

The impact of socioeconomic position on stage at diagnosis and survival in colorectal cancer patients in Switzerland

Anita Feller^{1,2}, Kurt Schmidlin¹, Andrea Bordoni³, Christine Bouchardy⁴, Jean-Luc Bulliard⁵, Bertrand Camey⁶, Isabelle Konzelmann⁷, Manuela Maspoli⁸, Miriam Wanner⁹, Marcel Zwahlen¹, Kerri M. Clough-Gorr^{1,10}

¹Institute of Social and Preventive Medicine (ISPM), Bern; ²National Institute for Cancer Epidemiology and Registration (NICER), Zurich; ³Ticino Cancer Registry, Locarno; ⁴Geneva Cancer Registry, Geneva; ⁵Vaud Cancer Registry, Lausanne; ⁶Fribourg Cancer Registry, Fribourg; ⁷Valais Cancer Registry, Sion; ⁸Neuchâtel and Jura Cancer Registry, Neuchâtel; ⁹Cancer Registry Zurich and Zug, Zurich; ¹⁰National Cancer Registry Ireland, Cork

1. Background

- Studies outside of Switzerland have reported socioeconomic inequalities in colorectal cancer (CRC) stage at diagnosis and survival [1-4].

2. Aim

- To investigate the impact of socioeconomic position (SEP) and further demographic characteristics
 - on colorectal cancer (CRC) stage at diagnosis
 - on CRC-specific survival
- To investigate whether potential survival inequalities can be explained by differences in stage at diagnosis and/or sociodemographic factors.

3. Methods

Data Source

- This study used population-based CRC data (ICD-10 C18-C20) from seven Swiss cantonal cancer registries 2001-2008 (N=10,088) anonymously linked to the Swiss National Cohort (SNC). Follow-up information on vital status was available until the end of 2013.

Socioeconomic position (SEP)

- SEP was defined based on education (low/middle/high).

Statistical analysis

- The association between cancer stage at presentation and SEP was investigated using logistic regressions (UICC stage I versus II-IV) reporting Odds Ratios (OR).
- Survival was analysed using competing risk regressions based on Fine and Gray's proportional hazard model. All underlying causes of death other than CRC were classified as competing risks. Results were reported as sub-hazard ratios (SHRs) for the risk of dying due to CRC.
- For stage at presentation and survival analysis, we calculated four models including the following covariates:
 - Model 1 - SEP
 - Model 2 - Model 1 plus age at diagnosis
 - Model 3 - Model 2 plus urbanity and language region
 - Model 4 - Model 3 plus tumour localisation (and stage at diagnosis for survival analysis)

5. Novelty and Impact

- This is the first population-based study in Switzerland investigating socioeconomic and demographic inequalities in stage at diagnosis and survival among CRC patients.
- In Switzerland, people of low SEP are diagnosed at later stages.
- Survival differences by SEP are explained by SEP disparities in stage at presentation.
- Non-Swiss and patients living in non-urban areas showed poorer survival.
- Swiss public health strategies should facilitate equal access to CRC screening and optimal CRC care for all social groups and in all regions of Switzerland.

6. References

- Kweon SS, Kim MG, Kang MR, Shin MH, Choi JS. Difference of stage at cancer diagnosis by socioeconomic status for four target cancers of the National Cancer Screening Program in Korea: Results from the Gwangju and Jeonnam cancer registries. *Journal of epidemiology* 2017;27:299-304.
- Schwartz KL, Crossley-May H, Vigneau FD, Brown K, Banerjee M. Race, socioeconomic status and stage at diagnosis for five common malignancies. *Cancer causes & control* : CCC 2003;14:761-6.
- Woods LM, Rachet B, Coleman MP. Origins of socio-economic inequalities in cancer survival: a review. *Annals of oncology : official journal of the European Society for Medical Oncology* 2006;17:5-19.
- Ciccone G, Prastaro C, Ivaldi C, Giacometti R, Vineis P. Access to hospital care, clinical stage and survival from colorectal cancer according to socio-economic status. *Annals of oncology : official journal of the European Society for Medical Oncology* 2000;11:1201-4.

