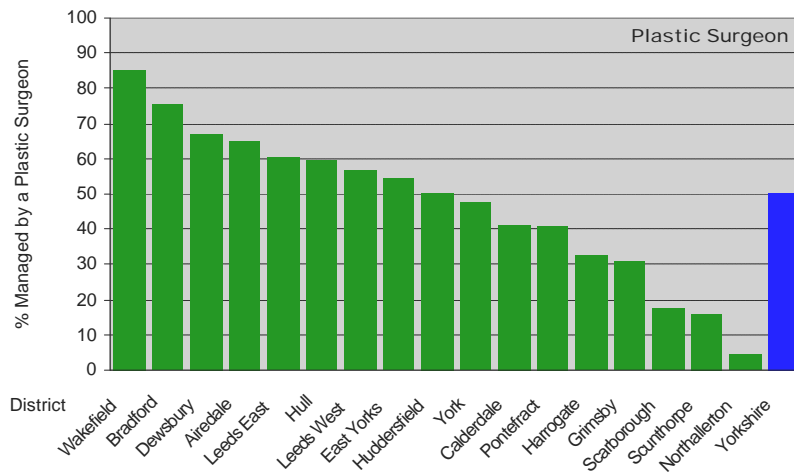
Socio-economic Group	Plastic Surgeon	Dermatologist	Gen. Surgeon	Total no. of Patients
(Most Affluent) 1 - 3	323 46.1%	288 41.1%	108 15.4%	700
4 - 7	629 51.3%	442 36.0%	226 18.4%	1227
(Least Affluent) 8 - 10	197 53.4%	133 36.0%	69 18.7%	369

Note: Socio-economic Group was not ascertained for 9 cases.

Both incidence and mortality from melanoma have been shown to be related to socio-economic status, with higher incidence rates but better survival for the more affluent groups. This variation in survival is thought to be influenced by differences in stage at presentation; the more affluent patients presenting earlier than those in the more deprived groups (MacKie and Hole, 1996). In the most affluent groups (1-3 above), there was a lower proportion of patients who were managed by either a plastic surgeon or a general surgeon, and a higher proportion managed by a dermatologists compared with the other, more deprived groups. This suggests that these patients did have lesions of better prognosis, which could be excised adequately by a dermatologist, with less need for reconstructive surgery or nodal dissection. The interaction between socio-economic status and lesion thickness on managing specialties is studied further in Sections 8.1.4 and 8.2.1.

4.3.5. Managing Specialties by District of Residence (Skin Only)

▼ Variation in Management - District of Residence



▼ Variation in Management by District of Residence

District	N	Plastic Surgeon	Dermatologist	General Surgeon	General Surgeon Only
York	244	116 47.5%	127 52.0%	32 13.1%	19 7.8%
Leeds East	219	132 60.3%	62 28.3%	32 14.6%	23 10.5%
Leeds West	215	122 56.7%	73 34.0%	23 10.7%	15 7.0%
East Yorkshire	173	94 54.3%	81 46.8%	15 8.7%	10 5.8%
Bradford	161	121 75.2%	22 13.7%	19 11.8%	12 7.5%
Airedale	154	100 64.9%	42 27.3%	21 13.6%	17 11.0%
Hull	146	87 59.6%	61 41.8%	15 10.3%	10 6.8%
Scarborough	143	25 17.5%	66 46.2%	60 42.0%	41 28.7%
Huddersfield	129	65 50.4%	55 42.6%	9 7.0%	4 3.1%
Harrogate	123	40 32.5%	61 49.6%	23 18.7%	13 10.6%
Calderdale	112	46 41.1%	42 37.5%	32 28.6%	15 13.4%
Scunthorpe	100	16 16.0%	37 37.0%	51 51.0%	41 41.0%
Grimsby	94	29 30.9%	48 51.1%	21 22.3%	10 10.6%
Dewsbury	91	61 67.0%	35 38.5%	11 12.1%	7 7.7%
Wakefield	83	71 85.5%	6 7.2%	8 9.6%	2 2.4%
Pontefract	71	29 40.8%	28 39.4%	18 25.4%	11 15.5%
Northallerton	47	2 4.3%	18 38.3%	14 29.8%	12 25.5%
All Yorkshire	2305	1156 50.2%	864 37.5%	404 17.5%	262 11.4%

The clinical specialties involved in the management of melanoma patients varied widely according to their district of residence. Generally, those districts with a relatively high proportion of patients managed by a plastic surgeon, tended to have lower rates of dermatological or general surgical management. This is likely to reflect differences in the local availability and access to plastic surgical services and may be also influenced by variation in the proportion of patients presenting with more advanced disease in each district. Although case mix does influence management, it would seem that the variation in management observed here, is too great to be a result of patient case mix alone.

In districts such as Scunthorpe and Scarborough, where there was limited access to plastic surgical services at that time (the nearest having been some distance away), a relatively high proportion of patients were managed by general surgeons. Huddersfield had the lowest proportion of patients managed by a general surgeon, with just 7% of patients being managed by consultant of this specialty. A breakdown of the main managing trusts according to district of residence is given in Section 4.5.1. The clinical specialties involved in management of melanoma patients at each trust are given in Section 4.5.2.

4.3.6. Managing Specialties over Time (Skin Only)

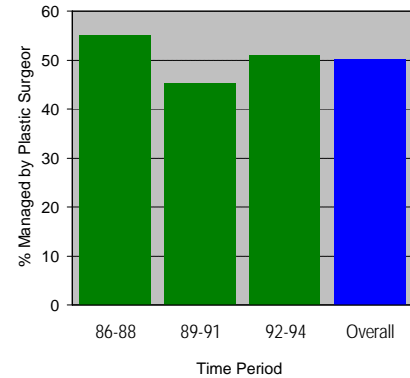
Plastic Surgeons

▼ Degree of Management by a Plastic Surgeon over Time

Time period	N	Managed by a Plastic Surgeon	
1986-1988	646	356	55.1%
1989-1991	771	349	45.3%
1992-1994	888	451	50.8%
All	2305	1156	50.2%

Across the study period, the proportion of patients managed by a plastic surgeon was relatively constant (around 50% of cases).

▼ % Cases Managed by a Plastic Surgeon over Time.



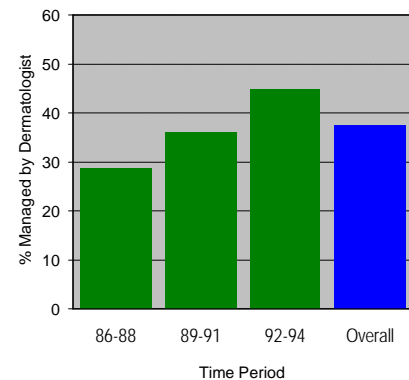
Dermatologists

▼ Degree of Management by a Dermatologist over Time

Time period	N	Managed by a Dermatologist	
1986-1988	646	186	28.8%
1989-1991	771	279	36.2%
1992-1994	888	399	44.9%
All	2305	864	37.5%

There was an increase in the proportion of patients managed by a dermatologist from 28.8% in the period 1986 to 1988, to 44.9% between 1992 and 1994. This could possibly correspond with an increase in the availability of dermatological services and could also be related to the decrease in the number of patients being managed by a general surgeon over the time period (see below).

▼ % Cases Managed by a Dermatologist Over Time



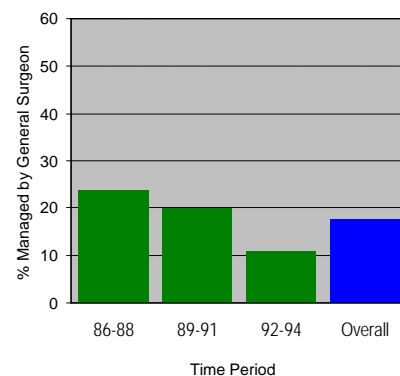
General Surgeons

▼ Management by a General Surgeon over Time

Time period	N	Managed by a General Surgeon	
1986-1988	646	153	23.7%
1989-1991	771	153	19.8%
1992-1994	888	98	11.0%
Overall	2305	404	17.5%

The proportion of patients managed by a general surgeon fell from 23.7% in the first third of the study period to 11.0% in the last third. As described above, it is likely that this change relates, particularly in some districts, with the rise in the proportion of patients managed by dermatologists. Increased public awareness could also have resulted in fewer patients presenting with more advanced disease. This would also lead to some decrease in the involvement of general surgeons.

▼ % Cases Managed by a General Surgeon over Time



Time trends showing main managing specialties by trust are described in Section 4.5.3.

4.3.7. Lesion Excisions by General Practitioners (Skin Only)

A contract issued in 1990 encouraged general practitioners to undertake minor surgical procedures in their practices (DoH *et al.*, 1989; Lowy *et al.*, 1994). The excision of minor skin lesions by GP's was thought to be advantageous to patients in that this reduced waiting times, travelling distance and was generally more convenient. The importance of adequate dermatological training for GP's excising skin lesions in their practices has frequently been stressed (Williams *et al.*, 1991). Death from metastatic melanoma after previous removal of 'moles' is well known (Whimster and Leonard, 1991) and sometimes a GP may excise a suspicious lesion of the skin which is only later diagnosed as a malignant melanoma. Guidelines for Yorkshire (1997) have recommended that, in instances where melanomas are excised inadvertently by a GP, the GP should be immediately alerted to the diagnosis. Herd *et al.* (1992) recommended that GP's should consider melanoma more often when they excise pigmented lesions; performing an excision biopsy with a lateral clearance of at least 2mm.

▼ GP Only (n=82) - Age, Sex, Lesion Site and Time Period.

	Factor	n	%
Age (yrs)	0-60	57	69.5%
	Over 60	25	30.5%
Sex	Female	57	69.5%
	Male	25	30.5%
Lesion Site	Face	6	7.3%
	Lower Limb	36	43.9%
	Trunk	14	17.0%
	Upper Limb	15	18.3%
	Unknown	11	13.5%
Time Period	1986-88	11	1.7%
	1989-91	19	2.5%
	1992-94	52	5.9%
Total		82	100%

In Section 4.3.1, 82 patients with a cutaneous melanoma were recorded as having been managed by their GP only. GPs appeared to excise lesions of relatively young patients, a high proportion of whom were female. There was also a high proportion of lesions of the limbs than in the general melanoma population (Section 3.2.3) suggesting that the lesions excised by GP's were likely to be those of generally good prognosis. None of these patients had *in situ* lesions as these were not included in our study data set.

▼ Patients Managed by GP Only by District of Residence

District	GP Only	GP Excisions		
East Yorkshire	15	8.7%	14	8.1%
York	13	5.3%	13	5.3%
Harrogate	10	8.1%	9	7.3%
Hull	7	4.8%	7	4.8%
Leeds West	6	2.8%	6	2.8%
Leeds East	6	2.7%	6	2.7%
Scarborough	5	3.5%	5	3.5%
Airedale	5	3.2%	5	3.2%
Huddersfield	5	3.9%	5	3.9%
Northallerton	4	8.5%	3	6.4%
Scunthorpe	2	2.0%	2	2.0%
Bradford	2	1.2%	2	1.2%
Grimsby	1	1.1%	1	1.1%
Pontefract	1	1.4%	1	1.4%
Calderdale	0	0.0%	0	0.0%
Dewsbury	0	0.0%	0	0.0%
Wakefield	0	0.0%	0	0.0%
Yorkshire	82	3.6%	79	3.5%

(Percentages quoted are % of melanoma patients in each district)

The proportion of GP managed patients increased over the time period from 1.7% between 1986 and 1988, to 5.9% between 1992 and 1994, probably as a result of the change in contract regarding GP surgery in 1990 (DoH *et al.*, 1989). This is most likely to have raised the number of GP excisions in the latter third of the study period.

The number of GP excisions varied by district of residence, from zero in some districts up to 14 excisions in East Yorkshire.

4.4. SPECIALIST MANAGEMENT - WORKLOAD (SKIN ONLY)

As previously stated, the optimal care of cancer patients and improved outcomes are most likely to be achieved by specialist consultants (Stiller, 1988; Selby *et al.*, 1996). In Section 4.3, we have investigated the proportion of patients managed by consultants of various clinical specialities. In this section, we assess the proportion of patients managed by consultants of each specialty managing a particular high or low number of melanoma patients per year.

