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# Mental health of unaccompanied refugee minors during the asylum process: an observational cohort study

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## ABSTRACT

**Objectives:** To examine the mental health of unaccompanied refugee minors (UM) prospectively during the asylum-seeking process, with a focus on specific stages in the asylum-process, such as age assessment, placement in a supportive or non-supportive facility, and final decision on the asylum applications.

**Design:** A two and a half year follow-up study of UM seeking asylum in Norway. Data were collected within three weeks (n=138), and at 4 months (n=101), 15 months (n=84) and 26 months (n=69) after arrival.

**Setting:** Initially in an observation and orientation centre for unaccompanied asylum-seeking adolescents, and subsequently wherever the UM were located in other refugee-facilities in Norway.

**Participants:** Male UM from Afghanistan, Somalia and Iran, with self-reported age 15-18.

**Main outcome measures:** Mental health symptoms assessed by Hopkins Symptom Checklist-25, and Harvard Trauma Questionnaire.

**Results:** At the group level the young asylum seekers reported high levels of psychological distress on arrival, and symptom levels that stayed relatively unchanged over time.

According to age-assessment procedures 56% of the population was not recognized as minors. Subsequent placement in a low- support facility was associated with higher levels of psychological distress in the follow-up period. Those who were placed in a reception centre for adults had higher levels of psychological distress symptoms both after 15 months and 26 months compared to the remaining participants who were placed in reception centers for youth. Refusal of asylum was highly associated with higher levels of psychological distress.

**Conclusions:** Mental health trajectory of young asylum-seekers appears to be negatively affected by low support and refusal of asylum.

### **Strengths and limitations of this study.**

x. Strengths include a longitudinal design, with first assessment within three weeks after arrival to the host country, and repeated measures.

x. Use of computer-based assessment with audio-translations throughout the study.

x. Selection of participants was limited to the most common nationality groups arriving in Norway at the time of inclusion.

x. High attrition rate due to the fact that asylum seekers tend to move between and within countries, and that many were told to leave the country.

### **INTRODUCTION**

In 2015 more than 88 700 unaccompanied minors (UM) fled to Europe<sup>1</sup>, putting considerable pressure on these countries to provide the necessary resources needed. Separated children that are no longer protected by parents or other caregivers, usually have to be under the age of 18 in order to be given the special protection and care that is granted unaccompanied refugee minors. In the countries of origin for UM the civil registration service of their country often function poorly, and birth certificates can be lost, thrown away or falsified.<sup>2</sup> The scientific basis for assessing age is controversial, in that these tests only determine physical maturity, and are most uncertain from the age of 15 to 21, where natural variation is at its greatest.<sup>3</sup> The consequences for many young asylum seekers assessed to be 18 years or older is that they will no longer be considered as minors, and therefore not receive special protection in accordance with the United Nations.<sup>2</sup>

Most studies investigating UM mental health have a cross-sectional design with a selection of youths with different levels of legal recognition and different durations of time in exile.<sup>4</sup>

These studies show consistently that individual factors such as exposure to violence and other traumatic events prior to migration, correspond to elevated symptoms of psychological distress.<sup>5</sup> In some studies the negative effects of exile related stressors are also described<sup>6</sup>, yet they focus on youths with varying time in exile. There are different asylum-procedures within the different countries<sup>7</sup>, and most UM endure some uncertainty before their legal status is defined. Most countries provide some form of shelter for UM while they are waiting for their case to be processed, but conditions vary greatly. Positive health effects have been shown to be associated with receiving a permanent residence permit<sup>8</sup>, but this process may take months

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3 and sometimes years. The impact of different levels of social support that UM are offered,  
4 especially after the first stage of reception and registration, have not been studied in detail.<sup>9</sup>  
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7 The aim of our study was to examine UM's mental health during the asylum-seeking process,  
8 and more specifically whether the official age assessed, level of support, and the outcome of  
9 the asylum application were associated with UM's mental health at different stages of the  
10 asylum seeking process.  
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## 14 15 16 17 18 19 20 21 **METHODS** 22

### 23 24 25 26 **Participants and procedures** 27

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31 The sample in this study was a male convenience sample recruited from an observation and  
32 orientation centre for unaccompanied asylum-seeking adolescents between ages 15 and 18  
33 years, which was the only one in Norway at this time. In this reception centre, all UMs who  
34 claimed to be in this age group stayed for the first weeks while asylum interviews and age-  
35 assessment procedures were performed. A research assistant kept track of all new arrivals, and  
36 each time our testing capacity allowed us to include some new participants, she was instructed  
37 to invite the ones who had arrived most recently. The study was conducted between  
38 September 2009 and March 2011. Altogether, the inclusion periods for this project were 12  
39 weeks in 2009, 8 weeks in 2010, and 21 weeks in 2011. During these time periods young  
40 asylum seekers came mainly from Afghanistan and Somalia. According to the statistics unit at  
41 the Norwegian Directorate of Immigration, 406 male UM from these language groups arrived  
42 in Norway during the inclusion periods. Unaccompanied males with self-reported age of 15 to  
43 18, that had just arrived, were contacted by the research assistant. Altogether, 216  
44 adolescents were asked to participate, and 209 returned the informed consent and attended the  
45 study. Some participants were included in an Expressive Arts intervention group (n=71), that  
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3 is not part of the present study. The remaining 138 are the focus of this article. More about the  
4 whole project can be found on our home pages<sup>10</sup>.  
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7 Information to participants included statements that participation would not impact the  
8 chances to stay in the country. Only one contact attempt was made for each individual, and no  
9 payment was offered.  
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12 Participants followed the normal procedures in the asylum process. In Norway all UMs  
13 receive assistance from a multi-disciplinary professional staff (educators, social workers,  
14 psychologists, physicians, and nurses) in the first reception centre while waiting for their  
15 “official-age” to be assigned. Those defined as 18 or older can be moved to adult housing  
16 where less professional assistance is provided. The asylum-seekers considered to be from 15  
17 to 18 years are moved to specialized youth centres, with staff available 24 hours, every day.  
18 The youngest children stay in even more specialized orphanages. There are some exceptions  
19 to this pattern, according to variable housing capacity some 18-year old asylum-seekers are  
20 allowed to stay in the youth centres for some time. The youth centres are located all over  
21 Norway, and have language classes for all inhabitants. Food is prepared and served by the  
22 staff, and there are staff members available day and night. Most centres have recreational  
23 activities, and they give individualised support and medical follow-up if needed. In an adult  
24 centre, the asylum-seekers are left to themselves most of the time. They buy and cook their  
25 own food, have no school or other scheduled activities, and have no guardians or staff  
26 members to ask for advice.  
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38 The first screening procedure was conducted within the first three weeks, and later repeated at  
39 4 months (n=101), 15 months (n=84) and 26 months (n=69) after arrival. At the last  
40 assessment the population was almost halved, mainly because many of the informants were  
41 transported out of the country, or had disappeared from the different living facilities.  
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## 51 **Measures**

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53 Demographic data was registered with the aid of interpreters at the initial assessment. We  
54 asked for self-reported age, literacy, years of school attendance, and whether their parents  
55 were still alive, deceased, or if participants had lost touch with their parents and did not know.  
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3 Later we registered the results of official age-assessments, especially which participants who  
4 were thought to be at least 18 years of age. We also determined the level of care offered  
5 according to placement in asylum centres for either adults or for youth. Before the last  
6 assessment we registered the legal status, as participants were either given time-limited or  
7 permanent permission to stay, or were refused legal residence in the country.  
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## 10 Exposure

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14 Serious Life Events checklist (SLE), was developed by Tammy Bean and colleagues<sup>11</sup> in  
15 order to assess if an adolescent meet the criteria A1 (experienced a traumatic event) in the  
16 DSM-IV, for a diagnosis of PTSD. It is a self-report questionnaire which asks whether or not  
17 the participant has experienced twelve different kinds of traumatic events, such as separation  
18 from family, natural disaster, war and physical or sexual abuse. The instrument was scored by  
19 answering yes or no on each item.  
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## 24 Psychological distress

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28 Hopkins Symptom Checklist-25 (HSCL-25)<sup>12</sup> is a self-administered questionnaire designed to  
29 measure anxiety and depression. It has been validated in various clinical and community  
30 samples.<sup>13,14</sup> The HSCL-37 A version is an extension of the HSCL-25, and has also been  
31 applied in a number of refugee studies with minors.<sup>15,16</sup> The additional 12 items measuring  
32 externalizing behavior are not included in this paper. Each item was scored with 1 (not  
33 bothered) to 4 (extremely bothered).  
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## 42 Post Traumatic Symptom Score (PTSS)

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44 The Harvard Trauma Questionnaire<sup>17</sup> is a comprehensive instrument that was developed to  
45 assess potentially traumatic experiences and post-traumatic symptoms in various cultural  
46 contexts. Its psychometric properties were first established in a highly traumatized, clinical  
47 population, but it has also been evaluated with a larger community sample, and with asylum  
48 seeking adolescents<sup>6,18</sup>. The HTQ part IV, comprises 30 symptom items, among which the  
49 first 16 items measure “The symptoms of PTSD” according to the DSM-IV.<sup>19</sup> These 16 items  
50 are scored with 1 (not at all) to 4 (extremely).  
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### Computer-based assessment

The chosen psychometric measurements were combined into a single questionnaire using the program MultiCASI<sup>20</sup>. The questionnaires were filled in by the participants themselves, in their native languages, Dari, Pashto, Farsi or Somali, using laptops with touch-screen function. Translations had been attained from earlier projects, and were controlled by independent, native speaking, interpreters before they were added to the questionnaire. The items appeared one after the other on the screen, together with answering alternatives. All text had a sound-file connected to it that started as soon as the item appeared on the screen. The test could be used with any level of reading competence, and the sound of each item could be activated by touch, as many times as necessary. Items could be skipped and left unanswered, but would then be repeated once more towards the end of the questionnaire. The first introduction to the computer based self-screening was done shortly after arrival, with one language group at the time. An interpreter was present together with maximum five participants, as they were instructed in how to use the touch screen. They were encouraged to ask clarifying questions as they went on with answering the items, all in the same room, with earphones on, in order not to disturb each other. During the following waves of data collection the same questionnaire was used and translating services were not necessary. The results were transported digitally to the SPSS files.

### Data analysis

Differences in HSCL and PTSS between 0, 4, 15 and 26 months were assessed by linear mixed effects models by categorical time, including an inter-individual random effect. Relationships between HSCL, and PTSS at each time point  $\geq 4$  months and characteristics known at that time point were assessed by unadjusted and linear regression. Specifically, covariates were being literate, parents deceased, number of adverse events and age assessed as  $\geq 18$  years at 4 months. At 15 months, being placed in a reception center for adults or youth, was included, and at 26 months also asylum status; permanent, time limited or refusal of asylum. Nonresponse analysis during follow up (4 to 26 months) used a generalized estimating equations (GEE) logistic regression by time and baseline HSCL score, reading ability, category for parents alive and number of serious life events. For descriptive analyses we used the SPSS version 22 for Windows. Beyond this, data was analyzed using R (The R Foundation for Statistical Computing, Vienna, Austria) with the R package nlme for mixed effects models and gee for GEE analyses<sup>21</sup>.



Table 1. Baseline characteristics of male unaccompanied refugee minors at arrival in Norway. Figures are given as number (%) when others not specified.

