Increased health-care utilisation in international adoptees

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ABSTRACT

INTRODUCTION: Several studies have documented that international adoptees have an increased occurrence of health problems and contacts to the health-care system after arriving to their new country of residence. This may be explained by pre-adoption adversities, especially for the period immediately after adoption. Our study aimed to the assess health-care utilisation of international adoptees in primary and secondary care for somatic and psychiatric diagnoses in a late post-adoption period. Is there an increased use of the health-care system in this period, even when increased morbidity in the group of international adoptees is taken into consideration?

METHODS: This was a Danish register-based cohort study examining health-care utilisation in a multivariable two-part model. The prevalence of selected outcomes and the quantity of use were assessed in a late (year three, four and five) post-adoption period. The cohort comprised internationally adopted children (n = 6,820), adopted between 1994 and 2005, and all non-adopted children (n = 492,374) who could be matched with the adopted children on sex, age, municipality and family constellation at the time of adoption.

RESULTS: International adoption increased the use of all services in primary care, while in secondary care only few areas showed an increased long-term morbidity.

CONCLUSION: International adoptees use medical services in primary care at a higher rate than non-adoptees some years after adoption. Excess use of services in secondary care is also present, but only exists in selected areas.

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Most international adoptees appear to be well adjusted in their adoptive families in the recipient country [1]. However, many children arrive to the recipient country with developmental and growth delays, and with medical and mental health issues related to adversities and maltreatment in their countries of origin [2]. Infectious and parasite-induced diseases are the most common issues [3], but also cases of anaemia, hepatitis and tuberculosis are frequently seen [4]. Substantial post-adoption recovery from these initial disadvantages is documented, and they are most pronounced in the first years for physical parameters such as weight and height [5]. However, the effects of early institutional depriv-

ation may persist in early adolescence; and for some children, psychological development follows a different pattern than that of non-adoptees [6].

Adoptees are reported to be overrepresented in psychiatric settings and use medical services at a higher rate than non-adoptees [7-9]. However, these studies investigate only very specific outcomes and do not give a comprehensive overview of health-care utilisation. Moreover, they have limited sample sizes and are not representative for international adoptees, or are based on self-reported data [8, 9]. The use of nationwide administrative databases, such as those established in the Nordic countries [10], allows us to analyse much larger, representative samples.

Increased morbidity and excessive use of health-care services is expected immediately after adoption, but it is uncertain if increased morbidity persists after a period of post-adoption recovery. The present study aims to assess health-care utilisation of international adoptees in a late post-adoption period.

METHODS

Study population

Data on international adoptees were obtained from the Danish Civil Registration System (CRS). In Denmark, adoption status is stated in the CRS along with country of origin [11]. The population in the present study was restricted to all Danish adoptions of children below 11 years of age processed from 1 January 1994 to 31 December 2005. For each included adoptee, the study population was augmented with all non-adopted children who, at the time of the adoption, were of the same sex and age, lived in the same municipality and in similar family constellation (e.g. nuclear family, single parent); this information was obtained from The Danish Family Relations Database which is based on kinship information from the CRS [11]. Next, national adoptees – primarily stepchild adoptions (**Figure 1**) – were excluded so that the adoptees in the final study population are international adoptees who are biologically unrelated to their adoptants.

Outcomes

Outcomes in the present study are measures of health-care utilisation over a period of time after the adoption,
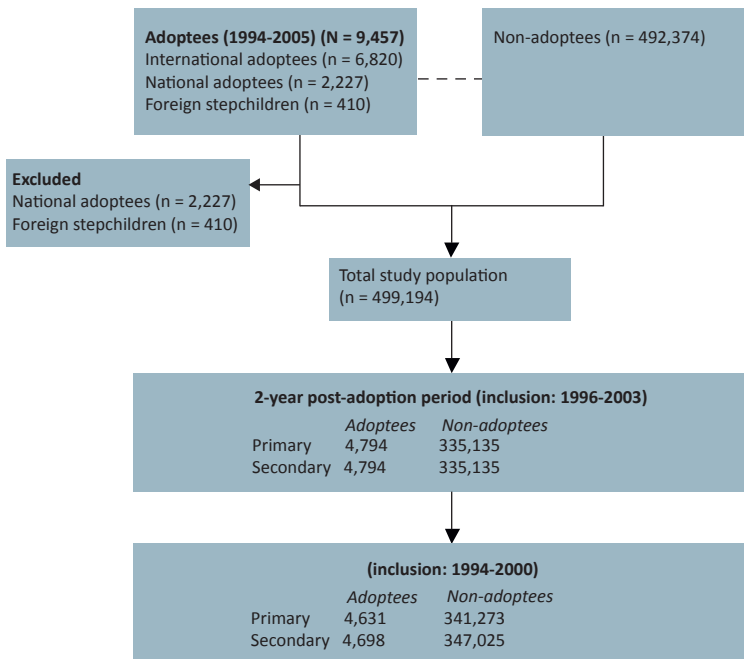
FIGURE 1

Flow chart of the inclusion process.