4.4.1. Mean Annual Workload of Consultants

Workload values were calculated for each consultant, and are defined as the mean number of skin melanoma patients managed per practising year. Allowances were made for new consultant posts and retirements during the study period. The table below should be read as in the following examples: There were 400 patients who were managed by 2 plastic surgeons whose mean annual melanoma workload was 23 cases per year.

▼ Plastic Surgeons

Workload Cases / Year	Patients	Consultants
3 or less	23 0.9%	5
4	4 0.2%	1
5	28 1.2%	1
6	65 2.8%	1
8	25 1.1%	1
9	17 0.7%	1
10	150 6.5%	3
12	149 6.5%	2
13	70 3.0%	1
15	58 2.5%	1
17	166 7.2%	2
23	400 17.4%	2
No plastic surgeon	1149 49.8%	-
Total	2305 100.0%	21

Q1=10 Mean Workload=15 Q3=23

1156 patients were managed by a total of 21 plastic surgeons, either with or without additional management by a dermatologist. The highest plastic surgeon workload was 23 new cases per year and there were two consultants with this workload. 24 (0.9%) patients were managed by 5 plastic surgeons who managed an average of just 3 new cases or less per year.

▼ Dermatologists

Workload Cases / Year	Patients	Consultants
3 or less	117 5.0%	15
4	80 3.5%	4
5	101 4.4%	3
6	90 3.9%	2
7	56 2.4%	1
8	176 7.6%	3
9	88 3.8%	1
12	46 2.0%	1
15	110 4.8%	1
No dermatologist	1441 62.5%	-
Total	2305 100.0%	31

Q1=4 Mean Workload=7 Q3=9

864 patients were managed by a total of 31 dermatologists, either with or without additional management by a plastic or general surgeon. The highest dermatologist workload was 15 new cases per year and there was one consultant with this workload. 110 (4.8%) of patients were managed by this consultant. 117 (5.0%) patients were managed by 15 dermatologists who managed an average of just 3 cases or less per year.

▼ General Surgeons

Workload Cases / Year	Patients	Consultants
<1	19 0.8%	8
1	285 12.4%	3
2	97 4.2%	10
3	3 0.1%	1
No general surgeon	1901 82.5%	-
Total	2305 100.0%	22

A total of 22 general surgeons managed 404 (17.5%) patients over the study period. The highest mean annual melanoma workload of any of these surgeons was just 3 new cases per year. There was just one general surgeon with this workload.

4.4.2. Mean Annual Workload of Hospitals

▼ Main Managing Hospitals

Workload Cases / Year	Cases		Hospitals	
1	136	5.9%	30	47.6%
2	67	2.9%	10	15.9%
3	37	1.6%	2	3.1%
4	49	2.1%	1	1.6%
5	163	7.1%	4	6.3%
6	6	0.3%	1	1.6%
7	37	1.6%	1	1.6%
9	127	5.5%	2	3.1%
10	77	3.3%	1	1.6%
11	286	12.4%	3	4.8%
13	58	2.5%	1	1.6%
15	105	4.6%	1	1.6%
19	145	6.3%	1	1.6%
22	163	7.1%	1	1.6%
23	163	7.1%	1	1.6%
25	133	5.8%	1	1.6%
29	226	9.8%	1	1.6%
49	327	14.2%	1	1.6%
Total	2305	100.0%	63	100.0%

Q1=9 Mean Workload=19 Q3=25

Workload values were calculated for the main hospitals of management. The highest hospital workload was 49 new cases of melanoma per year and there was one hospital with this workload. 327 patients (14.2%) were managed at that hospital. Referral to a particular hospital is likely to have been influenced by the patients' district of residence and the local services available, as well as lesion thickness; patients with thicker lesions being more likely to have been referred to a plastic surgical unit, where possible. Current recommendation is that patients with a lesion of thickness greater than 1.5mm should be referred to a specialist surgical unit (Guidelines for Yorkshire, 1997).

4.4.3. Managing Specialties by Hospital Workload

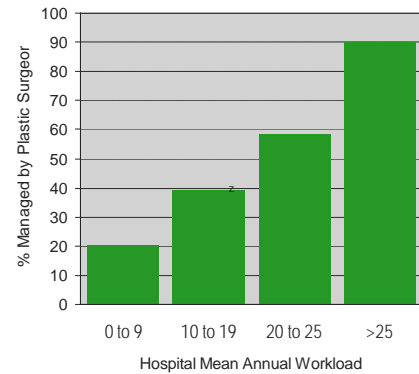
The following section investigates the proportion of patients managed by Plastic Surgeons, Dermatologists and General Surgeons according to the overall median annual workload of their main managing hospital.

▼ Degree of Management by a Plastic Surgeon by Hospital Workload

Hospital Workload	Managed by a Plastic Surgeon	Total n
0-9	127 20.4%	622
10-19	263 39.2%	671
20-25	268 58.4%	459
>25	498 90.1%	553
Overall	1156 50.2%	2305

The proportion of patients managed by a plastic surgeon increased with increasing hospital workload. 90.1% of patients managed at a hospital with annual melanoma workload greater than 25 were managed by a plastic surgeon. These data clearly reflect the concentration of relatively large numbers of patients into high workload plastic surgical units.

▼ Hospital Workload - % Managed by Plastic Surgeon

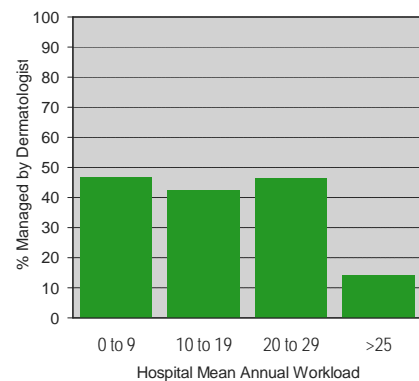


▼ Degree of Management by a Dermatologist by Hospital Workload

Hospital Workload	Managed by a Dermatologist	Total n
0-9	291 46.8%	622
10-19	283 42.2%	671
20-25	212 46.2%	459
>25	78 14.1%	553
Overall	864 37.5%	2305

The proportion of patients managed by a dermatologist was substantially lower at the hospitals with higher workloads - again probably reflecting a discrete pattern of referral of patients to high workload plastic surgical units. Over 40% of patients were managed by a dermatologist where the mean annual melanoma workload of the hospital was less than 25 cases, compared with just 14.1% of patients managed at a hospital with a high workload, greater than 25.

▼ Hospital Workload - % Managed by Dermatologist

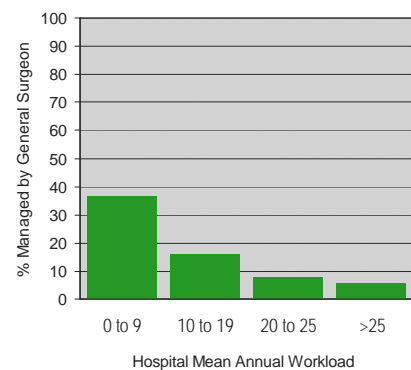


▼ Degree of Management by a General Surgeon by Hospital Workload

Hospital Workload	Managed by a General Surgeon	Total n
0-9	228 36.7%	622
10-19	108 16.1%	671
20-25	36 7.8%	459
>25	32 5.8%	553
Overall	404 17.5%	2305

The proportion of patients managed by a general surgeon was highest at the hospitals of lower workload. The degree of management by a general surgeon decreased from 36.7% at the hospitals of lowest workload, to just 5.8% at those hospitals (mainly plastic surgical units) with a high workload.

▼ Hospital Workload - % Managed by General Surgeon



4.5. MANAGING TRUSTS

The following analyses apply to melanomas of the skin (n=2305). For the purpose of these particular analyses, patients were assigned to a single trust, described as the main managing trust.

It is important to note that the main managing trust was defined here as the hospital where the lesion was excised or where the primary treatment decision was made. If a patient was referred for example, from a district general hospital to a plastic surgical unit, the trust containing the plastic surgical unit would be counted here as the main managing trust. In the analysis of managing specialties, patients may have been managed either on an in-patient or out-patient basis. From the available data we cannot ascertain which.

4.5.1. Main Managing Trusts by District of Residence

▼ Main Managing Trusts by District of Residence

District of Residence	Total No. Patients	Main Managing Trusts	No. of Patients	% of Patients in Each District
York	244	York Health Services NHS Trust	125	51.2%
		St James's & Seacroft University Hospitals NHS Trust	78	32.0%
		Other	41	16.8%
Leeds East	219	St James's & Seacroft University Hospitals NHS Trust	132	60.3%
		United Leeds Teaching Hospitals NHS Trust	50	22.8%
		Other	37	16.9%
Leeds West	215	United Leeds Teaching Hospitals NHS Trust	125	58.1%
		St James's & Seacroft University Hospitals NHS Trust	69	32.1%
		Other	21	9.8%
East Yorkshire	173	Royal Hull Hospitals NHS Trust	109	63.0%
		Other	64	37.0%
Bradford	161	Bradford Hospitals NHS Trust	143	88.8%
		Other	18	11.2%
Airedale	154	Bradford Hospitals NHS Trust	60	39.0%
		Airedale NHS Trust	51	33.1%
		Other	43	27.9%
Hull	146	Royal Hull Hospitals NHS Trust	127	87.0%
		Other	19	13.0%
Scarborough	143	Scarborough & North East Yorkshire Healthcare NHS Trust	98	68.5%
		St James's & Seacroft University Hospitals NHS Trust	13	9.1%
		Other	32	22.4%
Huddersfield	129	Huddersfield Healthcare NHS Trust	76	58.9%
		Bradford Hospitals NHS Trust	31	24.0%
		Other	22	17.1%
Harrogate	123	Harrogate Health Care NHS Trust	71	57.7%
		St James's & Seacroft University Hospitals NHS Trust	26	21.1%
		Other	26	21.1%
Calderdale	112	Calderdale Healthcare NHS Trust	69	61.6%
		Bradford Hospitals NHS Trust	34	30.4%
		Other	9	8.0%
Scunthorpe	100	Scunthorpe & Goole Hospitals NHS Trust	76	76.0%
		Royal Hull Hospitals NHS Trust	12	12.0%
		Other	12	12.0%
Grimsby	94	North East Lincolnshire NHS Trust	61	64.9%
		Royal Hull Hospitals NHS Trust	19	20.2%
		Other	14	14.9%
Dewsbury	91	Pinderfields Hospitals NHS Trust	39	42.9%
		Dewsbury Health Care NHS Trust	36	39.6%
		Bradford Hospitals NHS Trust	8	8.8%
		Other	8	8.8%
Wakefield	83	Pinderfields Hospitals NHS Trust	72	86.7%
		Other	11	13.3%
Pontefract	71	Pontefract Hospitals NHS Trust	37	52.1%
		Pinderfields Hospitals NHS Trust	21	29.6%
		Other	13	18.3%
Northallerton	47	Northallerton Health Services NHS Trust	41	87.2%
		Other	6	12.8%

The table above shows a list of the main managing trusts to which patients were referred from each district. For example, of the 244 patients who were residents of York, 51.2% were primarily managed within York Health Services NHS Trust and 32.0% were referred to St James's & Seacroft University Hospitals NHS Trust (although some of

these patients may have been initially referred to York Health Services NHS Trust, for example). Place of primary management varied according to district of residence; with varying proportions of patients in each district having been managed at a local trust, or having been referred to a trust containing a plastic surgical centre.

