



Individual characteristics and the use of emergency room services among adolescents and young adults

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Abstract

Predictors of emergency room (ER) service utilization and the visit rate among young people in 2005-2010 were investigated using a panel data model.

Students (N=416) completed a questionnaire concerning their health and psychosocial characteristics at ages 13-18 and 19-24 years. Data regarding the utilization of ER services were gathered from the medical records of the local public primary healthcare services. Multivariable logistic regression models were used to compute incidence rate ratios, odds ratios and the unsystematic variance component ρ , for ER utilization.

Male gender was associated with a lower ER visit rate (OR 0.5, 95% CI 0.3-0.7, $p < 0.001$). Good school performance among males at baseline was associated with decreased ER use (native language OR 0.1, 95% CI 0.0-0.6, $p = 0.01$; general subjects OR 0.2, 95% CI 0.0-0.6, $p = 0.009$). Alcohol consumption among females at baseline (OR 2.1, 95% CI 1.0-4.4, $p = 0.047$), and not studying or working among females on follow-up (OR 2.2, 95% CI 1.1-4.3, $p = 0.02$) associated with ER service utilization. Abuse in childhood (OR 2.7, 95% CI 1.5-4.8, $p = 0.001$) and mental health problems among males (OR 5.9, 95% CI 1.6-22.0, $p = 0.008$) associated with an increased ER service visit rate. The contribution of unmeasured factors, or the individual style, was estimated as unobserved heterogeneity ρ , which was associated with ER service utilization (OR 0.46, 95% CI 0.3-0.6 for males and OR 0.60, 95% CI 0.5-0.7 for females, $p < 0.001$).

There is a higher tendency among young people with psychosocial problems to utilize ER services. The individual style of health behaviour predicts ER service utilization, especially among females. Healthcare providers should pay particular attention to the health behaviours and mental health of young people who recurrently use ER services.

Introduction

Emergency room (ER) services offer walk-in medical treatment for patients with acute unexpected health complaints. In Finland, most people use public primary healthcare services such as ER services, which are of a high standard and available to everyone. The immediacy and the severity of the objective need for medical care are expected to determine the decision to use ER. However, factors other than those related to the medical condition could influence the decision to seek help from ER services.

The utilization of ER services increases in adolescence and young adulthood (1,2). Common reasons leading to this increasing use in young people include musculoskeletal issues, injuries and respiratory tract infections (1). Concerning mental health issues, the most common conditions leading to the need for ER services are depression, conduct disorders, substance use and unspecified neurotic disorders (3). Injury-related emergency visits increase in puberty (4). In a Finnish ER survey, up to two-thirds of underage patients attending ER due to injuries were under the influence of alcohol (5).

Recurrent ER visits by adolescents have been associated with female gender, older age, mental health problems (6), socioeconomic deprivation (6,7), a poorer health status (8) and alcohol-related injuries (9). In a paediatric ER study, positive responses to a suicide screening questionnaire associated with repeated ER visits in children (aged 8-12) and psychiatric hospitalization in adolescents (aged 13-18) (10). In another paediatric ER study, a higher proportion of ER visits compared to all other visits to healthcare services associated with lower educational and income levels in the family and public (health) insurance (11).

Health behaviours are generally defined as any activity with the purpose of preventing disease and improving health and well-being. The non-medical reasons affecting healthcare-seeking behaviour can be divided into two groups. Firstly, there are differences between population groups in their care-seeking behaviour, e.g. between males and females or persons of different ages. These differences are observable in the same sense that they can be statistically explained by gender and age. Secondly, there are differences between individuals that cannot be statistically explained in a

given data set ("unobserved heterogeneity" or "individual style"). The behavioural differences between individuals can be observed as variation in an individual's behaviour over time and variation in behaviour between individuals that cannot be explained by known and observable individual characteristics (12). Thus, individual health behaviours are more complicated than only defining the assortment of individual characteristics.

Panel data analysis is a statistical method that deals with two-dimensional (cross-sectional/time series) panel data, and in which data are collected over time and for the same individuals. This method enables the individual style of behaviour to be studied, as well as the existence and degree of individual heterogeneity, but not the variation in personal factors of the study subjects underlying it.

We investigated predictors of the utilization of ER services and the visit rate in 2005-2010 with a panel data model using both follow-up survey and register data from a primary healthcare ER unit. We investigated both known and unobserved factors associated with emergency room utilization among young people. The study addressed: 1) how health and psychosocial factors are associated with ER utilization and the visit rate, and 2) how large is the effect of the potential individual style in ER utilization. We focused on health and psychosocial characteristics such as participants' growth milieu and social relations, parental occupations, school performance, adverse experiences such as bullying or abuse, alcohol consumption in adolescence and young adulthood, and self-reported mental health and chronic health problems.

Methods

The participants belonged to follow-up study cohorts of the Adolescent Mental Health Survey. The baseline participants were pupils (age range 13-18 years) from comprehensive, upper secondary and vocational schools in Kuopio, a city in Eastern Finland with approximately 105 000 inhabitants. Data on participant characteristics and information on their physical and mental health were collected with structured self-report questionnaires (see Measurements section). Methodological details of the baseline study setting have previously been presented by Laukkanen et al. (2009) (13).

