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Maringe, C; Walters, S; Butler, J; Coleman, MP; Hacker, N; Hanna, L; Mosgaard, BJ; Nordin, A; Rosen, B; Engholm, G; Gjerstorff, ML; Hatcher, J; Johannesen, TB; McGahan, CE; Meechan, D; Middleton, R; Tracey, E; Turner, D; Richards, MA; Rachet, B; ICBP Module 1 Working Group (2012) Stage at diagnosis and ovarian cancer survival: Evidence from the International Cancer Benchmarking Partnership. *Gynecologic oncology*, 127 (1). pp. 75-82. ISSN 0090-8258 DOI: 10.1016/j.ygyno.2012.06.033

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DOI: [10.1016/j.ygyno.2012.06.033](https://doi.org/10.1016/j.ygyno.2012.06.033)

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1 **Stage at diagnosis and ovarian cancer survival: evidence from the**  
2 **International Cancer Benchmarking Partnership**

3

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## 68 **Acknowledgements**

69 We thank the cancer registry staff in all jurisdictions, whose sustained efforts in data collection and  
70 quality control over many years have made possible this study of ovarian cancer survival and stage at  
71 diagnosis. The authors would like to thank Martine Bomb, Catherine Foot and Donia Sadik at Cancer  
72 Research UK for their logistical support.

73

## 74 **Disclaimers**

75 This study was funded by the Department of Health, England (London, UK), and Cancer Research  
76 UK (London, UK). The Northern Ireland Cancer Registry is funded by the Northern Ireland Public  
77 Health Agency. The findings and conclusions in this report are those of the authors and do not  
78 necessarily represent the views of any government agency.

79 **Stage at diagnosis and ovarian cancer survival: evidence from the**  
80 **International Cancer Benchmarking Partnership**

81 **Abstract**

82 **Objective:** We investigate what role stage at diagnosis bears in international differences in  
83 ovarian cancer survival.

84 **Methods:** Data from population-based cancer registries in Australia, Canada, Denmark,  
85 Norway, and the UK were analysed for 20,073 women diagnosed with ovarian cancer during  
86 2004-7. We compare the stage distribution between countries and estimate stage-specific one-  
87 year net survival and the excess hazard up to 18 months after diagnosis, using flexible  
88 parametric models on the log cumulative excess hazard scale.

89 **Results:** One-year survival was 69% in the UK, 72% in Denmark and 74-75% elsewhere. In  
90 Denmark, 74% of patients were diagnosed with FIGO stage III-IV disease, compared to 60-  
91 70% elsewhere. International differences in survival were evident at each stage of disease;  
92 women in the UK had lower survival than in the other four countries for patients with FIGO  
93 stage III-IV disease (61.4% *vs.* 65.8-74.4%). International differences were widest for older  
94 women and for those with advanced stage or with no stage data.

95 **Conclusion:** Differences in stage at diagnosis partly explain international variation in ovarian  
96 cancer survival, and a more adverse stage distribution contributes to comparatively low  
97 survival in Denmark. This could arise because of differences in tumour biology, staging  
98 procedures or diagnostic delay. Differences in survival also exist within each stage, as  
99 illustrated by lower survival for advanced disease in the UK, suggesting unequal access to  
100 optimal treatment. Population-based data on cancer survival by stage are vital for cancer

101 surveillance, and global consensus is needed to make stage data in cancer registries more  
102 consistent.

103

## 104 **Introduction**

105 International differences in ovarian cancer survival are wide, persistent and largely  
106 unexplained, even between high-income countries with similar health systems [1]. We  
107 investigate whether these differences in overall survival may be explained by variation in  
108 stage at diagnosis or in stage-specific survival.

109 The International Cancer Benchmarking Partnership (ICBP) is a consortium of cancer  
110 registries, clinicians and epidemiologists using population-based data to examine  
111 international survival differences. We aim to provide benchmarks against which progress in  
112 outcomes can be evaluated, and which will help to refine policy for cancer control. Five  
113 countries (Australia, Canada, Denmark, Norway and the UK) contributed to this study of  
114 ovarian cancer.

## 115 **Material and methods**

### 116 *Data*

117 The ICBP collected population-based cancer registration data from Australia (New South  
118 Wales, Victoria), Canada (Alberta, British Columbia, Manitoba, Ontario), Denmark, Norway  
119 and the UK (eight regional registries covering all of England; Northern Ireland, Wales) for  
120 137,199 women diagnosed with a cancer of the ovary (including Fallopian tubes and adnexa:  
121 ICD-10 C56; C57.0-C57.9) during 1995-2007. Women diagnosed with a benign, uncertain or

122 borderline malignancy, in situ or metastatic tumour were ineligible (webappendix para 1).  
123 Extensive quality control has been documented [1].

124 To conduct survival analyses by stage at diagnosis, we used data from the most recent 4 years  
125 of the period 1995-2007, for which stage data were more complete, and from the 11 (of 18)  
126 cancer registries in which at least half of all women diagnosed in 2004-07 had a valid stage.  
127 The excluded registries (Victoria, Australia; Ontario, Canada; four English regional registries  
128 and Wales, UK) represented 54% of the original population base. Finally, 20,073 women  
129 were included in the analyses, of whom 14,948 (74.5%) had complete stage information on  
130 their registry record.

131 The classification and coding of stage at diagnosis varies, both clinically and between cancer  
132 registries. We developed guidelines for harmonising data on stage from disparate  
133 classification systems into a final, comparable variable for survival analysis (Walters *et al*,  
134 Comparability of stage data in cancer registries in six countries: lessons from the  
135 International Cancer Benchmarking Partnership, *in review*). We requested data coded to the  
136 TNM classification of stage, including separate information on the extent of the tumour (T),  
137 nodal involvement (N) and metastases (M) [2]. We prioritised pathological stage data (pT,  
138 pN) except for metastases, where we preferred clinical stage (cM). For some patients, only  
139 the grouped TNM stage was available. For many patients, registries submitted data coded to  
140 the International Federation of Gynaecology and Obstetrics (FIGO) staging system, which  
141 maps to the grouped TNM stages. For patients with TNM and/or FIGO data, we defined a  
142 final FIGO stage.

143 In New South Wales (and for some Norwegian patients with no TNM or FIGO stage) stage  
144 was categorised as 'localised', 'regional', or 'distant'. We also mapped TNM and FIGO to a



145 'localised, regional, distant' structure, based on the US Surveillance, Epidemiology and End  
146 Results Summary Stage 2000 (SEER SS2000) (Walters *et al, in review*). SEER SS2000 is  
147 closely equivalent to the Australian and Norwegian systems, but better documented and more  
148 widely known [3]. We present results using both SEER SS2000 (all countries) and FIGO  
149 (without Australia). There is general equivalence between FIGO stages I-II and SEER  
150 SS2000 'localised' and 'regional', and between FIGO stages III-IV and SEER SS2000  
151 'distant'. For simplicity here, stages I-IV will refer to FIGO, and 'localised', 'regional' or  
152 'distant' to SEER SS2000.

### 153 *Statistical analyses*

154 We used flexible parametric models with the *stpm2* command [4] implemented in Stata  
155 version 12 (StataCorp LP, College Station, TX; webappendix para 2) to model net survival  
156 [5]. We censored patients at three years and estimated net survival and excess mortality up to  
157 18 months after diagnosis, to ensure greater stability in the modelled estimates. Background  
158 mortality was derived from life tables of all-cause mortality rates for women in each  
159 jurisdiction by single year of age and calendar year at death [1]. Excess mortality is the  
160 excess (cancer-related) hazard of death at specific time points since diagnosis, and can be  
161 thought of as the mortality rate from the cancer alone.

