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# **Social inequality in diabetes patients' morbidity patterns from diagnosis to death: A Danish register-based investigation**

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## **Running Head:**

Social inequality in Danish Diabetes Patients' Morbidity Patterns from Diagnosis to Death – A concentration index approach.

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## **Funding sources**

This study has been conducted by ApEHR in cooperation with the Danish Diabetes Association and supported by a Ph.D. program from COHERE supported by The Danish Centre for Strategic Research in Type 2 Diabetes, DD2. A consortium of sponsors from the pharmaceutical industry comprising Astra Zeneca/BMS, Novo Nordisk, Merck, Sanofi Aventis and Bayer has provided an unrestricted grant to ApEHR for the conduct of this research.

## **Interest disclosure**

Neither the Danish Diabetes Association nor the consortium of sponsors from the pharmaceutical industry has had any influence on the conduct of the study.

## **Novelty statement**

- This study presents first time evidence on the composition of socioeconomic inequality in a range of diabetes morbidity indicators reflecting diabetes patients' life with diabetes from diagnosis to death.
- National register data on clinical and sociodemographic characteristics on the individual patient level allows for a comprehensive data pool.
- Comparison of income level and educational level as proxy for socioeconomic status provides new methodological insights.

## **Abstract**

**Aim:** Measuring socioeconomic inequalities in health and health care, and understanding the determinants of such inequalities, are critical for achieving higher equity in health. The aim of the paper is 1) to quantify inequality in diabetes morbidity patterns over patients' entire life span from diagnosis to death, and 2) to compare levels of inequality measured through income and educational level, respectively, as proxies for socioeconomic status (SES).

**Method:** Data on the entire Danish diabetes population in 2011 were applied. Patients' unique personal identification number enabled individual patient data from several national registers to be linked. Cox survival analysis and a concentration index decomposition approach were applied.

**Results:** Results indicate that lower SES is associated with higher morbidity and mortality. Significant differences in diabetes patients' morbidity patterns and survival indicate that diabetes impacts harder on patients of lower SES; hence these patients experience more severe complications and die earlier. Comparing education and income as proxies for patients' SES show important differences in inequality estimates, mainly as a result of reverse causality between income and diabetes.

**Keywords:** health inequality; diabetes; morbidity patterns; decomposition; socio-economic inequality.

## **Introduction**

Persistent differences in health by socioeconomic status (SES) have long been a serious health policy concern in many European countries[1]. It is well known that socioeconomic inequality exists in diabetes with higher incidence and mortality among patients of lower SES [2-6]. Marked prevalence increase of diabetes globally [7, 8], indicate that inequality in diabetes will also increase, stressing the importance of recognition and prioritizing of inequality aspects within chronic diseases as diabetes. Diabetes requires a great deal of self-care actions such as self-monitoring of blood glucose, adjustment of medicines in response to blood glucose readings, management of co-morbid medical conditions, dietary adherence, exercise etc.[6]. Several Danish reports have underlined marked socioeconomic differences in compliance to treatment, especially preventive efforts and retention of life style changes among chronic patients[9-11]. Inequality in patients' morbidity patterns indicate differences in patients' ability to take advantage of the services provided in a universal health care system as the Danish.

Evidence on the contributing factors to inequality in health in general and disease specific inequality may guide future efforts to reduce unequal distributions of for instance health care. This study presents first time evidence on the composition of socioeconomic inequality in a range of diabetes morbidity indicators reflecting diabetes patients' life with diabetes from diagnosis to death.

Taking advantage of the detailed Danish social and health registers [12] our research inquiries are threefold: 1) to quantify socioeconomic inequality in diabetes morbidity patterns, 2) to decompose inequality by quantifying the contribution attributable to individual sociodemographic determinants and 3) to compare educational and income level as proxy for patients' SES.

## **Patients and methods**

The study is part of a large-scale Danish observational investigation, the Diabetes Impact Study 2013, [7, 13-15].

Data is collected from: The National Patient register (NDR), the National Patient Register [16], the National Prescription Registry [17], the National Health Service Register [18] the Civil Registration System [19] and social registers at Statistics Denmark. Linkage of person-specific

data between registers is possible using the Danish Personal Identification Number, assigned to each Danish citizen for administrative purposes.

The study population is based on all patients registered in NDR diagnosed before 1<sup>st</sup> of January 2012 and alive 1<sup>st</sup> of January 2011, as described in detail elsewhere [13], leaving N = 318,729 patients. Data for this population were retrieved retrospectively back to time of diagnosis and forward until death or until 31<sup>st</sup> of December 2013.

### ***Methods of analysis***

#### *Cox regression*

The Cox proportional hazards model for survival-time is used to explore effects of patients' SES on survival time and time to complications. Cox regression is a semi-parametric method commonly used for duration analysis within health care[20].

Cox's model is based on the hazard function at time  $t$ ,  $h(t)$ . The model is usually written as:

$$h_i(t) = h_0(t)\exp\{\beta_1 x_{it} + \dots + \beta_q x_{iq}\}.$$

The hazard of patient  $i$  is specified as the product of two factors: 1) an unspecified baseline hazard function  $h_0(t)$ , which is restricted to be positive and only depending on time and not the covariates, and 2) a linear function of a set of  $q$  fixed covariates which is exponentiated and does not depend on time. The cumulative hazard function is calculated relative to the baseline (lowest value of covariates) at each time point. The Cox model does not assume any specific probability distribution to represent time until event. Patients are classified according to complication states as outlined in table 1, described in detail elsewhere [7].

**(Table 1 around here; see end of paper)**

Time to event is investigated for 4 outcomes, specified in table 2. Covariates include age, gender, marital status, ethnicity and region of residence.

**(Table 2 around here; see end of paper)**

### *Concentration Index and decomposition*

Similar to previous studies initiated by Wagstaff et al. [22] we use the concentration index as measure of relative socioeconomic inequality in morbidity patterns. A concentration curve  $L(s)$  plots the cumulative proportion of the population (ranked by SES, beginning with lowest SES) against the cumulative proportion of morbidity. The further  $L(s)$  lies from the diagonal, the larger the degree of inequality. The concentration index,  $C$ , is defined as twice the area between  $L(s)$  and the diagonal and takes a value of 0, when everyone is equally off regardless of SES. The minimum and maximum values of  $C$  are -1 and +1, respectively; these occur in the (hypothetical) situation where morbidity are concentrated in the hand of the least disadvantaged and the most disadvantaged person, respectively. Thus, the larger negative value of  $C$ , the more morbidity concentrates among lower SES groups. A computational formula for  $C$  was given by Kakwani et al.[21] as  $C = \frac{2}{N\mu} \sum_{i=1}^N y_i R_i - 1$ , where  $\mu = \frac{1}{N} \sum_{i=1}^N y_i$  is the mean of observed morbidity,  $N$  the sample size,  $y_i$  observed morbidity, and  $R_i$  the fractional rank defined as  $R_i = \frac{i-1}{N} + \frac{1}{2}$ .

Decomposition of the predicted degree of inequality into the contributions of explanatory factors was proposed by Wagstaff et al.[22]. The point of departure is a regression model, based on Ordinary Least Squares (OLS), which relates the outcome in question to the determinants. This leads to a decomposition of the concentration index of predicted morbidity as  $\hat{C} = \sum_k \frac{\beta_k \bar{x}_k}{\hat{\mu}} C_k$ , where  $\hat{\mu}$  is the mean of predicted morbidity,  $\bar{x}_k$  the mean of the determinant  $x_k$ , and  $C_k$  the concentration index of  $x_k$  (defined analogously to  $C$ ). This applies for continuous outcome variables. Complication group at diagnosis is, however, an ordinal variable and hence an ordered logit regression is applied following the methods outlined by Van Doorslaer and Jones[23]. Following their suggestions, we perform an ordered logit, estimate the linear prediction  $\hat{y} = \sum_k \beta_k x_k$ , which is rescaled to the interval between 0 and 1 by using the transformation  $\tilde{y} = \frac{\hat{y} - \min(\hat{y})}{\max(\hat{y}) - \min(\hat{y})}$ , whereafter  $\hat{C}$  is calculated from  $\tilde{y}$  as described above. As shown above, inequality is calculated as a sum of two terms: Predicted inequality (by the determinants of the regression), and residual inequality. Predicted inequality is obtained as a weighted sum of inequality contributions from each of the determinants. In principle, the

contribution from a determinant to total inequality is obtained by multiplying three parts: 1) the determinant's impact on the outcome variable as measured by the regression coefficient, 2) the degree of income related inequality in the determinant itself as measured by the concentration index for the determinant, and 3) the determinants' heaviness in the population as measured by its average value. Finally, the residual inequality is obtained by subtracting predicted inequality from observed inequality.

