Explaining excess morbidity amongst homeless shelter users: A multivariate analysis for the Danish adult population

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Aim of study

1. Analyse the excess morbidity (physical illness) amongst homeless shelter users compared to the general population

2. Perform a strong control for a wide range of confounders – gender, age, ethnic background, civil status, substance abuse, mental illness, unemployment, education, income poverty

3. Examine what potential confounders explain part of excess morbidity amongst shelter users

4. Policy implications

Data and methods

Micro data (individual data) on approx 4 million Danish adults

14,730 used homeless shelters over a five year period from 2002 to 2006

Physical illness measured from 2007 to 2011 through diagnosis data from the public health system

Prevalence of a range of illnesses estimated for men and women within age groups

A control of excess morbidity for confounding is performed

A regression decomposition model estimates what proportion of excess morbidity is explained by each confounding factor and what remains unexplained as an estimate of the effect of homelessness/shelter use on excess morbidity when confounding is controlled for

Background characteristics of male and female shelter users

	Men			Women		
	Shelter users % (N = 11,638)	General pop. % (N = 1,919,993)	Significance of the difference	Shelter users % (N = 3,092)	General pop. % (N = 2,021,553)	Significance of the difference
Age						
23-29 years	10.9	10.9		9.9	10.2	
30-39 years	23.7	19.3	***	21.1	18.2	***
40-49 years	33.0	21.0	***	33.5	19.6	***
50-59 years	22.6	18.7	***	25.2	17.7	***
60-69 years	8.3	16.7	***	9.1	16.2	***
70+ years	1.4	13.5	***	1.2	18.1	***
Immigrant	14.0	7.1	***	10.3	7.4	***
Child of immigrant	0.8	0.5	***	1.1	0.5	***
Single/widowed/divorced	79.9	31.6	***	70.4	36.1	***
Not employed	78.1	31.9	***	87.4	42.6	***
Income						
1. Lowest quintile	47.2	17.3	***	39.4	22.4	***
2	34.8	16.2	***	38.8	23.5	***
3.	12.5	18.1	***	16.3	21.8	***
4.	4.1	21.4	***	4.1	18.8	***
5. Highest quintile	1.4	27.1	***	1.4	13.4	***

Background characteristics of male and female shelter users

	Men			Women		
	Shelter users % (N = 11,638)	General pop. % (N = 1,919,993)	Significance of the difference	Shelter users % (N = 3,092)	General pop. % (N = 2,021,553)	Significance of the difference
Education						
Obligatory or high school	60.4	33.9	***	62.7	38.7	***
Vocational or short tertiary	26.5	44.6	***	21.3	34.7	***
Academic/professional	5.3	18.0	***	8.1	21.8	***
Unspecified	7.8	3.5	***	7.9	4.8	***
Severe mental illness	10.0	0.8	***	10.5	0.7	***
Other mental illness	28.5	3.6	***	42.5	5.5	***
Mental illness, total	32.8	4.1	***	46.0	5.9	***
Alcohol abuse	42.9	1.9	***	47.8	0.9	***
Drug abuse	30.8	0.8	***	30.5	0.3	***
Substance abuse (drug and/or alcohol)	61.1	2.5	***	64.3	1.2	***
Mental illness and substance abuse	24.9	0.7	***	33.2	0.5	***
Mental illness and/or substance abuse	69.0	5.9	***	77.1	6.5	***