Health-care utilisation in primary care (five outcomes) is defined as the number of:

– Daytime consultations to the general practitioner (GP)
– Medical specialist contacts
– Eye specialist contacts
– Ear specialist contacts
– Contacts to other medical specialists (e.g. surgery, child psychiatry, anaesthesiology, X-ray).

Health-care utilisation in hospitals (11 outcomes) follows the International Classification of Diseases (ICD)-10 classification and is defined as the number of contacts with specific diagnoses (hospital admissions or contacts to outpatient clinics):

– Hospital contacts (all entries in the NPR)
– Infectious and parasitic diseases (ICD-10: A00-B99)
– Diseases of the blood and blood-forming organs (ICD-10: D50-D89)
– Endocrine, nutritional and metabolic diseases (ICD-10: E00-E90)
– Mental and behavioural disorders (ICD-10: F00-F99)
– Diseases of the nervous system (ICD-10: G00-G99)
– Diseases of the respiratory system (ICD-10: J00-J99)
– Diseases of the digestive system (ICD-10: K00-K93)
– Congenital malformations, deformations and chromosomal abnormalities (ICD-10: Q00-Q99)
– Injury, poisoning and certain other consequences of external causes (ICD-10: S00-T98)
– Burns and corrosions (ICD-10: S00-T98).

Covariates

Sex, age, region, family constellation at the time of adoption and year of adoption were obtained from the CRS [11]. Family constellation indicates whether the child lives with both parents or with a single parent. Socioeconomic position of the household was measured both by the highest completed education obtained by an adult in the household as obtained from the Danish Education Register, and by family income obtained from the Income Statistics Register.

Statistics

For both periods and for each of the 16 outcomes, a multivariable two-part model was used to analyse the influence of being adopted on health-care utilisation [14]. The first part of the model analyses the prevalence of the outcome in the corresponding period using a Poisson regression approach so that the regression parameters can be expressed as the relative risk (RR) of experiencing the outcome at all in the period [15]. This first part tentatively investigates health care seeking behav-

or, in case of a non-adopted child, the time of adoption of the adoptee with whom the child was matched. An early two-year post-adoption period covers the first two full calendar years following the adoption year and represents the post-adoption recovery period. A late three-year post-adoption period spans the three calendar years following the early post-adoption period. Health-care utilisation is measured for selected primary care contacts or hospital admissions (see below), as the total number of these contacts in each of the post-adoption periods. Data on contacts to primary care up to 2005 were retrieved from the Danish National Health Services Register [12]. These data were registered under the child´s own identification number only as from 1997. Therefore, analyses on primary care outcomes for the early post-adoption period included only those adopted in the 1996-2003 period, and for the late post-adoption period only those adopted in the 1994-2000 period; these periods do not end by 2005 to ensure that all children have two and three years of follow-up, respectively. Data on diagnoses for in- and outpatient contacts to secondary care were obtained from the Danish national patient register (NPR) [13] and used the same inclusion years as the primary care analyses. If, for a certain person, register data were only available for part of a period, the available outcome information (e.g. days in hospital, number) was divided by the fraction of the period for which information was available.

iour, such as contacting health-care professionals, is often initiated by the parent(s). The second part of the model analyses the quantity of the outcome for the children who experienced the outcome in the corresponding period in a generalised linear model using a Gamma distribution and a logarithmic link function so that the regression parameters can be expressed as a multiplicative factor of how much more the outcome was experienced for the adopted children relative to the non-adopted children. The second part tentatively measures the behaviour of the health-care services because the quantity of use is often dependent on treatment protocols and medical decisions. Both parts of the model are adjusted for age at the time of adoption, sex, year of adoption, residence, income, education, family status and region. The analyses pertaining to the late post-adoption period also included the prevalence of hospital contact in the early post-adoption period to adjust for level of morbidity. A combined multiplicative effect of being adopted can be calculated by multiplying the RR from the first part and the factor from the second part.