In order to assess sampling variability and to obtain standard errors for the estimated quantities, a "bootstrap" procedure[24] in a four-step manner is applied[1, 25]: First, a random sub-sample of the size of the original sample is drawn with replacement. Second, the entire set of calculations, as specified above, are performed on this sample. Third, this whole process is repeated 1,000 times. Fourth, using the obtained 1,000 replicates, standard deviations and *t* statistics can be computed

### ***Variable definitions***

Patients' annual gross income is applied as ranking variable, since this measure is the most common measure of SES in the literature analysing inequality through concentration indices [1, 25, 26]. Patients' highest attained educational level is applied as ranking variable as well since this measure is frequently used in public health literature due to its simplicity and universality [27]. Patients' demographic and clinical characteristics are described and defined in table 3.

**(Table 3 around here; see end of paper)**

## **Results**

### *Time to complication and survival*

Table 4 shows hazard ratios of educational level (upper part of table) and income level (lower part of table) for the four times to event estimated. Full regression tables are given in Appendix A2.



Patients with high education have approximately 26% lower risk of dying when diagnosed with diabetes as compared to patients with short education. For income, the risk is 66% lower for patients with high income (column 2). Compared to patients with short education, patients with high education have 10-15 percent lower risk of developing minor and severe complications as well as dying when having severe complications. For income, again, the difference in risk is higher, with 20-60 percent reduction for patients of higher income groups compared to lower income groups (columns 3-5). This means that patients with lower annual income or with shorter education live shorter with diabetes from diagnosis, that they develop minor complications faster after diagnosis, and when having minor complications, they sooner develop severe complications. Finally, when they have severe complications, they die sooner as compared to patients with high annual income or high educational level, respectively. This indicates consistent differences by SES, also when relevant confounders are taken into account. The observed differences between effects of education and income, as proxy for SES, may reflect reverse causality for income, i.e. that the more morbid patients have incomes being influenced by their morbidity. Given that education is typically fulfilled before the morbidity occurs, such reverse causality should to a less extent be expected basing analyses on educational level.

**(Table 4 around here; see end of paper)**

Survival functions by educational level for risk of dying from diagnosis and onward is depicted in Fig. 1, stratified by complication at diagnosis, with cumulative hazard for survival (scale 0-1) on the y-axis and years on the x-axis. Survival by complication state at diagnosis inhibits the expected pattern with increased survival with fewer complications at diagnosis. Fig. 1 illustrates that the relative lower survival rate among patients of lower educational level as compared to higher educational level is consistent regardless of degree of complications at diagnosis.

**(Fig. 1 around here; see end of paper)**

#### *Concentration index*

Table 5 and 6 presents concentration indices for the selected morbidity indicators applying income and educational level as rank variable respectively. Contributions of the socio-demographic determinants to the overall predicted concentration index are presented, (the

former in percentage of the latter). Regression coefficients and individual concentration indices for each of the determinants are in Appendix A3 and A4. Due to the comprehensive set of analyses, only selected results are presented.

**(Table 5 and 6 around here; see end of paper)**

Fig. 2 depicts concentration indices ranked by income and educational level respectively. Severe complications at diagnosis and patient years with severe complications (PYRS in CG2) inhibits the highest value, all with a negative sign indicating that morbidity concentrate among the lower income/educational groups. Results indicate a pattern of worst morbidity at diagnosis and during disease progression being concentrated among the lowest socioeconomic groups, whereas healthier years with diabetes (PYRS in CG0) and longer duration of diabetes (total PYRS) concentrate among the socioeconomic better off patients.

**(Fig. 2 around here; see end of paper)**

Comparing the concentration indices ranked by income and educational level all signs agree, except for age at death, where income has negative and education positive sign. Age of death is higher among patients of lower income level, which is counterintuitive to these patients being more morbid. Inequality is almost non-existing in this variable, with only age explaining inequality with 75+ age groups contributing to higher age at death among lower income groups whereas the other age groups contribute to the opposite. This indicates that it is not as such the lower income groups who are reaching the highest age before dead, but rather the elder age groups that are becoming poorer. This is supported by the concentration index being positive for educational level supporting the more intuitive pattern, with longer survival among higher educated.

Opposite signs are also observed for unmarried and divorced. Using income as rank variable, it appears that morbidity indicators are concentrated among the higher income groups for these characteristics compared to married people, whereas the opposite is true for educational level. An explanation may be that while divorced people are more morbid and die younger they earn more to be able to finance their living. To the contrary, it is the lowest educated who are divorced, thus explaining some of the higher morbidity in this group.

There is a tendency of inequality being estimated higher when ranked by income than by education for the predicted concentration indices (Fig. 2). This is consistent with results from the survival analyses, which might be explained from reverse causality between income and health. Especially for the indicators severe complications at diagnosis, and PYRS in CG2, inequality estimates based on income are higher than estimates based on education. This corresponds well with the expectation since the most severe morbidity affects income levels most. The observed pattern is, however, not consistent within the different determinants, where magnitudes of the contributions vary, and not always with income as the largest.

Looking at the contribution by socioeconomic determinants to explained inequality (table 5+6), age and gender explain a lot of the observed inequality in morbidity patterns. Similar patterns are seen for men and women, where younger age groups (<30) and elder age groups (75+) contribute to the described inequality whereas for middle-aged groups (30-74) morbidity appears to be more equally distributed. Not being in job is associated with a higher extent of morbidity than being in job and with a lower duration of both PYRS in CG0 and in total. Since these groups generally have lower incomes, they contribute to inequality in the morbidity indicators. Retired are contributing to inequality by having low incomes and experiencing less years without complications as well as more severe complications.

## **Discussion**

Results illustrate that the impact of diabetes is mainly loading on patients of lower SES, with these patients living fewer years without developing complications, experiencing severe complications sooner and dying sooner than do patients of higher SES. Already at time of diagnosis, morbidity patterns were significantly different with patients of lower SES diagnosed in a higher age and at a worse health state with more complications. Results from the decomposition analyses underpinned this pattern. Our findings hence support and expand international literature on inequality in diabetes mortality[28], and risk of diabetes-related complications [6].

Especially patients outside the labor market, immigrants and divorced patients are vulnerable when belonging to lower SES groups. While the first group carry a great burden in respect to morbidity of diabetes, at the same time, as they belong to lower levels of SES both in relation to education and income, the two latter groups stands out with morbidity concentrating among higher income levels. For retired, our results hence support a well-known phenomenon for Denmark, where the elder traditionally receive relatively low incomes while enjoying worst health

states [1, 29]. For immigrants the explanation might be that immigrants of lower income are not diagnosed or followed during their disease in the same way as the more well-off immigrants, possibly due to cultural barriers. Our results implicate a need for strategies targeting socially vulnerable groups to achieve earlier diagnosis and hence fewer complications at diagnosis. For diagnosed patients, secondary prevention to assist these patients in managing their disease would be beneficial.

### *Proxies for SES*

With the aim to investigate associations between SES and morbidity or mortality, education provides more univocal results, as education generally is not expected to be influenced by morbidity, being attained earlier in life. Evidence of negative impact of type 1 diabetes on children's school performance [30], however, challenges this expectation for approximately 10% of the study population. Income level, on the other hand, provides a mere immediate picture of this relationship, including also reverse causality between disease and SES. Together, the two rankings enable a more varied understanding of results.

### *Limitations*

There are certain limitations of the study, which should be noticed. First, due to the registration process in NDR, some people in our patient population might be falsely registered, having had their blood glucose levels checked regularly [13]. We do, however, not see this as a serious disturbance of the findings concerning differences within SES.

Second, our survival analyses are biased by the construction of the patient cohort taking off in the 2011 population in a retrospective design. This means that some patients will have died before 2011 resulting in survival seeming higher than is actually the case. For the aim of analyzing differences according to SES this aspect, however, can be expected to result in conservative estimates.