4.5.2. Main Managing Trusts & Clinical Specialties

▼ Percentage of Patients Treated by Clinical Specialties (for Each Managing Trust)

NHS Trust	n	% all	Pla	Der	Gen S	Gen S Only
St James's & Seacroft University Hospitals NHS Trust	336	14.6%	84.2%	20.5%	8.6%	6.0%
Bradford Hospitals NHS Trust	284	12.3%	83.8%	12.7%	7.4%	5.3%
Royal Hull Hospitals NHS Trust	274	11.9%	67.2%	42.3%	5.1%	4.4%
United Leeds Teaching Hospitals NHS Trust	184	8.0%	45.7%	48.9%	12.5%	7.6%
Pinderfields Hospitals NHS Trust	148	6.4%	91.9%	10.1%	4.7%	0.7%
York Health Services NHS Trust	134	5.8%	19.4%	74.6%	20.1%	14.9%
Scarborough & NE Yorkshire Healthcare NHS Trust	102	4.4%	3.9%	46.1%	55.9%	37.3%
Harrogate Health Care NHS Trust	84	3.6%	10.7%	66.7%	27.4%	16.7%
Huddersfield Healthcare NHS Trust	78	3.4%	33.3%	59.0%	11.5%	6.4%
Scunthorpe & Goole Hospitals NHS Trust	77	3.3%	3.9%	41.6%	58.4%	50.6%
Calderdale Healthcare NHS Trust	70	3.0%	12.9%	54.3%	41.4%	18.6%
North East Lincolnshire NHS Trust	62	2.7%	11.3%	71.0%	24.2%	12.9%
Airedale NHS Trust	51	2.2%	37.3%	54.9%	31.4%	23.5%
Dewsbury Health Care NHS Trust	44	1.9%	27.3%	68.2%	27.3%	18.2%
Northallerton Health Services NHS Trust	43	1.9%	4.7%	44.1%	25.6%	23.3%
Pontefract Hospitals NHS Trust	42	1.8%	14.3%	54.8%	42.9%	26.2%
East Yorkshire Hospitals NHS Trust	6	0.3%	33.3%	33.3%	66.7%	0.0%
Others	286	12.4%	34.2%	38.2%	13.6%	9.4%
Yorkshire	2305	100.0%	50.2%	37.5%	17.5%	11.4%

Pla = Plastic Surgeon Der = Dermatologist Gen S = General Surgeon

As described at the beginning of Section 4.5, the main managing trusts are based upon the hospital where the main surgical procedure was performed. There was much variation in the main clinical specialties managing melanoma patients according to trust. As described in the analyses of hospital workload in Section 4.4, there was a high proportion of patients managed by a plastic surgeon in the trusts seeing the higher numbers of patients. This was thought to be due to variation in the organisation of services at these trusts; the higher volume trusts tending to be those containing the plastic surgical units. The extent of a patient's disease, lesion thickness and lesion site would, to some degree, determine the referral pathway of a melanoma patient to any particular trust; those with thinner lesions being more likely to be managed by a dermatologist, whilst patients with more advanced disease or those with lesions in difficult sites more likely to be referred to a trust with plastic surgical services or managed by a visiting plastic surgeon.

Thickness data were available for the years 1992 to 1994 only. The summary given in Section 8.3 of this report repeats this analysis by trust for the years 1992 to 1994 and also takes account of patient case mix and availability of services as far as possible.

4.5.3. Main Managing Trusts & Specialties over Time

Trust	Total n	Clinical Specialty	% Patients Managed by the Given Specialty in Each Time Period			% Change
			86 to 88	89 to 91	92 to 94	
St James's & Seacroft University Hospitals NHS Trust	336	Plastic Surgeon	44.4%	78.0%	87.1%	42.7%
		Dermatologist	1.8%	24.0%	34.7%	32.9%
		General Surgeon	10.7%	8.0%	7.3%	-3.4%
Bradford Hospitals NHS Trust	284	Plastic Surgeon	91.7%	76.0%	82.5%	-9.2%
		Dermatologist	2.8%	13.5%	25.0%	22.2%
		General Surgeon	4.6%	9.4%	8.8%	4.2%
Royal Hull Hospitals NHS Trust	274	Plastic Surgeon	70.1%	63.5%	67.3%	-2.8%
		Dermatologist	56.3%	36.5%	35.4%	-20.9%
		General Surgeon	8.0%	5.4%	2.7%	-5.3%
United Leeds Teaching Hospitals NHS Trust	184	Plastic Surgeon	44.4%	53.4%	35.4%	-9.0%
		Dermatologist	44.4%	35.6%	75.0%	30.6%
		General Surgeon	14.3%	11.0%	12.5%	-1.8%
Pinderfields Hospitals NHS Trust	148	Plastic Surgeon	88.1%	92.7%	93.8%	5.7%
		Dermatologist	2.4%	12.2%	13.8%	11.4%
		General Surgeon	9.5%	4.9%	1.5%	-8.0%
York Health Services NHS Trust	134	Plastic Surgeon	10.3%	29.3%	12.8%	2.5%
		Dermatologist	55.2%	70.7%	91.5%	36.3%
		General Surgeon	37.9%	22.4%	6.4%	-31.5%
Scarborough & North East Yorkshire Healthcare NHS Trust	102	Plastic Surgeon	3.8%	2.4%	5.9%	2.1%
		Dermatologist	53.8%	35.7%	52.9%	-0.9%
		General Surgeon	69.2%	54.8%	47.1%	-22.1%
Harrogate Health Care NHS Trust	84	Plastic Surgeon	3.6%	3.6%	25.0%	21.4%
		Dermatologist	53.6%	78.6%	67.9%	14.3%
		General Surgeon	39.3%	21.4%	21.4%	-17.9%
Huddersfield Healthcare NHS Trust	78	Plastic Surgeon	7.7%	36.0%	40.0%	32.3%
		Dermatologist	69.2%	52.0%	60.0%	-9.2%
		General Surgeon	30.8%	12.0%	5.0%	-25.8%
Scunthorpe & Goole Hospitals NHS Trust	77	Plastic Surgeon	0.0%	0.0%	12.5%	12.5%
		Dermatologist	23.5%	33.3%	66.7%	43.2%
		General Surgeon	64.7%	69.4%	37.5%	-27.2%
Calderdale Healthcare NHS Trust	70	Plastic Surgeon	6.9%	4.3%	33.3%	26.4%
		Dermatologist	48.3%	60.9%	55.6%	7.3%
		General Surgeon	48.3%	39.1%	33.3%	-15.0%
North East Lincolnshire NHS Trust	62	Plastic Surgeon	9.1%	0.0%	24.0%	14.9%
		Dermatologist	54.5%	76.9%	72.0%	17.5%
		General Surgeon	45.5%	19.2%	20.0%	-25.5%
Airedale NHS Trust	51	Plastic Surgeon	38.5%	41.7%	34.6%	-3.9%
		Dermatologist	23.1%	33.3%	80.8%	57.7%
		General Surgeon	61.5%	33.3%	15.4%	-46.1%
Dewsbury Health Care NHS Trust	44	Plastic Surgeon	23.1%	21.4%	35.3%	12.2%
		Dermatologist	38.5%	92.9%	70.6%	32.1%
		General Surgeon	61.5%	7.1%	17.6%	-43.9%
Northallerton Health Services NHS Trust	43	Plastic Surgeon	20.0%	0.0%	5.9%	-14.1%
		Dermatologist	0.0%	19.0%	88.2%	88.2%
		General Surgeon	80.0%	28.6%	5.9%	-74.1%
Pontefract Hospitals NHS Trust	42	Plastic Surgeon	16.7%	10.5%	17.6%	0.9%
		Dermatologist	33.3%	42.1%	76.5%	43.2%
		General Surgeon	66.7%	57.9%	17.6%	-49.1%
East Yorkshire Hospitals NHS Trust	6	Plastic Surgeon	66.7%	0.0%	0.0%	-66.7%
		Dermatologist	66.7%	0.0%	0.0%	-66.7%
		General Surgeon	100.0%	0.0%	50.1%	-49.9%

In Section 4.3.6, there appeared to be very little change in the overall proportion of patients managed by a plastic surgeon over the time period. However, the overall proportion of patients managed by a dermatologist rose and the proportion managed by a general surgeon fell during this time. The table above shows time trends regarding the proportion of patients managed by plastic surgeons, dermatologists and general surgeons at each individual trust.

Many of these changes appear to reflect reorganisation of dermatological and plastic surgical services in the region, along with a gradual migration of services towards the Cancer Centres. There were particularly large decreases in the proportion of patients managed by a general surgeon in the lower volume district general hospitals (from York Health Services NHS Trust and those listed below that trust).

5.1. INTERVALS OF MANAGEMENT

Public education, prevention programmes, earlier presentation to the GP, improvements in diagnostic services and referral for appropriate treatment are all potentially important to the improvement of melanoma mortality. Stage of disease is one of the most important prognostic factors for melanoma patients and early presentation is paramount.

Patients generally present to their GP with a suspicious pigmented lesion. The GP may then refer the patient to a diagnostic service, usually provided by dermatologists, where malignant melanoma is diagnosed. Patients may be referred for management by either a dermatologist and/or a plastic surgeon or general surgeon, depending upon the site of their lesion and the extent of disease.

▼ Interval Data - Entire Study Period

Interval	Data Available	25th Percentile	Median	75th Percentile	Mean
First Symptom to GP	561 24%	13 weeks	26 weeks	57 weeks	26 weeks
GP to First Hospital Visit	1345 58%	10 days	20 days	38 days	31 days
GP to Surgery	1315 57%	16 days	31 days	58 days	51 days
First Hospital Visit to Surgery	2181 95%	0 days	4 days	14 days	16 days

The median time intervals between first symptoms, GP referral to hospital, the first hospital visit and treatment are given above. Data were not available for all patients, with only 24% of patients having data recorded for the interval between first symptom and the GP's referral. According to Yorkshire guidelines (1997), the recommended interval between the GP's referral and visit to hospital for diagnosis is 4 weeks. During the study period, the medium length of time for this interval (where the relevant data were available) was just 10 days.

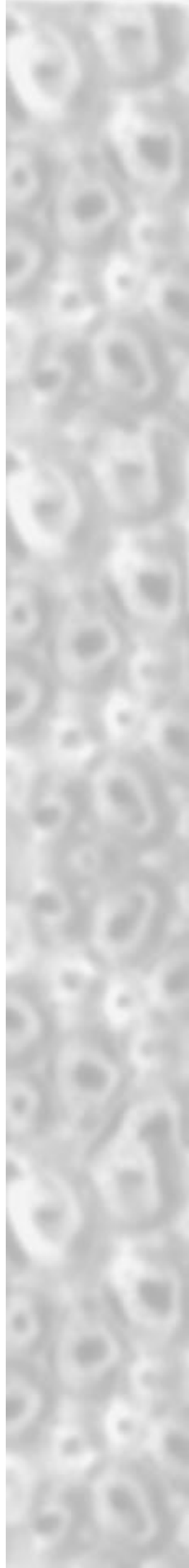
The recommended interval from initial consultation to removal of the lesion is 2 weeks. However, for the 57% of cases for which this interval was known, the median time from GP to surgery was over 4 weeks.

5.2. INTERVALS OF MANAGEMENT OVER TIME

▼ Intervals of Management over Time

Interval	Time Period	25th Percentile	Median	75th Percentile
First Symptom to GP (weeks)	1986-1988	13	26	78
	1989-1991	13	26	60
	1992-1994	13	26	52
GP to 1st Hospital Visit (days)	1986-1988	8	21	39
	1989-1991	9	17	35
	1992-1994	10	20	40
GP to Surgery (days)	1986-1988	18	36	63
	1989-1991	15	28	56
	1992-1994	17	30	61
1st Hospital Visit to Surgery (days)	1986-1988	1	6	17
	1989-1991	0	5	16
	1992-1994	0	4	15

There were no significant changes in the available referral intervals across the study period.

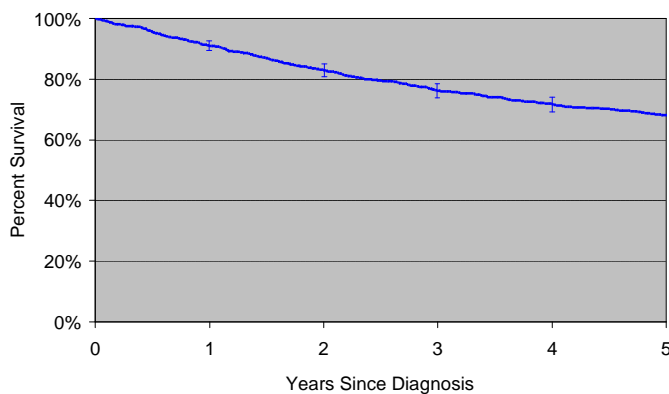


The prognosis of melanoma patients has been associated with lesion thickness, sex, site, age and socio-economic status (Weidner, 1981; MacKie and Hole, 1996; MacKie *et al.*, 1997; Balzi *et al.*, 1998; Smith *et al.*, 1998; Hemo *et al.*, 1999).