	N = 138
Age, self-reported	
Mean years (SD)	16.22 (0.84)
Range	15 - 18
Age, assessed by authorities	
Mean years(SD)	18.22 (2.27)
Range	15 - 28
Nationality	
Afghan	102 (73.9)
Somalian	32 (23.2)
Iranian	4 (2.9)
Literacy, self-reported	
	50 (36.8)
Loss of parent	
Father	85(62.9)
Mother	29(21.5)
Both	25(18.5)
Unknown	16(11.9)
Psychological distress (N=199)	
Mean HSCL (SD)	2.03 (0.58)
Caseness (n>2.0)	92 (46.2)
Posttraumatic stress (N=198)	
Mean PTSS (SD)	2.19 (0.58)
Caseness (n>2.0)	130 (64.4)

## Results

Three fourths of the population came from Afghanistan, while the remaining came from Somalia and Iran (table 1). There were no significant differences between the countries of origin and the variables included in this article. A minority (36%) were able to read in their own language. Mean number of serious life-time events experienced was 6.3 (SD 2.3), range 1-11. Most of the participants (96%) had experienced at least one of the serious life events listed. The most frequently reported experiences were life threatening events (82%), physical abuse (78%), and loss of a close relative (78%). The official age assessment found a mean age of 18.4 years (SD 2.4), range 15-28, which meant that 72 (56%) participants were considered to be adults. Of this “adult” group, 36 participants were allowed to stay at the care centres for adolescents, while the rest had to move to centres for adults. None of the participants received psychiatric treatment during the study. Overall there were no significant changes in the level of symptoms within the study period ( $p \geq .084$ ), neither for HSCL (Table 2) nor for PTSS.

**Table 2. Mixed effect coefficients (MEC) for time modelling the course of psychological distress (HSCL) and posttraumatic stress (PTSS) in unaccompanied refugee minors after arrival in host country.**

	HSCL			PTSS		
	MEC	95% CI	P	MEC	95% CI	P
Time			.136			.725
4 mo vs 0 mo	0.04	-0.09, 0.16	.557	0.02	-0.12, 0.15	.811
15 mo vs 0 mo	0.14	0.01, 0.27	.037	0.03	-0.11, 0.17	.671
26 mo vs 0 mo	-0.02	-0.16, 0.13	.831	-0.06	-0.21, 0.09	.441

HSCL : Hopkins symptom checklist

PTSS : Posttraumatic stress symptom checklist

Tables 3-5 show the associations between variables of interest, and symptoms of psychological distress at different test points. Outcome of age assessment, which was known shortly after the first assessment, had no significant association with psychological distress at 4 months (table 3). However, those who were estimated to be 18 years or older, had higher levels of symptoms at 15 months (table 4) and at 26 months (table 5), but not when adjusted for the outcome of the asylum-applications at the 26 month assessment.

**Table 3. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, related to course of psychological distress (HSCL) in young male asylum seekers 4 months after arrival in host country; unadjusted and adjusted results.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.348	0.115,0.581	.004	0.262	0.006, 0.518	.045
Parents deceased			.245			.457
Unknown vs both alive	0.175	-0.232,0.581	.396	0.146	-0.254, 0.545	.472
One dead vs both alive	0.146	-0.166,0.457	.355	0.182	-0.119, 0.483	.234
Both dead vs both alive	-0.172	-0.564,0.219	.384	-0.053	-0.442, 0.337	
Adverse events	0.066	0.015,0.116	.012	0.046	-0.006, 0.098	.084
Age assessed $\geq$ 18 years	0.126	-0.118,0.370	.308	0.068	-0.191, 0.326	.604

HSCL: Hopkins symptom checklist

Adjusted for whether subjects participated in initial 5 week expressive arts group-intervention

**Table 4. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, in addition to asylum-seeker facilities, related to course of psychological distress (HSCL) in young male asylum seekers 15 months after arrival in host country; unadjusted and adjusted results.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.054	-0.254,0.363	.727	0.008	-0.296, 0.313	.957
Parents deceased			.134			.073
Unknown vs both alive	0.240	-0.278,0.757	.359	0.346	-0.133, 0.825	.154
One dead vs both alive	0.253	-0.141,0.646	.206	0.317	-0.051, 0.684	.090
Both dead vs both alive	0.581	0.097,1.065	.019	0.626	0.157, 1.094	.010
Adverse events	0.039	-0.030,0.107	.262	0.054	-0.010, 0.119	.099
Age assessed ≥18 years	0.522	0.238,0.805	<0.001	0.375	0.058, 0.692	.021
Adult reception center	0.464	0.136,0.792	.006	0.354	0.011, 0.695	.043

HSCL: Hopkins symptom checklist

Adjusted for whether subjects participated in initial 5 week expressive arts group-intervention

**Table 5. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, asylum-seeker facilities, in addition to asylum-status, related to course of psychological distress (HSCL) in young male asylum seekers 26 months after arrival in host country; unadjusted and adjusted results.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.025	-0.305,0.355	.881	-0.040	-0.322, 0.242	.777
Parents deceased			.043			.038
Unknown vs both alive	0.591	0.021,1.162	.042	0.562	0.076, 1.047	.024
One dead vs both alive	0.261	-0.130,0.652	.187	0.384	0.049, 0.719	.025
Both dead vs both alive	0.670	0.160,1.180	.011	0.532	0.088, 0.976	.020
Adverse events	-0.059	-0.126,-0.008	.083	-0.041	-0.097,0.016	.155
Age assessed ≥18 years	0.392	0.086,0.697	.013	-0.070	-0.428, 0.288	.696
Adult reception center	0.717	0.372,1.063	<.001	0.272	-0.169,0.712	.222
Asylum status (vs acceptance)			<.001			.017
Time-limited asylum	-0.035	-0.391,0.320	.844	-0.103	-0.498, 0.292	.602
Refusal of asylum	0.787	0.402,1.172	<.001	0.590	0.122, 1.059	.015

HSCL: Hopkins symptom checklist

Adjusted for whether subjects participated in initial 5 week expressive arts group-intervention

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3 One third of the participants were placed in a reception centre for adults. Figure 1 shows the  
4 trajectories of psychological distress for participants placed in a reception centre for adults or  
5 for youth. Those who were placed in a reception centre for adults had higher levels of  
6 psychological distress symptoms both at 15 months (table 4) and 26 months (table 5)  
7 compared to the remaining participants who were placed in reception centres for youth.  
8 However, when adjusted for the outcome of the asylum application at the 26 month  
9 assessment, the difference was not significant.  
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15 Final decision on the asylum claims was given between the last two test points. Refusal was  
16 highly associated with higher levels of psychological distress. Achieving time limited  
17 residence permission was not significantly different compared to permanent asylum (table 5).  
18 Trajectories of psychological distress for those who received refusal or acceptance of their  
19 asylum application are illustrated graphically in figure 2. Refusal was related to the official  
20 determined age of the asylum seeker. Among the participants who were considered to be 18  
21 or more, 52 out of 72(72.2%) were refused, compared to 15 out of 59(25.4%) among the  
22 participants who were considered to be under 18 (7 missing).  
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29 The symptom scores of the PTSS (not illustrated in the tables) showed a similar association as  
30 the HSCL-scores, with higher levels of PTSD-symptoms for those placed in a reception center  
31 for adults at 15 months (adjusted difference 0.34, 95% CI 0.06 to 0.63,  $p=0.017$ ), as well as  
32 higher symptom scores for those who received a negative result for the asylum application at  
33 26 months (adjusted difference 0.60, 95% CI 0.24 to 0.95,  $p=0.001$ ).  
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39 Loss to follow-up was not significantly related to initial levels of distress. Also, none of the  
40 baseline covariates were significantly related to nonresponse.  
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## 47 **DISCUSSION**

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50 The present study is a follow-up of unaccompanied refugee minors with four waves of  
51 assessment from within three weeks after arrival to more than two years spent in the host  
52 country. At the group level the young asylum seekers reported high levels of psychological  
53 distress on arrival, and symptom levels that stayed relatively unchanged over time. A low  
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3 level of support during the asylum process and a negative outcome of the asylum application  
4 were associated with higher levels of psychological distress.  
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7 Determination of the legal status of the asylum seekers involved age assessment procedures,  
8 with x-rays and dental examinations for all participants in this study. This resulted in a  
9 considerable gap between self reported age and the official age estimates designated by the  
10 immigration authorities. On the basis of these examinations 55% of the asylum seekers were  
11 considered to be at least the age of 18, and thus did not achieve a UM status. They risked  
12 being moved to a facility for adults, with low levels of support and care, and limited access to  
13 education and leisure activities. Also, the likelihood of being granted asylum was related to  
14 age, as illustrated by the numbers of children and adults in our study who got refusal of their  
15 claims.  
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22 The results from our study is in agreement with other studies that have found that high-  
23 support housing, with sufficient supervision, was associated with lower levels of  
24 psychological symptoms<sup>5</sup>. Others have also described problems directly connected to the  
25 asylum process, and have registered them as components in a list of post-migration stressors<sup>9</sup>.  
26 A weakness with most of these studies, are cross-sectional designs where there are no base-  
27 line measurements. Only a few studies have repeated assessments<sup>6</sup> where problems directly  
28 connected to the asylum process, such as age-assessment procedures, lack of adequate  
29 housing, low support, etc., have been evaluated. The complexity of factors contributing to the  
30 increasing health risk, make it difficult to draw specific conclusions within the total burden of  
31 stressors.  
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40 In all studies with UM, it is likely that there will be some uncertainty concerning the  
41 participants' true chronological age<sup>3</sup>. Defined to be overage, in the present study, was not  
42 significantly related to the symptom scores at the 4 month assessment, and there was no  
43 indication that this process was stressful in itself. The age designated by the authorities,  
44 determined what type of housing and level of care that was offered during the remaining  
45 asylum-procedure. This meant that many of the participants had to live in a reception centre  
46 for adults, where they had no guardian, no school, had to cook for themselves, and budget  
47 their benefits. Our findings that this group had higher levels of psychological distress, add  
48 further evidence that living conditions in the asylum seeking period may influence the mental  
49 health of young refugees.<sup>6,9</sup>  
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3 The outcome of the individual asylum applications was revealed to the asylum seekers  
4 between one and two years after the arrival, and the negative impact of refusal was as  
5 expected, since several studies have found that difficulties obtaining legal residence are  
6 associated with a range of psychological problems for this group<sup>6</sup>. We also know that  
7 longitudinal studies indicate a trend towards reduction of mental health symptoms for  
8 resettled refugees over time.<sup>22</sup> In a follow-up study of 131 young refugees in Denmark, the  
9 long term effects of pre-migration adversity were mediated by a variety of factors connected  
10 to social life.<sup>23</sup> Another study suggests positive health effects upon receiving permanent  
11 residence mediated through improved living conditions.<sup>24</sup> This, in association with our  
12 findings, emphasizes the importance of a supportive post-migration environment for all  
13 refugees with pre-migratory experiences of serious trauma and human rights violations.  
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22 Strengths of our study include a longitudinal design, with first assessment within three weeks  
23 after arrival to the host country, and repeated measures. We used computer-based assessment  
24 with the same audio-translations throughout the study, and did not need to use interpreters in  
25 order to complete the psychometric measures at follow-up. Selection of participants was  
26 limited to the most common nationality groups arriving in Norway at the time of inclusion,  
27 and may limit the generalization of our findings. High attrition rate due to the fact that asylum  
28 seekers tend to move between and within countries, and that many were told to leave the  
29 country, may have biased our findings. It is also possible that our research team was not  
30 viewed as independent from the authorities, even though we stressed this fact when we  
31 informed about the project. Finally, we have no data as to whether poor mental health might  
32 have affected the likelihood of asylum. Mental health is generally not an issue in the  
33 processing of asylum applications in Norway. Also, the baseline levels of mental health did  
34 not differ between participants that later received asylum and those who did not.  
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### 46 47 **Implications**

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49 Our study shows that young asylum-seekers may spend considerable time in a safe Western  
50 country, without recovering from the distress they have when they arrive in the host country.  
51 A reason for the continuing psychological health problems in this non-clinical group of youth  
52 can possibly be found in the living conditions and the level of care that is provided.  
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3 Adolescence is a challenging transition-period for most people. Fleeing to a foreign country  
4 without parents or other caregivers makes this life-period even more challenging for young  
5 refugees, and puts a considerable responsibility on the receiving countries. The burden of  
6 increasing numbers of asylum-seekers challenges the political intentions of the UN  
7 Convention on the Rights of the Child (CRC) to always give precedence to “the best interest  
8 of the child”.<sup>25</sup> It is emphasized that safety and dignity in the use of medical assessments  
9 should be applied as a supplement to evaluations of the physical appearance and the  
10 psychological maturity of the child. Needs of vulnerable adolescents and young adults in a  
11 stressful life-situation deserve high priority and should be a main focus regardless of the  
12 outcome of age assessments.<sup>26</sup>

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20 In our society turning 18 is usually considered a transition point from child to adult. Yet with  
21 the limitations of the age determining process we cannot know for certain that this milestone  
22 has been reached. The consequences of this uncertainty can have legal, social and material  
23 implications.<sup>27</sup> If a child is put under difficult living-conditions, where previous human  
24 support and education is withdrawn, this can have unintended negative effects on these young  
25 individuals transitioning into adulthood. Some child protection services argue that vulnerable  
26 young adults are still in need of support and care after the age of 18<sup>28</sup>, and need to receive  
27 specialised care into their twenties.<sup>29</sup> Future studies should focus on how mental health and  
28 resilience evolve over a longer time span, and evaluate specific interventions and appropriate  
29 levels of care for young refugees.