Third, in the concentration index calculation, tied ranking was applied for educational level (9 categories). Following the suggestions by Clarke and Van Ourti [31], we compared tied ranking with income level as ranking variable within each educational category. Results indicate no univocal impact of applying the grouped rank variable. Validity of these comparisons, however, relies on the assumption that the relationship between morbidity and SES is similar for the two rankings. This may not necessarily be the case, as indicated by the results.

Fourth, relevant characteristics could not be included nor controlled for. Thus, we were not able to control results for general inequality in morbidity, the importance of which has previously been demonstrated [32]. Neither could we include data on patients' life style, which would enhance interpretation of results [5].

## **Conclusion**

We provide new evidence on inequality in diabetes morbidity patterns from diagnosis to death, with patients of lower SES being diagnosed in a worse state, living shorter with their disease and experiencing more severe complications. Furthermore, survival time and time to complication show clear decreasing tendencies with decreasing SES. To reduce inequality in health, it is therefore important to invest in efforts targeted towards socially vulnerable groups aiming at early detection and secondary prevention. Methodologically, our findings underpin important differences of using income and educational level, respectively, as proxy for SES. Several of our results may underpin universal structures behind inequality in diabetes, and in chronic disease in general, and thus be valuable beyond Denmark.

## **Funding**

This study has been conducted by ApEHR in cooperation with the Danish Diabetes Association and supported by a Ph.D. program from COHERE supported by The Danish Centre for Strategic Research in Type 2 Diabetes, DD2. A consortium of sponsors from the pharmaceutical industry comprising Astra Zeneca/BMS, Novo Nordisk, Merck, Sanofi Aventis and Bayer has provided an unrestricted grant to ApEHR for the conduct of this research.

## **Conflicts of Interest**

Neither the Danish Diabetes Association nor the consortium of sponsors from the pharmaceutical industry has had any influence on the conduct of the study.

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**Table 1: Patient classification according to complication state**

<b>Complication group</b>	<b>Health state*</b>
Complication group 0 (CG0)	Diabetes without registered complications
Complication group 1 (CG1)	Moderate or minor complications, problems with eyes, heart, kidney and nervous system, minor amputations below the ankle, bypass operation and some eye operations
Complication group 2 (CG2)	Severe complications: blindness, amputation above the ankle, severe heart failure, kidney transplant or dialysis

\*ICD codes defined for each complication group is given in Appendix A1.

**Table 2: Survival time outcomes and definitions**

Survival time indicators	Definition	
Diagnosis to death	Years from diagnosis to death or censoring with death in 2011, 2012 or 2013 (<3 <sup>rd</sup> of July) representing an event.	Variable with event or censoring.
Diagnosis to CG1	Years from diagnosis to patient experiencing minor complications or censoring with minor complications presenting in 2011, 2012 or 2013 (<3 <sup>rd</sup> of July) representing an event	Variable with event or censoring
CG1 to CG2	Years from CG1 to patient experiencing major complications or censoring with major complications presenting in 2011, 2012 or 2013 (<3 <sup>rd</sup> of July) representing an event	Variable with event or censoring
CG2 to death	Years from CG2 to patient's death or censoring with death in in 2011, 2012 or 2013 (< 3 <sup>rd</sup> of July) representing an event.	Variable with event or censoring

**Table 3: Definition of sociodemographic and clinical patient characteristics: along with variable categorizations**

Characteristics	Definitions	Categories
<b>Socioeconomics*</b>		
Highest educational level attained	Highest educational level attained at date of data extraction, based on the main groups in the Danish educational Nomenclature with 13 educational groups based on years of education.	Variable with 3 or 9 categories: <ol style="list-style-type: none"> <li>1) Primary education (&lt; 11 years)</li> <li>2) Middle high education (11 to 15years)</li> <li>3) Higher education (16+ years)</li> </ol> <ol style="list-style-type: none"> <li>1) Primary education</li> <li>2) Upper secondary education</li> <li>3) Vocational education and training</li> <li>4) Qualifying educational programmes</li> <li>5) Short cycle higher education</li> <li>6) Vocational bachelors education</li> <li>7) Bachelor programmes</li> <li>8) Master programmes</li> <li>9) PhD programmes</li> </ol>
Income level	Annual gross income 2011	Continuous variable or categorical with 3 categories: <ol style="list-style-type: none"> <li>1) 149,999 or less DKK</li> <li>2) 150,000 – 349,999 DKK</li> <li>3) 350,000 or more DKK</li> </ol>
<b>Demographics*</b>		
Gender	Gender	<ol style="list-style-type: none"> <li>1) Male</li> <li>2) Female</li> </ol>
Age	Age in mid-year	Continuous
Civil status	Marital status	<ol style="list-style-type: none"> <li>1) Married or in civil partnership</li> <li>2) Unmarried</li> <li>3) Widowed or longest living partner</li> <li>4) Divorced or cancelled partnership</li> </ol>
Ethnicity	Based on registrations in the Central Person Register 2011.	<ol style="list-style-type: none"> <li>1) Ethnic Dane</li> <li>2) Immigrant</li> <li>3) Descendant</li> </ol>
Region of residence	Residence 2011 in relation to the five Danish regions	<ol style="list-style-type: none"> <li>1) "Capital Region of Denmark"</li> <li>2) "Region Zealand"</li> <li>3) "Region of Southern Denmark"</li> <li>4) "Central Denmark Region"</li> <li>5) "North Denmark Region"</li> </ol>
Urbanity	Residence in type of geographic area in relation to urbanity	<ol style="list-style-type: none"> <li>1) City</li> <li>2) Suburbs</li> <li>3) Outer areas/country side</li> </ol>

Occupational status	Affiliation to the labour market	1) Affiliated to the labour market (employed or self-employed) 2) Unemployed (maternal leave, job seeker allowance) 3) Unemployed (unemployment benefit) 4) Education 5) Early retirement 6) Retired 7) Child
<b>Morbidity patterns</b>		
Complication group at diagnosis	Complication group at diagnosis	1) CG0 3) CG2
Age at diagnosis	Age in mid-year of diagnosis	Continuous
PYRS in CG0	Number of years diagnosed with diabetes before developing minor or major complications or dying before 3 <sup>rd</sup> of July 2013 for patients diagnosed in CG0	Continuous
PYRS in CG1	Number of years the patient lives in CG1 before developing major complications or dying before 3 <sup>rd</sup> of July for patients diagnosed in CG0 or CG1	Continuous
PYRS in CG2	Number of years the patient lives in CG2 before dying before 3 <sup>rd</sup> of July for patients diagnosed in CG0, CG1 or CG2	Continuous
Duration of diabetes (total PYRS)	Number of patient years before 3 <sup>rd</sup> of July	Continuous
Age at death	Patient age at death	Continuous
<b>Survival time indicators</b>		
Diagnosis to death	Years from diagnosis to death or censoring with death in 2011, 2012 or 2013 (<3 <sup>rd</sup> of July) representing an event.	Variable with event or censoring.
Diagnosis to CG1	Years from diagnosis to patient experiencing minor complications or censoring with minor complications presenting in 2011, 2012 or 2013 (<3 <sup>rd</sup> of July) representing an event	Variable with event or censoring

CG1 to CG2	Years from CG1 to patient experiencing major complications or censoring with major complications presenting in 2011, 2012 or 2013 (<3 <sup>rd</sup> of July) representing an event	Variable with event or censoring
CG2 to death	Years from CG2 to patient's death or censoring with death in 2011, 2012 or 2013 (< 3 <sup>rd</sup> of July) representing an event.	Variable with event or censoring

\*based on registrations on the 31<sup>st</sup> of December 2011

**Table 4: Hazard ratios for survival and time to complication development for educational level and income level**

Survival outcome*	Diagnosis -death		Diagnosis- Minor complications			Minor complications - severe complications			Severe complications- death		
	Exp(B)	95% CI	Exp(B)	95% CI	Exp(B)	95% CI	Exp(B)	95% CI	Exp(B)	95% CI	
SES variable (reference)											
Education (primary)											
Middle-high	0.87	0.85 0.90	0.93	0.92 0.94	0.96	0.95 0.98	0.96	0.95 0.98			
High	0.74	0.71 0.77	0.86	0.85 0.88	0.90	0.88 0.92	0.90	0.88 0.92			
Income (Low)											
Middle	0.56	0.55 0.57	0.90	0.89 0.91	0.98	0.96 0.99	0.58	0.57 0.60			
High	0.34	0.32 0.36	0.74	0.72 0.75	0.80	0.78 0.82	0.40	0.37 0.44			

\* controlled for: age, gender, civil status, ethnicity and region of residence. Significant on a 1% level.