Within this particular study, survival was the only outcome measure evaluated. Analysis of other potentially important measures such as the cosmetic results of treatment, was not possible using cancer registry data. The analyses in this chapter look at survival of melanoma patients according to individual factors, with no adjustment for case mix. A case mix-adjusted multivariate analysis of survival for the whole period 1986 to 1994 is presented in Chapter 7. Lesion thickness data are included in further survival analyses of the period 1992 to 1994 in Section 8.4.

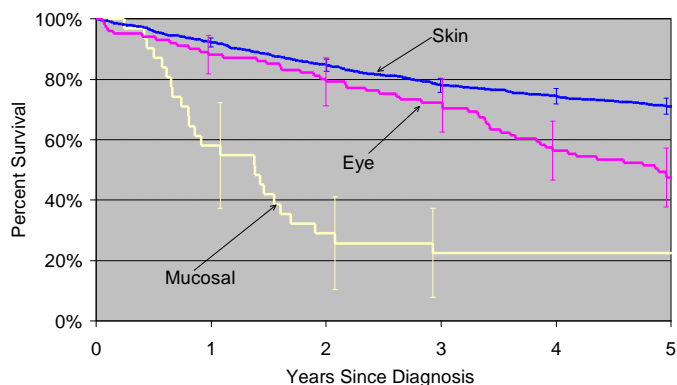
6.1. OVERALL SURVIVAL

▼ Survival of all Melanoma Patients



70% of all the patients included in this study (all melanomas - of skin, eye and mucosa) were alive at 5 years from diagnosis.

▼ Survival of all Melanoma Cases by Site Group

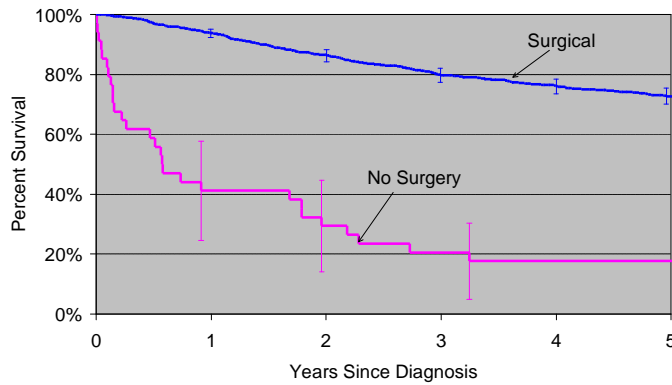


Survival for melanoma of the skin, eye and mucosa are shown here separately. At 5 years from diagnosis, 75% of the skin melanoma patients were still alive compared with 50% of the eye melanoma patients and just 20% of the mucosal melanoma patients.

6.2. SURVIVAL BY TREATMENT

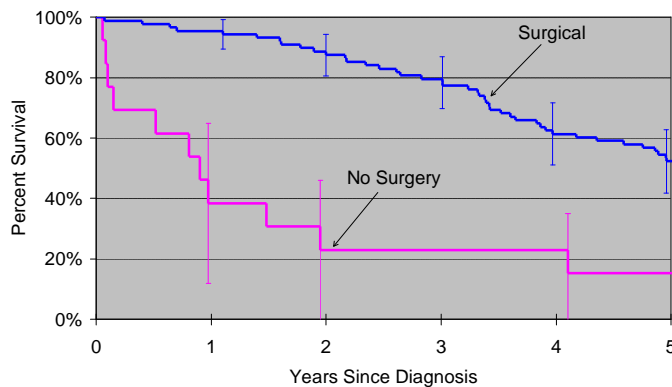
6.2.1. Survival of Surgical and Non-surgical Patients

▼ Melanoma of Skin: Surgery v No Surgery

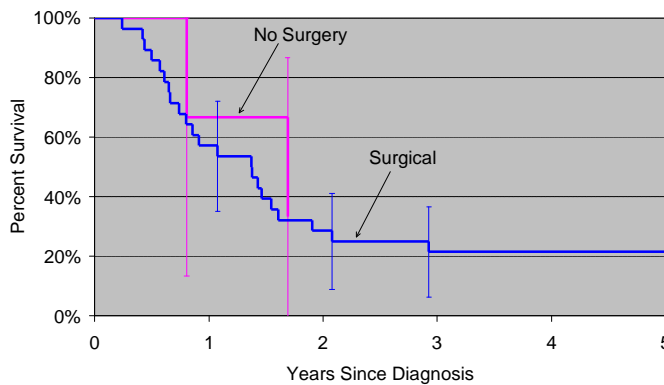


Unsurprisingly, survival was poorer for those patients with cutaneous melanoma and melanoma of the eye who did not receive surgery. However, there may have been valid clinical reasons why no surgery was performed.

▼ Melanoma of Eye: Surgery v No Surgery



▼ Mucosal Melanoma: Surgery v No Surgery



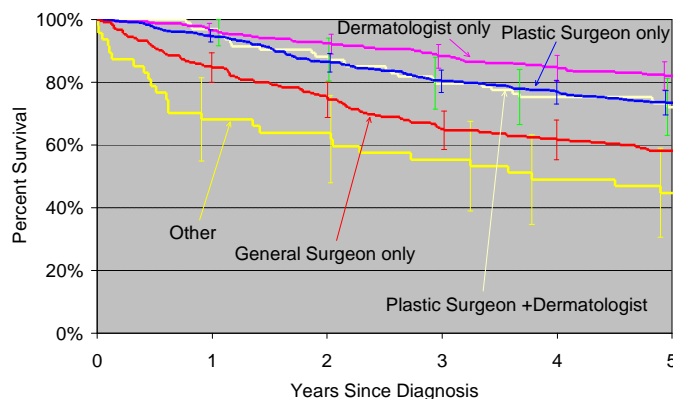
There were very few patients with mucosal melanoma who did not receive surgery, but again survival was poorer for the group of patients who were not operated upon.

6.3. SURVIVAL BY SPECIALTIES AND WORKLOAD

In Section 4.3 we saw that the clinical specialties involved in the management of melanoma patients varied according to the extent of disease, a patients age, socio-economic status and their district of residence. We also found variation in the mean annual melanoma workload of consultants of different specialties and between hospitals. The following analyses investigate survival of melanoma patients according to the combination of their managing specialties. The effects of the mean annual workload of hospital and consultants are also investigated.

6.3.1. Survival of Melanoma of Skin by Clinical Specialties

▼ Melanoma of Skin - Survival by Managing Specialties

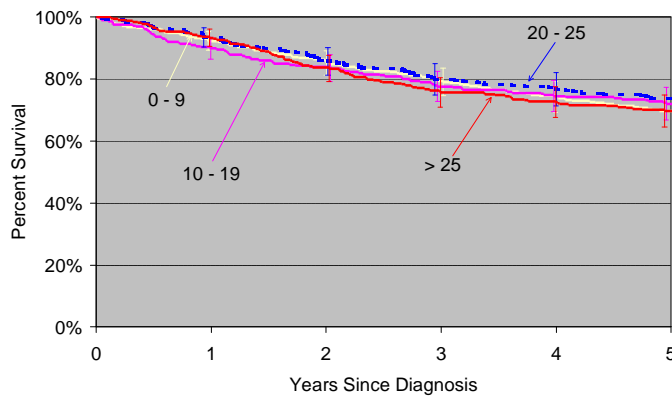


There were significant differences in the survival of patients managed by different clinical specialties, or combination of specialties. Over 80% of those managed by a dermatologist alone were alive at 5 years from diagnosis, whereas less than 60% of those managed by a general surgeon were alive at 5 years from diagnosis. These data should however, be interpreted with caution, since no adjustment for case mix factors such as lesion thickness has been made here. It is likely that the general surgeons removed more of the thicker, nodular amelanotic melanomas, which would have had a poorer prognosis (Williams *et al*, 1991). It is also likely that those patients managed solely by a dermatologist would have had relatively thin lesions with a generally better prognosis. The effects of case mix factors and lesion thickness upon managing specialty and outcome are investigated more fully in Chapter 8.

Because of the low numbers, the survival of those patients who were managed by their GP only was not determined here.

6.3.2. Survival of Melanoma of Skin by Hospital Workload

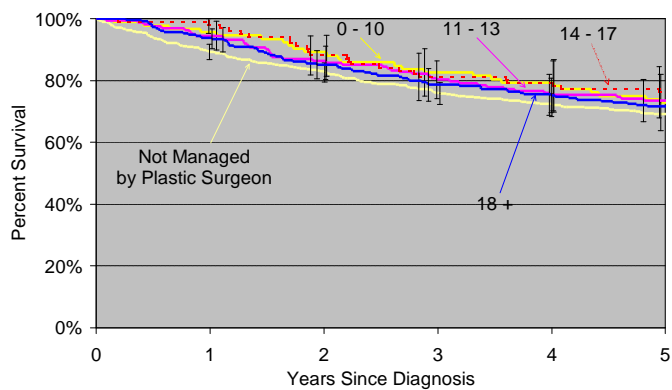
▼ Survival by Hospital Workload Group



There were no significant differences in survival according to the mean annual workload of the main managing hospital.

6.3.3. Survival of Melanoma of Skin by Consultant Workload

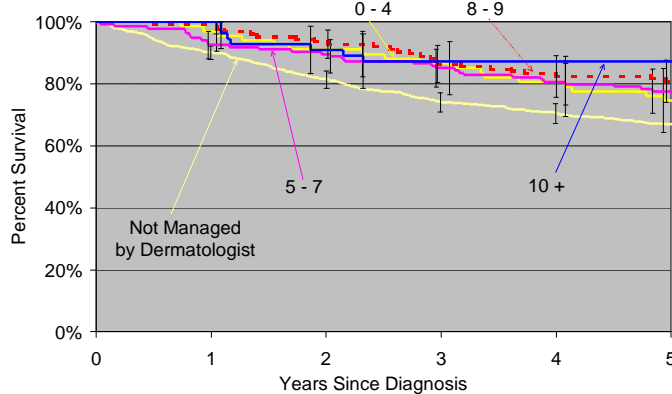
▼ Survival of Melanoma of Skin by Plastic Surgeon Workload



For those patients managed by a plastic surgeon, there was no difference in survival according to the mean annual workload of the consultant.

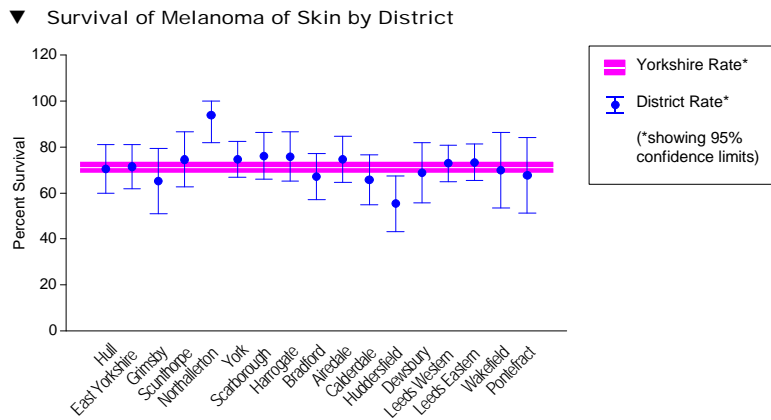
6.3.4. Survival of Melanoma of Skin by Consultant Workload

▼ Survival of Melanoma of Skin by Dermatologist Workload



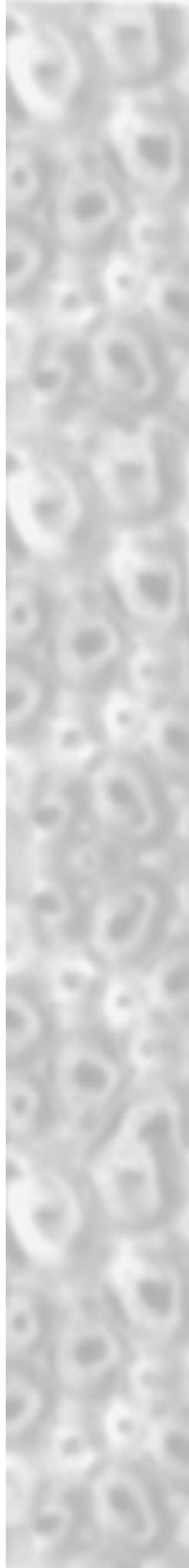
For those patients managed by a dermatologist, there was no difference in survival according to the mean annual workload of the consultant. Survival of those patients who were not managed by a dermatologist was significantly poorer, but this is because these would have been the poorer prognosis cases, who would have required management by plastic surgeons for example.