The healthcare utilization data consisted of Kuopio primary healthcare registers from 2005 to 2010, and comprised general practitioner and nursing services in outpatient clinics, school and student healthcare units and ER services. Only the data regarding the utilization of ER services were used. ER services are located at Kuopio University Hospital, and are provided in collaboration with public primary and specialist medical care. The supply of services was constant throughout the follow-up period, comprising the health service supply of one city, Kuopio.

Participants of the original baseline cohort were gathered in 2004-2005. The target population comprised 6421 adolescents aged 11-21 years. The response rate at baseline was 65.5%, giving a sample of 4214 adolescents. A total of 43 questionnaires were excluded due to an age of 12 or younger or 19 or older, leading to a final sample of 4171 adolescents. From this population, 1827 (43.8%) provided consent to be contacted for a follow-up study. A young age, female gender and a high number of hobbies were associated with providing consent and study participation. A self-rated follow-up questionnaire accompanied by a return envelope was sent in 2010-2011 by mail to those who had provided consent to be contacted for a follow-up study and whose postal address could be ascertained (N=1585). Current postal addresses were obtained from the Finnish Population Register Centre. The questionnaire was re-sent up to two times to those whose response was not received within one month. Finally, those participants who did not answer and whose telephone numbers were public (N=409) were contacted by telephone. Altogether, 797 adolescents (70.9% girls) participated in the follow-up. Only those who gave consent to access medical records in the follow-up phase, who had any medical recordings and whose municipality of residence was Kuopio in 2005 were included (N=416). Identification codes were used to match follow-up survey data with healthcare register data.

For all primary healthcare visits, a) the number and reasons for the visits, b) the professional status of the healthcare person providing the service (physician/other) and c) the visit location, were gathered from the medical records of each individual. For each visit to primary healthcare, the main reason for the visit was determined from the medical records and classified according to the International Classification of Primary Care (ICPC) (14). Only visits to the ER were investigated. ER users were compared with those not using ER services (named non-users). Of the 416 participants (females 67.3%), 65 made a total of 895 ER visits during the 6 years of follow-up. However, the rest (351 non-users of ER) had visits to other primary healthcare services, such as student healthcare and an outpatient clinic. ER service utilization was consistent when compared by year (statistically non-significant in the chi-squared test). The formation of the final data set is presented in Figure 1. The reasons for ER visits are presented in Table 1.

Figure 1. The target population and sample selection of the study.

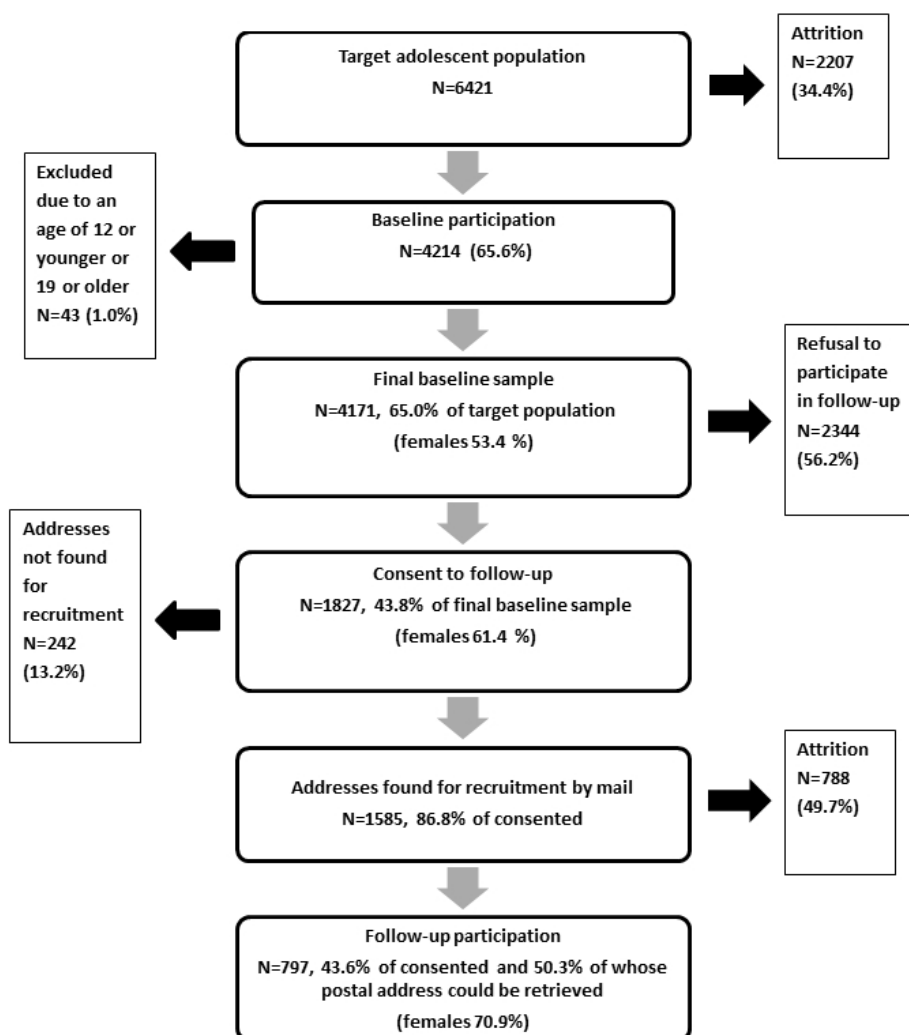


Table 1. Number and percentage of emergency room visits (N=895) between the years 2005 and 2010 according to the reasons.