162 Models were stratified by stage at diagnosis, including patients with missing data on stage as  
163 a distinct category. We allowed for variation with time since diagnosis in the effect of age at  
164 diagnosis and country; interactions were included to model non-proportionality between  
165 countries (webappendix para 3). All-ages estimates were age-standardised using stage-  
166 specific weights (webappendix table 1) derived from the age distribution of patients in all

167 jurisdictions combined, in the age categories 15-44, 45-54, 55-64, 65-74, 75-84 and 85-99  
168 years.

169 We conducted multiple imputation by chained equations to ascertain the probable stage  
170 distribution for tumours with missing stage, using the *ice* command in Stata [6-8]  
171 (webappendix para 4). We ran the imputation model 15 times, obtaining 15 imputed datasets.  
172 We report the overall stage distribution combined under Rubin's rules [8]. The same  
173 modelling strategy for stage-specific survival was then repeated on each of the 15 imputed  
174 datasets, and the range of estimates compared to the estimate based on the observed stage  
175 data.

## 176 **Findings**

### 177 *Distributions by stage and age*

178 Mean age at diagnosis varied from 63.8 to 65.2 years. Women with more advanced stage  
179 were older in all jurisdictions (Table 1, Figure 1), but the age distribution of unstaged women  
180 varied: compared to women with metastatic disease (stage IV; 'distant'), unstaged women  
181 were on average 4-12 years older in Norway and Canada, 1-2 years older in Denmark and the  
182 UK, and slightly younger in Australia.

183 Insert Table 1

184 The proportion of unstaged tumours ranged from 4% (Norway) to 32% (UK). The proportion  
185 increased with age, reaching 40% of 70-99 year-old women in Canada and the UK (Figure 1).

186 Insert Figure 1

187 Among women with a recorded stage, Canada and Norway had similar stage distributions,  
188 with nearly half of all women diagnosed in stage III. The UK and Australia also had similar  
189 distributions, with a higher proportion of ‘localised’ tumours (23% vs. less than 15%  
190 elsewhere).

191 Denmark had a very high proportion of women with stage IV tumours (43% vs. 23% or less  
192 elsewhere) and the lowest proportion in stage III (31% vs. 38% or more). The proportion with  
193 stage I tumours was similar in Canada, Denmark and Norway (20-23%) and higher in the UK  
194 (33%) (Table 1).

195 Imputing stage where it was missing did not substantially alter the distribution of stage in any  
196 country. The range of proportions of women diagnosed in stage III-IV changed from 61-74%  
197 to 64-75% (Table 1).

#### 198 *Net survival*

199 Age-standardised one-year net survival was lowest for women in the UK (68.8%),  
200 intermediate in Denmark (72.5%) and highest in Canada (74.2%), Norway (74.3%) and  
201 Australia (74.9%). In each age group, overall net survival (all stages combined) was lowest in  
202 the UK (Table 2).

203 Insert Table 2

204 In all countries, one-year net survival was about 40% lower for women aged 70-99 years than  
205 for women aged 15-49 years, and for women diagnosed at stage IV than at stage I. The  
206 international differences in survival by age were larger for women with more advanced  
207 disease or missing stage (Table 2).

208 Among women with early disease (stage I; ‘localised’), women in Denmark and Australia  
209 had lower age-standardised survival (94-95%) than elsewhere (over 97%). Survival for  
210 women with stage I cancers in Denmark was lower than for women with stage II disease.  
211 Among women with ‘regional’ cancers, survival was 85.6% in Australia compared to 93-96%  
212 elsewhere.

213 Among women with stage III-IV or ‘distant’ cancer, women in the UK had the lowest net  
214 survival at one year. Survival from ‘distant’ disease ranged from 61.4% in the UK to 65.8-  
215 66.6% in Australia, Denmark and Norway, and 74.4% in Canada.

#### 216 *Excess mortality*

217 The excess hazard was highest one month after diagnosis and became relatively constant after  
218 the sixth month. International variation in the excess hazard was greatest for women with  
219 early-stage disease (Figure 2).

220 For stage I disease, women in Denmark had the highest excess mortality up to 18 months  
221 after diagnosis. Women with ‘localised’ or ‘regional’ disease in Australia had consistently  
222 high excess mortality up to 18 months. Women in the UK with stage II-III or ‘distant’ disease  
223 had relatively high excess mortality at all time points between 1 and 18 months (Figure 2).

224 Insert Figure 2

#### 225 *Impact of missing data on net survival*

226 When we imputed stage for women with missing data and included them in the survival  
227 analyses, stage-specific survival was lower in all countries. This effect was largest in Canada  
228 at all stages, and for UK women with stage IV (or ‘distant’) disease. In Canada, stage-specific

229 survival was up to 11% lower when imputed data were included, and the apparent survival  
230 advantage for most stage categories diminished or disappeared (Figure 3).

231 Insert Figure 3

## 232 **Discussion**

233 This is the first attempt to produce a rigorous international comparison of survival from  
234 ovarian cancer by stage at diagnosis using routinely-collected data from population-based  
235 cancer registries. The design is important, both because of the size of the dataset, and because  
236 it includes all women in a given region or country, regardless of their age, social status, co-  
237 morbidity or prognosis, not just the small and highly selected sub-sets of patients usually  
238 recruited into clinical trials. Such studies are invaluable for international cancer surveillance,  
239 but quality assurance is particularly important [9].

240 Age-standardised one-year net survival from ovarian cancer was 68.8% in the UK, and from  
241 72.5% to 74.9% in the other four countries. The international range in survival (6.1%) is  
242 narrower than in a previous analysis (10.2%) [1], because seven of the eighteen registries  
243 were excluded for incomplete stage data, and there were differences in methodology and  
244 period of incidence. One-year survival was lower in the UK, despite a relatively favourable  
245 stage distribution. International differences in survival were evident within each stage  
246 category: the differences were larger for older women and those with tumours of advanced  
247 stage or unrecorded stage.

248 For most cancers, earlier stage is associated with earlier diagnosis, and low stage-specific  
249 survival may indicate sub-optimal treatment. Epithelial ovarian cancer represents over 90%  
250 of ovarian cancers, and there are two distinct sub-types rather than a stepwise progression

251 from one stage to the next. ‘Type I’ tumours are typically mucinous, clear-cell, low-grade  
252 serous or endometrioid carcinomas that present relatively early (stage I-II; ‘localised’ or  
253 ‘regional’). ‘Type II’ tumours are usually more aggressive and diagnosed at advanced stage  
254 with high-grade serous, carcinosarcomatous or undifferentiated morphology [10].

255 International differences in the distribution of stage at diagnosis may therefore reflect  
256 differences in both tumour biology and timing of diagnosis in addition to completeness,  
257 consistency and quality of staging. Differences in stage-specific survival may arise because  
258 of these factors, but also from differences in treatment. We consider these potential  
259 explanations below, together with their policy implications.

260 Countries where survival is low could have a higher prevalence of the more aggressive ‘type  
261 II’ tumours. The proportion of patients with stage III-IV or ‘distant’ tumours varied from  
262 60.0% in Australia to 63.9% in the UK, 65.8% in Canada, 69.8% in Norway and 74.5% in  
263 Denmark. The proportion of serous tumours, most of which (90%) would have been high-  
264 grade [11], was also highest in Denmark and Norway supporting an apparently higher  
265 proportion of ‘type II’ tumours. Specific morphology codes were available for 66-79% of  
266 women and were imputed where missing or non-specific (analysis not shown).