Statistical significance was assessed at a 1% level. Statistical Analysis Software 9.2 (SAS Institute, Cary, North Carolina) was used to analyse the data.

Ethics
The study was approved by the Danish Data Protection Agency.

Trial registration: not relevant.

RESULTS
Demographic variables
The study population (n = 499,194) consisted of a group of non-adoptees (n = 492,374) and a group of international adoptees (n = 6,820) (Figure 1). Demographic data are shown in **Table 1**. The international adoptees featured more girls (55.5%), while the non-adopted children had an approximately equal gender distribution (49.8% girls). Most of the adopted children were one year (42.4%) or 2-4 year old (40.5%) at the time of adoption. and most of the children arrived from the Far East (e.g. China, Vietnam, Korea) (40.9%), South America (24.0%), or Near East and the Indian subcontinent (e.g. Iraq, India) (18.7%).

Health-care utilisation
Table 2 shows increased health-care use in both primary and secondary care among adopted children in the first two years after their arrival in Denmark.

The health-care use in years three, four and five after adoption (the late post-adoption period) is shown in **Table 3**. After adjustment for increased morbidity in the early post-adoption period, the adopted children had an

TABLE 1

Demographic characteristics of the study participants. The values are n (%) (N$_{total}$ = 499,194).

	Adopted (N = 6,820)	Non-adopted (N = 492,374)
Sex		
Boy	2,902 (44.5)	246,996 (50.2)
Girl	3,918 (55.5)	245,378 (49.8)
Age, yrs		
0	509 (7.5)	162,151 (32.9)
1	2,891 (42.4)	180,082 (36.6)
2-4	2,760 (40.5)	89,681 (18.2)
> 4	660 (9.7)	60,460 (12.3)
Year at adoption/inclusion		
1994-1995	1,066 (15.6)	86,021 (17.5)
1996-1998	1,708 (25.0)	131,906 (26.8)
1999-2002	2,501 (36.7)	167,436 (34.0)
2003-2005	1,545 (22.7)	107,011 (21.7)
Residence		
Capital Region of Denmark	1,987 (29.1)	173,786 (35.3)
Aarhus, Aalborg and Odense	799 (11.7)	75,392 (15.3))
Anywhere in Denmark apart from the above 2 categories	4,034 (59.2)	243,196 (49.4)
Family status		
Lives with 2 parents	6,523 (95.7)	415,278 (84.3)
Lives with single mother	295 (4.3)	74,692 (15.2)
Does not live with parents	2 (0.0)	2,404 (0.5)
Region		
Denmark	0 (0.0)	471,758 (95.8)
Western Europe, North America and Australia	225 (3.3)	10,602 (2.2)
Former Sovjet Union, Romania, Bulgaria	572 (8.4)	1,755 (0.4)
Africa	337 (4.9)	2,453 (0.5)
South America	1,437 (21.1)	379 (0.1)
Near East and Indian subcontinent (Iraq, India)	1,215 (17.8)	3,807 (0.8)
Far East (China, Vietnam, Korea)	2,789 (40.9)	1,472 (0.3)
Foreign and unknown	245 (3.6)	148 (0.0)
Income, euro		
Negative income-20,000	27 (0.4)	44,028 (8.9)
20,000-40,000	160 (2.4)	88,332 (17.9)
40,000-70,000	1,302 (19.1)	122,133 (24.8)
> 70,000	5,330 (78.2)	236,250 (48.0)
Unspecified	1 (0.0)	1,631 (0.3)
Education		
Primary school	220 (3.2)	81,054 (16.5)
High school	145 (2.1)	28,460 (5.8)
Occupational education	2,030 (29.8)	174,861 (35.5)
Short higher education	515 (7.6)	32,323 (6.6)
Medium duration higher education	2,226 (32.6)	106,845 (21.7)
Long higher education	1,684 (24.7)	68,831 (14.0)

increased prevalence of contact in all surveyed primary care areas. Furthermore, when they had contact, the frequency was statistically significantly higher for contacts to the GP and medical specialist. Being adopted significantly increases the risk of hospital contacts in general and of diagnoses related to mental and behav-

TABLE 2

Selected health-care utilisation in international adoptees relative to non-adoptees, early two-year post-adoption period.