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42 **Acknowledgement:** Gratitude to Liv Berit Løken for her care and assistance with all aspects  
43 of the data collection. Thanks also to our very skilled interpreters, and to all the young  
44 participants.

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47  
48 **Contributors:** M. Jakobsen has had the main responsibility for the drafting and writing of the  
49 article. Heir was, in collaboration with DeMott and Jakobsen, responsible for the literature  
50 review and the conception and design of the article. DeMott and Jakobsen has been  
51 responsible for all phases of the data collection. Data analysis and interpretation of data was  
52 done in cooperation between Jakobsen, Heir and Wentzel-Larsen. All authors have  
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contributed to the scientific writing and proof-reading of the article. The paper has been read and approved by all authors before submission.

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**Competing interests:** None

**Ethics approval:** Regional Committees for Medical and Health Research Ethics.

**Data sharing statement:** No additional data are available.

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Figures

Fig 1. Course of psychological distress (HSCL) during follow up of asylum seekers placed in asylum centers for adults (n=38) and asylum seekers placed in asylum centers for youth (n=100).

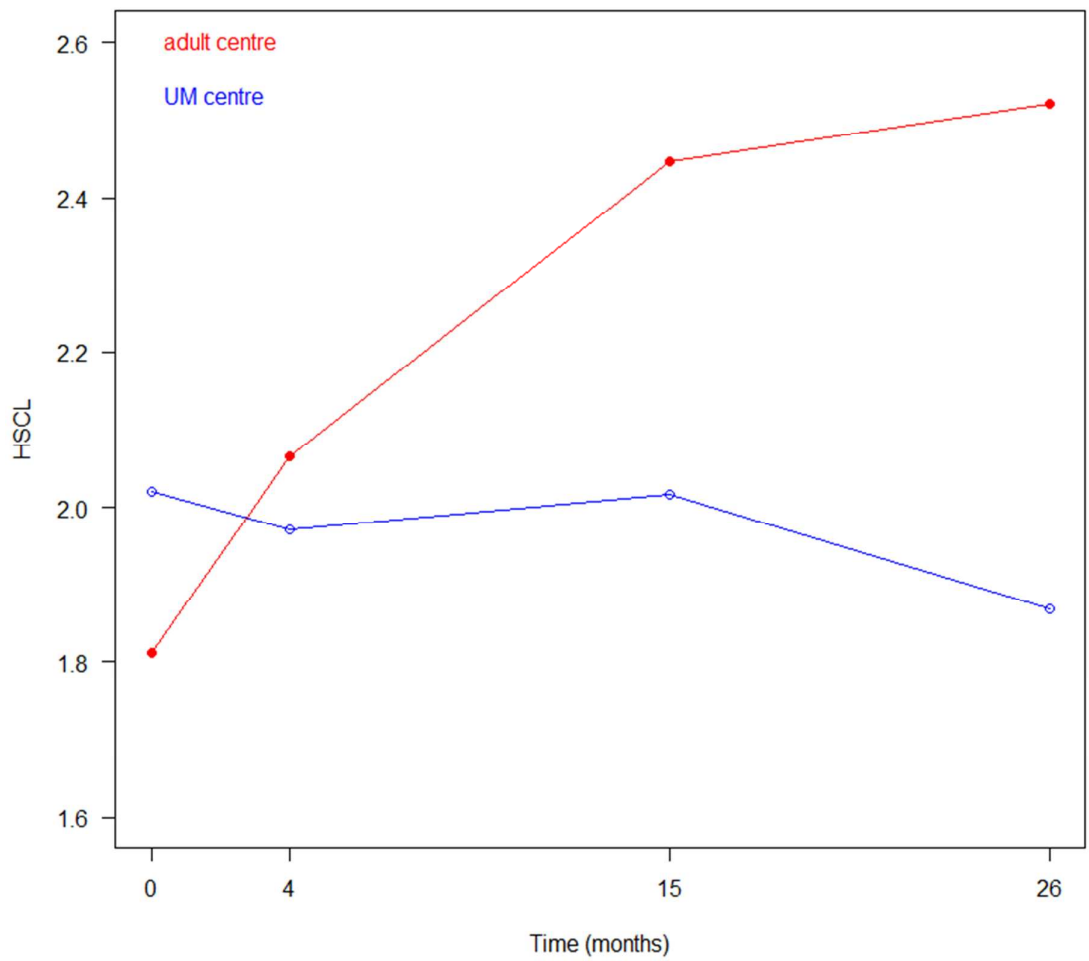
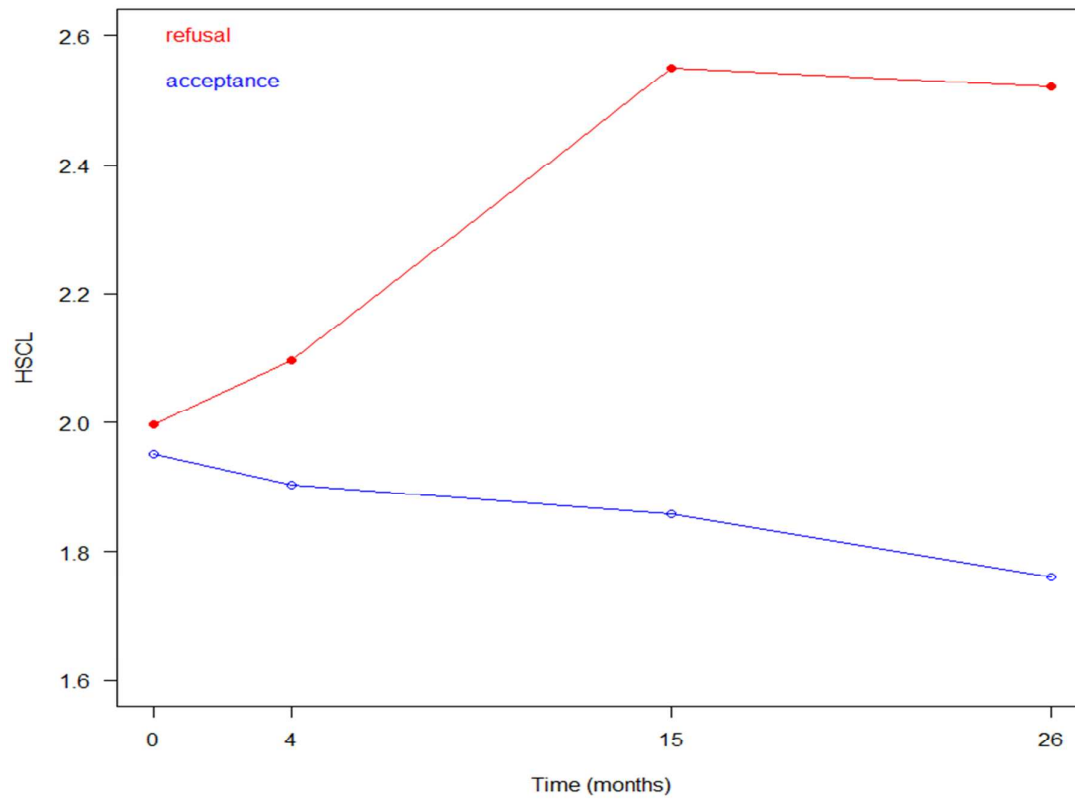


Fig 2. Course of psychological distress (HSCL) during follow up of asylum seekers who received refusal of asylum (n=67) and asylum seekers who received residence permission or time limited asylum (n=64).



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3 Research checklist  
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7 We have gone through the STROBE statement-Checklist list, and have tried to address all items in the  
8 article. We want to make some extra comments to these points:  
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12 10 and 13: This study has been conducted in cooperation with Norwegian immigration authorities,  
13 and there were restrictions on where and when we could gain access to the reception centers. The  
14 time periods when we were allowed to register are described in the article. We do not believe these  
15 restrictions impacted the selection of clients, since immigration to Norway happens all through the  
16 year, with very little control by the authorities. The restrictions were based on practical needs for  
17 turnover at the center, and we had to cooperate in order to do any research at all. The study size is  
18 the number of participants we were able to include within the designated time frames. It is hard to  
19 know how many participants we could have reached, since a lot of immigration is illegal, and asylum-  
20 seekers flee from the reception-centers all the time.  
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# BMJ Open

## Mental health and the impact of the asylum process: a longitudinal study of unaccompanied refugee minors.

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# Mental health and the impact of the asylum process: a longitudinal study of unaccompanied refugee minors.

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Word count: 4306



## ABSTRACT

**Objectives:** To examine the mental health of unaccompanied refugee minors (UM) prospectively during the asylum-seeking process, with a focus on specific stages in the asylum-process, such as age assessment, placement in a supportive or non-supportive facility, and final decision on the asylum applications.

**Design:** A two and a half year follow-up study of UM seeking asylum in Norway. Data were collected within three weeks (n=138), and at 4 months (n=101), 15 months (n=84) and 26 months (n=69) after arrival.

**Setting:** Initially in an observation and orientation centre for unaccompanied asylum-seeking adolescents, and subsequently wherever the UM were located in other refugee-facilities in Norway.

**Participants:** Male UM from Afghanistan, Somalia, Algeria and Iran.

**Main outcome measures:** Mental health symptoms assessed by Hopkins Symptom Checklist-25, and Harvard Trauma Questionnaire.

**Results:** At the group level the young asylum seekers reported high levels of psychological distress on arrival, and symptom levels that stayed relatively unchanged over time.

According to age-assessment procedures 56% of the population was not recognized as minors. Subsequent placement in a low- support facility was associated with higher levels of psychological distress in the follow-up period. Those who were placed in a reception centre for adults had higher levels of psychological distress symptoms both after 15 months and 26 months compared to the remaining participants who were placed in reception centers for youth. Refusal of asylum was highly associated with higher levels of psychological distress.

**Conclusions:** Mental health trajectory of young asylum-seekers appears to be negatively affected by low support and refusal of asylum.

### **Strengths and limitations of this study.**

x. Strengths include a longitudinal design, with first assessment within three weeks after arrival to the host country, and repeated measures.

x. Use of computer-based assessment with audio-translations throughout the study.

x. Selection of participants was limited to the most common nationality groups arriving in Norway at the time of inclusion.

x. High attrition rate due to the fact that asylum seekers tend to move between and within countries, and that many were told to leave the country.