Table 5: Decomposition of inequality in morbidity predictors ranked by income

Ranked by income	DIAGNOSIS				DISEASE PROGRESSION						DEATH	
	Complication state at diagnosis		Age at Diagnosis		PYRS in CG0*		PYRS in CG2*		Total PYRS*		Age at death	
	C	Sign.	C	Sign.	C	Sign.	C	Sign.	C	Sign.	C	Sign.
my	0.766	***	55.795	***	5.923	***	1.900	***	9.715	***	77.409	***
Ciy	-0.021		-0.039	***	0.031	***	-0.112	***	0.000		-0.008	***
Ciy predicted			-0.040	***	0.026	***	-0.088	***	0.004	***	-0.010	***
Cy unexplained			0.001	***	0.005	***	-0.023	***	-0.004	***	0.003	***
Explaining variables (reference group)	C	Sign.	C	Sign.	C	Sign.	C	Sign.	C	Sign.	C	Sign.
SES												
Income	0.34	***	-0.17		2.40		1.96		-10.74		-7.65	
Educational level (high education)												
Primary education	-0.19	***	1.41	***	10.64	***	1.54	*	382.87		0.47	
Medium high education	0.11	***	-0.54	***	-3.67	***	-0.42		138.62		-0.17	
Age and gender (Men 0-14) (Women 0-14)												
M15-29	-0.16	***	1.58	***	1.00	***	1.19	***	15.66		0.84	**
M30-44	0.39	***	-24.90	***	12.52	***	-16.63	***	205.58		-8.07	***
M45-59	0.38	***	119.21	***	67.30	***	-59.57	***	77.31		125.09	***
M60-74	0.02	***	-13.09	***	-6.70	***	-6.56	***	-5.05		154.52	***
M75+	-0.21	***	76.74	***	37.52	***	42.33	***	158.26		121.93	***
F15-29	-0.13	***	1.69	***	1.59	***	1.18	***	-8.73		0.84	**
F30-44	0.32	***	-24.77	***	-1.67		-14.20	***	209.09		-8.10	***
F45-59	0.48	***	116.98	***	21.49	***	-49.24	***	478.68		125.36	***
F60-74	0.02	***	-13.10	***	-3.88	***	-5.02	***	-1.76		154.62	***
F75+	-0.16	***	76.64	***	25.30	***	37.06	***	200.52		121.96	***
Labour market affiliation (in job)												

Not in job (maternity leave, job seeker allowance)	0.09	***	-0.08	***	-0.85	***	-0.03		16.58		-0.05	
Not in job (unemployment benefit)	-0.44	***	0.44	***	6.16	***	0.67	***	125.24		0.13	
Education, training	-0.90	***	0.76	***	3.69	***	1.26	***	-68.42		0.09	
Early retired	-0.15	***	-0.72	***	8.79	***	10.67	***	160.74		-0.06	
Retired	-0.21	***	-0.84	***	25.71	***	28.65	***	442.09		1.08	
Child	-0.98	***	2.84	***	11.24	***	3.53	***	275.21		0.11	
Marital status (married)												
Unmarried	0.03	***	0.04	***	-0.16	*	-0.34	***	-5.62		0.05	*
Widowed/longest living partner	-0.09	***	-0.06	**	0.68	***	0.98	***	12.80		0.06	
Divorced/cancelled partnership	0.04	***	0.01		-0.66	***	-0.39	***	-2.28		0.07	***
Ethnicity (Ethnic Dane)												
Immigrant	-0.21	***	0.77	***	2.15	***	-3.12	***	161.11		0.14	
Descendant	-0.24	***	0.03	***	0.12	*	-0.02		-3.58		0.00	
Region of residence (Capital Region of Denmark)												
Region Zealand	0.00		0.00		0.11		-0.05		-0.34		0.00	
Region of Southern Denmark	-0.04	***	0.26	***	1.38	***	-1.71	***	-64.53		0.02	
Central Denmark Region	0.00		-0.02		-0.22		0.07		-0.45		0.01	
North Denmark Region	-0.03	***	0.03	***	0.11		-0.81	***	-7.58		0.02	
Degree of urbanity of residence (cities)												
Suburbs	0.00	*	0.00		-0.15	*	-0.01		-0.62		0.00	
Country side	-0.04	***	0.09	***	-4.52	***	-0.73	***	-5.83		0.01	

\* PYRS = Patient years, CG0 = no complications, CG1 = minor complications, CG2 = severe complications

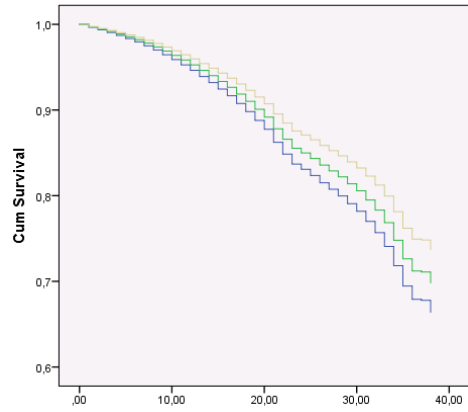


**Table 6: Decomposition of inequality in morbidity predictors ranked by education**

Ranked by education	DIAGNOSIS				DISEASE PROGRESSION						DEATH	
	Complication state at diagnosis		Age at Diagnosis		PYRS in CG0*		PYRS in CG2*		Total PYRS*		Age at death	
	C	Sign.	C	Sign.	C	Sign.	C	Sign.	C	Sign.	C	Sign.
My	0.760	***	55.795	***	5.922	***	1.901	***	9.715	***	0.037	***
Ciy	-0.010		-0.013	***	0.009	***	0.031	***	0.002	***	-0.025	***
Ciy predicted			-0.013	***	0.009	***	0.031	***	0.002	***	-0.031	***
Cy unexplained			0.000		0.000		0.000		0.000		0.006	***
Explaining variables (reference group)	C	Sign.	C	Sign.	C	Sign.	C	Sign.	C	Sign.	C	Sign.
SES												
Income	0.11	***	-0.15		2.54		2.20		-2.05		43.03	
Educational level (high education)												
Primary education	-0.58	***	12.12	***	108.60	***	17.23	**	414.57	**	226.40	**
Medium education	0.25	***	-3.55	***	-28.82	**	-3.74		128.63	*	101.99	***
Age and gender (Men0-14) (Women0-14)												
M15-29	-0.14	***	3.80	***	2.92	**	3.62	***	-6.71		20.52	***
M30-44	0.08	***	-15.40	***	-9.35	***	13.07	***	20.76	*	-54.37	***
M45-59	0.07	***	-66.10	***	-45.22	***	42.10	***	-8.04		171.28	***
M60-74	0.05	***	103.04	***	-63.78	***	65.72	***	3.02		244.18	***
M75+	0.00		1.56		0.94		1.10		-0.48		4.22	
F15-29	-0.11	***	4.06	***	4.62	**	3.61	***	3.11		20.48	***
F30-44	0.07	***	-15.32	***	-1.29		11.15	***	23.99	*	-53.55	***
F45-59	0.09	***	-64.87	***	-14.59	**	34.80	***	41.11		163.51	***