| Reasons for emergency room visits | All N (%) |
|---|------------------|
| Respiratory tract, otorhinolaryngological | 244 (27.3) |
| Other, non-specified ^a | 165 (18.4) |
| Orthopaedic | 110 (12.3) |
| Dermatological, allergies | 90 (10.1) |
| Neurological | 70 (7.8) |
| Injuries, non-specified | 60 (6.7) |
| Gastroenterological | 43 (4.8) |
| Urological | 42 (4.7) |
| Psychiatric | 34 (3.8) |
| Gynaecological | 18 (2.0) |
| Heart, circulation | 14 (1.6) |
| Endocrinological | 3 (0.3) |
| Intoxications | 2 (0.2) |
| Number of all reasons | 895 (100) |

^a Other, non-specified such as non-medical reason

Measurements

Measurements and questionnaires at baseline in 2005

The sex and age of the study participants were inquired in the questionnaire. The parental occupations were reclassified as "white-collar worker" (higher employee or self-employed) or "blue-collar worker" (worker, lower employee or other). The marital status of the parents was reclassified as "married" (married or living with a partner) or "divorced" (divorced, separated or other). School performance was self-rated separately for Finnish (i.e. native language and grammar), mathematics and general subjects (such as science, history and religion) with a grading of "poor/below average", "average" or "good".

The Alcohol Use Disorders Identification Test (AUDIT) (15) was originally designed for screening risky alcohol consumption in adults, but it is also sensitive in measuring problematic drinking behaviour in adolescents (16). We used the full version of AUDIT with a cut-off of equal to or greater than three for identifying alcohol problem use, abuse or dependence among adolescents (16).

Measurements and questionnaires at follow-up in 2011

Participants were asked to define their current marital status as "married", "living with a partner" or "single". The current mode of living was selected from the alternatives "living with a parent/parents" or "living alone/other accommodation". Each participant reported whether they currently studied ("yes" or "no") or worked ("yes" or "no"). Participants were also asked to report whether they currently or previously had any physician-diagnosed mental disorder. The AUDIT scores were used to evaluate alcohol use at baseline and at follow-up.

The participants were also asked about various forms of abuse or difficulties before the age of 16 years. The questions presented were: "Did your parents get divorced?" "Did you have long-term health problems?" and "Were you bullied at school?" Response alternatives were "yes," "no", or "I don't know". For the question: "Did your family have long-term economic difficulties, or were your parents unemployed?" answers were classified as "yes" or "no". Participants were also asked whether they had experienced emotional (yes/no), physical (yes/no) or sexual (yes/no) abuse in their childhood home when they were under the age of 16. Different forms of abuse were reclassified into a single variable with the values "none", "one form" or "two or more forms".

Data analysis

The chi-squared test was used to analyse group differences between emergency service users and non-users in categorical variables such as sex, parental occupation, school performance, marital status, mental health status, childhood abuse and alcohol consumption. The independent samples t-test was used to analyse group differences in the continuous variable age. We further modelled the utilization of ER services using panel data models to investigate whether these variables contributed to the use of ER services. Several preliminary regression models with different variable combinations

were investigated before the final models. The final models were structured with specific interest in socioeconomic and psychosocial factors. Service use was first modelled as an annual binary variable (service use during 2005-2010, "yes" or "no"). Secondly, a negative binomial regression model was used to explain the total annual frequency of service use as a count variable. Thus, the incidence rate ratio (IRR) interprets increased risk by a one unit increase in variables. Missing observations were included in the analysis. Finally, to avoid possible sources of bias, logistic regression analysis was used to investigate the association between background variables and being or not being in the healthcare utilization data (N=416). First, baseline only (N=4171), and secondly, both baseline and follow-up (N=797) background variables were included in the regression analyses.

The total variation in the models can be divided into two sources: one is systematic variance, which is explained by the variables included in the model, and the other is non-systematic variance, which, in addition to sampling error, is variation explained by within-group variance, referred to here as individual style. The individual style (associated with time-invariant but unknown and unobserved individual characteristics) is given by the proportion of the total variance contributed by the panel-level variance component ρ . The parameter ρ measures the proportion of the total variance associated with unexplained individual differences in the utilization of ER services. The variance in ER service utilization is divided into two components: the total variance and panel-level variance. The formula for ρ is: $\rho = \sigma_i^2 / (\sigma_i^2 + \sigma_e^2)$, i.e. variance contributed by the individual style/total variance. When ρ approaches zero, the style differences (panel-level variance component) are small and thus unimportant, and the panel estimator is no different from the pooled estimator. If ρ approaches one, the style differences (proportion of the individual style) increase, and the variation within individuals from one year to another, decreases. With ρ values near one, the individual style of health behaviour determines the use of ER: some persons visit the emergency room from year to year independent of their known and observed characteristics, while others with the same characteristics do not attend the ER.

The models were first estimated for the whole group and then for females and males separately. p-values below 0.05 were considered to indicate statistical significance. All the models were tested for multicollinearity, and all variance inflation factors (VIF) were less than 5. All of the analyses were conducted with SPSS (version 19.0) and STATA (version 11.2) statistical software.

Results

Sample characteristics

Females comprised 280 (67.3%) of the 416 participants and accounted for 708 (79.1%) of the 895 ER visits. There were 65 participants with at least one visit during 2005-2010. The mean number of emergency room visits during six years was 2.5 among females and 1.4 among males. The characteristics of participants are presented in Table 2.