### **INTRODUCTION**

In 2015 more than 88 700 unaccompanied minors (UM) fled to Europe<sup>1</sup>, putting considerable pressure on these countries to provide the necessary resources needed. Separated children that are no longer protected by parents or other caregivers, usually have to be under the age of 18 in order to be given the special protection and care that is granted unaccompanied refugee minors. In the countries of origin for UM the civil registration service of their country often function poorly, and birth certificates can be lost, thrown away or falsified.<sup>2</sup> The scientific basis for assessing age is controversial, in that these tests only determine physical maturity, and are most uncertain from the age of 15 to 21, where natural variation is at its greatest.<sup>3</sup> The consequences for many young asylum seekers assessed to be 18 years or older is that they will no longer be considered as minors, and therefore not receive special protection in accordance with the United Nations.<sup>2</sup>

Most studies investigating UM mental health have a cross-sectional design with a selection of youths with different levels of legal recognition and different durations of time in exile.<sup>4</sup>

These studies show consistently that individual factors such as exposure to violence and other traumatic events prior to migration, correspond to elevated symptoms of psychological distress.<sup>5</sup> In some studies the negative effects of exile related stressors are also described<sup>6</sup>, yet they focus on youths with varying time in exile. There are different asylum-procedures within the different countries<sup>7</sup>, and most UM endure some uncertainty before their legal status is defined. Most countries provide some form of shelter for UM while they are waiting for their case to be processed, but conditions vary greatly. Positive health effects have been shown to be associated with receiving a permanent residence permit<sup>8</sup>, but this process may take months

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3 and sometimes years. The impact of different levels of social support that UM are offered,  
4 especially after the first stage of reception and registration, have not been studied in detail.<sup>9</sup>  
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7 The aim of our study was to examine UM's mental health during the asylum-seeking process,  
8 and more specifically whether the official age assessed, level of support, and the outcome of  
9 the asylum application were associated with UM's mental health at different stages of the  
10 asylum seeking process.  
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## 14 15 16 17 18 19 20 21 **METHODS** 22

### 23 24 25 26 **Participants and procedures** 27

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32 The sample in this study was recruited from an asylum reception centre for unaccompanied  
33 asylum-seeking adolescents between ages 15 and 18 years, which was the only one in Norway  
34 at this time. In this reception centre, all UMs who claimed to be in this age group stayed for  
35 the first weeks while asylum interviews and age-assessment procedures were performed. A  
36 research assistant kept track of all new arrivals, and each time our testing capacity allowed us  
37 to include some new participants, she was instructed to invite the ones who had arrived most  
38 recently. The study was conducted between September 2009 and March 2011. Altogether, the  
39 inclusion periods for this project were 12 weeks in 2009, 8 weeks in 2010, and 21 weeks in  
40 2011. During these time periods young asylum seekers came mainly from Afghanistan and  
41 Somalia. According to the statistics unit at the Norwegian Directorate of Immigration, 406  
42 male UM from these language groups arrived in Norway during the inclusion periods.  
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45 Unaccompanied males that had just arrived were contacted by the research assistant.  
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47 Altogether, 216 adolescents were asked to participate, and 209 returned the informed consent  
48 and attended the study. Some participants were included in an Expressive Arts intervention  
49 group (n=71), that is not part of the present study. The remaining 138 are the focus of this  
50 article. Inclusion in the intervention-group was based on a randomizing –procedure shortly  
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3 after arrival in Norway. The participants in the present article were not significantly different  
4 from the intervention group in any baseline characteristics ( $p \geq .071$ ).  
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7 More about the whole project can be found on our home pages<sup>10</sup>.  
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10 Information to participants included statements that participation would not impact the  
11 chances to stay in the country. Only one contact attempt was made for each individual, and no  
12 payment was offered.  
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15 Participants followed the normal procedures in the asylum process. In Norway all UMs  
16 receive assistance from a multi-disciplinary professional staff (educators, social workers,  
17 psychologists, physicians, and nurses) in the first reception centre while waiting for their  
18 “official-age” to be assigned. Those defined as 18 or older can be moved to adult housing  
19 where less professional assistance is provided. The asylum-seekers considered to be from 15  
20 to 18 years are moved to specialized youth centres, with staff available 24 hours, every day.  
21 The youngest children stay in even more specialized orphanages. There are some exceptions  
22 to this pattern, according to variable housing capacity some 18-year old asylum-seekers are  
23 allowed to stay in the youth centres for some time. The youth centres are located all over  
24 Norway, and have language classes for all inhabitants. Food is prepared and served by the  
25 staff, and there are staff members available day and night. Most centres have recreational  
26 activities, and they give individualised support and medical follow-up if needed. In an adult  
27 centre, the asylum-seekers are left to themselves most of the time. They buy and cook their  
28 own food, have no school or other scheduled activities, and have no guardians or staff  
29 members to ask for advice.  
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41 The first screening procedure was conducted within the first three weeks, and later repeated at  
42 4 months ( $n=101$ ), 15 months ( $n=84$ ) and 26 months ( $n=69$ ) after arrival. At the last  
43 assessment the population was almost halved, mainly because many of the informants were  
44 transported out of the country, or had disappeared from the different living facilities. The  
45 participants who were deported were mostly individuals who had been registered as asylum-  
46 seekers in another European country before coming to Norway, or individuals suspected of  
47 having some connection to illegal activities. The ones who deflected were typically those who  
48 feared deportation after their asylum-applications were turned down. It was, however,  
49 impossible to obtain exact numbers and reasons for the attrition in this project.  
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## Measures

Demographic data was registered with the aid of interpreters at the initial assessment. We asked for self-reported age, literacy, years of school attendance, and whether their parents were still alive, deceased, or if participants had lost touch with their parents and did not know. Later we registered the results of official age-assessments, especially which participants who were thought to be at least 18 years of age. We also determined the level of care offered according to placement in asylum centres for either adults or for youth. Before the last assessment we registered the legal status, as participants were either given time-limited or permanent permission to stay, or were refused legal residence in the country.

## Exposure

Serious Life Events checklist (SLE) was developed by Tammy Bean and colleagues<sup>11</sup> in order to assess if an adolescent meet the criteria A1 (experienced a traumatic event) in the DSM-IV, for a diagnosis of PTSD. It is a self-report questionnaire which asks whether or not the participant has experienced twelve different kinds of traumatic events, such as separation from family, natural disaster, war and physical or sexual abuse. The instrument was scored by answering yes or no on each item.

## Psychological distress

Hopkins Symptom Checklist-25 (HSCL-25)<sup>12</sup> is a self-administered questionnaire designed to measure anxiety and depression. It has been validated in various clinical and community samples.<sup>13,14</sup> The HSCL-37 A version is an extension of the HSCL-25, and has also been applied in a number of refugee studies with minors.<sup>15,16</sup> The additional 12 items measuring externalizing behavior are not included in this paper. Each item was scored with 1 (not bothered) to 4 (extremely bothered). Scores  $\geq 2.0$  was considered probably clinically significant.<sup>17</sup>

## Post Traumatic Symptom Score (PTSS)

The Harvard Trauma Questionnaire<sup>18</sup> is a comprehensive instrument that was developed to assess potentially traumatic experiences and post-traumatic symptoms in various cultural

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3 contexts. Its psychometric properties were first established in a highly traumatized, clinical  
4 population, but it has also been evaluated with a larger community sample, and with asylum  
5 seeking adolescents<sup>6,19</sup>. The HTQ part IV, comprises 30 symptom items, among which the  
6 first 16 items measure “The symptoms of PTSD” according to the DSM–IV.<sup>20</sup> These 16 items  
7 are scored with 1 (not at all) to 4 (extremely). Scores  $\geq 2.0$  was considered probably clinically  
8 significant.<sup>17</sup>  
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### 13 14 15 16 Computer-based assessment

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18 The chosen psychometric measurements were combined into a single questionnaire using the  
19 program MultiCASI<sup>21</sup>. The questionnaires were filled in by the participants themselves, in  
20 their native languages, Dari, Pashto, Farsi or Somali, using laptops with touch-screen function.  
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22 Translations had been attained from earlier projects, and were controlled by independent,  
23 native speaking, interpreters before they were added to the questionnaire. The items appeared  
24 one after the other on the screen, together with answering alternatives. All text had a sound-  
25 file connected to it that started as soon as the item appeared on the screen. The test could be  
26 used with any level of reading competence, and the sound of each item could be activated by  
27 touch, as many times as necessary. Items could be skipped and left unanswered, but would  
28 then be repeated once more towards the end of the questionnaire. The first introduction to the  
29 computer based self-screening was done shortly after arrival, with one language group at the  
30 time. An interpreter was present together with maximum five participants, as they were  
31 instructed in how to use the touch screen. They were encouraged to ask clarifying questions as  
32 they went on with answering the items, all in the same room, with earphones on, in order not  
33 to disturb each other. During the following waves of data collection the same questionnaire  
34 was used and translating services were not necessary. The results were transported digitally to  
35 the SPSS files.  
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### 48 Data analysis

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50 Differences in HSCL and PTSS between 0, 4, 15 and 26 months were assessed by linear  
51 mixed effects models by categorical time, including an inter-individual random effect.  
52 Relationships between HSCL, and PTSS at each time point  $\geq 4$  months and characteristics  
53 known at that time point were assessed by unadjusted and linear regression. Specifically,  
54 covariates were being literate, parents deceased, number of adverse events and age assessed as  
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 3  $\geq 18$  years at 4 months. At 15 months, being placed in a reception center for adults or youth,  
 4 was included, and at 26 months also asylum status; permanent, time limited or refusal of  
 5 asylum. Due to a low number of missing values in the independent variables in the regression  
 6 analyses (at most 3 missing values on any independent variable) complete case analysis was  
 7 considered appropriate. Nonresponse analysis during follow up (4 to 26 months) used a  
 8 generalized estimating equations (GEE) logistic regression by time and baseline HSCL score,  
 9 reading ability, category for parents alive and number of serious life events. For descriptive  
 10 analyses we used the SPSS version 22 for Windows. Beyond this, data was analyzed using R  
 11 (The R Foundation for Statistical Computing, Vienna, Austria) with the R package nlme for  
 12 mixed effects models and gee for GEE analyses<sup>22</sup>.  
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Table 1. Baseline characteristics of male unaccompanied refugee minors at arrival in Norway. Figures are given as number (%) when others not specified.

	N = 138
Age, self-reported (n=127)	
Mean years (SD)	16.18 (0.84)
Range	15 - 18
Age, assessed by authorities (n=132)	
Mean years(SD)	18.22 (2.27)
Range	15 - 27
Nationality	
Afghan	102 (73.9)
Somalian	32 (23.2)
Iranian	3 (2.2)
Algerian	1 (0.7)
Literacy, self-reported	50 (36.8)
Loss of parent	
Father	85(62.9)
Mother	29(21.5)

Both	25(18.5)
Unknown	16(11.9)
Psychological distress (n=132)	
Mean HSCL (SD)	1.70 (0.43)
Caseness (n>2.0)	29 (21.0)
Posttraumatic stress (n=133)	
Mean PTSS (SD)	2.15 (0.62)
Caseness (n>2.0)	81 (58.7)

## Results

Three fourths of the population came from Afghanistan, while the remaining came from Somalia and Iran (table 1). There were no significant differences between the countries of origin and the variables included in this article. A minority (36%) were able to read in their own language. Mean number of serious life-time events experienced was 6.3 (SD 2.3), range 1-11. Most of the participants (96%) had experienced at least one of the serious life events listed. The most frequently reported experiences were life threatening events (82%), physical abuse (78%), and loss of a close relative (78%). The official age assessment found a mean age of 18.4 years (SD 2.4), range 15-28, which meant that 72 (56%) participants were considered to be adults. Of this “adult” group, 36 participants were allowed to stay at the care centres for adolescents, while the rest had to move to centres for adults. None of the participants received psychiatric treatment during the study. Overall there were no significant changes in the level of symptoms within the study period ( $p \geq .084$ ), neither for HSCL (Table 2) nor for PTSS.