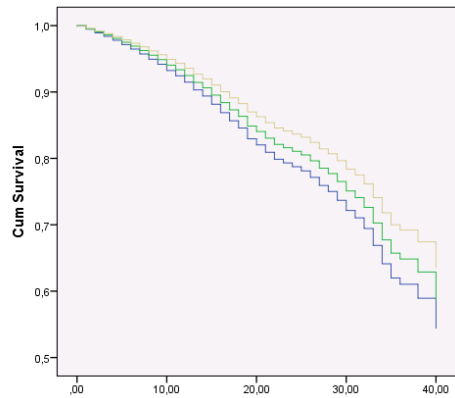
F60-74	0.07	***	-	103.11	***	-36.96	***	-	50.26	***	2.75	-	224.03	***
F75+	0.00			1.56		0.64			0.96		-0.62		3.81	
<b>Labour market affiliation (in job)</b>														
Not in job (maternity leave, job seeker allowance)	0.05	***		-0.12	***	-1.59	***		-0.07		-4.70	*	-0.40	
Not in job (unemployment benefit)	-0.05	***		0.15	***	2.61	**		0.30	***	6.17	*	0.03	
Education, training	-0.36	***		0.87	***	5.13	***		1.83	***	15.65	*	14.06	***
Early retired	-0.13	***		-1.79	***	26.42	***		33.87	***	-65.85	*	27.41	***
Retired	-0.06	***		-0.69	***	25.87	***		30.50	***	-49.03	*	-10.43	
Child	0.76	***		-6.27	***	-30.13	***		-9.93	***	-89.81	*	-60.39	***
<b>Marital status (married)</b>														
Unmarried	-0.02	***		-0.06	***	0.29			0.67	***	-1.54		4.66	***
Widowed/longest living partner	-0.11	***		-0.21	**	2.90	*		4.37	***	-8.09		37.59	***
Divorced/cancelled partnership	-0.03	***		-0.01		1.77	**		1.08	***	0.51		6.33	***
<b>Ethnicity (Ethnic Dane)</b>														
Immigrant	0.15	***		-1.58	***	-5.29	**		8.09	***	-62.85	*	13.33	***
Descendant	0.11	***		-0.03	***	-0.19			0.03		-1.24		0.07	
<b>Region of residence (Capital Region of Denmark)</b>														
Region Zealand	-0.02	***		0.06	***	2.09	**		-1.02	***	2.51		0.08	
Region of Southern Denmark	-0.03	***		0.71	***	4.59	***		-5.94	***	27.44	*	-3.56	**
Central Denmark Region	-0.01	***		0.40	***	5.71	***		-1.92	***	15.21	*	-2.24	***
North Denmark Region	-0.06	***		0.18	***	0.78			-5.89	***	6.91	*	-2.69	**
<b>Degree of urbanity of residence (cities)</b>														
Suburbs	-0.03	***		0.03		-2.98	**		-0.23		1.21		0.85	
Country side	-0.06	***		0.43	***	-24.87	***		-4.20	***	17.37		4.72	

\* PYRS = Patient years, CG0 = no complications, CG1 = minor complications, CG2 = severe complications



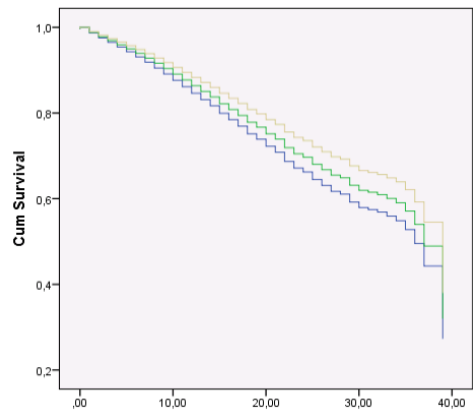
BLUE) Primary education < 11 years of education  
 GREEN) Middle high education < 16 years,of education  
 YELLOW) Higher education 16+ years of education

**a) No complications at diagnosis**



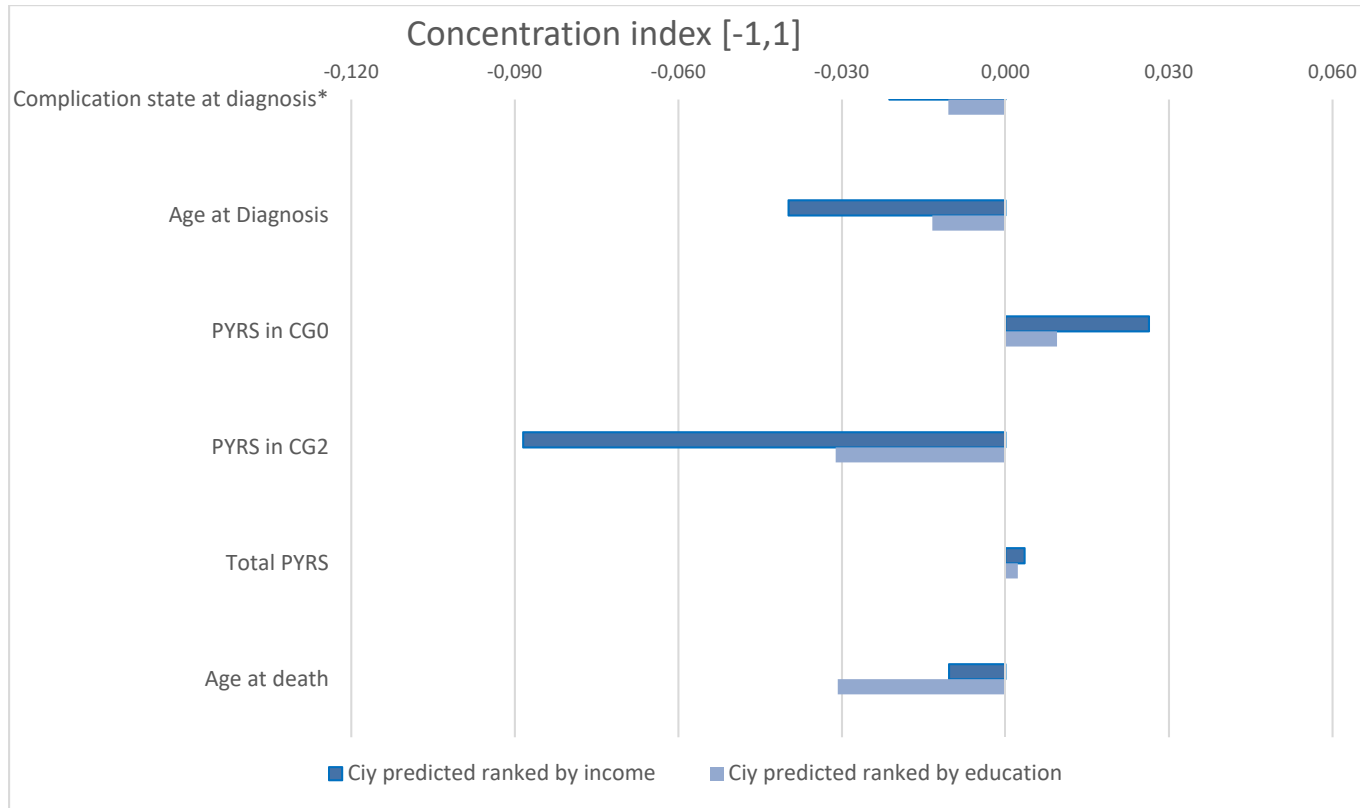
BLUE) Primary education < 11 years of education  
 GREEN) Middle high education < 16 years,of education  
 YELLOW) Higher education 16+ years of education

**b) Minor complications at diagnosis**



BLUE) Primary education < 11 years of education  
GREEN) Middle high education < 16 years,of education  
YELLOW) Higher education 16+ years of education  
**c) Severe complications at diagnosis**

**Figure 1: Survival from diagnosis and onwards by educational level and complication group at diagnosis**



\*Not significant

Figure 2: Concentration indices of morbidity indicators ranked by income and educational level.

## **Figure legends**

**Figure 1: Survival from diagnosis and onwards by educational level and complication group at diagnosis**

**Figure 2: Concentration indices of morbidity indicators ranked by income and educational level.**

## Appendices

### Appendix A1 Cox regressions

#### Appendix A1a: Cox regression diagnosis to death/censoring with income as differentiating factor

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Income (low)			3118.846	2	0			
Middle	-0.581	0.012	2363.859	1	0	0.559	0.547	0.573
High	-1.092	0.029	1375.067	1	0	0.336	0.317	0.356
Gender	-0.519	0.012	1964.51	1	0	0.595	0.581	0.609
Age	0.065	0.001	13156.674	1	0	1.068	1.066	1.069
Marital status (married)			1854.204	3	0			
Unmarried	0.573	0.02	857.226	1	0	1.774	1.707	1.844
Widowed	0.449	0.015	933.377	1	0	1.566	1.522	1.612
Divorced	0.557	0.017	1098.366	1	0	1.745	1.689	1.804
Ethnicity (Dane)			220.65	2	0			
Immigrant	-0.388	0.026	220.251	1	0	0.678	0.644	0.714
Descendant	-0.122	0.151	0.651	1	0.42	0.885	0.659	1.19
Region of residence (Capital Region)			46.866	4	0			
Region Zealand	-0.01	0.017	0.342	1	0.559	0.99	0.957	1.024
Region of Southern Denmark	-0.066	0.015	19.146	1	0	0.936	0.908	0.964
Central Denmark Region	-0.069	0.016	19.435	1	0	0.933	0.905	0.962
North Denmark Region	-0.106	0.019	29.614	1	0	0.9	0.866	0.935