MEN	23-39 years			40-59 years			60+ years		
	Shelter users % (N = 4,032)	General pop. % (N = 578,911)	Significance of the difference	Shelter users % (N = 6,478)	General pop. % (N = 761,809)	Significance of the difference	Shelter users % (N = 1,128)	General pop. % (N = 579,273)	Significance of the difference
Infections	17.0	3.0	***	16.3	3.2	***	12.9	7.5	***
Tuberculosis	1.0	0.1	***	1.2	0.1	***	0.6	0.1	***
Sepsis	1.7	0.1	***	3.4	0.6	***	5.1	3.3	***
Erysipelas	2.3	0.3	***	3.1	0.6	***	3.1	1.2	***
Viral hepatitis	10.2	0.3	***	7.4	0.4	***	0.7	0.1	***
Hepatitis C	9.5	0.2	***	6.8	0.3	***	0.6	<0.1	***
HIV	1.2	0.1	***	1.3	0.2	***	0.2	0.1	
Neoplasms	2.4	2.3		7.2	6.2	***	15.9	20.6	***
Malignant neoplasms	0.4	0.7	*	3.9	3.1	***	11.4	15.6	***
Blood diseases	1.9	0.6	***	4.8	1.4	***	8.7	6.3	***
Nutritonal anemias	0.4	0.1	***	0.8	0.2	***	2.5	1.1	***
Endocrine diseases	5.5	2.9	***	14.6	8.3	***	25.9	19.5	***
Diabetes	1.8	1.1	***	5.9	3.9	***	11.5	9.0	**
Nervous system	8.2	3.6	***	11.9	6.4	***	12.9	10.0	**
Epilepsy	3.2	0.7	***	4.0	0.9	***	2.9	1.2	***
Eye diseases	3.3	2.7	*	5.6	4.4	***	11.8	12.7	
Ear diseases	1.9	1.3	***	3.2	3.2		5.2	12.1	***
Circulatory system	10.9	4.0	***	23.9	14.2	***	39.2	39.4	
Respiratory system	11.1	4.3	***	19.0	5.9	***	28.5	17.4	***
Pneumonia	4.9	0.9	***	10.5	2.0	***	15.8	9.9	***
COPD	1.2	0.1	***	6.6	1.3	***	13.3	7.0	***
Digestive system	17.2	7.2	***	27.9	12.1	***	30.3	21.3	***
Liver diseases	2.0	0.2	***	7.8	0.9	***	6.9	1.1	***
Skin diseases	12.0	3.5	***	10.3	3.8	***	8.2	5.1	***
Skin infections	9.4	2.0	***	6.7	1.7	***	3.6	1.6	***
Musculoskeletal system	18.0	13.3	***	21.9	18.5	***	20.0	21.9	
Genitourinary system	6.3	5.7		8.4	6.0	***	17.8	17.1	
Injuries	61.2	39.7	***	52.1	30.0	***	43.0	24.1	***
Poisoning	17.2	1.4	***	12.5	1.2	***	8.4	1.2	***
At least one disease (excl. injuries and poisoning)	56.9	36.4	***	68.4	49.5	***	76.7	75.4	

WOMEN	23-39 years			40-59 years			60+ years		
	Shelter users % (N = 958)	General pop. % (N = 574,605)	Significance of the difference	Shelter users % (N = 1,817)	General pop. % (N = 755,246)	Significance of the difference	Shelter users % (N = 317)	General pop. % (N = 693,836)	Significance of the difference
Infections	24.1	3.2	***	19.8	2.7	***	11.4	6.5	***
Tuberculosis	0.9	<0.1	***	1.9	<0.1	***	0.0	<0.1	
Sepsis	3.9	0.2	***	4.1	0.5	***	4.1	2.2	*
Erysipelas	2.4	0.1	***	3.5	0.3	***	2.5	1.1	*
Viral hepatitis	16.1	0.2	***	8.3	0.2	***	0.9	0.1	***
Hepatitis C	14.5	0.1	***	8.1	0.2	***	0.9	<0.1	***
HIV	2.3	0.1	***	1.9	0.1	***	0.3	<0.1	***
Neoplasms	5.3	5.4		11.6	11.8		17.4	17.7	
Malignant neoplasms	0.5	1.0		5.4	4.9		11.0	12.5	
Blood diseases	5.7	1.6	***	7.3	1.9	***	9.5	6.1	*
Nutritonal anemias	2.1	0.3	***	1.9	0.4	***	3.2	1.3	**
Endocrine diseases	16.5	12.5	***	18.8	10.8	***	28.7	20.4	***
Diabetes	3.2	1.0	***	5.2	2.7	***	8.2	6.4	
Nervous system	10.8	5.0	***	12.7	6.7	***	17.4	8.2	***
Epilepsy	3.8	0.8	***	4.3	0.8	***	4.4	0.9	***
Eye diseases	5.2	2.9	***	6.7	4.7	***	11.7	15.2	
Ear diseases	3.1	1.5	***	2.9	2.8		3.5	9.7	***
Circulatory system	14.6	5.8	***	22.2	13.3	***	33.8	35.4	
Respiratory system	15.9	5.1	***	22.2	5.9	***	24.3	15.2	***
Pneumonia	7.8	1.0	***	11.7	1.8	***	9.8	8.2	
COPD	2.1	0.2	***	9.6	1.5	***	15.8	6.5	***
Digestive system	22.2	9.1	***	31.2	11.7	***	32.2	18.6	***
Liver diseases	3.7	0.2	***	9.0	0.7	***	9.2	0.8	***
Skin diseases	14.6	4.2	***	10.8	4.2	***	4.7	4.9	
Skin infections	11.0	1.3	***	6.5	1.2	***	2.5	1.1	*
Musculoskeletal system	19.9	14.5	***	25.2	23.5		29.3	29.4	
Genitourinary system	21.6	17.6	**	23.3	15.0	***	22.1	17.2	*
Injuries	54.4	27.4	***	54.2	26.0	***	49.8	30.3	***
Poisoning	22.7	1.3	***	18.0	1.2	***	13.6	1.2	***
At least one disease (excl. injuries and poisoning)	72.2	51.6	***	75.0	57.6	***	81.1	74.5	**