Services	2-year prevalence of service				2-year quantity of service[a]				Combined effect
	adopted, n (%)	non-adopted, n (%)	RR[b] (95% CI)	p-value[d]	adopted, mean (SD)	non-adopted, mean (SD)	F[c] (95% CI)	p-value[d]	
Primary health care									
General practitioner contacts	4,665 (97.3)	324,750 (96.9)	1.067 (1.055-1.079)	< 0.0001	5.75 (4.29)	6.59 (5.32)	1.245 (1.203-1.288)	< 0.0001	1.328
Medical specialist contacts	1,319 (27.5)	76,777 (22.9)	1.795 (1.665-1.947)	< 0.0001	1.48 (1.82)	1.27 (1.48)	1.297 (1.146-1.468)	< 0.0001	2.328
Eye specialist contacts	688 (14.4)	24,864 (7.4)	2.226 (1.983-2.498)	< 0.0001	1.36 (1.13)	1.10 (0.94)	1.665 (1.053-1.288)	0.0031	2.592
Ear specialist contacts	1,666 (34.75)	106,830 (31.9)	1.550 (1.445-1.662)	< 0.0001	2.72 (2.98)	2.98 (2.91)	1.145 (1.049-1.250)	0.0025	1.774
Other health professions	82 (1.7)	6,854 (2.0)	1.797 (1.158-2.790)	0.0089	6.39 (17.16)	8.61 (28.79)	0.426 (0.213-0.855)	0.0164	0.766
Secondary health care									
Hospital contacts	1,991 (41.5)	145,779 (43.5)	1.337 (1.268-1.409)	< 0.0001	1.08 (1.08)	1.19 (1.31)	1.090 (1.016-1.168)	0.0155	1.456
Infectious and parasitic diseases	136 (2.8)	12,508 (3.7)	1.243 (0.970-1.593)	0.0850	0.61 (0.35)	0.66 (0.38)	0.936 (0.850-1.029)	0.1699	1.163
Diseases of the blood and blood-forming organs	15 (0.3)	743 (0.2)	2.896 (1.408-5.957)	0.0039	0.73 (0.46)	1.55 (2.59)	0.431 (0.233-0.795)	0.0071	1.247
Endocrine, nutritional and metabolic diseases	0 (0.0)	111 (0.0)	NA	NA	NA	0.73 (0.44)	NA	NA	NA
Mental and behavioural disorders	8 (0.2)	636 (0.2)	2.555 (1.054-6.196)	0.0379	0.63 (0.23)	0.67 (0.44)	0.758 (0.588-0.978)	0.0329	1.938
Diseases of the nervous system	8 (0.2)	357 (0.1)	1.027 (0.405-2.602)	0.9556	0.68 (0.26)	0.91 (0.82)	0.798 (0.513-1.240)	0.3154	0.819
Diseases of the respiratory system	294 (6.1)	28,446 (8.5)	1.231 (1.029-1.472)	0.0229	0.85 (0.86)	0.92 (0.83)	1.066 (0.972-1.170)	0.1755	1.312
Diseases of the digestive system	89 (1.9)	6,266 (1.9)	1.643 (1.202-2.246)	0.0019	0.76 (0.33)	0.84 (0.57)	0.926 (0.789-1.087)	0.3485	1.522
Malformations, deformations and abnormalities	140 (2.9)	7,553 (2.3)	2.361 (1.785-3.123)	< 0.0001	0.85 (0.63)	1.00 (1.01)	0.882 (0.701-1.108)	0.2810	2.082
Consequences of external causes	970 (20.2)	78,319 (23.4)	1.235 (1.134-1.344)	< 0.0001	0.74 (0.45)	0.76 (0.47)	1.073 (1.014-1.136)	0.0145	1.325
Burns and corrosions	510 (10.6)	38,923 (11.6)	1.272 (1.124-1.440)	< 0.0001	0.68 (0.37)	0.70 (0.45)	1.005 (0.934-1.082)	0.8920	1.279

CI = confidence interval; NA = not available, cannot be computed; RR = relative risk; SD = standard deviation.

a) For those who use the service at all in the 2-year post-adoption period.

b) An RR of any use of the corresponding service at all during the 2-year post-adoption period of international adoptees compared with non-adoptees; the RR is estimated by a Poisson regression and adjusted for age, sex, year of adoption/inclusion, residence, income, education, family status and region.

c) A factor (F) of how much more the corresponding service was used during the 2-year post-adoption period by international adoptees compared with non-adoptees; F is estimated in a generalised linear model using a gamma distribution and a logarithmic link function and adjusted for age, sex, year of adoption/inclusion, residence, income, education, family status and region.

d) To adjust for multiple testing, the significance level was set at p < 0.01.

ioural disorders, malformations, deformations and abnormalities, burns and corrosions and other consequences of external causes.