Factors associated with one or more visits to ER: Results from logistic regression analysis

Poor or below average school performance compared with good school performance in the native language and average school performance in general subjects associated with emergency visits among males. A baseline AUDIT score of more than 3 associated with ER visits among females. ER visits associated with current mental health problems among males, but with previous mental health problems among females. Among females, not currently working or studying associated with ER visits. In these models, the relatively high p values (OR 0.46 for males and OR 0.60 for females) indicate that individual style significantly contributes to the utilization of emergency services. The higher value for females compared to males indicates a gender difference, whereby the style effect is larger among females than males (Table 3).

Factors associated with the total frequency of ER visits: Results from negative binomial regression analysis

Female gender associated with a higher ER visit rate. A lower paternal occupational status among both genders and a lower maternal occupation status among female participants associated with a higher ER visit rate. Among males, poor or below average school performance as compared to good school performance in the native language, and poor or below average school performance as compared to average school performance in general subjects increased the ER visit rate. Having no long-term health problems was associated with a higher ER visit rate among females. Among females, being single and not currently working or studying associated with a higher ER visit rate, while among males, a higher visit rate associated with current mental disorders. Females reporting no parental divorce under the age of 16 visited the ER

less frequently. Conversely, among both genders, two or more forms of abuse were associated with higher ER visit rates. In the negative binomial regression, the likelihood ratio test also demonstrated the existence of a statistically significant unobserved heterogeneity, i.e. individual style effect (Table 4).

Factors associated with being in the healthcare utilization data: Results from logistic regression analyses

From the baseline questionnaire characteristics alone, female gender (OR 2.0, 95% CI 1.6-2.6, $p < 0.001$) and younger age in both genders (OR 0.8, CI 0.7-0.9, $p < 0.001$) associated with being in the healthcare utilization data. In analysis with both baseline and follow-up questionnaire characteristics, a younger age in both genders and a white-collar worker occupational status of the father in males associated with being in the healthcare utilization data. From the follow-up characteristics, living with the parents compared to living alone or in other accommodation in both genders and abuse in females associated with being in the healthcare utilization data (Table 5).

Table 2. Characteristics of adolescents and young adults (N=416) from the follow-up cohorts in 2005 and 2011, and a comparison of emergency room users and non-users during 2005-2010.

| Variables | Emergency room utilization | | | | p-value ^a | |
|-----------------------------------|----------------------------------|--------------|----------------------------|--------------|----------------------|-------------------|
| | 1 or more visits N=65 (15.6%) | | No visits N=351 (84.4%) | | | |
| Baseline questions in 2005 | | | | | | |
| Age | Years | Mean 15.3 | SD (1.49) | Mean 15.1 | SD (1.53) | 0.26 ^b |
| Sex | | N | % | N | % | |
| | Girl | 45 | 69.2 | 235 | 67.0 | 0.72 |
| | Boy | 20 | 30.8 | 116 | 33.1 | |
| Paternal occupation | | | | | | 0.90 |
| | White-collar worker | 25 | 38.5 | 133 | 37.9 | |
| | Blue-collar worker | 35 | 53.9 | 196 | 55.8 | |
| | Missing data | 5 | 7.7 | 22 | 6.3 | |
| Maternal occupation | | | | | | 0.99 |
| | White-collar worker | 24 | 36.7 | 132 | 37.6 | |
| | Blue-collar worker | 37 | 56.9 | 199 | 56.7 | |
| | Missing data | 4 | 6.2 | 20 | 5.7 | |
| Parental marital status | | | | | | 0.72 |
| | Married/Living with a partner | 40 | 61.5 | 234 | 66.7 | |
| | Divorced/Other | 24 | 36.9 | 112 | 31.9 | |
| | Missing data | 1 | 1.5 | 5 | 1.4 | |
| School performance | | | | | | |
| Native language | Poor/Below average | 12 | 18.5 | 26 | 7.4 | 0.02 |
| | Average | 39 | 60.0 | 243 | 69.2 | |
| | Good | 14 | 21.5 | 82 | 23.4 | |
| Mathematics | Poor/Below average | 23 | 35.4 | 110 | 31.3 | 0.78 |
| | Average | 29 | 44.6 | 172 | 49.0 | |
| | Good | 13 | 20.0 | 69 | 19.7 | |
| General subjects | Poor/Below average | 11 | 16.9 | 43 | 12.3 | 0.25 |
| | Average | 35 | 53.9 | 226 | 64.6 | |
| | Good | 19 | 29.2 | 81 | 23.1 | |
| AUDIT ^c score in 2005 | 0 - 2 | 26 | 44.1 | 199 | 61.0 | 0.02 |
| | 3 or more | 33 | 55.9 | 127 | 39.0 | |