**Table 2. Mixed effect coefficients (MEC) for time modelling the course of psychological distress (HSCL) and posttraumatic stress (PTSS) in unaccompanied refugee minors after arrival in host country.**



	HSCL			PTSS		
	MEC	95% CI	P	MEC	95% CI	P
Time			.136			.725
4 mo vs 0 mo	0.04	-0.09, 0.16	.557	0.02	-0.12, 0.15	.811
15 mo vs 0 mo	0.14	0.01,0.27	.037	0.03	-0.11, 0.17	.671
26 mo vs 0 mo	-0.02	-0.16, 0.13	.831	-0.06	-0.21, 0.09	.441

HSCL : Hopkins symptom checklist

PTSS : Posttraumatic stress symptom checklist

Tables 3-5 show the associations between variables of interest, and symptoms of psychological distress at different test points. Outcome of age assessment, which was known shortly after the first assessment, had no significant association with psychological distress at 4 months (table 3). However, those who were estimated to be 18 years or older, had higher levels of symptoms at 15 months (table 4) and at 26 months (table 5), but not when adjusted for the outcome of the asylum-applications at the 26 month assessment.

**Table 3. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, related to course of psychological distress (HSCL) in young male asylum seekers 4 months after arrival in host country; unadjusted and adjusted results.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.348	0.115,0.581	.004	0.262	0.006, 0.518	.045
Parents deceased			.245			.457
Unknown vs both alive	0.175	-0.232,0.581	.396	0.146	-0.254, 0.545	.472

One dead vs both alive	0.146	-0.166,0.457	.355	0.182	-0.119, 0.483	.234
Both dead vs both alive	-0.172	-0.564,0.219	.384	-0.053	-0.442, 0.337	
Adverse events	0.066	0.015,0.116	.012	0.046	-0.006, 0.098	.084
Age assessed $\geq 18$ years	0.126	-0.118,0.370	.308	0.068	-0.191, 0.326	.604

HSC: Hopkins symptom checklist

Adjusted for whether subjects participated in initial 5 week expressive arts group-intervention

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**Table 4. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, in addition to asylum-seeker facilities, related to course of psychological distress (HSCL) in young male asylum seekers 15 months after arrival in host country; unadjusted and adjusted results.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.054	-0.254,0.363	.727	0.008	-0.296, 0.313	.957
Parents deceased			.134			.073
Unknown vs both alive	0.240	-0.278,0.757	.359	0.346	-0.133, 0.825	.154
One dead vs both alive	0.253	-0.141,0.646	.206	0.317	-0.051, 0.684	.090
Both dead vs both alive	0.581	0.097,1.065	.019	0.626	0.157, 1.094	.010
Adverse events	0.039	-0.030,0.107	.262	0.054	-0.010, 0.119	.099
Age assessed ≥18 years	0.522	0.238,0.805	<0.001	0.375	0.058, 0.692	.021
Adult reception center	0.464	0.136,0.792	.006	0.354	0.011, 0.695	.043

HSCL: Hopkins symptom checklist

Adjusted for whether subjects participated in initial 5 week expressive arts group-intervention

**Table 5. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, asylum-seeker facilities, in addition to asylum-status, related to course of psychological distress (HSCL) in young male asylum seekers 26 months after arrival in host country; unadjusted and adjusted results.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.025	-0.305,0.355	.881	-0.040	-0.322, 0.242	.777
Parents deceased			.043			.038
Unknown vs both alive	0.591	0.021,1.162	.042	0.562	0.076, 1.047	.024
One dead vs both alive	0.261	-0.130,0.652	.187	0.384	0.049, 0.719	.025
Both dead vs both alive	0.670	0.160,1.180	.011	0.532	0.088, 0.976	.020
Adverse events	-0.059	-0.126,-0.008	.083	-0.041	-0.097,0.016	.155
Age assessed ≥18 years	0.392	0.086,0.697	.013	-0.070	-0.428, 0.288	.696
Adult reception center	0.717	0.372,1.063	<.001	0.272	-0.169,0.712	.222
Asylum status (vs acceptance)			<.001			.017
Time-limited asylum	-0.035	-0.391,0.320	.844	-0.103	-0.498, 0.292	.602
Refusal of asylum	0.787	0.402,1.172	<.001	0.590	0.122, 1.059	.015

HSCL: Hopkins symptom checklist

Adjusted for whether subjects participated in initial 5 week expressive arts group-intervention

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3 One third of the participants were placed in a reception centre for adults. Figure 1 shows the  
4 trajectories of psychological distress for participants placed in a reception centre for adults or  
5 for youth. Those who were placed in a reception centre for adults had higher levels of  
6 psychological distress symptoms both at 15 months (table 4) and 26 months (table 5)  
7 compared to the remaining participants who were placed in reception centres for youth.  
8 However, when adjusted for the outcome of the asylum application at the 26 month  
9 assessment, the difference was not significant.  
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15 Final decision on the asylum claims was given between the last two test points. Refusal was  
16 highly associated with higher levels of psychological distress. Achieving time limited  
17 residence permission was not significantly different compared to permanent asylum (table 5).  
18 Trajectories of psychological distress for those who received refusal or acceptance of their  
19 asylum application are illustrated graphically in figure 2. Refusal was related to the official  
20 determined age of the asylum seeker. Among the participants who were considered to be 18  
21 or more, 52 out of 72(72.2%) were refused, compared to 15 out of 59(25.4%) among the  
22 participants who were considered to be under 18 (7 missing).  
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30 The symptom scores of the PTSS (not illustrated in the tables) showed a similar association as  
31 the HSCL-scores, with higher levels of PTSD-symptoms for those placed in a reception center  
32 for adults at 15 months (adjusted difference 0.34, 95% CI 0.06 to 0.63,  $p=0.017$ ), as well as  
33 higher symptom scores for those who received a negative result for the asylum application at  
34 26 months (adjusted difference 0.60, 95% CI 0.24 to 0.95,  $p=0.001$ ).  
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40 Loss to follow-up was not significantly related to initial levels of distress. Also, none of the  
41 baseline covariates were significantly related to nonresponse.  
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## 47 **DISCUSSION**

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50 The present study is a follow-up of unaccompanied refugee minors with four waves of  
51 assessment from within three weeks after arrival to more than two years spent in the host  
52 country. At the group level the young asylum seekers reported high levels of psychological  
53 distress on arrival, and symptom levels that stayed relatively unchanged over time. A low  
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3 level of support during the asylum process and a negative outcome of the asylum application  
4 were associated with higher levels of psychological distress.  
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7 Determination of the legal status of the asylum seekers involved age assessment procedures,  
8 with x-rays and dental examinations for all participants in this study. This resulted in a  
9 considerable gap between self reported age and the official age estimates designated by the  
10 immigration authorities. On the basis of these examinations 55% of the asylum seekers were  
11 considered to be at least the age of 18, and thus did not achieve a UM status. They risked  
12 being moved to a facility for adults, with low levels of support and care, and limited access to  
13 education and leisure activities. Also, the likelihood of being granted asylum was related to  
14 age, as illustrated by the numbers of children and adults in our study who got refusal of their  
15 claims.  
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23 The results from our study is in agreement with other studies that have found that high-  
24 support housing, with sufficient supervision, was associated with lower levels of  
25 psychological symptoms<sup>5</sup>. Others have also described problems directly connected to the  
26 asylum process, and have registered them as components in a list of post-migration stressors<sup>9</sup>.  
27 A weakness with most of these studies, are cross-sectional designs where there are no base-  
28 line measurements. Only a few studies have repeated assessments<sup>6</sup> where problems directly  
29 connected to the asylum process, such as age-assessment procedures, lack of adequate  
30 housing, low support, etc., have been evaluated. The complexity of factors contributing to the  
31 increasing health risk, make it difficult to draw specific conclusions within the total burden of  
32 stressors.  
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41 In all studies with UM, it is likely that there will be some uncertainty concerning the  
42 participants' true chronological age<sup>3</sup>. Defined to be overage, in the present study, was not  
43 significantly related to the symptom scores at the 4 month assessment, and there was no  
44 indication that this process was stressful in itself. The age designated by the authorities,  
45 determined what type of housing and level of care that was offered during the remaining  
46 asylum-procedure. This meant that many of the participants had to live in a reception centre  
47 for adults, where they had no guardian, no school, had to cook for themselves, and budget  
48 their benefits. Our findings that this group had higher levels of psychological distress, add  
49 further evidence that living conditions in the asylum seeking period may influence the mental  
50 health of young refugees.<sup>6,9</sup> It was probably known in the community and among the youth  
51 that being categorized as an adult increased the risk of asylum refusal. This factor is  
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3 impossible to separate from the expectations associated with the placement in youth or adult  
4 reception-centres. There should be a cautious interpretation of the results because of this  
5 clustering of risk factors.  
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8 The outcome of the individual asylum applications was revealed to the asylum seekers  
9 between one and two years after the arrival, and the negative impact of refusal was as  
10 expected since several studies have found that difficulties obtaining legal residence are  
11 associated with a range of psychological problems for this group<sup>6</sup>. We also know that  
12 longitudinal studies indicate a trend towards reduction of mental health symptoms for  
13 resettled refugees over time.<sup>23</sup> In a follow-up study of 131 young refugees in Denmark, the  
14 long term effects of pre-migration adversity were mediated by a variety of factors connected  
15 to social life.<sup>24</sup> Another study suggests positive health effects upon receiving permanent  
16 residence mediated through improved living conditions.<sup>25</sup> This, in association with our  
17 findings, emphasizes the importance of a supportive post-migration environment for all  
18 refugees with pre-migratory experiences of serious trauma and human rights violations.  
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27 Strengths of our study include a longitudinal design, with first assessment within three weeks  
28 after arrival to the host country, and repeated measures. We used computer-based assessment  
29 with the same audio-translations throughout the study, and did not need to use interpreters in  
30 order to complete the psychometric measures at follow-up. Due to a random selection of  
31 participants we consider the sample to be representative for the refugees arriving to Norway  
32 in the first decade of the century. However, selection of participants was limited to the most  
33 common nationality groups arriving in Norway in this period, and may limit the  
34 generalization of our findings to refugees in general.  
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41 High attrition rate due to the fact that asylum seekers tend to move between and within  
42 countries, and that many were told to leave the country, may have biased our findings. It is  
43 also possible that our research team was not viewed as independent from the authorities, even  
44 though we stressed this fact when we informed about the project. Finally, we have no data as  
45 to whether poor mental health might have affected the likelihood of asylum. Mental health is  
46 generally not an issue in the processing of asylum applications in Norway. Also, the baseline  
47 levels of mental health did not differ between participants that later received asylum and those  
48 who did not.  
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## 58 **Implications**