Appendix A1b: Cox regression diagnosis to death/censoring with education as differentiating factor

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Education (short)			256.767	2	0			
Middle	-0.135	0.013	108.354	1	0	0.874	0.852	0.897
High	-0.307	0.021	210.838	1	0	0.736	0.706	0.767
Gender	-0.446	0.012	1281.337	1	0	0.64	0.625	0.656
Age	0.075	0.001	14587.427	1	0	1.078	1.077	1.079
Marital status (married)			1013.147	3	0			
Unmarried	0.462	0.02	515.808	1	0	1.588	1.526	1.653
Widowed	0.257	0.015	287.926	1	0	1.293	1.255	1.332
Divorced	0.445	0.017	678.391	1	0	1.561	1.51	1.614
Ethnicity (Dane)			50.427	2	0			
Immigrant	-0.22	0.031	50.355	1	0	0.802	0.755	0.853
Descendant	-0.061	0.18	0.115	1	0.735	0.941	0.662	1.338
Region of residence (Capital Region)			13.778	4	0.008			
Region Zealand	0.036	0.018	4.066	1	0.044	1.037	1.001	1.074
Region of Southern Denmark	-0.006	0.016	0.152	1	0.696	0.994	0.963	1.026
Central Denmark Region	-0.019	0.017	1.235	1	0.267	0.982	0.95	1.014
North Denmark Region	-0.039	0.021	3.554	1	0.059	0.962	0.923	1.002



Appendix A1c: Cox regression diagnosis to minor complications/censoring with income as differentiating factor

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Income (low)			1209.791	2	0			
Middle	-0.111	0.006	380.916	1	0	0.895	0.885	0.905
High	-0.308	0.009	1171.498	1	0	0.735	0.722	0.748
Gender	-0.419	0.005	6011.762	1	0	0.658	0.651	0.665
Age	0.017	0	6036.63	1	0	1.017	1.017	1.018
Marital status (married)			874.921	3	0			
Unmarried	0.147	0.008	316.574	1	0	1.158	1.14	1.177
Widowed	0.156	0.008	427.187	1	0	1.169	1.151	1.186
Divorced	0.162	0.008	456.207	1	0	1.176	1.159	1.194
Ethnicity (Dane)			34.687	2	0			
Immigrant	-0.056	0.01	33.415	1	0	0.946	0.928	0.964
Descendant	0.049	0.051	0.923	1	0.337	1.05	0.95	1.161
Region of residence (Capital Region)			560.449	4	0			
Region Zealand	-0.005	0.008	0.326	1	0.568	0.995	0.98	1.011
Region of Southern Denmark	-0.107	0.007	220.306	1	0	0.898	0.886	0.911
Central Denmark Region	0.031	0.007	18.902	1	0	1.032	1.017	1.046
North Denmark Region	-0.13	0.009	192.662	1	0	0.878	0.862	0.894

Appendix A1d: Cox regression diagnosis to minor complications/censoring with education as differentiating factor

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Education (short)			339.975	2	0			
Middle	-0.07	0.006	146.199	1	0	0.933	0.922	0.943
High	-0.148	0.009	295.711	1	0	0.863	0.848	0.877
Gender	-0.401	0.006	5252.219	1	0	0.67	0.662	0.677
Age	0.019	0	7313.558	1	0	1.019	1.019	1.02
Marital status (married)			731.312	3	0			
Unmarried	0.158	0.008	352.953	1	0	1.171	1.152	1.191
Widowed	0.123	0.008	252.882	1	0	1.131	1.114	1.148
Divorced	0.151	0.008	387.906	1	0	1.163	1.146	1.181
Ethnicity (Dane)			6.061	2	0.048			
Immigrant	-0.022	0.011	4.319	1	0.038	0.978	0.958	0.999
Descendant	0.073	0.058	1.615	1	0.204	1.076	0.961	1.204
Region of residence (Capital Region)			510.362	4	0			
Region Zealand	0	0.008	0.002	1	0.96	1	0.984	1.016
Region of Southern Denmark	-0.103	0.007	190.383	1	0	0.902	0.889	0.916
Central Denmark Region	0.035	0.007	22.742	1	0	1.036	1.021	1.051
North Denmark Region	-0.123	0.01	162.572	1	0	0.884	0.868	0.901

Appendix A1e: Cox regression minor complications to severe complications/censoring with income as differentiating factor

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Income (low)			308.7	2	0			
Middle	-0.024	0.007	10.779	1	0.001	0.976	0.962	0.99
High	-0.222	0.013	298.155	1	0	0.801	0.781	0.821
Gender	-0.17	0.007	567.575	1	0	0.844	0.832	0.856
Age	0.027	0	7635.019	1	0	1.027	1.026	1.028
Marital status (married)			73.441	3	0			
Unmarried	0.03	0.012	6.802	1	0.009	1.03	1.007	1.054
Widowed	0.016	0.009	3.038	1	0.081	1.017	0.998	1.036
Divorced	0.084	0.01	72.274	1	0	1.088	1.067	1.109
Ethnicity (Dane)			16.833	2	0			
Immigrant	-0.054	0.013	16.705	1	0	0.948	0.923	0.972
Descendant	0.022	0.078	0.08	1	0.778	1.022	0.877	1.192
Region of residence (Capital Region)			243.379	4	0			
Region Zealand	-0.071	0.01	47.506	1	0	0.931	0.913	0.95
Region of Southern Denmark	-0.06	0.009	42.264	1	0	0.942	0.925	0.959
Central Denmark Region	-0.082	0.009	77.328	1	0	0.921	0.904	0.938
North Denmark Region	-0.186	0.012	226.756	1	0	0.831	0.811	0.851

**Appendix A1f: Cox regression minor complications to severe complications/censoring with education as differentiating factor**

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Education (short)			97.035	2	0			
Middle	-0.04	0.008	27.725	1	0	0.961	0.947	0.975
High	-0.11	0.011	91.761	1	0	0.896	0.876	0.916
Gender	-0.123	0.007	281.629	1	0	0.884	0.872	0.897
Age	0.022	0	4864.93	1	0	1.022	1.022	1.023
Marital status (married)			73.123	3	0			
Unmarried	0.052	0.012	19.447	1	0	1.053	1.029	1.078
Widowed	0.003	0.01	0.068	1	0.794	1.003	0.984	1.022
Divorced	0.078	0.01	60.838	1	0	1.081	1.06	1.102
Ethnicity (Dane)			4.9	2	0.086			
Immigrant	0.032	0.015	4.828	1	0.028	1.033	1.003	1.063
Descendant	-0.021	0.088	0.054	1	0.816	0.98	0.824	1.165
Region of residence (Capital Region)			271.513	4	0			
Region Zealand	-0.074	0.011	48.147	1	0	0.929	0.91	0.948
Region of Southern Denmark	-0.1	0.01	108.92	1	0	0.905	0.888	0.922
Central Denmark Region	-0.11	0.01	129.171	1	0	0.896	0.879	0.913
North Denmark Region	-0.187	0.013	214.343	1	0	0.83	0.809	0.851

Appendix A1g: Cox regression severe complications to death/censoring with income as differentiating factor

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Income (low)			1507.857	2	0			
Middle	-0.541	0.015	1239.793	1	0	0.582	0.565	0.6
High	-0.911	0.04	508.208	1	0	0.402	0.372	0.435
Gender	-0.388	0.015	633.155	1	0	0.679	0.659	0.7
Age	0.053	0.001	4583.908	1	0	1.054	1.053	1.056
Marital status (married)			782.058	3	0			
Unmarried	0.516	0.026	391.914	1	0	1.676	1.592	1.764
Widowed	0.399	0.019	450.816	1	0	1.491	1.437	1.547
Divorced	0.43	0.022	377.014	1	0	1.538	1.472	1.606
Ethnicity (Dane)			64.176	2	0			
Immigrant	-0.267	0.033	63.424	1	0	0.766	0.717	0.818
Descendant	-0.183	0.193	0.9	1	0.343	0.833	0.571	1.215
Region of residence (Capital Region)			14.88	4	0.005			
Region Zealand	0.027	0.022	1.523	1	0.217	1.027	0.984	1.072
Region of Southern Denmark	-0.031	0.019	2.454	1	0.117	0.97	0.934	1.008
Central Denmark Region	-0.05	0.02	6.209	1	0.013	0.951	0.914	0.989
North Denmark Region	0.009	0.026	0.115	1	0.735	1.009	0.959	1.061