6.4. 5-YEAR SURVIVAL OF MELANOMA OF SKIN BY DISTRICT OF RESIDENCE



Survival varied according to district of residence from less than 60% in Huddersfield, to over 90% in Northallerton. Northallerton is however, a district which is close to the border of the geographical area included in this study and the numbers of patients registered from this district are relatively small. Many patients in this district, particularly those of poorer prognosis, would have been referred extra-regionally for their treatment. These cases would have been excluded from the study, thus raising the district survival figures slightly.

The relatively low survival of Huddersfield residents could have been partly due to differences in case mix. These data do not account for differences in stage by district and this is investigated in Section 8.2.3 .



MULTIVARIATE ANALYSES



7.1. RELATIVE RISK (1986-94)

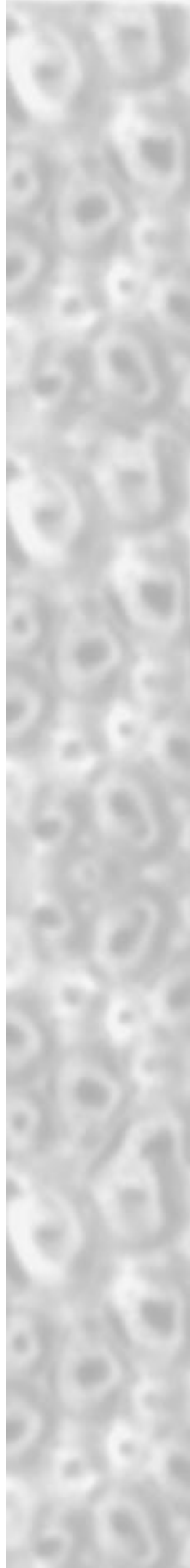
In the following multivariate analysis, the relative effects on survival of patients' sex, age, socio-economic status, the lesion site, treatment, the specialties of their managing consultants and the workload of the hospital has been determined using Cox's proportional hazards regression. The relative risk of each factor is examined individually (in the 'factors alone' column), then after allowing for the other case mix factors, and finally after allowing for all factors together. The analyses in this section pertain to the period 1986 to 1994 and do not include data on lesion thickness. Thickness data were available for the period 1992 to 1994 only and are included in a separate multivariate analysis in Section 8.4.2.

7.1.1. All Skin Melanoma Patients (n=2305)

Factors	Group	Relative Risk		
		Factors Alone	Allowing for Casemix	All Factors Together
CASEMIX				
Sex	Male	1.00	1.00	1.00
	Female	0.50 (0.41 - 0.60)	0.49 (0.40 - 0.60)	0.51 (0.41 - 0.62)
Age (yrs)	<40	1.00	1.00	1.00
	40 - 59	1.88 (1.29 - 2.74)	1.86 (1.28 - 2.70)	1.80 (1.23 - 2.62)
	60+	4.59 (3.24 - 6.50)	4.84 (3.41 - 6.88)	4.47 (3.14 - 6.37)
Lesion Site	Lower Limb	1.00	1.00	1.00
	Unspecified	2.02 (1.45 - 2.83)	1.75 (1.24 - 2.47)	1.06 (0.71 - 1.57)
	Head/Face/Neck	1.31 (1.00 - 1.72)	0.71 (0.54 - 0.95)	0.82 (0.61 - 1.09)
	Trunk	1.32 (1.02 - 1.70)	1.03 (0.78 - 1.36)	1.02 (0.78 - 1.35)
Socio-economic Profile	Upper Limb	1.05 (0.78 - 1.42)	1.08 (0.79 - 1.46)	1.09 (0.80 - 1.49)
	1 - 3 (Most Affluent)	1.00	1.00	1.00
	4 - 7	1.21 (0.96 - 1.53)	1.14 (0.90 - 1.44)	1.12 (0.89 - 1.43)
Period	8 - 10 (Least Affluent)	1.74 (1.32 - 2.29)	1.47 (1.11 - 1.95)	1.56 (1.18 - 2.08)
	1986 - 88	1.00	1.00	1.00
	1989 - 90	0.92 (0.75 - 1.12)	0.89 (0.72 - 1.09)	0.96 (0.78 - 1.19)
HOSPITAL FACTORS				
Treatment	No Surgery	1.00	1.00	1.00
	Surgical	0.14 (0.10 - 0.21)	0.21 (0.14 - 0.32)	0.29 (0.18 - 0.45)
Specialties	Dermatologist + Plastic Surgeon	1.00	1.00	1.00
	Dermatologist Only	0.68 (0.45 - 1.04)	0.72 (0.47 - 1.11)	0.76 (0.49 - 1.18)
	Plastic Surgeon Only	1.08 (0.73 - 1.58)	0.96 (0.65 - 1.41)	0.96 (0.62 - 1.38)
	General Surgeon Only	1.99 (1.34 - 2.94)	1.84 (1.23 - 2.75)	1.92 (1.26 - 2.94)
	GP Only	0.80 (0.24 - 2.62)	1.15 (0.35 - 3.80)	1.03 (0.31 - 3.45)
Hospital Workload	Other Specialty	3.78 (2.23 - 6.40)	4.13 (2.39 - 7.12)	3.46 (1.95 - 6.13)
	0 - 9	1.00	1.00	1.00
	10 - 19	0.85 (0.66 - 1.11)	0.84 (0.64 - 1.10)	1.08 (0.81 - 1.43)
	20 - 25	0.82 (0.62 - 1.08)	0.80 (0.60 - 1.06)	1.21 (0.88 - 1.66)
	>25	0.96 (0.75 - 1.24)	0.88 (0.68 - 1.13)	1.34 (0.98 - 1.84)

As described in the published literature, sex, age and socio-economic status all influenced the survival of melanoma patients (Weidner, 1981; MacKie and Hole, 1996; MacKie *et al.*, 1997; Balzi *et al.*, 1998; Smith *et al.*, 1998; Hemo *et al.*, 1999). Relative risk for women was found to be half that of men. Relative risk also increased in older patients and with declining socio-economic status, despite higher incidence being found in the more affluent groups. Lesion site also influenced survival. Survival was poorest for those patients with melanomas on the head, neck and trunk compared with those with melanomas on the limbs, but after adjusting for case mix factors, these differences disappeared. Many of the lesion sites were unspecified and this group was of poorest prognosis.

There were no survival changes over the time during the period 1986 to 1994.



As expected, those patients who had surgery had significantly better survival than those who did not. There was no significant difference in relative risk for those patients managed by a dermatologist and/or a plastic surgeon or those managed only by their GP. However, survival of the group of patients managed by general surgeons or other specialties was significantly poorer, both before and after adjusting for the available case mix factors.

As previously mentioned, such differences in relative risk could be due to variation in lesion thickness, those patients presenting with thicker lesions being of poorer prognosis. The influence of lesion thickness on survival is addressed in Section 8.4 of this report.

There was no significant effect of hospital workload on survival.

LESION THICKNESS: 1992-94

Lesion thickness is probably the most important prognostic factor for melanoma patients (Barnhill *et al.*, 1996; Tersmette *et al.*, 1996; MacKie *et al.*, 1997; Smith *et al.*, 1998; Balzi *et al.*, 1998). When comparing outcomes of different subsets of patients, it is important that adequate adjustments are made for case mix. As mentioned several times throughout this report, lesion thickness was not routinely available for the whole study period. However, for the years 1992 to 1994, thickness data were extracted, where available, by project staff, from the histopathology records stored at NYCRIS. These data were then incorporated into the following analyses.

8.1. DESCRIPTIVE ANALYSES

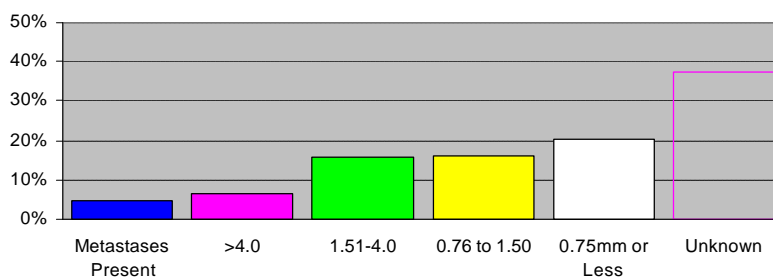
Lesion thickness was investigated for a total of 688 patients diagnosed with a cutaneous melanoma between 1992 and 1994. This information was available for 62.6% of patients. In order to determine trends in case mix, management and outcome, patients were grouped into four lesion thickness bands. These were based upon those prognostic groups specified according to Breslow's classification. Any patients with definite metastases recorded were categorised separately, as management and outcome for this poor-prognosis group of patients was likely to differ.

8.1.1. Lesion Thickness

▼ Numbers of Patients in Each Lesion Thickness Category

Lesion Thickness (mm)	Patients	Overall	% of Known (Valid n=431)
0.75mm or Less	139	20.2%	32.3%
0.76 to 1.50	111	16.1%	25.8%
1.51-4.0	107	15.6%	24.8%
>4.0	43	6.3%	10.0%
Metastases Present	31	4.5%	7.2%
Unknown	257	37.4%	-
Total	688	100.0%	100.0%

▼ Numbers of Patients in Each Lesion Thickness Category



In the 37.4% of cases where thickness information was unknown, this was either because the pathology report was unavailable for review, or the information was not specifically written upon the pathology report.

A higher proportion of patients presented with relatively thin lesions; 20.2% having a lesion of 0.75mm or less (32.3% of those patients for whom thickness data were available).

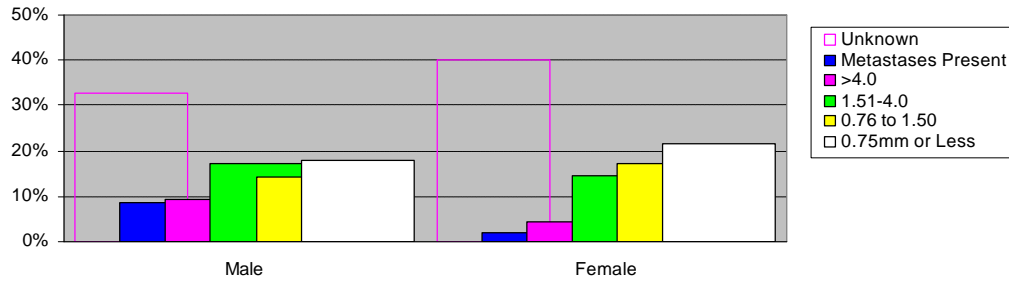
8.1.2. Lesion Thickness by Sex

▼ Lesion Thickness by Sex

Lesion Thickness (mm)	Male		Female	
0.75mm or Less	46	17.8%	93	21.6%
0.76 to 1.50	37	14.3%	74	17.2%
1.51-4.0	44	17.1%	63	14.7%
>4.0	24	9.3%	19	4.4%
Metastases Present	22	8.5%	9	2.1%
Unknown	85	32.9%	172	40.0%
Total	258	100.0%	430	100.0%

Although incidence of melanoma was much higher in females, a higher proportion of men presented with more advanced disease; thicker lesions or metastases compared with women. This is likely to contribute to the survival difference observed between the sexes in Chapter 7.