MEN	Model 1		Model 2		Decomposition of the excess morbidity amongst shelter users (model 1 vs. model 2)								
	Age-adjusted OR	95% CI	Fully adjusted OR	95% CI	Substance abuse	Mental illness	Employ-ment	Income	Education	Civil status	Ethnicity	Not ex-plained	Total
Infections	5.14***	(4.87-5.41)	1.58***	(1.49-1.67)	37	3	17	4	2	8	1	28	100
Tuberculosis	19.77***	(16.23-24.09)	3.15***	(2.53-3.94)	18	-4	18	14	4	9	3	38	100
Sepsis	5.04***	(4.51-5.64)	1.49***	(1.32-1.68)	32	7	28	0	2	7	-1	24	100
Erysipelas	4.58***	(4.09-5.13)	1.58***	(1.39-1.79)	38	2	18	1	4	8	-2	30	100
Viral hepatitis	16.83***	(15.39-18.39)	2.15***	(1.96-2.35)	38	-4	15	10	4	7	3	27	100
Hepatitis C	21.25***	(19.25-23.46)	2.10***	(1.91-2.31)	37	-3	18	12	4	6	1	24	100
HIV	5.94***	(4.96-7.11)	1.56***	(1.28-1.91)	16	4	14	3	-2	37	3	25	100
Neoplasms	1.08*	(1.00-1.17)	0.94	(0.87-1.02)	-	-	-	-	-	-	-	-	-
Malignant neoplasms	1.07	(0.96-1.18)	0.89*	(0.80-0.99)	-	-	-	-	-	-	-	-	-
Blood diseases	2.93***	(2.67-3.22)	1.16**	(1.05-1.28)	37	3	28	9	3	7	-1	14	100
Nutritonal anemias	4.70***	(3.83-5.77)	1.30**	(1.05-1.62)	31	3	27	11	3	9	-1	17	100
Endocrine diseases	1.82***	(1.72-1.93)	0.93*	(0.88-0.99)	22	13	36	14	7	8	1	0	100
Diabetes	1.52***	(1.39-1.65)	0.78***	(0.72-0.86)	8	11	39	21	8	10	3	0	100
Nervous system	1.88***	(1.77-2.00)	1.02	(0.95-1.08)	32	22	53	-10	2	-1	-1	3	100
Epilepsy	4.03***	(3.64-4.46)	1.03	(0.93-1.15)	22	14	56	-5	6	8	-3	2	100
Eye diseases	1.26***	(1.17-1.37)	1.01	(0.93-1.1)	19	-5	86	-1	-9	-1	6	5	100
Ear diseases	0.98	(0.87-1.09)	1.01	(0.90-1.13)	-	-	-	-	-	-	-	-	-
Circulatory system	1.95***	(1.86-2.05)	1.09***	(1.03-1.14)	38	5	30	10	4	0	0	13	100
Respiratory system	3.26***	(3.10-3.43)	1.22***	(1.15-1.29)	34	8	21	10	5	5	0	17	100
Pneumonia	4.89***	(4.57-5.23)	1.33***	(1.24-1.43)	31	9	25	7	5	6	-1	18	100
COPD	5.39***	(4.95-5.87)	1.21***	(1.11-1.33)	33	3	22	20	5	6	-1	11	100
Digestive system	2.56***	(2.45-2.68)	1.30***	(1.24-1.36)	39	6	20	6	2	-1	0	28	100
Liver diseases	6,70***	(6,15-7,31)	1,18***	(1,07-1,29)	51	-3	24	14	-1	7	0	9	100
Skin diseases	2.91***	(2.74-3.09)	1.38***	(1.30-1.48)	34	8	19	-1	2	6	1	30	100
Skin infections	3.95***	(3.68-4.25)	1.71***	(1.58-1.85)	32	6	12	3	4	5	1	39	100
Musculoskeletal system	1.24***	(1.18-1.30)	1.06*	(1.01-1.11)	64	-6	32	13	1	-36	4	28	100
Genitourinary system	1.33***	(1.25-1.42)	0.98	(0.91-1.05)	30	20	57	-6	0	-2	1	0	100
Injuries	2.53***	(2.43-2.62)	1.54***	(1.48-1.60)	48	6	-6	1	4	1	-1	47	100
Poisoning	9.84***	(9.27-10.45)	2.04***	(1.91-2.18)	38	10	9	6	3	3	-1	31	100
Average	-	-	-	-	33	5	28	6	3	5	1	20	100