Appendix A1h: Cox regression severe complications to death or censoring with education as differentiating factor

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Education (low)			97.824	2	0			
Middle	-0.038	0.008	25.029	1	0	0.963	0.949	0.977
High	-0.111	0.011	93.942	1	0	0.895	0.875	0.915
Gender	-0.156	0.007	456.705	1	0	0.855	0.843	0.868
Age	0.029	0	8718.299	1	0	1.029	1.029	1.03
Marital status (married)			91.813	3	0			
Unmarried	0.052	0.012	19.489	1	0	1.053	1.029	1.078
Widowed	0.009	0.01	0.86	1	0.354	1.009	0.99	1.028
Divorced	0.091	0.01	82.243	1	0	1.095	1.074	1.116
Ethnicity (Dane)			3.777	2	0.151			
Immigrant	-0.026	0.015	3.078	1	0.079	0.975	0.947	1.003
Descendant	0.071	0.088	0.65	1	0.42	1.074	0.903	1.276
Region of residence (Capital Region)			217.75	4	0			
Region Zealand	-0.066	0.011	39.057	1	0	0.936	0.917	0.955
Region of Southern Denmark	-0.054	0.01	32.179	1	0	0.947	0.93	0.965
Central Denmark Region	-0.077	0.01	64.244	1	0	0.926	0.908	0.943
North Denmark Region	-0.183	0.013	205.663	1	0	0.833	0.813	0.854

Appendix A2: Decomposition of inequality in morbidity predictors ranked by income, B and CI

Ranked by income		DIAGNOSIS				DISEASE PROGRESSION						DEATH	
		Complication state at diagnosis		Age at Diagnosis		PYRS in CG0*		PYRS in CG2*		Total PYRS*		Age at death	
Variable (reference group)		Mean	sign.	Mean	sign.	Mean	sign.	Mean	sign.	Mean	sign.	Mean	sign.
Income													
Income	b01	-0		4E-08		6E-08		-0		-0		0.00	
	ci01	0.11	***	0.34	***	0.34	***	0.34	***	0.34	***	0.34	***
Education (high education)													
low education	b02	0.11	***	0.37	***	-0.24	***	0.04	*	-0.34	***	0.07	
	ci02	-0.58	***	-0.19	***	-0.19	***	-0.19	***	-0.19	***	-0.08	***
Medium education	b03	0.07	***	0.26	***	-0.16	***	0.02		-0.25	***	0.05	
	ci03	0.25	***	0.11	***	0.11	***	0.11	***	0.11	***	0.06	***
Age and gender (Men 0-14) (Women 0-14)													
M15-29	b04	0.06	***	0.86	***	-0.05	***	0.06	***	0.04	***	0.96	***
	ci04	-0.14	***	-0.16	***	-0.16	***	-0.16	***	-0.16	***	-0.41	***
M30-44	b05	0.05	***	0.91	***	-0.04	***	0.06	***	0.03	***	0.98	***
	ci05	0.08	***	0.39	***	0.39	***	0.39	***	0.39	***	0.20	***
M45-59	b06	0.05	***	0.96	***	-0.05	***	0.05	***	0.00		0.99	***
	ci06	0.07	***	0.38	***	0.38	***	0.38	***	0.38	***	0.28	***
M60-74	b07	0.04	***	0.96	***	-0.04	***	0.05	***	0.00		0.99	***
	ci07	0.05	***	0.02	***	0.02	***	0.02	***	0.02	***	0.06	***
M75+	b08	0.04	***	0.96	***	-0.04	***	0.05	***	0.01	***	0.99	***
	ci08	0.00		-0.21	***	-0.21	***	-0.21	***	-0.21	***	-0.03	***
F15-29	b09	0.05	***	0.92	***	-0.07	***	0.06	***	-0.02	**	0.97	***
	ci09	-0.11	***	-0.13	***	-0.13	***	-0.13	***	-0.13	***	-0.43	**
F30-44	b10	0.03	***	0.91	***	-0.01		0.05	***	0.04	***	0.99	***
	ci10	0.07	***	0.32	***	0.32	***	0.32	***	0.32	***	0.37	***
F45-59	b11	0.03	***	0.94	***	-0.01	***	0.04	***	0.02	***	0.99	***
	ci11	0.09	***	0.48	***	0.48	***	0.48	***	0.48	***	0.55	***
F60-74	b12	0.03	***	0.97	***	-0.02	***	0.04	***	0.00		0.99	***
	ci12	0.07	***	0.02	***	0.02	***	0.02	***	0.02	***	0.12	***

F75+	b13	0.04	***	0.96	***	-0.03	***	0.05	***	0.01	***	0.99	***
	ci13	0.00		-0.16	***	-0.16	***	-0.16	***	-0.16	***	-0.03	***
Labour market affiliation (in job)													
Not in job (maternity leave, job seeker allowance)	b14	0.14	***	0.86	***	-0.82	***	0.04		-0.87	***	0.12	
	ci14	0.05	***	0.09	***	0.09	***	0.09	***	0.09	***	0.41	***
Not in job (unemployment benefit)	b15	0.33	***	1.07	***	-1.28	***	0.16	***	-1.07	***	0.42	*
	ci15	-0.05	***	-0.44	***	-0.44	***	-0.44	***	-0.44	***	-0.28	***
Education, training	b16	0.18	*	2.20	***	-0.92	***	0.36	***	-1.00	***	1.97	
	ci16	-0.36	***	-0.90	***	-0.90	***	-0.90	***	-0.90	***	-0.86	***
Early retired	b17	0.68	***	-0.87	***	-0.92	***	1.28	***	0.81	***	0.06	
	ci17	-0.13	***	-0.15	***	-0.15	***	-0.15	***	-0.15	***	0.06	***
Retired	b18	0.25	***	-0.16	***	-0.42	***	0.53	***	0.28	***	0.19	
	ci18	-0.06	***	-0.21	***	-0.21	***	-0.21	***	-0.21	***	-0.04	***
Child	b19	1.14	***	11.08	***	-3.77	***	1.36	***	-4.00	***	7.91	
	ci19	0.76	***	-0.98	***	-0.98	***	-0.98	***	-0.98	***	-0.99	***
Marital status (married)													
Unmarried	b20	-0.01		-0.16	***	-0.06	*	0.15	***	0.11	***	-0.03	
	ci20	-0.02	***	0.03	***	0.03	***	0.03	***	0.03	***	0.11	***
widowed/longest living partner	b21	0.06	***	-0.09	**	-0.09	***	0.14	***	0.09	**	-0.03	
	ci21	-0.11	***	-0.09	***	-0.09	***	-0.09	***	-0.09	***	0.04	***
Divorced/cancelled partnership	b22	0.10	***	-0.03		-0.22	***	0.15	***	-0.02		-0.04	**
	ci22	-0.03	***	0.04	***	0.04	***	0.04	***	0.04	***	0.08	***
Ethnicity (Ethnic Dane)													
Immigrant	b23	-0.22	***	0.87	***	-0.21	***	-0.35	***	-0.88	***	0.08	
	ci23	0.15	***	-0.21	***	-0.21	***	-0.21	***	-0.21	***	-0.21	***
Descendant	b24	0.23	**	0.72	***	-0.29	*	-0.05		-0.66	***	0.04	
	ci24	0.11	***	-0.24	***	-0.24	***	-0.24	***	-0.24	***	-0.08	
Region of residence (Capital Region of Denmark)													
Region Zealand	b25	-0.01		0.14	***	-0.34	***	-0.18	***	-0.15	***	0.02	
	ci25	-0.02	***	0.00		0.00		0.00		0.00		0.00	
Region of Southern Denmark	b26	-0.01		0.63	***	-0.29	***	-0.41	***	-0.61	***	0.01	
	ci26	-0.03	***	-0.04	***	-0.04	***	-0.04	***	-0.04	***	-0.04	***
Central Denmark Region	b27	0.04	***	0.87	***	-0.90	***	-0.33	***	-0.85	***	0.03	
	ci27	-0.01	***	0.00		0.00		0.00		0.00		-0.01	**