▼ Lesion Thickness by Sex

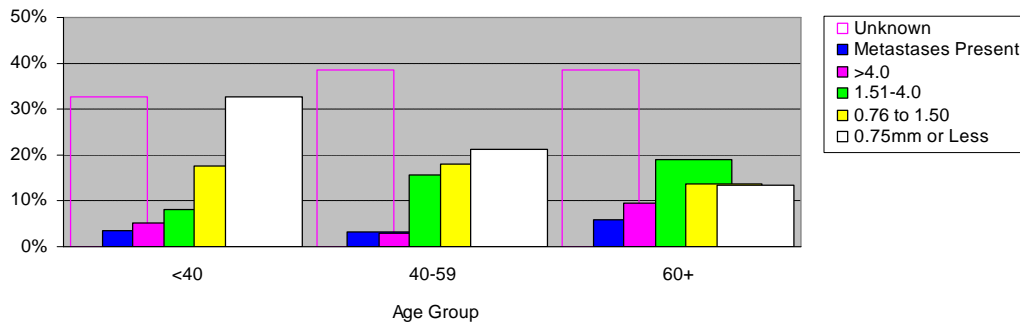


8.1.3. Lesion Thickness by Age

▼ Lesion Thickness by Age Group

Lesion Thickness (mm)	Age <40		Age 40 - 59		Age 60+	
0.75mm or Less	44	32.6%	56	21.4%	39	13.4%
0.76 to 1.50	24	17.8%	47	17.9%	40	13.7%
1.51-4.0	11	8.1%	41	15.6%	55	18.9%
>4.0	7	5.2%	8	3.1%	28	9.6%
Metastases Present	5	3.7%	9	3.4%	17	5.8%
Unknown	44	32.6%	101	38.5%	112	38.5%
Total	135	100.0%	262	100.0%	291	100.0%

▼ Lesion Thickness by Age Group



The probability of presenting with a thicker lesion has been shown to increase with increasing age (Tersmette *et al.*, 1996). A high proportion (32.6%) of younger patients, i.e. those aged less than 40 years, presented with relatively thin lesions of 0.75mm and under compared with just 13.4% in the over 60's. Relatively few (8.9%) in the youngest age group presented with lesions over 4.0mm or with metastatic disease. Thicker lesions were more common in the over 60 age group.

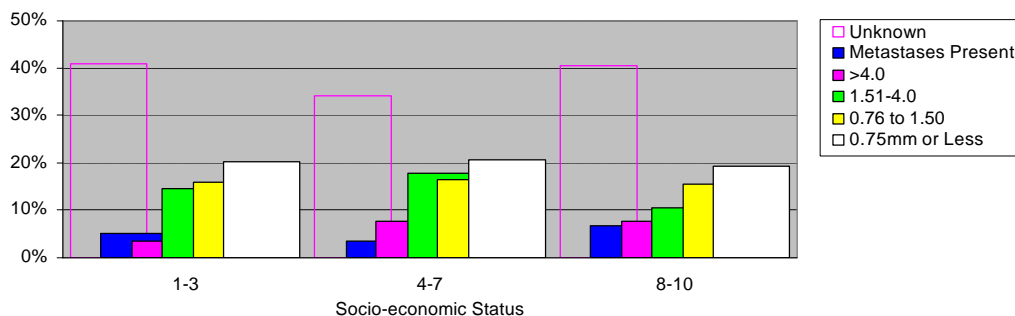
Since a higher proportion of men than women presented with thicker lesions, and lesion thickness increased with increasing age, it might be expected that the men were significantly older. However there was found to be no significant difference in mean age by gender, and men of all ages presented with more advanced disease than women.

8.1.4. Lesion Thickness by Socio-economic Status

▼ Lesion Thickness by Socio-economic Status

Lesion Thickness (mm)	1-3 (most affluent)		4-7 (intermediate)		8-10 (most deprived)	
0.75mm or Less	45	20.4%	74	20.5%	20	19.2%
0.76 to 1.50	35	15.8%	59	16.3%	16	15.4%
1.51-4.0	32	14.5%	64	17.7%	11	10.6%
>4.0	8	3.6%	27	7.5%	8	7.7%
Metastases Present	11	5.0%	13	3.6%	7	6.7%
Unknown	90	40.7%	124	34.3%	42	40.4%
Total	221	100.0%	361	100.0%	104	100.0%

▼ Lesion Thickness by Socio-economic Status



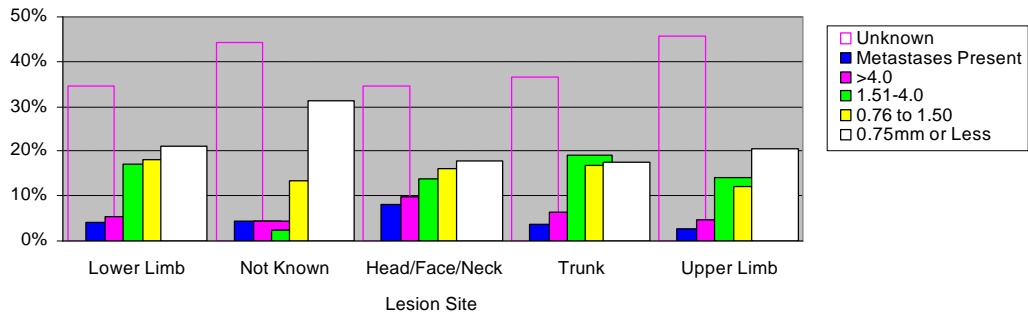
In Section 3.1.3, the incidence of cutaneous melanoma was found to increase with increasing socio-economic status, yet in the multivariate survival analysis in Section 7.1, survival was found to be significantly worse for those in the most deprived socio-economic groups compared with the most affluent. It is likely that this was due to differences in stage at presentation between groups; patients in the more deprived groups presenting with more advanced disease and thicker lesions. Between 1992 and 1994, there was a slight difference in the proportion of patients presenting with thicker lesions or metastatic disease according to their socio-economic group; a greater proportion of lesions of poorest prognosis being in the most deprived group.

8.1.5. Lesion Thickness by Site

▼ Lesion Thickness by Site

Lesion Thickness (mm)	Lower Limb		Not Known		Head Face Neck		Trunk		Upper Limb	
0.75mm or Less	54	21.1%	14	31.1%	22	17.7%	27	17.3%	22	20.6%
0.76 to 1.50	46	18.0%	6	13.3%	20	16.1%	26	16.7%	13	12.1%
1.51-4.0	44	17.2%	1	2.2%	17	13.7%	30	19.2%	15	14.0%
>4.0	14	5.5%	2	4.4%	12	9.7%	10	6.4%	5	4.7%
Metastases Present	10	3.9%	2	4.4%	10	8.1%	6	3.8%	3	2.8%
Unknown	88	34.4%	20	44.4%	43	34.7%	57	36.5%	49	45.8%
Total	256	100.0%	45	100.0%	124	100.0%	156	100.0%	107	100.0%

▼ Lesion Thickness by Site



In Section 3.2.3, a greater proportion of men presented with lesions of the trunk, whilst a large number of women presented with melanoma of the lower limb. In Section 8.1.2 males presented with generally thicker lesions than females. Lesions of the trunk have been reported to be of poorest prognosis (Wiedner, 1981) yet in Section 7.1.1 no survival differences according to lesion site were observed after adjusting for case mix. Where data were available, it was found that the melanomas of the head, face and neck actually had the greatest proportion of lesions over 4.0mm and metastatic disease.

8.2. MANAGEMENT

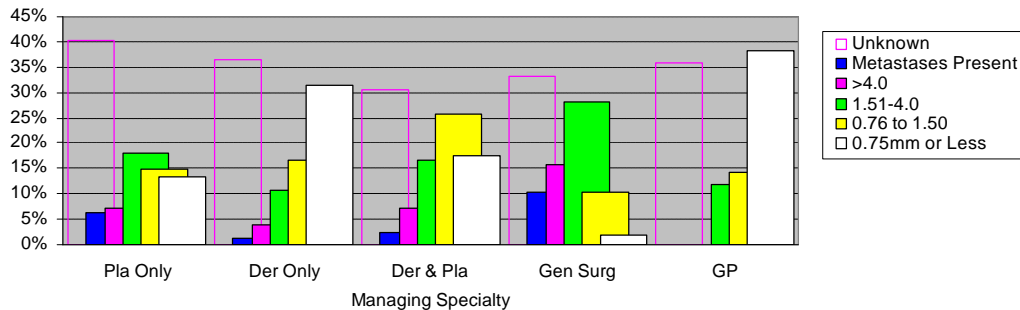
8.2.1. Lesion Thickness and Managing Specialty

▼ Lesion Thickness by Managing Specialty Group

Lesion Thickness (mm)	Pla Only	Der Only	Der & Pla	Gen Surg	GP only
0.75mm or Less	34 13.3%	74 31.4%	15 17.6%	1 1.8%	16 38.1%
0.76 to 1.50	38 14.9%	39 16.5%	22 25.9%	6 10.5%	6 14.3%
1.51-4.0	46 18.0%	25 10.6%	14 16.5%	16 28.1%	5 11.9%
>4.0	18 7.1%	9 3.8%	6 7.1%	9 15.8%	0 0.0%
Metastases Present	16 6.3%	3 1.3%	2 2.4%	6 10.5%	0 0.0%
Unknown	103 40.4%	86 36.4%	26 30.6%	19 33.3%	15 35.7%
Total	255 37.2%	236 34.5%	85 12.4%	57 8.3%	42 7.6%

Der = Dermatologist Pla = Plastic Surgeon Gen Surg = General Surgeon

▼ Lesion Thickness by Managing Specialty Group



▼ Median Lesion Thickness by Managing Specialty Group

Managing Specialties	Der & Pla	Der Only	Pla Only	Gen Surg	GP
Median Lesion Thickness (mm)	1.2	0.8	1.5	3.0	0.7

In Section 4.3 the clinical specialties of the consultants involved in the management of melanoma patients varied. Managing specialty also affected outcome in Section 7.1, with poorest survival for those patients managed by a general surgeon. It was presumed that management by a consultant of any particular specialty was likely to be influenced by the stage of disease at presentation. The figures above show that this appeared to be the case. Patients managed by a dermatologist alone, or by their GP, generally had thinner, better prognosis lesions, whilst patients managed by plastic surgeons had thicker lesions, and a large proportion of patients managed by a general surgeon had advanced disease.

8.2.2. Management by District of Residence

Pla= Plastic Surgeon
Der= Dermatologist
Gen Surg= General Surgeon
GP= General Practitioner

▼ Specialist Management by District of Residence

District	Pla Only	Der Only	Der & Pla	Gen Surg	GP Only
Hull	19 42.2%	18 40.0%	3 6.7%	15 10.3%	1 2.2%
East Yorkshire	18 40.0%	19 42.2%	3 6.7%	15 8.7%	5 11.1%
Grimsby	7 29.2%	10 41.7%	1 4.2%	21 22.3%	0 0.0%
Scunthorpe	1 3.7%	14 51.9%	3 11.1%	51 51.0%	1 3.7%
Northallerton	0 0.0%	13 68.4%	1 5.3%	14 29.8%	2 10.5%
York	10 11.8%	42 49.4%	21 24.7%	32 13.1%	7 8.2%
Scarborough	3 14.3%	11 52.4%	3 14.3%	60 42.0%	0 0.0%
Harrogate	10 22.2%	13 28.9%	7 15.6%	23 18.7%	7 15.6%
Bradford	24 60.4%	6 15.0%	4 10.0%	19 11.8%	1 2.5%
Airedale	21 55.3%	9 23.7%	4 10.5%	21 13.6%	3 7.9%
Calderdale	6 24.0%	7 28.0%	6 24.0%	32 28.6%	0 0.0%
Huddersfield	20 42.6%	22 46.8%	1 2.1%	9 7.0%	3 6.4%
Dewsbury	17 47.2%	8 22.2%	9 25.0%	11 12.1%	0 0.0%
Leeds West	26 38.8%	22 32.8%	7 10.4%	23 10.7%	6 9.0%
Leeds East	26 42.6%	14 23.0%	10 16.4%	32 14.6%	5 8.2%
Wakefield	37 92.5%	2 5.0%	0 0.0%	8 9.6%	0 0.0%
Pontefract	10 43.5%	6 26.1%	2 8.7%	18 25.4%	1 4.3%
Yorkshire	255 37.2%	236 34.5%	85 12.4%	404 17.5%	42 7.6%

In Section 4.3.5, management varied according to district of residence during the period 1986 to 1994. This was thought to be influenced by patient case mix; stage at presentation in particular, and also by the organisation and availability of local services. This variation was still evident during the latter part of the time period; 1992 to 1994, although the numbers of cases in some districts were very small and the results should therefore be interpreted with caution. There was a particularly high proportion of patients managed by a general surgeon from the districts of Scunthorpe and Scarborough (51.0% and 42.0%), whilst relatively few patients (7.0%) were managed by a general surgeon in Huddersfield. Harrogate had the highest proportion of patients managed by their GP only (15.6%). As described in Section 8.2.1, managing specialties varied according to lesion thickness. The proportion of patients in each district with lesions of various thickness are presented in Section 8.2.3 below.