267 Given the different clinical behaviour of type I and type II ovarian cancers, international  
268 differences in stage distribution may not all be attributable to differences in time to diagnosis  
269 [12;13]. There may be some diagnostic delay among women with type II cancers in the UK  
270 and Denmark, where the proportion with advanced disease was 26.1% and 43.6%,  
271 respectively, compared to 18-20% in Canada and Norway. Overall, however, the stage  
272 distribution in the UK is relatively favourable, and it is unlikely that delayed diagnosis  
273 explains lower survival in that country.

274 The proportion of tumours with missing stage data varied from 3.8% (Norway) to 31.7%  
275 (UK), although analyses were restricted to registries where at least 50% of tumours were  
276 staged. We used imputation to deal with any potential bias from missing stage data. Even  
277 without data on treatment and co-morbidity, imputation remains the most robust method of  
278 dealing with missing data [7]. We do not consider that the international differences in stage  
279 distribution or stage-specific survival arise because of differences in the completeness of  
280 stage data.

281 We prioritised stage data in the same way for each patient and each country with a single  
282 protocol and a pre-defined algorithm to obtain a final stage variable. However, we had no  
283 control over the availability of the raw data or the quality of the original staging procedures.

284 It was not possible to obtain FIGO and TNM stage data on ovarian cancer from all countries.  
285 This necessitated mapping the FIGO system to the SEER SS2000 system. Mapping was  
286 relatively straightforward: we estimated potential misclassification of just 0.2% of node-  
287 positive tumours with no extra-pelvic extension and for which individual T, N and M data  
288 were unavailable (Walters *et al*, *in review*). Such minor misclassification is unlikely to  
289 explain why women in Australia had the highest overall net survival (75.2%) but those with  
290 ‘regional’ disease had lower survival than elsewhere (85.6% vs. 93.0%-95.5%). This  
291 difference was reduced when women with imputed stage were included, suggesting that the  
292 low survival for ‘regional’ disease in Australia was partly driven by low survival among the  
293 large number of elderly women with a known stage.

294 The quality of staging may contribute to international differences in both stage distribution  
295 and stage-specific survival. For example, sub-optimal staging in which nodal involvement  
296 and extra-pelvic metastases are missed, meaning that stage III disease would be coded as

297 stage I [14;15], could explain the surprising finding that survival among elderly women in  
298 Denmark with stage I cancer was lower than for stage II. The low proportion of stage III  
299 cancers in Denmark (30.8% vs. 37.8%-49.6% elsewhere) and the high proportion of stage IV  
300 (43.6% vs. 17.9%-26.1%) could also arise because some stage III tumours were misclassified  
301 as stage IV: this is suggested by rather high survival in both stage categories compared to  
302 other countries. Misclassification could arise if women were categorised as stage IV in  
303 Denmark solely on the presence of pleural effusion, whereas other jurisdictions also required  
304 malignant cytology of pleural fluid.

305 Evaluating the impact of staging investigations on stage distributions and stage-specific  
306 survival would require data on the determinants of stage [16], for example full staging  
307 laparotomy or cross-sectional imaging, and whether extent of disease was confirmed by  
308 histology or cytology.

309 All five countries have long-established, complete and reliable cancer registration.  
310 Nonetheless, there may be differences in the extent to which primary peritoneal cancers  
311 (ICD-10 C48) are mistakenly recorded as ovarian cancer (C56), given the similarities with  
312 the presentation of ovarian cancer. The extent to which cancers registered as primary ovarian  
313 cancer may in fact be metastatic (e.g. from colorectal cancer) may also vary, and a higher  
314 proportion of such cancers, which have poor prognosis, may be expected in countries such as  
315 the UK with high recorded incidence of ovarian cancer and a higher proportion of non-  
316 specific morphology (33% vs. less than 26% elsewhere).

317 Population-based international comparisons of stage and stage-specific survival for ovarian  
318 cancer thus remain difficult. Resolving the difficulties will require a new global consensus on  
319 staging (Walters *et al*, *in review*). Nonetheless, this dataset of 20,000 women with ovarian



320 cancer broadens our understanding of international differences in survival. Stage-specific  
321 survival and the relationships between stage and age, and stage and morphology (data not  
322 shown) are consistent with clinical expectation. The stage distributions also largely reflect  
323 previously published figures [17-20], despite differences in categorisation.

324 This study raises several policy issues. Women in the UK had the lowest overall survival  
325 despite a relatively favourable stage distribution. Survival for women diagnosed at an early  
326 stage (I-II; 'localised' or 'regional') was average, but for women with advanced disease  
327 (stage III-IV; 'distant') survival was significantly lower than in other countries. The UK  
328 should consider whether the treatment of women with stage III-IV cancer conforms to that in  
329 the other four countries. The proportion of patients with missing data on stage was higher in  
330 the UK than elsewhere. It should be investigated whether this is because fewer women are in  
331 fact staged, or because transmission of stage data to the cancer registries is less complete than  
332 elsewhere.

333 Women in Australia, Norway and Canada had very similar levels of overall survival. Survival  
334 in Canada with known stage was relatively high for women with stages I, III and IV, but  
335 when imputed stage data were included, this apparent advantage disappeared. One-quarter of  
336 women in Canada were missing data on stage, and these women were generally older, with  
337 lower survival. This was in contrast with Australia, where older women were almost as likely  
338 to be staged as younger women. Canada should investigate whether staging of elderly women  
339 with ovarian cancer needs to be improved. Norway had relatively complete staging and high  
340 age-standardised survival for women with early-stage disease. This survival advantage was  
341 not apparent for women with more advanced disease, however, and the management of these  
342 patients should perhaps be reviewed.

343 Denmark had the least favourable stage distribution and the second lowest overall survival.  
344 This could arise because of differences in tumour biology or because of delayed diagnosis for  
345 type I or type II disease.

#### 346 *Conclusion*

347 One-year net survival is significantly lower in the UK than in Australia, Canada, Norway and  
348 Denmark. Lower overall survival in the UK arises because of particularly low survival among  
349 women with advanced disease: the management of these women should be investigated. In  
350 Denmark, the more advanced stage distribution may arise because of a higher prevalence of  
351 aggressive type II cancers, or because of delays in diagnosis.

352

353 Population-based survival comparisons are powerful because they include all patients, and  
354 are up-to-date and affordable. To facilitate such research, global agreement is needed on the  
355 classification system for stage at diagnosis. International protocols should be issued or  
356 updated to standardise both clinical practice on staging and the routine transmission of these  
357 data to population-based cancer registries. Information on the determinants of stage should be  
358 captured, to facilitate quality assurance and robust international comparisons of stage and  
359 stage-specific survival.

360

#### 361 **Conflict of interest statement**

362 M.A Richards is the National Cancer Director (England, funded by the Department of  
363 Health). All remaining authors have no conflict of interest.