DISCUSSION
Main findings

The results show that being adopted from abroad significantly increases the use of all services in primary care in the late post-adoption period. In secondary care, contacts related to malformations and consequences of external causes including burns and corrosions are more frequent in the late post-adoption period. Mental and behavioural disorders are also more frequent among adoptees. The analysis of health-care utilisation in the late post-adoption period is adjusted for hospitalisation in the early post-adoption period; a proxy for morbidity. In this way, the effect of the adoption itself is separated from the effect of a generally higher morbidity often seen in adoptees. The observed increase in the use of health care in the late post-adoption period may therefore be viewed as an effect of adoption per se and not just as a function of higher morbidity.

Relation to previous studies

Our results are consistent with a previous Danish study that describes higher rates of GP contacts and hospital admissions for adoptees that persist long after adoption; specialist contacts were even seen to be increasing compared with non-adoptees in the time after adoption [8]. An increased use of services in the early post-adoption period is expected, as the Danish Health and Medicines Authority advises Danish adoptive families to contact their GP after the adoption is completed to carry out standard physical examinations based on the child's

TABLE 3

Selected health-care utilisation in international adoptees relative to non-adoptees, late three-year post-adoption period.

Services	3-year prevalence of service				3-year quantity of service[a]				Combined effect
	adopted, n (%)	non-adopted, n (%)	RR[b] (95% CI)	p-value[d]	adopted, mean (SD)	non-adopted, mean (SD)	F[c] (95% CI)	p-value[d]	
Primary health care									
General practitioner contacts	4,425 (95.6)	328,166 (96.2)	1.036 (1.025-1.048)	< 0.0001	3.76 (2.93)	4.01 (3.23)	1.186 (1.145-1.229)	< 0.0001	1.229
Medical specialist contacts	1,151 (24.9)	80,222 (23.5)	1.375 (1.269-1.490)	< 0.0001	1.28 (1.55)	1.08 (1.42)	1.254 (1.115-1.410)	< 0.0001	1.724
Eye specialist contacts	1,034 (22.3)	41,724 (12.2)	1.796 (1.642-1.966)	< 0.0001	1.05 (1.00)	0.94 (0.94)	1.013 (0.916-1.119)	0.8074	1.819
Ear specialist contacts	1,705 (36.8)	111,627 (32.7)	1.347 (1.259-1.442)	< 0.0001	1.91 (2.05)	1.96 (2.01)	1.061 (0.962-1.172)	0.2373	1.430
Other medical specialist contacts	154 (3.3)	8,934 (2.6)	1.771 (1.333-2.352)	< 0.0001	6.84 (16.82)	7.66 (19.94)	0.753 (0.349-1.625)	0.4696	1.333
Secondary health care									
Hospital contacts	1,915 (40.8)	153,623 (44.3)	1.280 (1.217-1.346)	< 0.0001	0.82 (0.69)	0.86 (1.00)	1.047 (0.995-1.102)	0.0798	1.339
Infectious and parasitic diseases	92 (2.0)	6,657 (1.9)	1.175 (0.869-1.588)	0.2960	0.46 (0.34)	0.47 (0.35)	1.051 (0.926-1.193)	0.4427	1.234
Diseases of the blood and blood-forming organs	23 (0.5)	836 (0.2)	1.326 (0.778-2.259)	0.2999	0.83 (0.93)	1.24 (2.94)	1.267 (0.686-2.339)	0.4500	1.679
Endocrine, nutritional and metabolic diseases	0 (0.0)	57 (0.0)	NA	NA	NA	0.51 (0.34)	NA	NA	NA
Mental and behavioural disorders	21 (0.5)	1,260 (0.4)	2.652 (1.314-5.349)	0.0065	0.45 (0.18)	0.47 (0.30)	0.913 (0.675-1.236)	0.5571	2.422
Diseases of the nervous system	8 (0.2)	507 (0.2)	0.701 (0.256-1.920)	0.4900	0.79 (0.40)	0.83 (0.74)	0.940 (0.604-1.462)	0.7839	0.659
Diseases of the respiratory system	201 (4.3)	20,213 (5.8)	1.044 (0.847-1.287)	0.6844	0.56 (0.32)	0.64 (0.57)	1.032 (0.933-1.141)	0.5413	1.078
Diseases of the digestive system	93 (2.0)	7,613 (2.2)	1.386 (1.038-1.852)	0.0271	0.54 (0.32)	0.60 (0.43)	0.867 (0.742-1.012)	0.0704	1.202
Malformations, deformations and abnormalities	120 (2.6)	6,952 (2.0)	1.704 (1.224-2.372)	0.0016	0.59 (0.39)	0.71 (0.72)	0.817 (0.669-0.998)	0.0476	1.392
Consequences of external causes	1,034 (22.0)	101,074 (29.1)	1.139 (1.055-1.229)	< 0.0001	0.59 (0.39)	0.61 (0.43)	1.029 (0.974-1.087)	0.3071	1.172
Burns and corrosions	491 (10.5)	35,866 (10.3)	1.375 (1.211-1.561)	< 0.0001	0.49 (0.27)	0.50 (0.46)	0.978 (0.922-1.038)	0.4621	1.345