North Denmark Region	b28	-0.03		0.21	***	-0.06		-0.52	***	-0.20	***	0.03	
	ci28	-0.06	***	-0.03	***	-0.03	***	-0.03	***	-0.03	***	-0.04	***
Urbanity (Cities)													
Suburbs	b29	-0.01		0.05		0.37	***	-0.03		-0.05		0.00	
	ci29	-0.03	***	0.00	*	0.00	*	0.00	*	0.00	*	-0.01	
Country side	b30	-0.05	***	0.13	***	0.52	***	-0.10	***	-0.13	***	0.00	
	ci30	-0.06	***	-0.04	***	-0.04	***	-0.04	***	-0.04	***	-0.05	***

\* PYRS = Patient years, CG0 = no complications, CG1 = minor complications, CG2 = severe complications

Appendix A3: Decomposition of inequality in morbidity predictors ranked by education, B and CI

Ranked by education		DIAGNOSIS				DISEASE PROGRESSION						DEATH	
		Complication state at diagnosis		Age at Diagnosis		PYRS in CG0*		PYRS in CG2*		Total PYRS *		Age at death	
Variable (reference group)		Mean	sign.	Mean	sign.	Mean	sign.	Mean	sign.	Mean	sign.	Mean	sign.
Income	b01	-0		5E-08		5E-08		-5E-08		-2E-08		9E-07	
	ci01	0.11	***	0.109	***	0.109	***	0.109	***	0.109	***	0.089	***
Education (high education)													
low education	b02	0.11	***	0.37	***	-0.24	***	0.04	**	-0.33	***	0.07	
	ci02	-0.58	***	-0.58	***	-0.58	***	-0.58	***	-0.58	***	-0.50	***
Medium education	b03	0.07	***	0.27	***	-0.16	***	0.02		-0.25	***	0.05	
	ci03	0.25	***	0.25	***	0.25	***	0.25	***	0.25	***	0.31	***
Age and gender (Men 0-14) (Women 0-14)													
M15-29	b04	0.06	***	0.86	***	-0.05	***	0.06	***	0.04	***	0.96	***
	ci04	-0.14	***	-0.14	***	-0.14	***	-0.14	***	-0.14	***	-0.28	***
M30-44	b05	0.05	***	0.91	***	-0.04	***	0.06	***	0.03	***	0.98	***
	ci05	0.08	***	0.08	***	0.08	***	0.08	***	0.08	***	0.05	
M45-59	b06	0.05	***	0.96	***	-0.05	***	0.05	***	0.00		0.99	***
	ci06	0.07	***	0.07	***	0.07	***	0.07	***	0.07	***	0.02	*
M60-74	b07	0.04	***	0.96	***	-0.04	***	0.05	***	0.00		0.99	***
	ci07	0.05	***	0.05	***	0.05	***	0.05	***	0.05	***	0.04	***
M75+	b08	0.04	***	0.96	***	-0.04	***	0.05	***	0.01	***	0.99	***
	ci08	0.00		0.00		0.00		0.00		0.00		0.05	***
F15-29	b09	0.05	***	0.92	***	-0.07	***	0.06	***	-0.02	**	0.97	***
	ci09	-0.11	***	-0.11	***	-0.11	***	-0.11	***	-0.11	***	-0.30	**
F30-44	b10	0.03	***	0.91	***	-0.01		0.05	***	0.04	***	0.99	***
	ci10	0.07	***	0.07	***	0.07	***	0.07	***	0.07	***	0.08	
F45-59	b11	0.03	***	0.94	***	-0.02	***	0.04	***	0.02	***	0.99	***
	ci11	0.09	***	0.09	***	0.09	***	0.09	***	0.09	***	0.05	*
F60-74	b12	0.03	***	0.97	***	-0.02	***	0.04	***	0.00		0.99	***

	ci12	0.07	***	0.07	***	0.07	***	0.07	***	0.07	***	0.07	***
F75+	b13	0.04	***	0.96	***	-0.03	***	0.05	***	0.01	***	0.99	***
	ci13	0.00		0.00		0.00		0.00		0.00		0.04	***
<b>Labour market affiliation (in job)</b>													
Not in job (maternity leave, job seeker allowance)	b14	0.14	***	0.86	***	-0.83	***	0.04		-0.87	***	0.11	
	ci14	0.05	***	0.05	***	0.05	***	0.05	***	0.05	***	0.13	***
Not in job (unemployment benefit)	b15	0.33	***	1.07	***	-1.28	***	0.16	***	-1.08	***	0.41	*
	ci15	-0.05	***	-0.05	***	-0.05	***	-0.05	***	-0.05	***	0.18	***
Education, training	b16	0.18	*	2.21	***	-0.93	***	0.36	***	-1.01	***	2.03	
	ci16	-0.36	***	-0.36	***	-0.36	***	-0.36	***	-0.36	***	-0.15	
Early retired	b17	0.68	***	-0.87	***	-0.92	***	1.28	***	0.81	***	0.05	
	ci17	-0.13	***	-0.13	***	-0.13	***	-0.13	***	-0.13	***	-0.08	***
Retired	b18	0.25	***	-0.16	***	-0.42	***	0.54	***	0.28	***	0.18	
	ci18	-0.06	***	-0.06	***	-0.06	***	-0.06	***	-0.06	***	0.00	*
Child	b19	1.14	***	11.07	***	-3.78	***	1.36	***	-4.01	***	8.06	
	ci19	0.76	***	0.76	***	0.76	***	0.76	***	0.76	***	0.88	***
<b>Marital status (married)</b>													
Unmarried	b20	-0.01		-0.16	***	-0.06	*	0.15	***	0.11	***	-0.03	
	ci20	-0.02	***	-0.02	***	-0.02	***	-0.02	***	-0.02	***	-0.05	***
widowed/longest living partner	b21	0.06	***	-0.09	**	-0.09	***	0.14	***	0.09	**	-0.03	
	ci21	-0.11	***	-0.11	***	-0.11	***	-0.11	***	-0.11	***	0.02	***
Divorced/cancelled partnership	b22	0.10	***	-0.02		-0.22	***	0.15	***	-0.02		-0.04	**
	ci22	-0.03	***	-0.03	***	-0.03	***	-0.03	***	-0.03	***	-0.05	***
<b>Ethnicity (Ethnic Dane)</b>													
Immigrant	b23	-0.22	***	0.87	***	-0.21	***	-0.35	***	-0.88	***	0.08	
	ci23	0.15	***	0.15	***	0.15	***	0.15	***	0.15	***	0.27	***
Descendant	b24	0.23	**	0.72	***	-0.29	*	-0.05		-0.68	***	0.04	
	ci24	0.11	***	0.11	***	0.11	***	0.11	***	0.11	***	0.22	**
<b>Region of residence (Capital Region of Denmark)</b>													
Region Zealand	b25	-0.01		0.14	***	-0.34	***	-0.18	***	-0.15	***	0.02	
	ci25	-0.02	***	-0.02	***	-0.02	***	-0.02	***	-0.02	***	-0.02	**

Region of Southern Denmark	b26	-0.01		0.63	***	-0.29	***	-0.41	***	-0.62	***	0.01	
	ci26	-0.03	***	-0.03	***	-0.03	***	-0.03	***	-0.03	***	-0.02	***
Central Denmark Region	b27	0.04	***	0.87	***	-0.90	***	-0.33	***	-0.85	***	0.02	
	ci27	-0.01	***	-0.01	***	-0.01	***	-0.01	***	-0.01	***	-0.03	***
North Denmark Region	b28	-0.03		0.21	***	-0.06		-0.52	***	-0.20	***	0.03	
	ci28	-0.06	***	-0.06	***	-0.06	***	-0.06	***	-0.06	***	-0.06	***
<b>Urbanity (Cities)</b>													
Suburbs	b29	-0.01		0.05		0.37	***	-0.03		-0.05		0.00	
	ci29	-0.03	***	-0.03	***	-0.03	***	-0.03	***	-0.03	***	-0.02	***
Country side	b30	-0.05	***	0.12	***	0.52	***	-0.10	***	-0.13	***	0.00	
	ci30	-0.06	***	-0.06	***	-0.06	***	-0.06	***	-0.06	***	-0.06	***

\* PYRS = Patient years, CG0 = no complications, CG1 = minor complications, CG2 = severe complications

\*\* bN = Regression coefficient of variable N    \*\*\*ciN = Concentration index of variable N