| Variables | | Emergency room utilization | | | | p-value ^a |
|---|----------------------------------|----------------------------------|------|----------------------------|------|----------------------|
| | | 1 or more visits N=65 (15.6%) | | No visits N=351 (84.4%) | | |
| Follow-up questions in 2011 | | | | | | |
| Marital status | Married/Co-habitation | 29 | 44.6 | 127 | 36.3 | 0.20 |
| | Single | 36 | 55.4 | 223 | 63.7 | |
| Current mode of living | Living with parent/parents | 11 | 16.9 | 97 | 27.8 | 0.07 |
| | Other accommodation | 54 | 83.1 | 252 | 72.2 | |
| Currently working or studying | Yes | 33 | 50.8 | 202 | 57.6 | 0.42 |
| | No | 32 | 49.2 | 146 | 41.6 | |
| | Missing data | 0 | 0.0 | 3 | 0.7 | |
| Mental disorders | No | 47 | 72.3 | 276 | 78.6 | 0.17 |
| | Yes, previously | 12 | 18.5 | 35 | 10.0 | |
| | Yes, currently | 6 | 9.2 | 33 | 9.4 | |
| Adverse childhood experiences before age 16 Parental divorce | Yes | 24 | 36.9 | 117 | 33.3 | 0.07 |
| | No | 39 | 60.0 | 230 | 65.5 | |
| | Cannot say | 2 | 3.1 | 1 | 0.3 | |
| Chronic health problems | Yes | 54 | 83.1 | 286 | 81.5 | 0.81 |
| | No | 11 | 16.9 | 63 | 17.9 | |
| | Cannot say | 0 | 0.0 | 2 | 0.6 | |
| Bullying at school | Yes | 23 | 35.4 | 99 | 28.2 | 0.68 |
| | No | 40 | 61.5 | 238 | 67.8 | |
| | Cannot say | 2 | 3.6 | 13 | 3.7 | |
| | Missing data | 1 | 0.2 | 1 | 0.3 | |
| Long-term economic difficulties in the childhood home | No | 45 | 69.2 | 274 | 78.1 | 0.12 |
| | Yes | 20 | 30.8 | 77 | 21.9 | |
| Abuse, emotional, physical, or sexual | None | 43 | 66.2 | 276 | 78.6 | 0.05 |
| | One form | 11 | 16.9 | 46 | 13.1 | |
| | Two or more forms | 11 | 16.9 | 29 | 8.3 | |
| | AUDIT ^c score in 2011 | 13 | 20.0 | 70 | 20.0 | |
| | 3 or more | 52 | 80.0 | 280 | 80.0 | 1.00 |

^aChi², ^b Independent samples t-test

^cAUDIT=Alcohol Use Disorders Identification Test

Table 3. OR^a (95% CI) for emergency room utilization in relation to background variables (N=414)^b.

| Variables | All OR (95% CI) p-value | Males OR (95% CI) p-value | Females OR (95% CI) p-value |
|--|----------------------------|------------------------------|--------------------------------|
| Baseline questionnaire in 2005 | | | |
| Year | | | |
| 2005 | 1.0 | 1.0 | 1.0 |
| 2006 | 0.9 (0.7-1.1) 0.48 | 0.6 (0.4-0.9) 0.02 | 1.0 (0.8-1.3) 0.71 |
| 2007 | 1.2 (1.0-1.5) 0.08 | 1.8 (1.1-2.9) 0.02 | 1.1 (0.9-1.4) 0.29 |
| 2008 | 1.3 (1.1-1.7) 0.006 | 0.7 (0.4-1.2) 0.22 | 1.6 (1.2-2.0) <0.001 |
| 2009 | 1.3 (1.0-1.6) 0.04 | 0.4 (0.2-0.7) 0.002 | 1.6 (1.2-2.1) <0.001 |
| 2010 | 1.7 (1.4-2.1) <0.001 | 1.7 (1.0-2.8) 0.04 | 1.8 (1.4-2.2) <0.001 |
| School performance | | | |
| Native language | | | |
| Poor/Below average | 1.0 | 1.0 | 1.0 |
| Average | 0.7 (0.3-1.6) 0.37 | 0.7 (0.2-2.4) 0.57 | 0.7 (0.2-2.7) 0.60 |
| Good | 0.5 (0.2-1.4) 0.17 | 0.1 (0.0-0.6) 0.01 | 0.7 (0.2-3.1) 0.65 |
| General subjects | | | |
| Poor/Below average | 1.0 | 1.0 | 1.0 |
| Average | 0.6 (0.3-1.2) 0.17 | 0.2 (0.0-0.6) 0.009 | 0.9 (0.4-2.3) 0.83 |
| Good | 0.6 (0.2-1.4) 0.19 | 0.4 (0.1-2.1) 0.29 | 0.5 (0.2-1.5) 0.23 |
| AUDIT score in 2005 | | | |
| 0-2 | 1.0 | 1.0 | 1.0 |
| >3 | 1.7 (0.9-3.0) 0.09 | 1.7 (0.6-5.0) 0.36 | 2.1 (1.0-4.4) 0.047 |
| Follow-up questionnaire in 2011 | | | |
| Currently working or studying | | | |
| Yes | 1.0 | 1.0 | 1.0 |
| No | 2.0 (1.1-3.3) 0.01 | 1.1 (0.4-2.8) 0.82 | 2.2 (1.1-4.3) 0.02 |
| Mental disorders | | | |
| No | 1.0 | 1.0 | 1.0 |
| Yes, previously | 4.0 (1.7-9.2) 0.001 | 8.6 (0.7-99.5) 0.09 | 3.1 (1.2-7.8) 0.02 |
| Yes, currently | 2.0 (0.8-4.8) 0.12 | 10.5 (1.9-59.6) 0.008 | 1.4 (0.5-4.2) 0.50 |
| ^c Rho | 0.6 (0.5-0.6) <0.001 | 0.5 (0.3-0.6) <0.001 | 0.6 (0.5-0.7) <0.001 |

^aOR=odds ratio. CI=confidence interval.