8.2.3. Lesion Thickness by District of Residence

▼ Lesion Thickness by District

District	Lesion Thickness (valid %)					(% of district)	
	0.75mm or less	0.76 - 1.50mm	1.51 - 4.0mm	4.1mm or More	Metastases	Unknown	
Hull	7 24.1%	6 20.7%	8 27.6%	4 13.8%	4 13.8%	16 35.6%	
E Yorkshire	9 33.3%	5 18.5%	6 22.2%	3 11.1%	4 14.8%	18 40.0%	
Grimsby	2 14.3%	6 42.9%	3 21.4%	2 14.3%	1 7.1%	10 41.7%	
Scunthorpe	3 15.0%	7 35.0%	3 15.0%	2 10.0%	5 25.0%	7 25.9%	
Northallerton	7 41.2%	5 29.4%	3 17.6%	1 5.9%	1 5.9%	2 10.5%	
York	21 38.2%	17 30.9%	11 20.0%	5 9.1%	1 1.8%	30 35.3%	
Scarborough	2 14.3%	4 28.6%	6 42.9%	1 7.1%	1 7.1%	7 33.3%	
Harrogate	8 29.6%	5 18.5%	7 25.9%	4 14.8%	3 11.1%	18 40.0%	
Bradford	12 60.0%	1 5.0%	5 25.0%	1 5.0%	1 5.0%	20 50.0%	
Airedale	9 52.9%	1 5.9%	4 23.5%	3 17.6%	0 0.0%	21 55.3%	
Calderdale	6 42.9%	4 28.6%	2 14.3%	1 7.1%	1 7.1%	11 44.0%	
Huddersfield	16 48.5%	4 12.1%	8 24.2%	2 6.1%	3 9.1%	14 29.8%	
Dewsbury	3 13.6%	7 31.8%	9 40.9%	2 9.1%	1 4.5%	14 38.9%	
Leeds West	16 34.8%	12 26.1%	10 21.7%	6 13.0%	2 4.3%	21 31.3%	
Leeds East	14 36.8%	12 31.6%	8 21.1%	2 5.3%	2 5.3%	23 37.7%	
Wakefield	1 3.8%	11 42.3%	9 34.6%	4 15.4%	1 3.8%	14 35.0%	
Pontefract	3 25.0%	4 33.3%	5 41.7%	0 0.0%	0 0.0%	11 47.8%	
Yorkshire	3 32.3%	111 25.8%	107 24.8%	43 100.0%	31 100.0%	257 37.4%	

(NB to be interpreted with caution; low numbers in some districts)

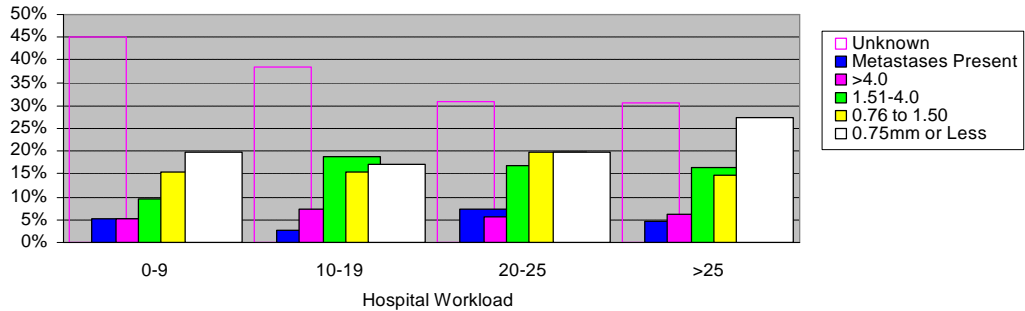
In Section 8.2.2, a relatively high proportion of patients from the districts of Scunthorpe and Scarborough were managed by a general surgeon. In Scunthorpe, 25% of the patients had advanced, metastatic disease and this could explain, at least in part, some of the variation in management seen in this district compared with some of the other districts.

8.2.4. Lesion Thickness by Hospital Workload

▼ Lesion Thickness by Hospital Workload

Lesion Thickness (mm)	0-9 Cases / Year		10-19 Cases / Year		20-25 Cases / Year		>25 Cases / Year	
0.75mm or less	35	19.8%	44	17.1%	25	19.8%	35	27.3%
0.76 to 1.50	27	15.3%	40	15.6%	25	19.8%	19	14.8%
1.51-4.0	17	9.6%	48	18.7%	21	16.7%	21	16.4%
>4.0	9	5.1%	19	7.4%	7	5.6%	8	6.3%
Metastases present	9	5.1%	7	2.7%	9	7.1%	6	4.7%
Unknown	80	45.2%	99	38.5%	39	31.0%	39	30.5%
Total	177	100.0%	257	100.0%	126	100.0%	128	18.6%

▼ Lesion Thickness by Hospital Workload



Current recommendations state that patients with a lesions greater than 1.5mm thick should be referred to a specialist surgical unit (Yorkshire Guidelines, 1997), however, there was relatively little difference in lesion thickness according to hospital workload, and patients with thicker lesions appeared to be managed at all hospitals during the study period.

8.3. TRUST SUMMARIES: 1992-94

▼ Managing Specialties by Trust, Median Thickness (where known) and Median Age

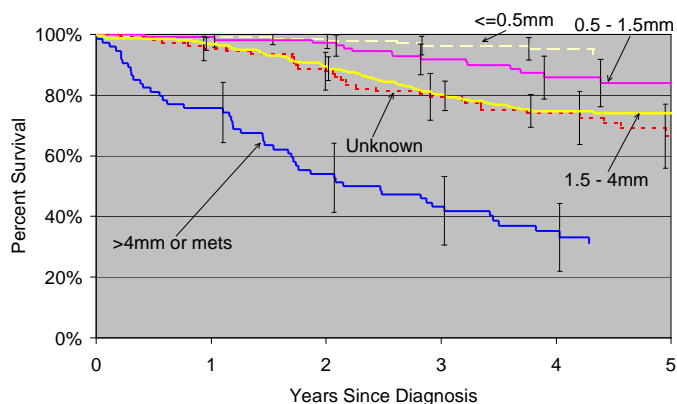
Trust	N	Specialties			Median (mm) Thickness	Median Age (yrs)
		Pla	Der	Gen Surg		
St James's & Seacroft University Hospitals NHS Trust	92	88.0%	34.8%	8.7%	1.1	58
Royal Hull Hospitals NHS Trust	72	55.6%	47.2%	2.8%	1.8	59
Pinderfields Hospitals NHS Trust	63	93.7%	14.3%	1.6%	2.0	57
Bradford Hospitals NHS Trust	55	78.2%	27.3%	10.9%	0.6	59
York Health Services NHS Trust	47	12.8%	91.5%	6.4%	0.8	55
United Leeds Teaching Hospitals NHS Trust	46	34.8%	76.1%	13.0%	1.3	54
Huddersfield Healthcare NHS Trust	38	39.5%	57.9%	5.3%	0.8	45
Harrogate Healthcare NHS Trust	25	20.0%	64.0%	24.0%	3.0	59
Scunthorpe & Goole Hospitals NHS Trust	24	12.5%	66.7%	37.5%	1.2	53
Calderdale Healthcare NHS Trust	17	35.3%	58.8%	29.4%	0.8	52
Northallerton Health Services NHS Trust	17	5.9%	88.2%	5.9%	1.1	50
Dewsbury Healthcare NHS Trust	16	37.5%	68.8%	18.8%	1.6	46
North East Lincolnshire NHS Trust	11	18.2%	81.8%	9.1%	2.5	67
Pontefract Hospitals NHS Trust	10	20.0%	70.0%	20.0%	0.7	55
Airedale NHS Trust	9	44.4%	77.8%	11.1%	0.7	57
Scarborough & NE Yorkshire Healthcare NHS Trust	7	14.3%	57.1%	42.9%	2.4	68
East Yorkshire Hospitals NHS Trust	2	0.0%	0.0%	50.0%	-	46

The above table shows a summary according to main managing trust (see Section 4.5 for definition of main managing trust), the proportion of patients managed by each clinical specialty, the median age and median lesion thickness (where known) of the patients managed. The trusts are listed in volume order, with the higher volume, plastic surgical units near the top. Even between the higher volume trusts, there was wide variation in managing specialty which was not completely explained by variation in patient age and lesion thickness. Patients with greater median thickness combined with an older median age were managed at Royal Hull, Pinderfields, Harrogate, North East Lincolnshire and Scarborough NHS Trusts, whilst generally, a group of relatively young patients with thinner lesions were managed at Bradford, York, Huddersfield, Calderdale, Pontefract and Airedale NHS Trusts.

8.4. SURVIVAL ANALYSES 1992-94

8.4.1. Survival by Lesion Thickness Group

▼ Survival by Lesion Thickness Group



As expected, survival was poorer where lesion thickness was greater or where metastases were present. Survival of the group where lesion thickness was unknown was intermediate, suggesting that this group was a mix of both good and poorer prognosis cases i.e. the group was not biased.

8.4.2. Multivariate Analysis

Factors	Group	Relative Risk		
		Factors Alone	Allowing for Casemix	All Factors Together
CASEMIX				
Sex	Male	1.00	1.00	1.00
	Female	0.45 (0.34 - 0.61)	0.51 (0.37 - 0.72)	0.52 (0.37 - 0.74)
Age (yrs)	<40	1.00	1.00	1.00
	40-59	1.83 (1.01 - 3.32)	1.66 (0.90 - 3.05)	1.77 (0.95 - 3.29)
	60+	4.28 (2.45 - 7.48)	3.14 (1.77 - 5.57)	3.45 (1.93 - 6.16)
Lesion Site	Lower Limb	1.00	1.00	1.00
	Unspecified	1.58 (0.88 - 2.83)	2.26 (1.24 - 4.14)	2.22 (1.20 - 4.10)
	Head/Face/Neck	1.69 (1.13 - 2.52)	1.00 (0.66 - 1.51)	0.86 (0.56 - 1.31)
	Trunk	1.11 (0.73 - 1.68)	0.94 (0.60 - 1.47)	0.91 (0.58 - 1.42)
	Upper Limb	0.86 (0.52 - 1.41)	0.70 (0.42 - 1.18)	0.74 (0.44 - 1.25)
Socio-economic Profile	1-3 (High)	1.00	1.00	1.00
	4-7	1.07 (0.76 - 1.51)	1.18 (0.83 - 1.68)	1.14 (0.79 - 1.63)
	8-10 (Low)	1.25 (0.79 - 1.96)	1.22 (0.76 - 1.94)	1.08 (0.67 - 1.74)
Lesion thickness	<=0.75mm	1.00	1.00	1.00
	0.76- 1.5mm	3.13 (1.30 - 7.55)	3.12 (1.29 - 7.57)	2.47 (1.01 - 6.04)
	1.5 1- 4.0mm	6.69 (2.95 - 15.17)	5.78 (2.51 - 13.28)	4.51 (1.93 - 10.51)
	>4.0 mm	14.79 (6.37 - 34.34)	10.74 (4.56 - 25.30)	8.24 (3.44 - 19.72)
	Metastatic Disease	46.64 (20.08-108.32)	36.97 (15.47-87.52)	17.39 (6.83-44.32)
	Unknown	5.45 (2.50 - 11.89)	5.06 (2.31 - 11.09)	4.13 (1.86 - 9.16)
HOSPITAL FACTORS				
Treatment	No Surgery	1.00	1.00	1.00
	Surgical	0.05 (0.03 - 0.09)	0.10 (0.05 - 0.21)	0.11 (0.05 - 0.24)
Specialties	Der + Plastic Surgeon	1.00	1.00	1.00
	Dermatologist Only	0.58 (0.33-1.00)	0.73 (0.42-1.28)	0.67 (0.38-1.22)
	Plastic Surgeon Only	1.24 (0.76-2.02)	1.06 (0.64-1.77)	1.10 (0.66-1.84)
	General Sur Only	2.17 (1.21-3.88)	1.45 (0.79-2.64)	1.31 (0.70-2.43)
	GP Only	0.19 (0.05-0.82)	0.26 (0.06-1.11)	0.26 (0.06-1.16)
	Other Specialty	2.97 (1.35-6.55)	2.89 (1.28-6.50)	2.02 (0.86-4.74)
Hospital Workload	0-9	1.00	1.00	1.00
	10-19	0.82 (0.56 - 1.19)	0.79 (0.54 - 1.17)	0.89 (0.59 - 1.34)
	20-25	0.77 (0.48 - 1.22)	0.73 (0.45 - 1.17)	0.85 (0.52 - 1.38)
	>25	0.90 (0.57 - 1.40)	0.85 (0.54 - 1.35)	0.89 (0.53 - 1.48)

The multivariate analysis in Chapter 7 was repeated using the data for 1992, 1993 and 1994. Lesion thickness was introduced into the model.