364

365

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425

## Table and figure legends

426

427 **Table 1.** Number and mean age of ovarian cancer patients diagnosed during 2004-2007,  
428 country and stage at diagnosis (FIGO and SEER Summary Stage 2000), before and after  
429 imputation

430

### Legend:

432 <sup>1</sup> Australia: New South Wales

433 <sup>2</sup> Canada: Alberta, British Columbia and Manitoba

434 <sup>3</sup> United Kingdom: Northern and Yorkshire Cancer Registry and Information Service

435 (NYCRIS), Eastern Cancer Registration and Information Centre (ECRIC), South West

436 Cancer Intelligence Service (SWCIS) and West Midlands Cancer Intelligence Unit (WMCIU)

437 in England; Northern Ireland

438 <sup>4</sup> Number of patients before imputation

439

440 **Figure 1.** Proportions of ovarian cancer patients with missing data on stage and observed  
441 cumulative stage distribution by age at diagnosis and country, FIGO and SEER Summary  
442 Stage 2000

443

### Notes:

445 Australia: New South Wales; Canada: Alberta, British Columbia and Manitoba; UK:

446 Northern and Yorkshire Cancer Registry and Information Service (NYCRIS), Eastern Cancer  
447 Registration and Information Centre (ECRIC), South West Cancer Intelligence Service

448 (SWCIS) and West Midlands Cancer Intelligence Unit (WMCIU) in England; Northern

449 Ireland

450 **Table 2.** One-year net survival (%) overall, age-standardised and age-specific, by stage at  
451 diagnosis and country for ovarian cancer patients diagnosed during 2004-2007

452

453 Legend:

454 <sup>1</sup> Australia: New South Wales

455 <sup>2</sup> Canada: Alberta, British Columbia and Manitoba

456 <sup>3</sup> United Kingdom: Northern and Yorkshire Cancer Registry and Information Service

457 (NYCRIS), Eastern Cancer Registration and Information Centre (ECRIC), South West

458 Cancer Intelligence Service (SWCIS) and West Midlands Cancer Intelligence Unit (WMCIU)

459 in England; Northern Ireland

460 <sup>4</sup> The all-ages estimates vary slightly between the FIGO and SEER SS2000 analyses because

461 Australian patients are included in net survival models in the SEER SS2000 analyses

462

463 **Figure 2.** Age-standardised excess hazard (per 1,000 person-years, log scale) from ovarian

464 cancer patients with known stage, by stage, country and time since diagnosis: FIGO stage and

465 SEER Summary Stage 2000

466

467 Notes:

468 Australia: New South Wales; Canada: Alberta, British Columbia and Manitoba; UK:

469 Northern and Yorkshire Cancer Registry and Information Service (NYCRIS), Eastern Cancer

470 Registration and Information Centre (ECRIC), South West Cancer Intelligence Service

471 (SWCIS) and West Midlands Cancer Intelligence Unit (WMCIU) in England; Northern

472 Ireland

473

474 **Figure 3.** Age-standardised one year net survival from ovarian cancer by stage at diagnosis  
475 and country using known stage and imputed stage, FIGO and SEER Summary Stage 2000

476

477 Legend:

478 X survival estimate derived from women with known stage

479 I range of survival estimates derived for all women after imputation of stage where it  
480 was missing (see text)

481

482 Notes:

483 Australia: New South Wales; Canada: Alberta, British Columbia and Manitoba; UK:  
484 Northern and Yorkshire Cancer Registry and Information Service (NYCRIS), Eastern Cancer  
485 Registration and Information Centre (ECRIC), South West Cancer Intelligence Service  
486 (SWCIS) and West Midlands Cancer Intelligence Unit (WMCIU) in England; Northern  
487 Ireland

488

489 **Webappendix**

490

491 Study population and details of methodology

492

493 **Supplementary table 1.** Stage-specific sets of weights used for age standardisation of  
494 ovarian cancer estimates

495

**Table 1. Number and mean age of ovarian cancer patients diagnosed during 2004-2007, country and stage at diagnosis (FIGO and SEER Summary Stage 2000), before and after imputation**

Country	FIGO stage					SEER Summary Stage 2000				
	Stage	Number <sup>4</sup>	Mean age	%		Stage	Number <sup>4</sup>	Mean age	%	
				Observed	After imputation				Observed	After imputation
New South Wales (Australia <sup>1</sup> )	All patients					All patients	1,714	63.8		
	Missing stage					Missing stage	166	65.4	9.7	
	I					Localised	358	56.5	23.1	23.3
	II					Regional	257	62.5	16.6	16.7
	III					Distant	933	66.8	60.3	60.0
Canadian provinces <sup>2</sup>	All patients	2,311	63.9			All patients	2,311	63.9		
	Missing stage	584	71.6	25.3		Missing stage	584	71.6	25.3	
	I	392	55.0	22.7	22.1	Localised	245	53.2	14.2	14.1
	II	224	60.0	13.0	12.2	Regional	379	59.1	21.9	20.1
	III	829	62.8	48.0	47.8	Distant	1,103	63.9	63.9	65.8
	IV	282	67.1	16.3	17.9					
Denmark	All patients	2,296	65.2			All patients	2,296	65.2		
	Missing stage	524	67.6	22.8		Missing stage	524	67.6	22.8	
	I	359	60.8	20.3	20.0	Localised	219	61.2	12.4	12.2
	II	99	61.7	5.6	5.6	Regional	251	61.1	14.2	13.8
	III	554	63.6	31.3	30.8	Distant	1,302	65.7	73.5	74.0
	IV	760	67.2	42.9	43.6					



<b>Norway</b>	<b>All patients</b>	1,843	65.2			<b>All patients</b>	1,843	65.2		
	<b>Missing stage</b>	171	76.5	9.3		<b>Missing stage</b>	70	78.7	3.8	
	<b>I</b>	391	58.7	23.4	22.1	<b>Localised</b>	217	58.7	12.2	12.1
	<b>II</b>	140	63.8	8.4	8.1	<b>Regional</b>	326	61.9	18.4	18.2
	<b>III</b>	829	65.4	49.6	49.6	<b>Distant</b>	1,230	66.5	69.4	69.8
	<b>IV</b>	312	67.5	18.7	20.2					
<b>UK registries<sup>3</sup></b>	<b>All patients</b>	11,909	64.7			<b>All patients</b>	11,909	64.7		
	<b>Missing stage</b>	3,781	67.8	31.7		<b>Missing stage</b>	3,781	67.8	31.7	
	<b>I</b>	2,681	57.1	33.0	30.5	<b>Localised</b>	1,886	56.1	23.2	21.5
	<b>II</b>	478	63.2	5.9	5.6	<b>Regional</b>	1,275	60.9	15.7	14.4
	<b>III</b>	3,127	65.5	38.5	37.8	<b>Distant</b>	4,967	66.7	61.1	64.1
	<b>IV</b>	1,842	68.7	22.7	26.1					

<sup>1</sup> Australia: New South Wales

<sup>2</sup> Canada: Alberta, British Columbia and Manitoba

<sup>3</sup> United Kingdom: Northern and Yorkshire Cancer Registry and Information Service (NYCRIS), Eastern Cancer Registration and Information Centre (ECRIC), South West Cancer Intelligence Service (SWCIS) and West Midlands Cancer Intelligence Unit (WMCIU) in England; Northern Ireland

<sup>4</sup> Number of patients before imputation

**Table 2. One-year net survival (%) overall, age-standardised and age-specific, by stage at diagnosis and country for ovarian cancer patients diagnosed during 2004-2007**