^bOnly significant results are reported. The model was also adjusted for gender, age, paternal occupation, maternal occupation, school performance in mathematics, marital status, current mode of living, the AUDIT score in 2011, bullying at school, parental divorce, abuse, chronic health problems and economic difficulties in the childhood home.

^cRho=When ρ approaches zero, the panel-level variance component is small. If ρ approaches one, the proportion of the variation between individuals increases, and the variation within individuals from one year to another, decreases.

Table 4. IRR^a (95% CI) for a high number of emergency room visits in relation to background variables (N=414)^b.

| Variables | All IRR (95% CI) | p-value | Males IRR (95% CI) | p-value | Females IRR (95% CI) | p-value |
|---|---------------------|---------|-----------------------|---------|-------------------------|---------|
| Baseline questionnaire in 2005 | | | | | | |
| Sex | | | | | | |
| Female | 1.0 | | | | | |
| Male | 0.5 (0.3-0.7) | <0.001 | | | | |
| Age | 1.2 (1.0-1.3) | 0.009 | 1.2 (0.9-1.6) | 0.18 | 1.1 (0.9-1.2) | 0.30 |
| Year | | | | | | |
| 2005 | 1.0 | | 1.0 | | 1.0 | |
| 2006 | 1.2 (1.0-1.3) | 0.005 | 0.7 (0.5-1.0) | 0.02 | 1.3 (1.1-1.4) | <0.001 |
| 2007 | 1.3 (1.2-1.4) | <0.001 | 2.1 (1.5-2.7) | <0.001 | 1.2 (1.1-1.4) | <0.001 |
| 2008 | 1.4 (1.3-1.6) | <0.001 | 0.9 (0.6-1.3) | 0.58 | 1.5 (1.3-1.6) | <0.001 |
| 2009 | 1.1 (1.0-1.3) | 0.049 | 0.6 (0.4-0.9) | 0.02 | 1.2 (1.1-1.3) | 0.004 |
| 2010 | 1.3 (1.2-1.5) | <0.001 | 1.3 (1.0-1.8) | 0.07 | 1.3 (1.2-1.5) | <0.001 |
| Paternal occupation | | | | | | |
| White-collar worker | 1.0 | | 1.0 | | 1.0 | |
| Blue-collar worker | 1.5 (1.1-2.1) | 0.02 | 1.5 (0.7-3.2) | 0.30 | 1.2 (0.8-1.9) | 0.32 |
| Maternal occupation | | | | | | |
| White-collar worker | 1.0 | | 1.0 | | 1.0 | |
| Blue-collar worker | 1.4 (1.0-1.9) | 0.048 | 1.1 (0.5-2.4) | 0.73 | 2.0 (1.3-3.0) | 0.002 |
| School performance | | | | | | |
| Native language | | | | | | |
| Poor/Below average | 1.0 | | 1.0 | | 1.0 | |
| Average | 0.8 (0.5-1.3) | 0.34 | 0.5 (0.2-1.5) | 0.20 | 0.6 (0.2-1.3) | 0.19 |
| Good | 0.5 (0.3-1.0) | 0.05 | 0.1 (0.0-0.5) | 0.006 | 0.5 (0.2-1.4) | 0.18 |
| General subjects | | | | | | |
| Poor/Below average | 1.0 | | 1.0 | | 1.0 | |
| Average | 0.6 (0.4-1.0) | 0.03 | 0.3 (0.1-0.8) | 0.02 | 0.8 (0.5-1.5) | 0.54 |
| Good | 0.5 (0.3-0.9) | 0.03 | 0.6 (0.2-2.4) | 0.48 | 0.5 (0.3-1.1) | 0.08 |
| Follow-up questionnaire in 2011 | | | | | | |
| Marital status | | | | | | |
| Married or living with a partner | 1.0 | | 1.0 | | 1.0 | |
| Single or other | 1.7 (1.2-2.4) | 0.002 | 1.9 (0.8-4.9) | 0.17 | 2.6 (1.6-4.0) | <0.001 |
| Currently working or studying | | | | | | |
| Yes | 1.0 | | 1.0 | | 1.0 | |
| No | 1.3 (1.0-1.8) | 0.06 | 1.0 (0.5-1.9) | 0.99 | 2.0 (1.3-3.1) | 0.002 |
| Mental disorders | | | | | | |
| No | 1.0 | | 1.0 | | 1.0 | |
| Yes, previously | 1.8 (1.1-2.8) | 0.01 | 3.8 (0.4-35.7) | 0.25 | 1.2 (0.7-2.1) | 0.53 |
| Yes, currently | 1.1 (0.7-1.7) | 0.74 | 5.9 (1.6-22.0) | 0.008 | 1.6 (0.9-3.0) | 0.12 |
| AUDIT score in 2011 | | | | | | |
| 0-2 | 1.0 | | 1.0 | | 1.0 | |
| >3 | 0.6 (0.4-0.8) | 0.002 | 0.8 (0.3-1.9) | 0.61 | 0.4 (0.2-0.8) | 0.004 |
| Adverse childhood experiences before age 16 | | | | | | |
| Parental divorce | | | | | | |
| Yes | 1.0 | | 1.0 | | 1.0 | |
| No | 0.7 (0.5-0.9) | 0.02 | 1.1 (0.5-2.3) | 0.79 | 0.3 (0.2-0.5) | <0.001 |
| Cannot say | 1.2 (0.3-5.7) | 0.78 | 1.0 | | 0.8 (0.1-5.4) | 0.80 |
| Chronic health problems | | | | | | |
| Yes | 1.0 | | 1.0 | | 1.0 | |
| No | 2.8 (1.7-4.6) | <0.001 | 1.3 (0.2-6.8) | 0.79 | 3.4 (1.9-6.1) | <0.001 |
| Cannot say | 2.8 (0.9-9.3) | 0.09 | 0.1 (0.0-2.3) | 0.14 | 5.0 (1.1-22.8) | 0.04 |
| Bullying at school | | | | | | |
| Yes | 1.0 | | 1.0 | | 1.0 | |
| No | 0.6 (0.4-0.8) | 0.004 | 1.0 (0.4-2.2) | 0.92 | 0.7 (0.5-1.1) | 0.13 |
| Cannot say | 0.3 (0.2-0.8) | 0.008 | 0.0 (0.0-0.9) | 0.04 | 0.3 (0.1-0.8) | 0.01 |
| Abuse | | | | | | |
| None | 1.0 | | 1.0 | | 1.0 | |
| One form | 0.5 (0.4-0.8) | 0.007 | 0.6 (0.1-4.5) | 0.66 | 0.4 (0.2-0.8) | 0.004 |
| Two or more forms | 2.7 (1.5-4.8) | 0.001 | 3.3 (0.6-17.6) | 0.16 | 1.8 (0.9-3.5) | 0.09 |
| ^c LR test | | <0.001 | | <0.001 | | <0.001 |