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3 Our study shows that young asylum-seekers may spend considerable time in a safe Western  
4 country, without recovering from the distress they have when they arrive in the host country.  
5 A reason for the continuing psychological health problems in this non-clinical group of youth  
6 can possibly be found in the living conditions and the level of care that is provided.  
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10 Adolescence is a challenging transition-period for most people. Fleeing to a foreign country  
11 without parents or other caregivers makes this life-period even more challenging for young  
12 refugees, and puts a considerable responsibility on the receiving countries. The burden of  
13 increasing numbers of asylum-seekers challenges the political intentions of the UN  
14 Convention on the Rights of the Child (CRC) to always give precedence to “the best interest  
15 of the child”.<sup>26</sup> It is emphasized that safety and dignity in the use of medical assessments  
16 should be applied as a supplement to evaluations of the physical appearance and the  
17 psychological maturity of the child.  
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21 An important objection to the use of dental/bone-age assessments is their lack of precision,  
22 especially around the time of puberty. The tests have been criticized for their large margins of  
23 error, and their inadequacy in determining chronological age.<sup>3</sup> Professionals in various  
24 countries have differed with some doctors refusing to take part in such tests, while others have  
25 argued that these assessments are the best practice available.  
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29 Needs of vulnerable adolescents and young adults in a stressful life-situation deserve high  
30 priority and should be a main focus regardless of the outcome of age assessments.<sup>27</sup>  
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34 In our society turning 18 is usually considered a transition point from child to adult. Yet with  
35 the limitations of the age determining process we cannot know for certain that this milestone  
36 has been reached. The consequences of this uncertainty can have legal, social and material  
37 implications.<sup>28</sup> If a child is put under difficult living-conditions, where previous human  
38 support and education is withdrawn, this can have unintended negative effects on these young  
39 individuals transitioning into adulthood. Some child protection services argue that vulnerable  
40 young adults are still in need of support and care after the age of 18<sup>29</sup>, and need to receive  
41 specialised care into their twenties.<sup>30</sup> Future studies should focus on how mental health and  
42 resilience evolve over a longer time span, and evaluate specific interventions and appropriate  
43 levels of care for young refugees.  
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**Competing interests:** None

**Ethics approval:** Regional Committees for Medical and Health Research Ethics.

**Data sharing statement:** No additional data are available.

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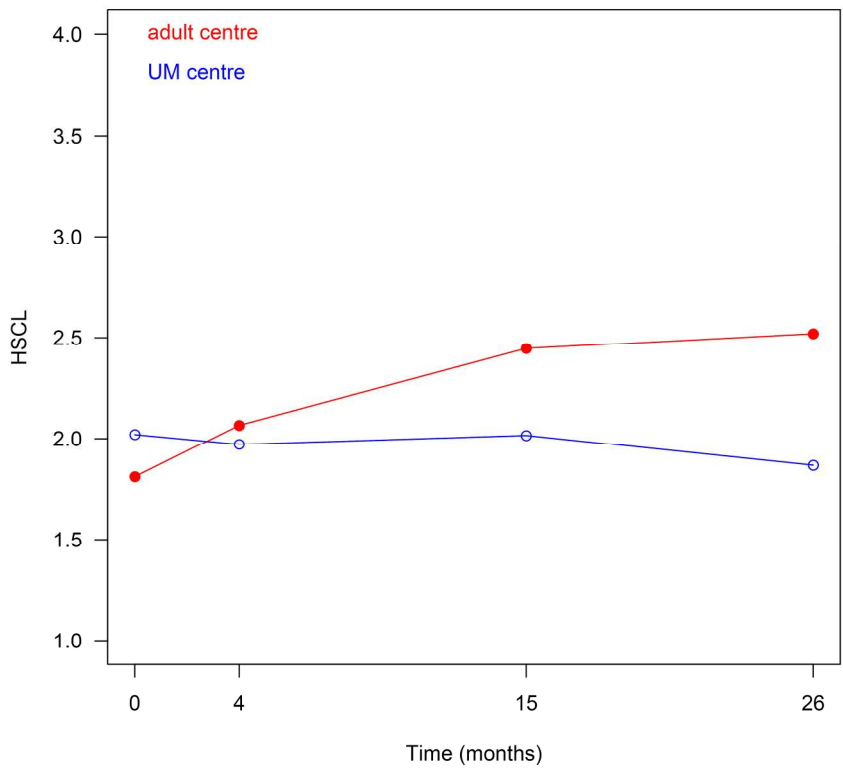
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Figure legends:

Fig 1. Course of psychological distress (HSCL) during follow up of asylum seekers placed in asylum centers for adults (n=38) and asylum seekers placed in asylum centers for youth (n=100).

Fig 2. Course of psychological distress (HSCL) during follow up of asylum seekers who received refusal of asylum (n=67) and asylum seekers who received residence permission or time limited asylum (n=64).

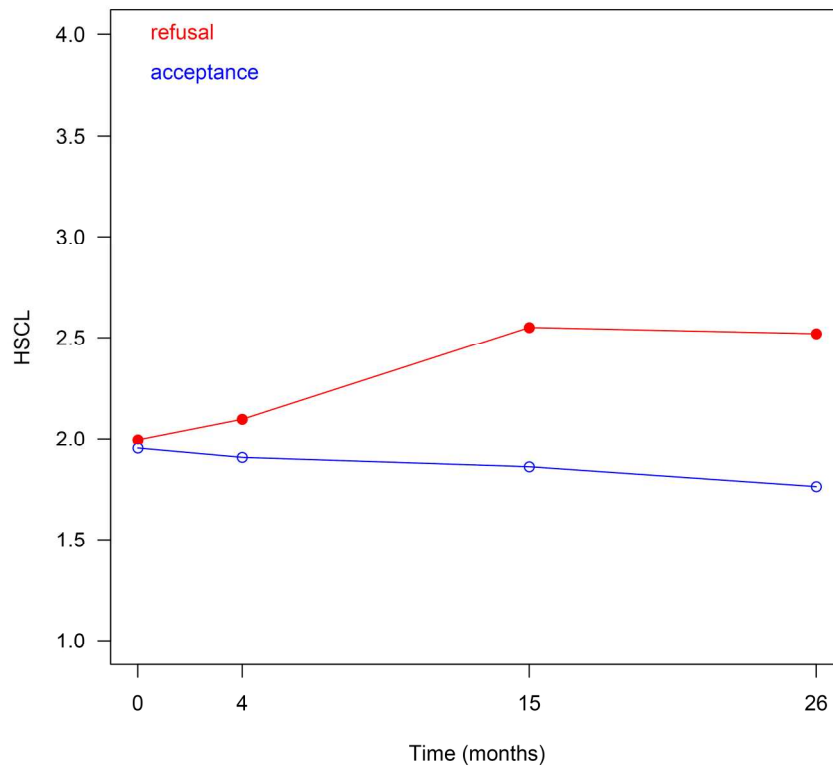
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## STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.	Relevant text from manuscript
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract		Done: Longitudinal study
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found		Done: see Abstract
<b>Introduction</b>				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3	Done: see introduction
Objectives	3	State specific objectives, including any prespecified hypotheses	4	Specified hypoth. not possible
<b>Methods</b>				
Study design	4	Present key elements of study design early in the paper	4-5	Done
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5	Done
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	4	Done: see introduction and methods
		<i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls		
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed		N.a.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7	Done: see methods (effect modifiers not included)
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7	Done
Bias	9	Describe any efforts to address potential sources of bias	7-8	Done: see statistical methods
Study size	10	Explain how the study size was arrived at	4	Data collection was done in collaboration with immigration authorities. The numbers were determined by new arrivals during the periods we were allowed to be at the centre.

Continued on next page

Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8	Done: see statistical methods
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7-8	Done
		(b) Describe any methods used to examine subgroups and interactions	7-8	Done
		(c) Explain how missing data were addressed	7-8	Done.
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy		N.a.
		(e) Describe any sensitivity analyses		N.a.
<b>Results</b>				
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4	Done: see methods
		(b) Give reasons for non-participation at each stage	5	Uncertain
		(c) Consider use of a flow diagram		N.a.
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9	Done: see results and table 1
		(b) Indicate number of participants with missing data for each variable of interest		N.a.
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	5	Done: see methods
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time		Done: see tables 2-5
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure		
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures		
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-13	Done
		(b) Report category boundaries when continuous variables were categorized	6-7	Done: see table 1 and measures
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period		N.a.

Continued on next page

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses		N.a.
<b>Discussion</b>				
Key results	18	Summarise key results with reference to study objectives	9	Done
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15-16	Done
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	15-17	Done
Generalisability	21	Discuss the generalisability (external validity) of the study results	16	Done
<b>Other information</b>				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18	Done.

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

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# BMJ Open

## Mental health and the impact of the asylum process: a longitudinal study of unaccompanied refugee minors.

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# Mental health and the impact of the asylum process: a longitudinal study of unaccompanied refugee minors.

Authors: Marianne Jakobsen <sup>1\*</sup>, Melinda A. Meyer DeMott <sup>1</sup>, Tore Wentzel-Larsen <sup>1,3</sup> & Trond Heir <sup>1,2</sup>

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## ABSTRACT

**Objectives:** To examine the mental health of unaccompanied refugee minors (UM) prospectively during the asylum-seeking process, with a focus on specific stages in the asylum-process, such as age assessment, placement in a supportive or non-supportive facility, and final decision on the asylum applications.

**Design:** A two and a half year follow-up study of UM seeking asylum in Norway. Data were collected within three weeks (n=138), and at 4 months (n=101), 15 months (n=84) and 26 months (n=69) after arrival.

**Setting:** Initially in an observation and orientation centre for unaccompanied asylum-seeking adolescents, and subsequently wherever the UM were located in other refugee-facilities in Norway.

**Participants:** Male UM from Afghanistan, Somalia, Algeria and Iran.

**Main outcome measures:** Mental health symptoms assessed by Hopkins Symptom Checklist-25, and Harvard Trauma Questionnaire.

**Results:** At the group level the young asylum seekers reported high levels of psychological distress on arrival, and symptom levels that stayed relatively unchanged over time.

According to age-assessment procedures 56% of the population was not recognized as minors. Subsequent placement in a low- support facility was associated with higher levels of psychological distress in the follow-up period. Those who were placed in a reception centre for adults had higher levels of psychological distress symptoms both after 15 months and 26 months compared to the remaining participants who were placed in reception centers for youth. Refusal of asylum was highly associated with higher levels of psychological distress.

**Conclusions:** Mental health trajectory of young asylum-seekers appears to be negatively affected by low support and refusal of asylum.

### **Strengths and limitations of this study.**

x. Strengths include a longitudinal design, with first assessment within three weeks after arrival to the host country, and repeated measures.

x. Use of computer-based assessment with audio-translations throughout the study.

x. Selection of participants was limited to the most common nationality groups arriving in Norway at the time of inclusion.

x. High attrition rate due to the fact that asylum seekers tend to move between and within countries, and that many were told to leave the country.