As seen in Section 7.1.1, relative risk for women was half that of men, and this difference remained even after adjusting for all known casemix factors including lesion thickness. This is in agreement with the findings of Stidham *et al.*, (1996) who found females to have a significant survival advantage over males, which could not be explained fully by age, site, tumour thickness or histology.

An age greater than 60 years was also found to significantly decrease survival, and was independent of the other known case mix factors.

Lesions of the trunk have been reported to be of poorest prognosis (Weidner, 1981). Lesion site, as in Section 7.1.1, did influence survival; but was significantly poorer for those patients with melanomas of the head, face and neck. In Section 8.1.5, we saw that these sites actually had the highest proportion of thicker or metastatic lesions. After adjusting for case mix, including lesion thickness, there was no significant difference in survival according to site in this group of patients. Many of the sites were unspecified, and this group remained significantly poorer in prognosis, even after adjusting for case mix.

In contrast to the findings in Section 7.1.1, there was no significant difference in relative risk according to socio-economic group, despite increased incidence in the higher socio-economic groups and the likelihood of thicker lesions in the more deprived groups. This was possibly because there was no great difference in lesion thickness according to socio-economic group within the period 1992 to 1994 (see Section 8.1.4), possibly reflecting an increase in public awareness of the dangers of melanoma and early recognition and presentation during more recent years of the study.

As expected, there were large differences in relative risk according to lesion thickness category; risk increasing with greater thickness, and survival was poorest for those

patients with metastatic disease (regardless of lesion thickness). Lesion thickness was by far the greatest independent indicator of prognosis for melanoma patients.

Without adjustment for case mix, the clinical specialty of the managing consultant had significant effect on survival. Compared with a baseline relative risk of 1.0 for those managed by both a dermatologist and a plastic surgeon, relative risk was significantly lower for those patients managed by a dermatologist alone and by a GP alone, and was significantly higher for those managed by a general surgeon. However, after adjusting for casemix, including lesion thickness, there were no significant differences in survival according to the clinical specialties of the managing consultants. The results of the multivariate analysis in Section 7.1.1 did not and could not adjust for lesion thickness and the survival of those patients managed by a general surgeon was shown to be significantly worse than that of patients managed by the other specialties. The fact that this difference disappeared after adjusting for lesion thickness emphasises the importance of ensuring adequate adjustment for case mix in comparing outcomes for any subsets of patients, in population-based studies such as this.

In summary, after adjusting for all known case mix factors, including lesion thickness, independent indicators of prognosis for patients with cutaneous melanoma were found to be sex, age, lesion thickness and surgical excision.

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9.2. NYCRIS DATA

9.2.1. Cancer Registration in the Northern & Yorkshire Region

Data held by the Northern and Yorkshire Cancer Registry and Information Service (NYCRIS) have been analysed in this report. The results presented are applicable only to the population of the former Yorkshire Regional Health Authority, a socially diverse yet relatively stable population of 3.6 million. In total, approximately 17,500 new cancer patients are registered annually within that region, the details being extracted from hospital clinical notes by trained cancer registration staff.

The data collected by the former Yorkshire Cancer Registry have been analysed in this report. Data include information regarding tumour histology and definitive treatment within the first 9 weeks of diagnosis of a primary tumour. Treatment modalities; diagnostic/definitive, radiotherapy and chemotherapy are routinely recorded by NYCRIS, along with managing hospitals, managing consultants and their specialties and corresponding treatment starting dates. Investigations, drug types and dosage information and consultants providing opinion, without the actual transfer of management responsibility are not recorded. The dataset also includes patient information such as age at diagnosis, and district of residence. For this particular study, lesion thickness data were obtained, from pathology reports for patients diagnosed between 1992 and 1994.

9.2.2. Overview of Study Dataset

Data items that were available and unavailable for study were as follows:

▼ Availability of Relevant Data Items

Data Type	Available	Not Available
Patient	Age	
	Sex	
	District of residence	
	Socio-economic status	
	Year of diagnosis	
	Date of birth & death	
Tumour	Site of Tumour	
	Histology of tumour	
	Lesion thickness 1992-1994	Lesion thickness (1986 to 1991)
	Lymph node involvement & metastases	
Management	Managing consultant & speciality	Consultants providing opinion only & histopathologists
	Managing hospital & trust	
	Radiotherapy hospital	
	Date of first hospital visit	
Treatment	Definitive surgical procedures	Biopsies and investigative procedures
		Excision Margins
	Radiotherapy (both radical & palliative)	Radiotherapy intent
	Chemotherapy (both radical & palliative)	Drugs used & dosage
Referral	Dates of treatment	Other palliative care
	Date of first symptom	Chronological referral pathway
	Date of GP referral to hospital	
	Date of first hospital visit	
Outcome	Dates of Surgery, RT, Chemotherapy	
	Survival	Quality of Life
		Cosmesis
		Other Quality of Care

Extra-regional Management : Information was collected on all patients managed within the Yorkshire region. For Yorkshire residents managed outside of the region, however, details of treatment were not available and these patients were excluded from study. This had a particular effect on the results presented for districts close to the border of the region (in particular, Northallerton).

Managing Hospital/Consultant : The hospital of primary management was available for all patients, as was information about any attendance at a radiotherapy centre. Details were not, however, recorded of referral for assessment, where management of the patient was not formally transferred.

Nature of Surgery : For the period covered by this study (1986-94), both diagnostic and therapeutic surgery given within nine weeks of the first treatment episode was routinely recorded. Width of excision was not known.

Chemotherapy : The use of chemotherapy within the first nine weeks of treatment was routinely recorded. Details of drugs used and dosage were not available.

Radiotherapy: The use of radiotherapy within the first nine weeks of treatment was routinely recorded. The intent of therapy was not available.

9.2.3. Data Quality

In addition to the routine data quality assurance mechanisms which are maintained by NYCRIS, the dataset used in this study was subject to a site-specific programme of quality control, prior to analysis.

9.3. STATISTICAL METHODS

Definitions

For the purposes of this report, the region studied was that of the former Yorkshire Regional Health Authority, and districts studied were the districts of residence, and corresponds to the District Health Authority of the period. Data were presented for patients who were resident within the Yorkshire Health region at the time of diagnosis and treated within the region.

All populations referred to in the methodology are the ONS mid-year population estimates based on the 1981 or 1991 censuses.

Registrations and Deaths

A registration is any new case of primary invasive cancer, identified by the Northern and Yorkshire Cancer Registry, arising in the population under study. The incidence rate gives the annual number of new patients registered with an invasive tumour per 100,000 population.

Age-Standardised Rate

Age-standardised registration rates (ASRs) have been calculated where the comparison of incidence between groups was of interest. This rate enables such comparisons to be made allowing for differences in their population structures, and is equivalent to the rate that would be seen if the standard population were subject to the same rates as that of the group. ASRs have been standardised against the European standard population.

To obtain the observed annual rate by five-year age groups for each area, the total number of registrations in the time period was divided by the area population for that period. The ASR was then calculated by multiplying the standard population for the five-year period by the observed rate, within each age group. The result was summed to give a rate per 100,000 population. This is known as the direct method of age standardisation.

The charts show the ASR as a dot, with the 95% Confidence Interval for the ASR as an error line around it. The Yorkshire rate is shown as a double line, the middle representing the rate and the line thickness depicting the confidence interval.

Survival

Survival times were calculated from date of diagnosis (taken as date of first hospital visit) to date of death or censoring. Death certificate only registrations were excluded, as their survival times were unknown, so they could not contribute to any survival analysis. Patients were deemed to be alive if no death certificate had been received by the time the analysis was undertaken. They were censored at the 1st January 1997.

Survival distributions were estimated for each variable separately using the Kaplan-Meier method. These were presented as curves.

Multivariate Relative Risk Analysis

Multivariate survival comparisons were made by Cox's Proportional Hazards regression. For each histological type, age, period of diagnosis, treatment and hospital centre were entered into the model. The results were presented as relative risk estimates, compared to a base category (value 1.00). Estimates were presented for each factor separately, for each factor allowing for case mix and for all factors together. Interactions between

factors were also examined, but where insignificant they were omitted from the results tables.

Socio-Economic Profile Classification

This is based on an analysis of 120 original census variables, at Enumeration District (ED) level, many of which are highly correlated. A transformation is applied to these variables by Principal Components Analysis to create uncorrelated derived variables. The ED's are then grouped together using Cluster Analysis based on the new derived variables or principal component scores.

Initially there are 160 relatively homogenous profile groups. These have been further aggregated by cluster analysis into 40 groups and then into 10 groups, or 'Super Profiles'. The names attached to the different Super Profiles are an attempt to capture the wider characteristics of the groups in a name that can be easily referred to.

A summary and characteristic description of the 10 Super Profile groups and the 40 groups contained within them is given below.

▼ Socio-Economic Profile Classification

Super Profile Group	Description
I 'Affluent Achievers'	Very high income professionals in exclusive areas. Mature families with large detached properties in 'stockbroker belts'. Mature families in select suburban properties.
II 'Country Life'	Prosperous and farming communities. Small holders and rural workers (mainly Scotland)
III 'Thriving Greys'	High income households in genteel neighbourhoods. Affluent ageing couples, many in purchase property. Older professionals in retirement areas. Comfortably well off older owner occupiers. Affluent ageing couples in rural areas.
IV 'Settled Suburbans'	White collar families in owner occupied suburban semis. Mature white collar couples in established suburban semis. White collar couples in mixed suburban housing.
V 'Nest Builders'	Mortgaged commuting professionals with children in detached properties. Double income young families in select properties. Military families. Young white collar families in small semis and terraces. Young white collar families in smaller semis. Young blue and white collar families in semis and terraces. Young families in terraces, mainly council.
VI 'Producers'	Older blue collar owner occupiers in semis. Older workers established in semis and terraces. Older and retired blue collar workers in small council properties.
VII 'Senior Citizens'	Retired white collar workers in owner occupied flats. Older residents and young transient singles many in seaside towns. Old and young buying terraces and flats. Retired blue collar workers in council flats, mainly in Scotland.
VIII 'Urban Venturers'	High income young professionals mainly renting (mainly Greater London). Young white collar workers in multi racial areas (mainly London). Young professionals buying property. Young families buying terraces in multi racial areas. Young families renting basic accommodation. Young white collar singles sharing city centre accommodation.
IX 'Hard Pressed Families'	Blue collar families in council properties. Young blue collar families in council terraces. Manufacturing workers in terraced housing.
X 'Have Nots'	Families in council flats in multiracial areas with high unemployment. Blue collar young families in council properties with high unemployment. Young families, many single parent, with high unemployment. Young singles and pensioners in council flats with high unemployment.