7. Contact

Anita Feller
Institute of Social and Preventive Medicine (ISPM)
University of Bern
Finkenhubelweg 11
3012 Bern
Switzerland
anita.feller@ispm.unibe.ch

National Institute for Cancer Epidemiology and Registration
c/o University of Zurich
Hirschengraben 82
8001 Zurich
Switzerland
anita.feller@nicer.org

4. Results

Odds ratios (OR) of later colorectal cancer stage at diagnosis

	Model 1		Model 2		Model 3		Model 4	
	OR	[95%CI]	OR	[95%CI]	OR	[95%CI]	OR	[95%CI]
SEP								
High SEP (ref.)								
Middle SEP	1.13	[0.99-1.29]	1.11	[0.97-1.27]	1.11	[0.97-1.27]	1.11	[0.97-1.27]
Low SEP	1.35	[1.16-1.57]	1.28	[1.09-1.50]	1.27	[1.08-1.50]	1.28	[1.08-1.50]
Sex								
male (ref.)								
female			1.08	[0.96-1.21]	1.08	[0.96-1.21]	1.05	[0.93-1.18]
Age at diagnosis								
50-64 years (ref.)								
< 50 years			1.22	[0.96-1.54]	1.22	[0.96-1.55]	1.22	[0.96-1.54]
65-74 years			1.03	[0.90-1.18]	1.03	[0.91-1.18]	1.02	[0.89-1.16]
75-84 years			1.20	[1.04-1.38]	1.19	[1.03-1.38]	1.14	[0.99-1.32]
Civil status								
married (ref.)								
single			1.36	[1.11-1.68]	1.35	[1.10-1.66]	1.36	[1.10-1.67]
widowed			1.05	[0.88-1.25]	1.04	[0.87-1.25]	1.05	[0.88-1.25]
divorced			1.16	[0.97-1.39]	1.15	[0.96-1.38]	1.15	[0.96-1.38]
Nationality								
Swiss (ref.)								
Non-Swiss			1.02	[0.88-1.18]	1.02	[0.88-1.18]	1.03	[0.88-1.19]
Urbanity								
urban (ref.)								
peri-urban					0.92	[0.82-1.04]	0.93	[0.82-1.04]
rural					0.98	[0.82-1.16]	0.96	[0.80-1.15]
Language region								
German (ref.)								
French					1.04	[0.93-1.17]	1.19	[0.84-1.69]
Italian					0.95	[0.81-1.13]	0.93	[0.78-1.10]
Localisation								
Colon (ref.)								
rectum							0.68	[0.61-0.76]

Sub-hazard ratios (SHR) of risk of colorectal cancer death among CRC patients

	Model 1		Model 2		Model 3		Model 4	
	SHR	[95%CI]	SHR	[95%CI]	SHR	[95%CI]	SHR	[95%CI]
SEP								
High SEP (ref.)								
Middle SEP	1.07	[0.98-1.17]	1.05	[0.96-1.16]	1.05	[0.95-1.15]	0.99	[0.89-1.09]
Low SEP	1.18	[1.16-1.57]	1.14	[1.02-1.27]	1.14	[1.02-1.27]	1.08	[0.96-1.21]
Sex								
male (ref.)								
female			0.96	[0.88-1.03]	0.96	[0.89-1.04]	0.95	[0.88-1.04]
Age at diagnosis								
50-64 years (ref.)								
< 50 years			0.72	[0.61-0.85]	0.72	[0.61-0.85]	0.59	[0.50-0.70]
65-74 years			0.90	[0.82-0.99]	0.90	[0.82-0.98]	0.85	[0.78-0.94]
75-84 years			1.33	[1.22-1.45]	1.34	[1.22-1.46]	1.43	[1.30-1.57]
Civil status								
married (ref.)								
single			1.14	[1.00-1.29]	1.15	[1.01-1.31]	0.99	[0.86-1.14]
widowed			0.89	[0.79-1.00]	0.89	[0.79-1.00]	0.95	[0.84-1.08]
divorced			1.10	[0.98-1.24]	1.11	[0.99-1.25]	1.02	[0.90-1.15]
Nationality								
Swiss (ref.)								
Non-Swiss			1.15	[1.04-1.27]	1.13	[1.02-1.25]	1.20	[1.08-1.34]
Urbanity								
urban (ref.)								
peri-urban					1.08	[1.00-1.17]	1.15	[1.05-1.25]
rural					1.16	[1.04-1.29]	1.15	[1.02-1.30]
Language region								
German (ref.)								
French					0.95	[0.88-1.03]	0.97	[0.77-1.23]
Italian					0.93	[0.83-1.04]	0.91	[0.81-1.03]
Localisation								
Colon (ref.)								
rectum							1.10	[1.01-1.19]
Stage at diagnosis								
Stage I (ref.)								
Stage II							3.20	[2.54-4.02]
Stage III							8.13	[6.54-10.10]
Stage IV							30.00	[24.15-37.21]