		New South Wales (Australia <sup>1</sup> )			Canadian provinces <sup>2</sup>			Denmark			Norway			UK registries <sup>3</sup>		
		NS		NS	NS		NS	NS		NS	NS		NS	NS		
		(%)	95% CI		(%)	95% CI		(%)	95% CI		(%)	95% CI		(%)	95% CI	
<b>FIGO stage</b>																
All patients	All ages			<b>74.7</b>	73.3	76.1	<b>72.6</b>	71.1	74.2	<b>73.9</b>	72.3	75.6	<b>68.6</b>	67.9	69.3	
	Age-standardised			<b>74.1</b>	73.4	74.8	<b>72.4</b>	71.6	73.1	<b>74.3</b>	73.5	75.1	<b>68.7</b>	68.3	69.1	
	15-49			<b>93.9</b>	93.4	94.5	<b>93.1</b>	92.5	93.7	<b>93.9</b>	93.3	94.5	<b>92.8</b>	92.3	93.2	
	50-69			<b>83.2</b>	82.1	84.4	<b>80.9</b>	79.6	82.2	<b>83.2</b>	81.9	84.5	<b>78.0</b>	77.3	78.7	
	70-99			<b>55.0</b>	52.7	57.4	<b>54.6</b>	52.2	56.9	<b>56.0</b>	53.4	58.6	<b>48.3</b>	47.1	49.5	
Stage I	All ages			<b>97.7</b>	96.2	99.1	<b>93.3</b>	91.0	95.7	<b>98.5</b>	97.2	99.7	<b>97.3</b>	96.6	97.9	
	Age-standardised			<b>97.3</b>	96.3	98.3	<b>94.7</b>	93.6	95.8	<b>98.5</b>	97.9	99.2	<b>97.2</b>	96.9	97.6	
	15-49			<b>99.3</b>	98.7	100.0	<b>99.4</b>	98.9	100.0	<b>99.0</b>	98.0	100.0	<b>98.9</b>	98.4	99.3	
	50-69			<b>98.1</b>	97.0	99.3	<b>97.0</b>	95.4	98.7	<b>98.5</b>	97.4	99.7	<b>97.4</b>	96.8	98.0	
	70-99			<b>93.1</b>	86.9	99.3	<b>81.0</b>	73.7	88.4	<b>97.8</b>	95.0	100.0	<b>94.6</b>	92.9	96.4	
Stage II	All ages			<b>92.3</b>	89.0	95.6	<b>96.0</b>	92.0	100.0	<b>93.2</b>	89.1	97.3	<b>89.7</b>	87.0	92.4	
	Age-standardised			<b>91.7</b>	89.9	93.5	<b>95.9</b>	94.0	97.8	<b>93.6</b>	91.8	95.5	<b>89.9</b>	88.5	91.3	
	15-49			<b>96.5</b>	94.6	98.4	<b>98.4</b>	96.7	100.0	<b>97.4</b>	95.5	99.3	<b>95.9</b>	94.0	97.8	
	50-69			<b>93.4</b>	90.4	96.3	<b>96.6</b>	93.2	100.0	<b>95.0</b>	91.9	98.2	<b>91.5</b>	89.1	93.9	
	70-99			<b>86.3</b>	79.9	92.7	<b>93.1</b>	86.2	100.0	<b>88.9</b>	82.0	95.7	<b>83.7</b>	78.8	88.6	
Stage III	All ages			<b>83.5</b>	81.3	85.6	<b>81.0</b>	78.2	83.8	<b>76.2</b>	74.0	78.5	<b>69.8</b>	68.3	71.3	
	Age-standardised			<b>82.3</b>	80.6	83.9	<b>79.9</b>	77.7	82.1	<b>77.5</b>	75.9	79.1	<b>70.3</b>	69.2	71.4	
	15-49			<b>90.0</b>	86.7	93.2	<b>88.4</b>	83.5	93.4	<b>90.9</b>	87.3	94.4	<b>84.1</b>	81.1	87.0	
	50-69			<b>87.0</b>	84.8	89.2	<b>85.7</b>	82.9	88.5	<b>87.4</b>	85.2	89.6	<b>76.4</b>	74.6	78.2	
	70-99			<b>74.0</b>	69.7	78.3	<b>68.8</b>	62.8	74.9	<b>55.8</b>	51.3	60.2	<b>57.1</b>	54.5	59.6	

Stage IV	All ages	<b>57.0</b>	51.9	62.1	<b>59.8</b>	56.6	63.0	<b>55.0</b>	50.2	59.8	<b>51.7</b>	49.6	53.8			
	Age-standardised	<b>57.0</b>	53.4	60.7	<b>57.9</b>	55.6	60.2	<b>54.5</b>	51.2	57.8	<b>52.6</b>	51.1	54.1			
	15-49	<b>62.0</b>	50.1	73.9	<b>82.5</b>	75.2	89.9	<b>72.7</b>	61.9	83.5	<b>71.5</b>	65.9	77.1			
	50-69	<b>68.0</b>	61.8	74.3	<b>72.4</b>	68.5	76.2	<b>72.5</b>	66.5	78.4	<b>66.3</b>	63.6	69.1			
	70-99	<b>45.4</b>	38.0	52.7	<b>40.5</b>	35.7	45.2	<b>35.8</b>	29.2	42.4	<b>35.7</b>	32.8	38.6			
Missing stage	All ages	<b>46.5</b>	43.2	49.7	<b>62.7</b>	59.0	66.5	<b>29.3</b>	22.7	35.8	<b>52.6</b>	51.3	53.9			
	Age-standardised	<b>51.3</b>	48.9	53.7	<b>60.7</b>	57.9	63.5	<b>38.1</b>	31.9	44.4	<b>51.0</b>	50.0	52.0			
	15-49	<b>84.9</b>	78.3	91.4	<b>91.6</b>	86.7	96.5	<b>73.2</b>	40.5	100.0	<b>88.2</b>	86.0	90.4			
	50-69	<b>68.2</b>	62.8	73.6	<b>73.4</b>	68.4	78.3	<b>47.6</b>	32.2	63.1	<b>67.9</b>	65.9	70.0			
	70-99	<b>28.9</b>	24.6	33.1	<b>46.5</b>	40.8	52.3	<b>22.5</b>	15.5	29.4	<b>31.2</b>	29.3	33.1			
<b>SEER Summary Stage 2000</b>																
All patients <sup>4</sup>	All ages	<b>75.2</b>	73.6	76.8	<b>74.8</b>	73.4	76.2	<b>72.7</b>	71.2	74.2	<b>73.9</b>	72.3	75.6	<b>68.7</b>	68.0	69.4
	Age-standardised	<b>74.9</b>	73.9	75.9	<b>74.2</b>	73.3	75.0	<b>72.5</b>	71.6	73.4	<b>74.3</b>	73.4	75.3	<b>68.8</b>	68.4	69.2
	15-49	<b>95.8</b>	94.9	96.7	<b>94.2</b>	93.3	95.2	<b>93.2</b>	92.0	94.4	<b>94.9</b>	93.8	95.9	<b>92.6</b>	92.1	93.2
	50-69	<b>85.3</b>	83.8	86.8	<b>83.6</b>	82.2	84.9	<b>81.0</b>	79.5	82.5	<b>84.2</b>	82.6	85.8	<b>77.9</b>	77.1	78.7
	70-99	<b>54.4</b>	51.3	57.4	<b>54.7</b>	51.9	57.4	<b>54.6</b>	51.8	57.5	<b>54.5</b>	51.5	57.6	<b>48.7</b>	47.4	49.9
Localised	All ages	<b>94.0</b>	92.0	96.0	<b>98.1</b>	96.4	99.9	<b>91.5</b>	88.2	94.9	<b>97.3</b>	94.6	99.9	<b>98.0</b>	97.3	98.7
	Age-standardised	<b>94.2</b>	93.0	95.5	<b>97.7</b>	96.5	98.9	<b>94.2</b>	92.8	95.6	<b>97.8</b>	96.5	99.1	<b>98.0</b>	97.6	98.3
	15-49	<b>99.8</b>	99.6	100.0	<b>99.4</b>	98.6	100.0	<b>99.3</b>	98.6	100.0	<b>99.8</b>	99.3	100.0	<b>99.0</b>	98.5	99.5
	50-69	<b>98.0</b>	96.8	99.3	<b>98.3</b>	96.7	99.9	<b>96.4</b>	94.1	98.7	<b>98.8</b>	97.3	100.0	<b>98.0</b>	97.3	98.7
	70-99	<b>78.2</b>	70.7	85.7	<b>94.3</b>	87.1	100.0	<b>76.8</b>	67.0	86.6	<b>92.1</b>	82.7	100.0	<b>96.3</b>	94.4	98.1
Regional	All ages	<b>84.3</b>	80.5	88.1	<b>94.0</b>	91.9	96.2	<b>95.6</b>	93.2	98.1	<b>94.6</b>	92.3	97.0	<b>93.0</b>	91.7	94.4
	Age-standardised	<b>85.6</b>	83.7	87.4	<b>93.5</b>	92.4	94.7	<b>95.5</b>	94.2	96.7	<b>95.0</b>	94.0	96.1	<b>93.0</b>	92.3	93.7
	15-49	<b>96.2</b>	94.6	97.8	<b>98.4</b>	97.6	99.2	<b>98.9</b>	98.1	99.6	<b>98.8</b>	98.2	99.5	<b>98.4</b>	97.8	99.0
	50-69	<b>90.0</b>	87.0	92.9	<b>95.6</b>	94.0	97.3	<b>96.8</b>	95.0	98.7	<b>96.6</b>	95.0	98.2	<b>94.9</b>	93.8	96.1
	70-99	<b>69.8</b>	62.4	77.2	<b>86.2</b>	81.1	91.3	<b>90.6</b>	85.3	96.0	<b>89.0</b>	84.2	93.8	<b>85.7</b>	82.7	88.8