^aIRR=Incidence rate ratios. IRR interprets an increased risk as a 1 standard deviation (SD) increase in scale scores. CI=Confidence interval. p-value: * <0.050, **<0.010, ***<0.001

^bOnly significant results are reported. The model was also adjusted for school performance in mathematics, the AUDIT score in 2005, the current mode of living and economic difficulties in the childhood home

^cLR=Likelihood ratio test, panel vs. pooled

Table 5. OR^a (95% CI) for being in the emergency room data in relation to background variables from study points one and two (N=734)^b.

| Variables | All OR (95% CI) | p-value | Males OR (95% CI) | p-value | Females OR (95% CI) | p-value |
|---|--------------------|---------|----------------------|---------|------------------------|---------|
| Baseline questionnaire | | | | | | |
| Age | 0.8 (0.7-0.9) | <0.001 | 0.7 (0.5-1.0) | 0.032 | 0.8 (0.7-0.9) | 0.001 |
| Paternal occupation | | | | | | |
| White-collar worker | 1.0 | | 1.0 | | 1.0 | |
| Blue-collar worker | 0.7 (0.5-1.0) | 0.031 | 0.4 (0.2-0.9) | 0.028 | 0.7 (0.5-1.1) | 0.164 |
| Follow-up questionnaire | | | | | | |
| Current mode of living | | | | | | |
| Living with parent/parents | 1.0 | | 1.0 | | 1.0 | |
| Other accommodation | 0.2 (0.1-0.4) | <0.001 | 0.3 (0.1-0.8) | 0.024 | 0.2 (0.1-0.5) | <0.001 |
| Adverse childhood experiences before age 16 | | | | | | |
| Abuse: emotional, physical or sexual | | | | | | |
| None | 1.0 | | 1.0 | | 1.0 | |
| One form | 1.8 (1.1-3.0) | 0.029 | 1.3 (0.2-7.5) | 0.788 | 1.8 (1.0-3.2) | 0.036 |
| Two or more forms | 0.8 (0.5-1.5) | 0.584 | 0.7 (0.2-3.4) | 0.68 | 0.8 (0.4-1.6) | 0.626 |

^aOR=Odds ratio. CI=Confidence interval

^bOnly significant results are reported. The model was also adjusted for gender, maternal occupation, school performance in the native language, mathematics and general subjects, the AUDIT score in 2005, marital status, currently working or studying, bullying at school, parental divorce, chronic health problems, economic difficulties in the childhood home, mental disorders and the AUDIT score in 2011

Discussion

A lower school performance at baseline associated with ER service utilization among males, and not studying or working at the follow-up among females. Female gender, a lower parental socioeconomic status and childhood psychosocial problems increased the utilization rate of ER services. In addition, mental health problems among males and being single among females associated with an increased ER service visit rate. An individual style, measured as unobserved heterogeneity, was also observed in ER service visits. The proportion of the individual style in ER service utilization was larger among females than males.

ER utilization by adolescent and young adult females was greater than that of males, which is in line with the previous literature (6). In addition, recurrent ER visits by adolescents have been suggested to be related to socioeconomic deprivation (6,7). Socioeconomic distress, such as a low educational level and low income, has also been related to frequent ER use by adults (17). In parallel with this, in our study, a lower parental occupational status among males and not being at school or at work among females increased ER utilization. Health behaviour and style of healthcare service utilization may have been learned from the childhood family and social environment. These study findings are in line with public health statistics, in which socioeconomic deprivation is related to a poor health status (18).