WOMEN	Model 1		Model 2		Decomposition of the excess morbidity amongst shelter users (model 1 vs. model 2)								
	Age-adjusted OR	95% CI	Fully adjusted OR	95% CI	Substance abuse	Mental illness	Employ-ment	Income	Education	Civil status	Ethnicity	Not explained	Total
Infections	7.59***	(6.91-8.33)	2.04***	(1.85-2.25)	35	6	14	1	3	5	0	35	100
Tuberculosis	32.39***	(23.33-44.96)	5.03***	(3.42-7.41)	28	-4	14	5	6	3	1	46	100
Sepsis	8.94***	(7.43-10.76)	1.87***	(1.53-2.27)	31	8	24	0	4	5	0	29	100
Erysipelas	8.54***	(6.89-10.58)	2.07***	(1.65-2.61)	33	4	22	-1	5	4	0	34	100
Viral hepatitis	20.34***	(17.50-23.65)	2.96***	(2.53-3.47)	41	-4	9	6	5	6	1	36	100
Hepatitis C	27.66***	(23.51-32.55)	2.87***	(2.43-3.39)	38	-4	14	7	4	8	1	32	100
HIV	16.59***	(12.16-22.65)	3.16***	(2.27-4.41)	29	-1	6	7	5	12	2	41	100
Neoplasms	0.97	(0.86-1.09)	0.89	(0.79-1.01)	-	-	-	-	-	-	-	-	-
Malignant neoplasms	1.03	(0.86-1.22)	0.89	(0.74-1.06)	-	-	-	-	-	-	-	-	-
Blood diseases	3.67***	(3.19-4.22)	1.31***	(1.13-1.52)	35	5	25	2	6	5	0	21	100
Nutritonal anemias	4.88***	(3.80-6.26)	1.47**	(1.13-1.91)	30	6	27	1	7	5	1	24	100
Endocrine diseases	1.77***	(1.62-1.94)	0.93	(0.85-1.02)	26	19	36	8	8	3	0	0	100
Diabetes	2.35***	(1.99-2.77)	0.90	(0.76-1.07)	14	13	40	14	11	8	1	0	100
Nervous system	2.12***	(1.90-2.36)	1.06	(0.95-1.19)	20	24	50	-5	2	1	0	8	100
Epilepsy	5.41***	(4.52-6.47)	1.26*	(1.04-1.52)	17	20	41	-2	6	5	-1	14	100
Eye diseases	1.47***	(1.27-1.69)	1.14	(0.99-1.32)	16	-13	60	-2	-5	8	1	35	100
Ear diseases	1.14	(0.93-1.40)	0.95	(0.77-1.17)	-	-	-	-	-	-	-	-	-
Circulatory system	1.96***	(1.79-2.14)	1.05	(0.96-1.16)	41	4	30	6	8	4	0	8	100
Respiratory system	3.93***	(3.59-4.30)	1.25***	(1.14-1.37)	37	11	21	3	5	7	0	16	100
Pneumonia	6.24***	(5.53-7.04)	1.51***	(1.33-1.72)	32	11	22	1	6	6	0	23	100
COPD	7.26***	(6.32-8.34)	1.26**	(1.09-1.45)	35	7	23	8	6	10	0	11	100
Digestive system	3.09***	(2.85-3.34)	1.27***	(1.17-1.39)	38	11	22	3	3	1	0	22	100
Liver diseases	9,36***	(8,09-10,82)	1,40***	(1,20-1,63)	57	1	20	4	0	3	0	15	100
Skin diseases	2.73***	(2.43-3.05)	1.29***	(1.15-1.45)	35	14	22	-4	2	6	0	25	100
Skin infections	5.46***	(4.75-6.28)	1.90***	(1.64-2.21)	32	9	14	-2	3	5	0	38	100
Musculoskeletal system	1.17***	(1.08-1.28)	0.90*	(0.82-0.98)	40	-3	69	2	-4	-4	1	0	100
Genitourinary system	1.54***	(1.42-1.68)	1.02	(0.93-1.11)	36	27	25	2	5	1	0	3	100
Injuries	3.31***	(3.07-3.56)	1.61***	(1.50-1.74)	39	11	6	-4	3	5	0	40	100
Poisoning	15.48***	(13.97-17.16)	1.88***	(1.68-2.09)	39	18	14	0	3	4	0	23	100
Average	-	-	-	-	33	8	26	2	4	5	0	22	100

Conclusions

- Even when performing a strong control for confounding an unexplained excess morbidity remains amongst shelter users compared to the general population

- Excess morbidity is found for infectious diseases, lung, skin, blood and digestive diseases, injuries and poisoning

- However, when controlling for confounding excess morbidity is substantially smaller than uncontrolled estimates

- Substance abuse and unemployment are major confounders, whereas income poverty is not

- Policy implications – homelessness in itself poses a serious threath to health – and more integrated forms of health and social support as well as rehousing is needed

Thanks for the attention

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