Distant	All ages	<b>65.0</b>	62.6	67.5	<b>76.3</b>	74.2	78.5	<b>66.8</b>	64.6	68.9	<b>65.6</b>	63.5	67.7	<b>60.9</b>	59.7	62.1
	Age-standardised	<b>66.6</b>	65.2	68.1	<b>74.4</b>	73.1	75.8	<b>65.8</b>	64.4	67.2	<b>66.1</b>	64.8	67.4	<b>61.4</b>	60.7	62.1
	15-49	<b>92.1</b>	90.2	94.0	<b>90.3</b>	88.2	92.3	<b>90.4</b>	88.4	92.4	<b>92.6</b>	91.0	94.2	<b>86.2</b>	84.8	87.6
	50-69	<b>77.5</b>	75.0	80.1	<b>80.8</b>	78.8	82.9	<b>75.2</b>	73.0	77.4	<b>78.6</b>	76.4	80.8	<b>69.8</b>	68.5	71.1
	70-99	<b>45.7</b>	41.8	49.7	<b>63.9</b>	59.8	67.9	<b>48.4</b>	44.6	52.2	<b>44.1</b>	40.5	47.7	<b>45.0</b>	43.2	46.8
Missing stage	All ages	<b>66.2</b>	60.1	72.2	<b>48.4</b>	45.2	51.7	<b>62.7</b>	59.0	66.4	<b>28.6</b>	20.0	37.2	<b>52.7</b>	51.3	54.0
	Age-standardised	<b>64.5</b>	61.2	67.8	<b>53.6</b>	51.9	55.3	<b>60.9</b>	59.0	62.9	<b>36.9</b>	32.8	41.0	<b>51.3</b>	50.4	52.3
	15-49	<b>93.2</b>	91.0	95.4	<b>88.9</b>	86.7	91.1	<b>90.2</b>	88.2	92.1	<b>82.1</b>	76.6	87.5	<b>87.9</b>	85.8	89.9
	50-69	<b>79.6</b>	74.8	84.4	<b>69.9</b>	66.7	73.1	<b>75.9</b>	72.7	79.0	<b>64.1</b>	55.3	73.0	<b>67.8</b>	65.9	69.7
	70-99	<b>44.2</b>	35.2	53.3	<b>30.5</b>	26.6	34.5	<b>44.6</b>	39.6	49.6	<b>18.3</b>	9.5	27.0	<b>31.4</b>	29.6	33.3

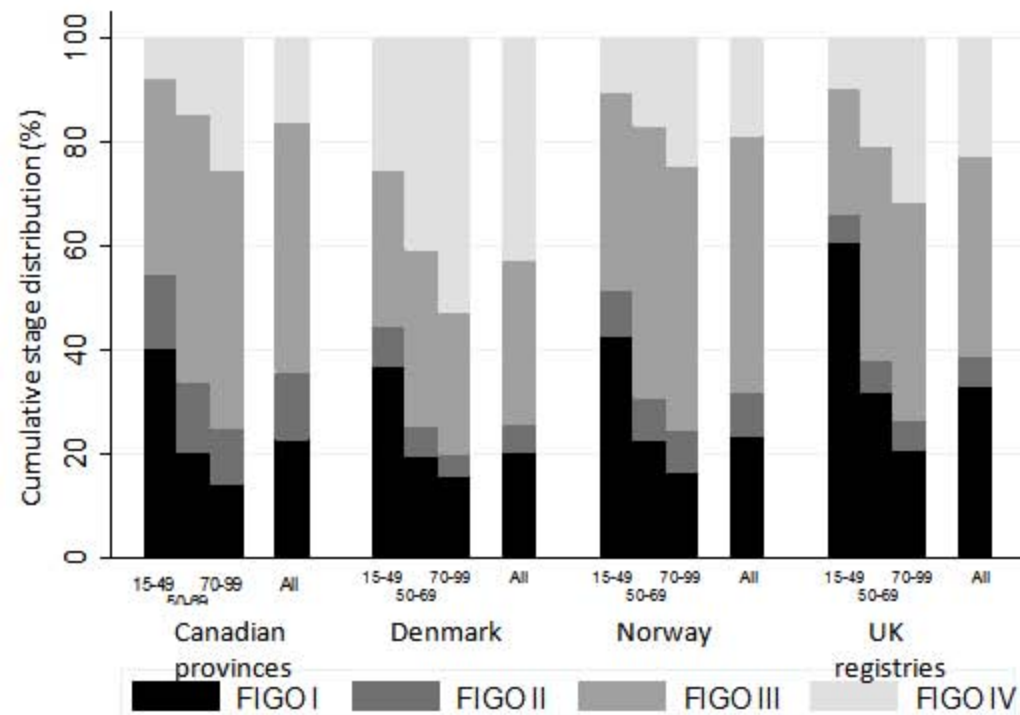
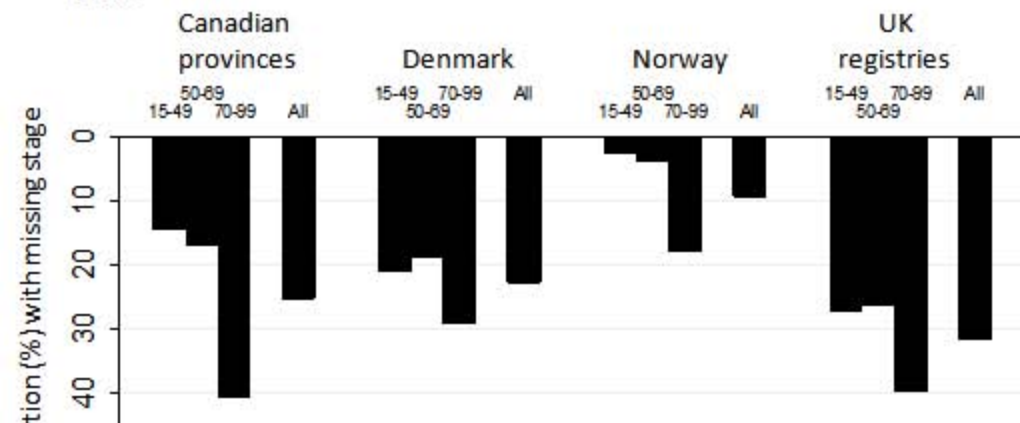
<sup>1</sup> Australia: New South Wales