Among adults, long-term illnesses and the use of other health resources were related to higher ER utilization (17). Surprisingly, in our study, females without long-term somatic illness in childhood had higher ER visit rates. It may be possible that adolescents with long-term somatic problems have learned to take care of their health and use non-ER services more often compared to their peers. Mental disorders, both current and previous disorders among males and previous disorders among females, associated with ER visits. Mental health problems could be related to risky behaviour and therefore to increased ER utilization. In previous studies among adolescents, mental health problems have predicted higher ER utilization (6,10). In adult studies, frequent ER visits have also been associated with psychological distress and mental health problems (17,19,20).

The number of recurrent emergency visits has been reported to be higher due to alcohol-related injuries in adolescents (9). Among adults, an association has been observed between problem drinking and increased ER visits (14,16,21). In our study, hazardous alcohol use in adolescence (age 13-18 years) was related to ER service utilization, but not to the frequency of ER visits. No such relationships were observed in young adults (aged 19-24) with an AUDIT score cut-off of three. This might be explained by the difference in alcohol use among adolescents and young adults, with higher AUDIT scores in adults compared to adolescents.

In our study, the effect of unobserved heterogeneity, i.e. an individual style in ER utilization, was found for both genders. Our results appear to indicate that this style is more endemic among females than among males. In practice, this means that the utilization of emergency services for males is more random than for females. For instance, the age variables have low significance for males. Previous studies have described individual factors related to ER utilization. However, we have found no previous studies on the individual style in ER utilization measured with unobserved heterogeneity.

Participants in the ER study data were more often females, young and living with their parents when compared to participants who dropped out from this study. Moreover, a higher paternal occupational status in males and experiences of abuse in childhood or adolescence in females related to being in the ER data. In the study results, a history of a lower socioeconomic status and abuse increased ER utilization in both genders. Despite our analysis of the contribution of background factors, it remains unknown whether these characteristics caused bias in the selection of the participants.

The individual style and psychosocial problems among young females with frequent ER utilization need to be discussed. It is possible that some adolescents and young adults prefer to use ER instead of choosing to wait for an appointment at a healthcare centre. It is also possible that some young people with several untreated somatic and mental health problems use ER services in the event of a health crisis. Such differences in healthcare service utilization might be related to difficulties in life management or social exclusion. There might be inabilities such as difficulties in making long-term decisions concerning health and predicting healthcare needs, or in using the booking systems of the healthcare services. It might also be possible that at a young age, psychosocial problems in females are more often related to healthcare service utilization than in males.

Strengths and limitations

The supply of healthcare services remained constant during the research period. The high utilization rate of public healthcare services in Finland allowed us to obtain a comprehensive study sample. However, self-reporting of healthcare use is more vulnerable to bias, especially in cases of potentially embarrassing health complaints. Compared to relying solely on self-report data, access to medical records offered more exact data on actual healthcare visits. We were able to examine the exact number and date of emergency visits, and therefore use the panel data model.

The high drop-out rate must be considered as a limitation. Moreover, the nature of the self-report questionnaire as an information source must be considered as a possible limitation. More systematic recording of the reasons for and/or diagnosis from primary healthcare visits would have improved our data. Furthermore, the sample did not include adolescents who were absent from school at the time of the survey, which needs to be taken into account while interpreting our results. Nevertheless, age and gender were taken into account in the regression analyses. Moreover, possible selection bias in the data were investigated in relation to background variables. However, somatic and mental health reasons for ER visits were not investigated separately due to the small number of reported mental health reasons. Furthermore, utilizing structured clinical interviews to obtain diagnoses would have been a more exact means to evaluate the mental health status than self-reported questionnaires. Nevertheless, due to the large sample size of the study, we were unable to utilize such tools in this data set. Questionnaire responses from 2005 and 2011 were used in the same regression models to explain ER utilization during 2005-2010, which has to be considered as a limitation when interpreting the causality of the results. Only those who participated in the follow-up gave consent to an investigation of their medical records, and the effect of consenting was not therefore examined.

Conclusions

Both known individual characteristics and unobserved heterogeneity predicted ER utilization in adolescents and young adults. There are higher tendencies for ER utilization among females with psychosocial problems and males with school problems and mental health issues, which is in line with the previous literature, and suggests health behaviour differences between genders and socioeconomic groups. The above-mentioned psychosocial difficulties related to ER utilization are also closely related to severe problems in life management, such as social exclusion. An unexplained individual style also predicts personal ER utilization among adolescents and young adults. In this study, the effect was larger among females than males.

The results from this specific study sample and setting are relevant to clinical practice and models of healthcare services. There are needs to improve healthcare services and the social support of young people in a variety of locations. Providers in all healthcare settings should be aware that several individual characteristics, including psychosocial concerns, influence the rate of ER use.

Young people with no access to student or occupational healthcare services might experience ER as the most feasible source of healthcare. Other possible reasons for relying on ER services might be intense worry related to one's health, hopes for an immediate solution to the current health issue and being inexperienced in using the healthcare systems. Nevertheless, encountering young persons in an ER setting might also offer the possibility of having an impact on individual health behaviours and the style of using healthcare resources.

Healthcare providers should be aware of the style of health behaviour and the psychosocial problems of adolescents and young adults who recurrently use ER services. More research is needed to clarify whether these gender differences in ER service utilization can be generalized to other adolescent and young adult populations. Further investigation of individual heterogeneity and its components underlying the utilization of healthcare services might be very valuable for clinical practice and public health.

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