### **INTRODUCTION**

In 2015 more than 88 700 unaccompanied minors (UM) fled to Europe<sup>1</sup>, putting considerable pressure on these countries to provide the necessary resources needed. Separated children that are no longer protected by parents or other caregivers, usually have to be under the age of 18 in order to be given the special protection and care that is granted unaccompanied refugee minors. In the countries of origin for UM the civil registration service of their country often function poorly, and birth certificates can be lost, thrown away or falsified.<sup>2</sup> The scientific basis for assessing age is controversial, in that these tests only determine physical maturity, and are most uncertain from the age of 15 to 21, where natural variation is at its greatest.<sup>3</sup> The consequences for many young asylum seekers assessed to be 18 years or older is that they will no longer be considered as minors, and therefore not receive special protection in accordance with the United Nations.<sup>2</sup>

Most studies investigating UM mental health have a cross-sectional design with a selection of youths with different levels of legal recognition and different durations of time in exile.<sup>4</sup>

These studies show consistently that individual factors such as exposure to violence and other traumatic events prior to migration, correspond to elevated symptoms of psychological distress.<sup>5</sup> In some studies the negative effects of exile related stressors are also described<sup>6</sup>, yet they focus on youths with varying time in exile. There are different asylum-procedures within the different countries<sup>7</sup>, and most UM endure some uncertainty before their legal status is defined. Most countries provide some form of shelter for UM while they are waiting for their case to be processed, but conditions vary greatly. Positive health effects have been shown to be associated with receiving a permanent residence permit<sup>8</sup>, but this process may take months

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3 and sometimes years. The impact of different levels of social support that UM are offered,  
4 especially after the first stage of reception and registration, have not been studied in detail.<sup>9</sup>  
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7 The aim of our study was to examine UM's mental health during the asylum-seeking process,  
8 and more specifically whether the official age assessed, level of support, and the outcome of  
9 the asylum application were associated with UM's mental health at different stages of the  
10 asylum seeking process.  
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## 14 15 16 17 18 19 20 21 **METHODS** 22

### 23 24 25 26 **Participants and procedures** 27

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32 The sample in this study was recruited from an asylum reception centre for unaccompanied  
33 asylum-seeking adolescents between ages 15 and 18 years, which was the only one in Norway  
34 at this time. In this reception centre, all UMs who claimed to be in this age group stayed for  
35 the first weeks while asylum interviews and age-assessment procedures were performed. A  
36 research assistant kept track of all new arrivals, and each time our testing capacity allowed us  
37 to include some new participants, she was instructed to invite the ones who had arrived most  
38 recently. The study was conducted between September 2009 and March 2011. Altogether, the  
39 inclusion periods for this project were 12 weeks in 2009, 8 weeks in 2010, and 21 weeks in  
40 2011. During these time periods young asylum seekers came mainly from Afghanistan and  
41 Somalia. According to the statistics unit at the Norwegian Directorate of Immigration, 406  
42 male UM from these language groups arrived in Norway during the inclusion periods.  
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45 Unaccompanied males that had just arrived were contacted by the research assistant.  
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47 Altogether, 216 adolescents were asked to participate, and 209 returned the informed consent  
48 and attended the study. Some participants were included in an Expressive Arts intervention  
49 group (n=71), that is not part of the present study. The remaining 138 are the focus of this  
50 article. Inclusion in the intervention-group was based on a randomizing –procedure shortly  
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3 after arrival in Norway. The participants in the present article were not significantly different  
4 from the intervention group in any baseline characteristics ( $p \geq .071$ ).  
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7 More about the whole project can be found on our home pages<sup>10</sup>.  
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10 Information to participants included statements that participation would not impact the  
11 chances to stay in the country. Only one contact attempt was made for each individual, and no  
12 payment was offered.  
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15 Participants followed the normal procedures in the asylum process. In Norway all UMs  
16 receive assistance from a multi-disciplinary professional staff (educators, social workers,  
17 psychologists, physicians, and nurses) in the first reception centre while waiting for their  
18 “official-age” to be assigned. Those defined as 18 or older can be moved to adult housing  
19 where less professional assistance is provided. The asylum-seekers considered to be from 15  
20 to 18 years are moved to specialized youth centres, with staff available 24 hours, every day.  
21 The youngest children stay in even more specialized orphanages. There are some exceptions  
22 to this pattern, according to variable housing capacity some 18-year old asylum-seekers are  
23 allowed to stay in the youth centres for some time. The youth centres are located all over  
24 Norway, and have language classes for all inhabitants. Food is prepared and served by the  
25 staff, and there are staff members available day and night. Most centres have recreational  
26 activities, and they give individualised support and medical follow-up if needed. In an adult  
27 centre, the asylum-seekers are left to themselves most of the time. They buy and cook their  
28 own food, have no school or other scheduled activities, and have no guardians or staff  
29 members to ask for advice.  
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41 The first screening procedure was conducted within the first three weeks, and later repeated at  
42 4 months ( $n=101$ ), 15 months ( $n=84$ ) and 26 months ( $n=69$ ) after arrival. At the last  
43 assessment the population was almost halved, mainly because many of the informants were  
44 transported out of the country, or had disappeared from the different living facilities. The  
45 participants who were deported were mostly individuals who had been registered as asylum-  
46 seekers in another European country before coming to Norway, or individuals suspected of  
47 having some connection to illegal activities. The ones who deflected were typically those who  
48 feared deportation after their asylum-applications were turned down. It was, however,  
49 impossible to obtain exact numbers and reasons for the attrition in this project. When we  
50 compared those who have completed all four assessments with those who missed out at one occasion  
51 or more, there were no significant differences in any baseline demographic or symptom variables.  
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## Measures

Demographic data was registered with the aid of interpreters at the initial assessment. We asked for self-reported age, literacy, years of school attendance, and whether their parents were still alive, deceased, or if participants had lost touch with their parents and did not know. Later we registered the results of official age-assessments, especially which participants who were thought to be at least 18 years of age. We also determined the level of care offered according to placement in asylum centres for either adults or for youth. Before the last assessment we registered the legal status, as participants were either given time-limited or permanent permission to stay, or were refused legal residence in the country. New variables of interest such as level of care and legal status were included when they occurred prior to a new assessment.

## Exposure

Serious Life Events checklist (SLE) was developed by Tammy Bean and colleagues<sup>11</sup> in order to assess if an adolescent meet the criteria A1 (experienced a traumatic event) in the DSM-IV, for a diagnosis of PTSD. It is a self-report questionnaire which asks whether or not the participant has experienced twelve different kinds of traumatic events, such as separation from family, natural disaster, war and physical or sexual abuse. The instrument was scored by answering yes or no on each item.

## Psychological distress

Hopkins Symptom Checklist-25 (HSCL-25)<sup>12</sup> is a self-administered questionnaire designed to measure anxiety and depression. It has been validated in various clinical and community samples.<sup>13,14</sup> The HSCL-37 A version is an extension of the HSCL-25, and has also been applied in a number of refugee studies with minors.<sup>15,16</sup> The additional 12 items measuring externalizing behavior are not included in this paper. Each item was scored with 1 (not bothered) to 4 (extremely bothered). Scores  $\geq 2.0$  was considered probably clinically significant.<sup>17</sup>

### Post Traumatic Symptom Score (PTSS)

The Harvard Trauma Questionnaire<sup>18</sup> is a comprehensive instrument that was developed to assess potentially traumatic experiences and post-traumatic symptoms in various cultural contexts. Its psychometric properties were first established in a highly traumatized, clinical population, but it has also been evaluated with a larger community sample, and with asylum seeking adolescents<sup>6,19</sup>. The HTQ part IV, comprises 30 symptom items, among which the first 16 items measure “The symptoms of PTSD” according to the DSM–IV.<sup>20</sup> These 16 items are scored with 1 (not at all) to 4 (extremely). Scores  $\geq 2.0$  was considered probably clinically significant.<sup>17</sup>

### Computer-based assessment

The chosen psychometric measurements were combined into a single questionnaire using the program MultiCASI<sup>21</sup>. The questionnaires were filled in by the participants themselves, in their native languages, Dari, Pashto, Farsi or Somali, using laptops with touch-screen function. Translations had been attained from earlier projects, and were controlled by independent, native speaking, interpreters before they were added to the questionnaire. The items appeared one after the other on the screen, together with answering alternatives. All text had a sound-file connected to it that started as soon as the item appeared on the screen. The test could be used with any level of reading competence, and the sound of each item could be activated by touch, as many times as necessary. Items could be skipped and left unanswered, but would then be repeated once more towards the end of the questionnaire. The first introduction to the computer based self-screening was done shortly after arrival, with one language group at the time. An interpreter was present together with maximum five participants, as they were instructed in how to use the touch screen. They were encouraged to ask clarifying questions as they went on with answering the items, all in the same room, with earphones on, in order not to disturb each other. During the following waves of data collection the same questionnaire was used and translating services were not necessary. The results were transported digitally to the SPSS files.

### Data analysis

Differences in HSCL and PTSS between 0, 4, 15 and 26 months were assessed by linear mixed effects models by categorical time, including an inter-individual random effect.



Relationships between HSCL, and PTSS at each time point  $\geq 4$  months and characteristics known at that time point were assessed by unadjusted and linear regression. Specifically, covariates were being literate, parents deceased, number of adverse events and age assessed as  $\geq 18$  years at 4 months. At 15 months, being placed in a reception center for adults or youth, was included, and at 26 months also asylum status; permanent, time limited or refusal of asylum. Due to a low number of missing values in the independent variables in the regression analyses (at most 3 missing values on any independent variable) complete case analysis was considered appropriate. Nonresponse analysis during follow up (4 to 26 months) used a generalized estimating equations (GEE) logistic regression by time and baseline HSCL score, reading ability, category for parents alive and number of serious life events. For descriptive analyses we used the SPSS version 22 for Windows. Beyond this, data was analyzed using R (The R Foundation for Statistical Computing, Vienna, Austria) with the R package nlme for mixed effects models and gee for GEE analyses<sup>22</sup>.

Table 1. Baseline characteristics of male unaccompanied refugee minors at arrival in Norway. Figures are given as number (%) when others not specified.

	N = 138
Age, self-reported (n=130)	
Mean years (SD)	16.22 (0.84)
Range	14 - 20
Age, assessed by authorities (n=132)	
Mean years(SD)	18.22 (2.27)
Range	15 - 27
Nationality	
Afghan	102 (73.9)
Somalian	32 (23.2)
Iranian	3 (2.2)
Algerian	1 (0.7)
Literacy, self-reported (n=136)	50 (36.8)

No loss of parent	30(21.7)
Loss of father	60(43.5)
Loss of mother	4(2.9)
Loss of both parents	25(18.5)
Unknown	16(11.9)
Psychological distress (n=131)	
Mean HSCL (SD)	1.94 (0.58)
Caseness (n $\geq$ 2.0)	29 (21.0)
Posttraumatic stress (n=133)	
Mean PTSS (SD)	2.16 (0.62)
Caseness (n $\geq$ 2.0)	81 (58.7)

## Results

Three fourths of the population came from Afghanistan, while the remaining came from Somalia and Iran (table 1). There were no significant differences between the countries of origin and the variables included in this article. A minority (36%) were able to read in their own language. Mean number of serious life-time events experienced was 6.1 (SD 2.3), range 1-11. Most of the participants (96%) had experienced at least one of the serious life events listed. The most frequently reported experiences were life threatening events (82%), physical abuse (78%), and loss of a close relative (78%). The official age assessment found a mean age of 18.4 years (SD 2.4), range 15-28, which meant that 72 (56%) participants were considered to be adults. Of this “adult” group, 36 participants were allowed to stay at the care centres for adolescents, while the rest had to move to centres for adults. None of the participants received psychiatric treatment during the study. Overall there were no significant changes in the level of symptoms within the study period ( $p \geq .084$ ), neither for HSCL (Table 2) nor for PTSS.

**Table 2. Mixed effect coefficients (MEC) for time modelling the course of psychological distress (HSCL) and posttraumatic stress (PTSS) in unaccompanied refugee minors after arrival in host country.**

	HSCL			PTSS		
	MEC	95% CI	P	MEC	95% CI	P
Time			.136			.725
4 mo vs 0 mo	0.04	-0.09, 0.16	.557	0.02	-0.12, 0.15	.811
15 mo vs 0 mo	0.14	0.01,0.27	.037	0.03	-0.11, 0.17	.671
26 mo vs 0 mo	-0.02	-0.16, 0.13	.831	-0.06	-0.21, 0.09	.441

HSCL : Hopkins symptom checklist

PTSS : Posttraumatic stress symptom checklist

Tables 3-5 show the associations between variables of interest, and symptoms of psychological distress at different test points. Outcome of age assessment, which was known shortly after the first assessment, had no significant association with psychological distress at 4 months (table 3). However, those who were estimated to be 18 years or older, had higher levels of symptoms at 15 months (table 4) and at 26 months (table 5), but not when adjusted for the outcome of the asylum-applications at the 26 month assessment.