<sup>2</sup> Canada: Alberta, British Columbia and Manitoba

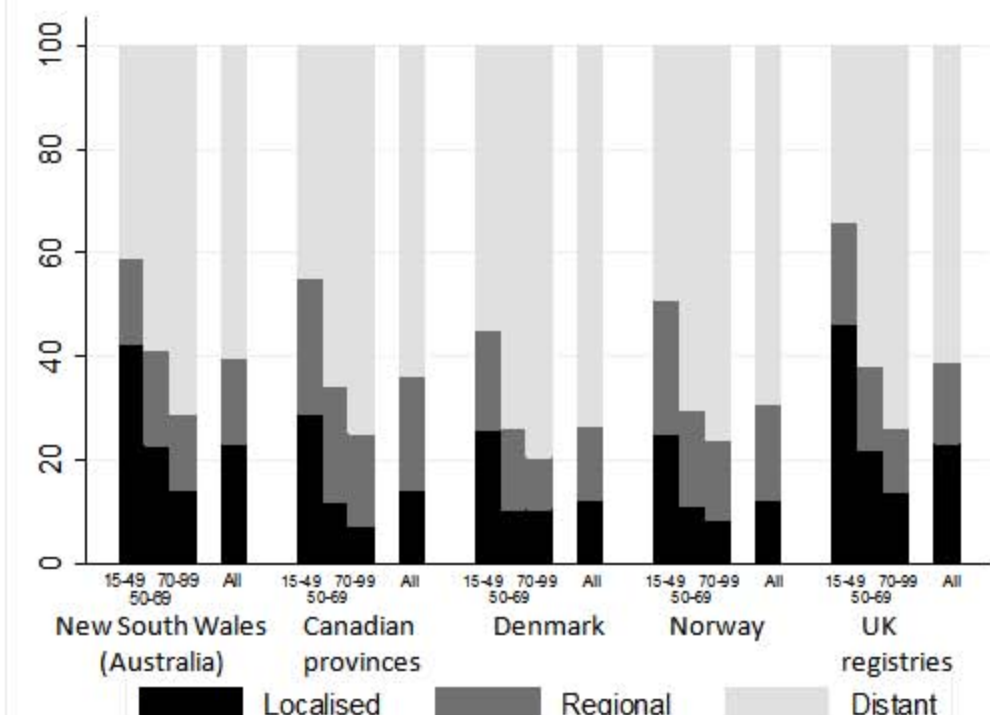
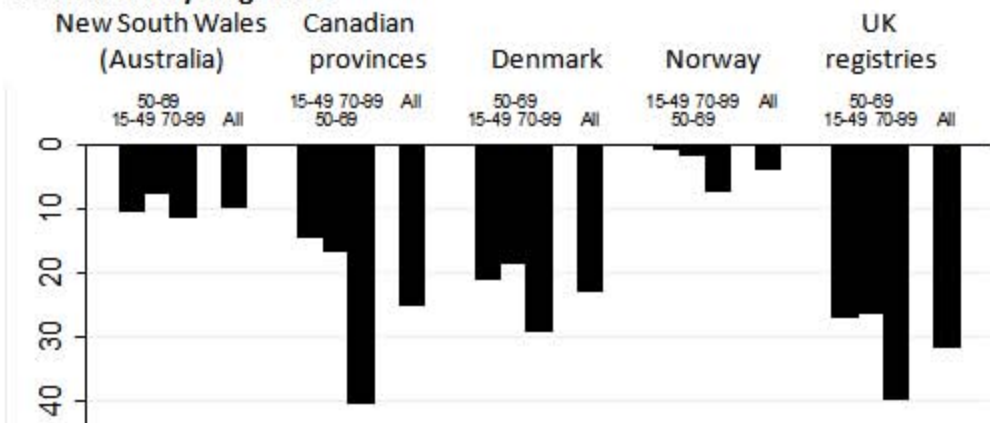
<sup>3</sup> United Kingdom: Northern and Yorkshire Cancer Registry and Information Service (NYCRIS), Eastern Cancer Registration and Information Centre (ECRIC), South West Cancer Intelligence Service (SWCIS) and West Midlands Cancer Intelligence Unit (WMCIU) in England; Northern Ireland