CI = confidence interval; NA = not available, cannot be computed; RR = relative risk; SD = standard deviation.

a) For those who use the service at all in the 3-year post-adoption period.

b) An RR of any use of the corresponding service at all during the 3-year post-adoption period of international adoptees compared with non-adoptees; the RR is estimated by a Poisson regression and adjusted for age, sex, year of adoption/inclusion, residence, income, education, family status, region and the yearly number of GP contacts in the 2-year post-adoption period.

c) A factor (F) of how much more the corresponding service was used during the 3-year post-adoption period by international adoptees compared with non-adoptees; F is estimated in a generalised linear model using a gamma distribution and a logarithmic link function and adjusted for age, sex, year of adoption/inclusion, residence, income, education, family status, region and the yearly number of GP contacts in the 2-year post-adoption period.

d) To adjust for multiple testing, significance level was set at $p < 0.01$.

state of health [16]. Considering the children's pre-adoption history, it is possible that the GP has a lower threshold for referring adoptees than non-adopted children to a medical specialist, which could explain the increased use of medical specialist services in the late post-adoption period. An increased risk for infectious and parasitic diseases, diseases of the respiratory and digestive system in the early post-adoption period is in accordance with previous results on clinical assessments on adopted children after their arrival, which show pathological findings in the abovementioned disease classifications [2]. These findings confirm insufficient conditions in the countries of origin, and these medical conditions show a tendency to disappear with proper treatment. Congenital malformations, deformations and abnormalities appear in the late post-adoption period, which indicates

that a higher prevalence persists beyond post-adoption recovery [8, 17]. Previous studies have also established an increased risk for mental health problems among adopted children [9, 18], and another study has shown patterns with post-adoption syndrome that includes attention deficit and hyperactivity (ADHD) [19]. These mental health problems could explain the increased risk of diagnoses related to consequences of external causes and burns and corrosions.

A higher psychiatric referral rate among adoptees is not necessarily related to the severity of their behavioural problems, but may be caused by a lower threshold for referral among GPs. Furthermore, the higher contact rate could be caused by the adoptive parents' generally higher socioeconomic status and a presumed greater familiarity with the health-care system [20].

Limitations

In this register study we only had data on diagnoses for secondary care and this information is only indicative of the overall distribution of diagnoses since most mild diseases are diagnosed and treated in primary care only. No data were available on the circumstances of the adoptees prior to the adoption or the state of health of the adoptee in their country of origin. The effect of poor pre-adoption care could therefore not be analysed. Finally, it is uncertain if the increased morbidity in international adoptees, seen in the first part of the model, is evidence of the parent's health care-seeking behaviour or the system's treatment of the patient as seen in the second part of he model.

Implications/perspectives

The results indicate that the international adoptees arrive in their adoptive families with a varying degree of somatic and mental health problems. But most strikingly, our findings show that despite notable post-adoption recovery, some adoptees may experience long-term deficits in many domains and therefore need professional and medical assistance. These findings indicate the need for recognising the adoptees as a vulnerable group that needs special medical attention in the longer term – consisting of, for instance, medical evaluations and prolonged health assessment follow-ups. Future research should examine the clinical and practical implications of this for Danish health care. In particular, morbidity in adulthood among international adoptees should be studied.

CONCLUSION

International adoptees use medical services at a higher rate than non-adoptees. The increase is most pronounced in primary care but also present for some areas of secondary care, especially mental care.

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