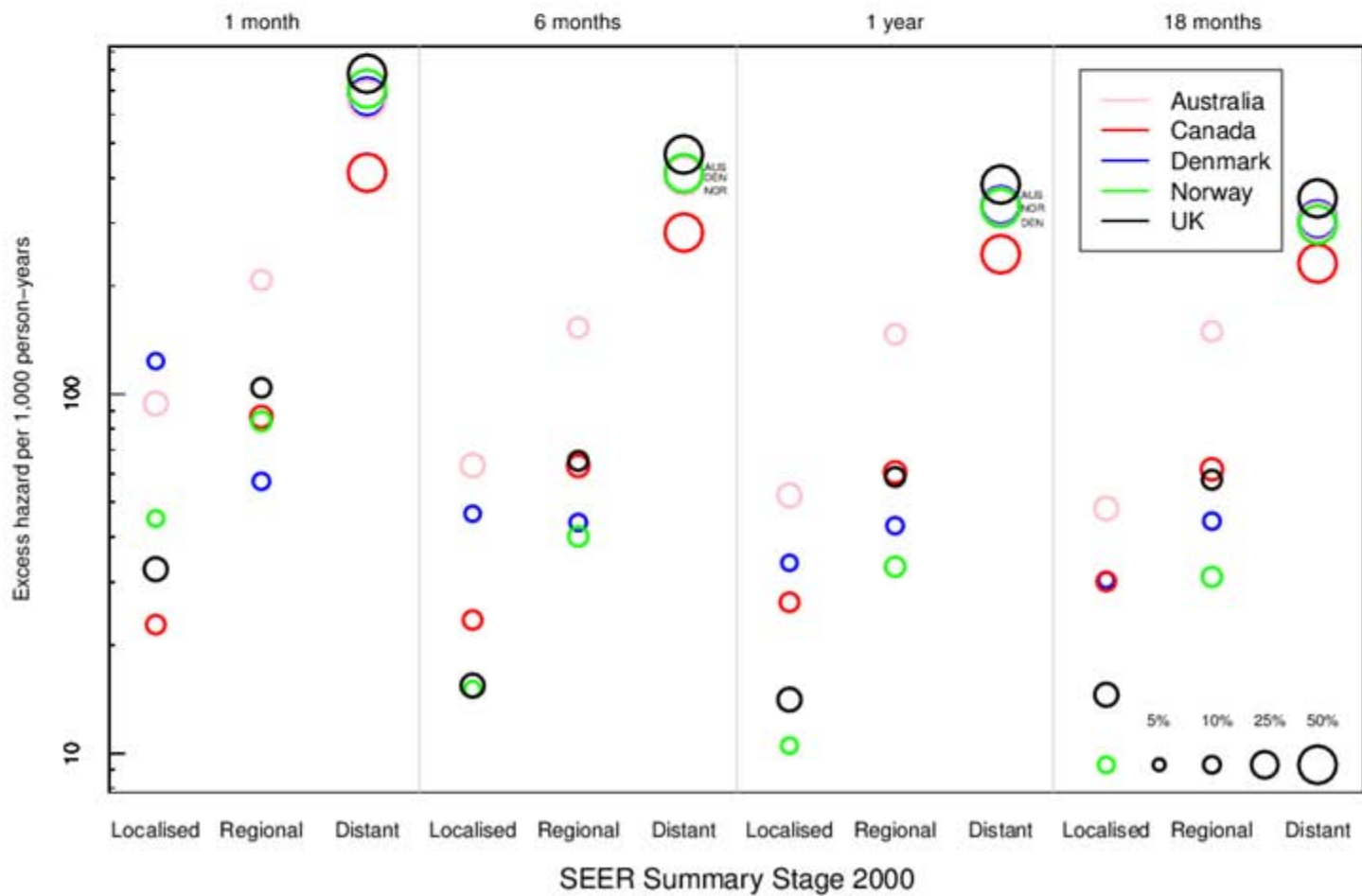
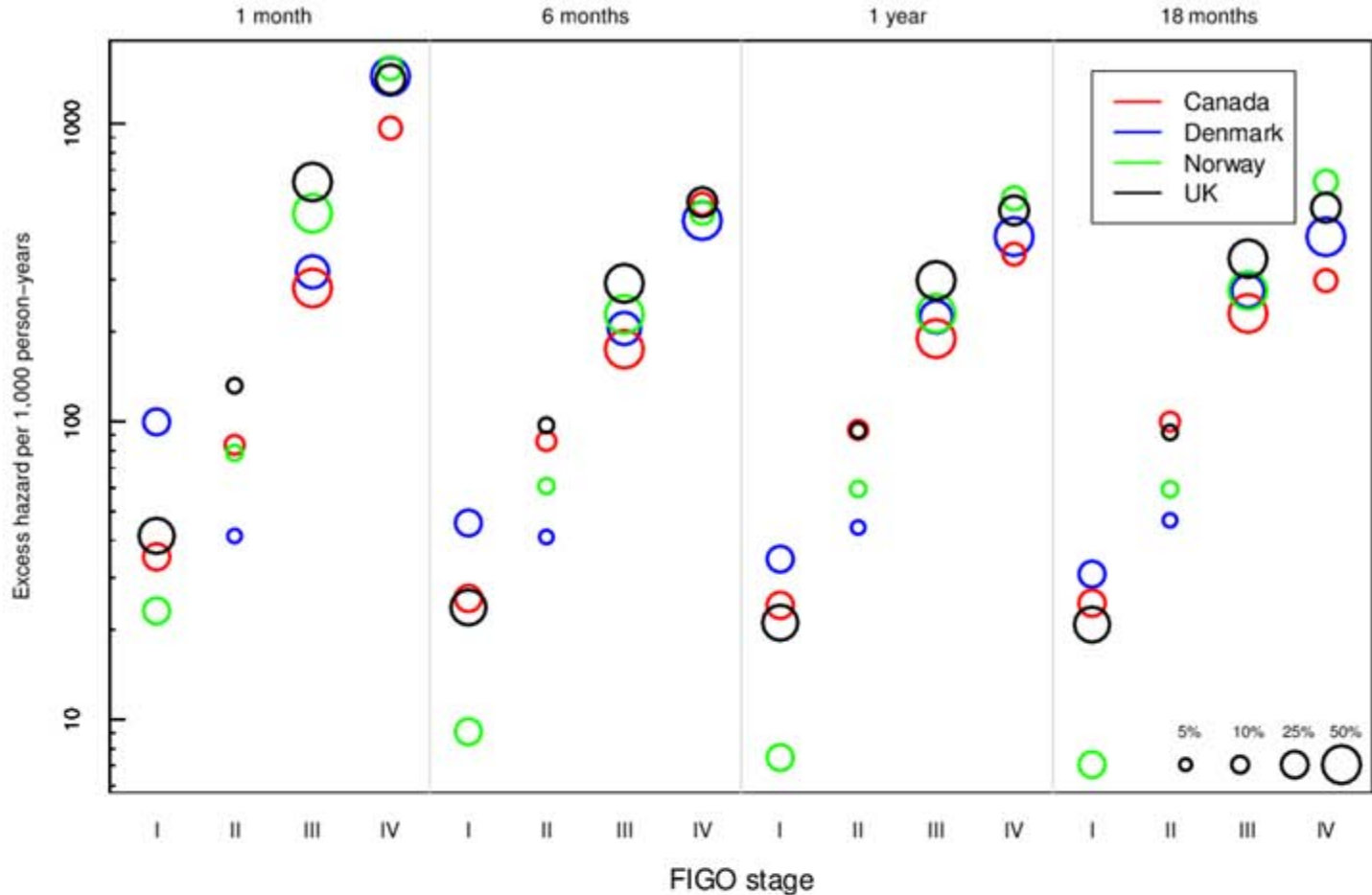
<sup>4</sup> The all-ages estimates vary slightly between the FIGO and SEER SS2000 analyses because Australian patients are included in net survival models in the SEER SS2000 analyses

FIGO

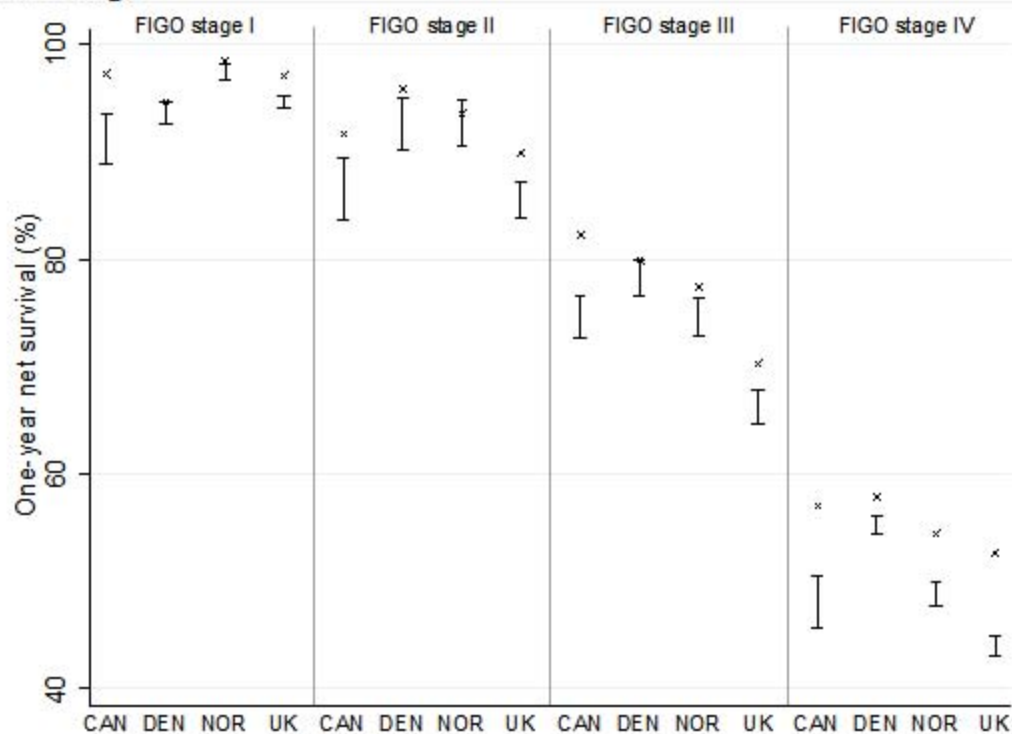


SEER Summary Stage 2000





## FIGO stage



## SEER Summary Stage 2000