**Table 3. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, related to course of psychological distress (HSCL) in young male asylum seekers 4 months after arrival in host country; results unadjusted and adjusted for the other variables.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.348	0.115,0.581	.004	0.262	0.006, 0.518	.045

Parents deceased			.245			.457
Unknown vs both alive	0.175	-0.232,0.581	.396	0.146	-0.254, 0.545	.472
One dead vs both alive	0.146	-0.166,0.457	.355	0.182	-0.119, 0.483	.234
Both dead vs both alive	-0.172	-0.564,0.219	.384	-0.053	-0.442, 0.337	
Adverse events	0.066	0.015,0.116	.012	0.046	-0.006, 0.098	.084
Age assessed $\geq 18$ years	0.126	-0.118,0.370	.308	0.068	-0.191, 0.326	.604

HSCL: Hopkins symptom checklist

For peer review only

**Table 4. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, in addition to asylum-seeker facilities, related to course of psychological distress (HSCL) in young male asylum seekers 15 months after arrival in host country; results unadjusted and adjusted for the other variables.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.054	-0.254,0.363	.727	0.008	-0.296, 0.313	.957
Parents deceased			.134			.073
Unknown vs both alive	0.240	-0.278,0.757	.359	0.346	-0.133, 0.825	.154
One dead vs both alive	0.253	-0.141,0.646	.206	0.317	-0.051, 0.684	.090
Both dead vs both alive	0.581	0.097,1.065	.019	0.626	0.157, 1.094	.010
Adverse events	0.039	-0.030,0.107	.262	0.054	-0.010, 0.119	.099
Age assessed ≥18 years	0.522	0.238,0.805	<0.001	0.375	0.058, 0.692	.021
Adult reception center	0.464	0.136,0.792	.006	0.354	0.011, 0.695	.043

HSCL: Hopkins symptom checklist

**Table 5. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, asylum-seeker facilities, in addition to asylum-status, related to course of psychological distress (HSCL) in young male asylum seekers 26 months after arrival in host country; results unadjusted and adjusted for the other variables.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.025	-0.305,0.355	.881	-0.040	-0.322, 0.242	.777
Parents deceased			.043			.038
Unknown vs both alive	0.591	0.021,1.162	.042	0.562	0.076, 1.047	.024
One dead vs both alive	0.261	-0.130,0.652	.187	0.384	0.049, 0.719	.025
Both dead vs both alive	0.670	0.160,1.180	.011	0.532	0.088, 0.976	.020
Adverse events	-0.059	-0.126,-0.008	.083	-0.041	-0.097,0.016	.155
Age assessed ≥18 years	0.392	0.086,0.697	.013	-0.070	-0.428, 0.288	.696
Adult reception center	0.717	0.372,1.063	<.001	0.272	-0.169,0.712	.222
Asylum status (vs acceptance)			<.001			.017
Time-limited asylum	-0.035	-0.391,0.320	.844	-0.103	-0.498, 0.292	.602
Refusal of asylum	0.787	0.402,1.172	<.001	0.590	0.122, 1.059	.015

HSCL: Hopkins symptom checklist

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3 One third of the participants were placed in a reception centre for adults. Figure 1 shows the  
4 trajectories of psychological distress for participants placed in a reception centre for adults or  
5 for youth. Those who were placed in a reception centre for adults had higher levels of  
6 psychological distress symptoms both at 15 months (table 4) and 26 months (table 5)  
7 compared to the remaining participants who were placed in reception centres for youth.  
8 However, when adjusted for the outcome of the asylum application at the 26 month  
9 assessment, the difference was not significant.  
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15 Final decision on the asylum claims was given between the last two test points. Refusal was  
16 highly associated with higher levels of psychological distress. Achieving time limited  
17 residence permission was not significantly different compared to permanent asylum (table 5).  
18 Trajectories of psychological distress for those who received refusal or acceptance of their  
19 asylum application are illustrated graphically in figure 2. Refusal was related to the official  
20 determined age of the asylum seeker. Among the participants who were considered to be 18  
21 or more, 52 out of 72(72.2%) were refused, compared to 15 out of 59(25.4%) among the  
22 participants who were considered to be under 18 (7 missing).  
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29 The symptom scores of the PTSS (not illustrated in the tables) showed a similar association as  
30 the HSCL-scores, with higher levels of PTSD-symptoms for those placed in a reception center  
31 for adults at 15 months (adjusted difference 0.34, 95% CI 0.06 to 0.63,  $p=0.017$ ), as well as  
32 higher symptom scores for those who received a negative result for the asylum application at  
33 26 months (adjusted difference 0.60, 95% CI 0.24 to 0.95,  $p=0.001$ ).  
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39 Loss to follow-up was not significantly related to initial levels of distress. Also, none of the  
40 baseline covariates were significantly related to nonresponse.  
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## 47 **DISCUSSION**

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49 The present study is a follow-up of unaccompanied refugee minors with four waves of  
50 assessment from within three weeks after arrival to more than two years spent in the host  
51 country. At the group level the young asylum seekers reported high levels of psychological  
52 distress on arrival, and symptom levels that stayed relatively unchanged over time. A low  
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3 level of support during the asylum process and a negative outcome of the asylum application  
4 were associated with higher levels of psychological distress.  
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7 Determination of the legal status of the asylum seekers involved age assessment procedures,  
8 with x-rays and dental examinations for all participants in this study. This resulted in a  
9 considerable gap between self reported age and the official age estimates designated by the  
10 immigration authorities. On the basis of these examinations 55% of the asylum seekers were  
11 considered to be at least the age of 18, and thus did not achieve a UM status. They risked  
12 being moved to a facility for adults, with low levels of support and care, and limited access to  
13 education and leisure activities. Also, the likelihood of being granted asylum was related to  
14 age, as illustrated by the numbers of children and adults in our study who got refusal of their  
15 claims.  
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22 The results from our study is in agreement with other studies that have found that high-  
23 support housing, with sufficient supervision, was associated with lower levels of  
24 psychological symptoms<sup>5</sup>. Others have also described problems directly connected to the  
25 asylum process, and have registered them as components in a list of post-migration stressors<sup>9</sup>.  
26 A weakness with most of these studies, are cross-sectional designs where there are no base-  
27 line measurements. Only a few studies have repeated assessments<sup>6</sup> where problems directly  
28 connected to the asylum process, such as age-assessment procedures, lack of adequate  
29 housing, low support, etc., have been evaluated. The complexity of factors contributing to the  
30 increasing health risk, make it difficult to draw specific conclusions within the total burden of  
31 stressors.  
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40 In all studies with UM, it is likely that there will be some uncertainty concerning the  
41 participants' true chronological age<sup>3</sup>. Defined to be overage, in the present study, was not  
42 significantly related to the symptom scores at the 4 month assessment, and there was no  
43 indication that this process was stressful in itself. The age designated by the authorities,  
44 determined what type of housing and level of care that was offered during the remaining  
45 asylum-procedure. This meant that many of the participants had to live in a reception centre  
46 for adults, where they had no guardian, no school, had to cook for themselves, and budget  
47 their benefits. Our findings that this group had higher levels of psychological distress, add  
48 further evidence that living conditions in the asylum seeking period may influence the mental  
49 health of young refugees.<sup>6,9</sup> It was probably known in the community and among the youth  
50 that being categorized as an adult increased the risk of asylum refusal. This factor is  
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3 impossible to separate from the expectations associated with the placement in youth or adult  
4 reception-centres. There should be a cautious interpretation of the results because of this  
5 clustering of risk factors. It is also possible that the asylum interviews were more adversarial  
6 for those who had adverse age assessments. These interviews happened early in the asylum-  
7 trajectories, but these official age assessments may have been used to question testimonial  
8 credibility in the asylum process.  
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12 The outcome of the individual asylum applications was revealed to the asylum seekers  
13 between one and two years after the arrival, and the negative impact of refusal was as  
14 expected since several studies have found that difficulties obtaining legal residence are  
15 associated with a range of psychological problems for this group<sup>6</sup>. We also know that  
16 longitudinal studies indicate a trend towards reduction of mental health symptoms for  
17 resettled refugees over time.<sup>23</sup> In a follow-up study of 131 young refugees in Denmark, the  
18 long term effects of pre-migration adversity were mediated by a variety of factors connected  
19 to social life.<sup>24</sup> Another study suggests positive health effects upon receiving permanent  
20 residence mediated through improved living conditions.<sup>25</sup> This, in association with our  
21 findings, emphasizes the importance of a supportive post-migration environment for all  
22 refugees with pre-migratory experiences of serious trauma and human rights violations.  
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32 Strengths of our study include a longitudinal design, with first assessment within three weeks  
33 after arrival to the host country, and repeated measures. We used computer-based assessment  
34 with the same audio-translations throughout the study, and did not need to use interpreters in  
35 order to complete the psychometric measures at follow-up. Due to a random selection of  
36 participants we consider the sample to be representative for the refugees arriving to Norway  
37 in the first decade of the century. However, selection of participants was limited to the most  
38 common nationality groups arriving in Norway in this period, and may limit the  
39 generalization of our findings to refugees in general.  
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46 High attrition rate due to the fact that asylum seekers tend to move between and within  
47 countries, and that many were told to leave the country, may have biased our findings. It is  
48 also possible that our research team was not viewed as independent from the authorities, even  
49 though we stressed this fact when we informed about the project. Finally, we have no data as  
50 to whether poor mental health might have affected the likelihood of asylum. Mental health is  
51 generally not an issue in the processing of asylum applications in Norway. Also, the baseline  
52 levels of mental health did not differ between participants that later received asylum and those  
53 who did not.  
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## Implications

Our study shows that young asylum-seekers may spend considerable time in a safe Western country, without recovering from the distress they have when they arrive in the host country. A reason for the continuing psychological health problems in this non-clinical group of youth can possibly be found in the living conditions and the level of care that is provided.

Adolescence is a challenging transition-period for most people. Fleeing to a foreign country without parents or other caregivers makes this life-period even more challenging for young refugees, and puts a considerable responsibility on the receiving countries. The burden of increasing numbers of asylum-seekers challenges the political intentions of the UN Convention on the Rights of the Child (CRC) to always give precedence to “the best interest of the child”.<sup>26</sup> It is emphasized that safety and dignity in the use of medical assessments should be applied as a supplement to evaluations of the physical appearance and the psychological maturity of the child.

An important objection to the use of dental/bone-age assessments is their lack of precision, especially around the time of puberty. The tests have been criticized for their large margins of error, and their inadequacy in determining chronological age.<sup>3</sup> Professionals in various countries have differed with some doctors refusing to take part in such tests, while others have argued that these assessments are the best practice available.

Needs of vulnerable adolescents and young adults in a stressful life-situation deserve high priority and should be a main focus regardless of the outcome of age assessments.<sup>27</sup> It is noteworthy that access to psychiatric care was not evident for any of the participants although a majority of this sample had symptom levels suggesting a positive diagnosis of PTSD. This may reflect a lack of resources available for this population or reluctance to ask for health care.

In our society turning 18 is usually considered a transition point from child to adult. Yet with the limitations of the age determining process we cannot know for certain that this milestone has been reached. The consequences of this uncertainty can have legal, social and material implications.<sup>28</sup> If a child is put under difficult living-conditions, where previous human support and education is withdrawn, this can have unintended negative effects on these young individuals transitioning into adulthood. Some child protection services argue that vulnerable

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3 young adults are still in need of support and care after the age of 18<sup>29</sup>, and need to receive  
4 specialised care into their twenties.<sup>30</sup> Future studies should focus on how mental health and  
5 resilience evolve over a longer time span, and evaluate specific interventions and appropriate  
6 levels of care for young refugees.  
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14 **Acknowledgement:** Gratitude to Liv Berit Løken for her care and assistance with all aspects  
15 of the data collection. Thanks also to our very skilled interpreters, and to all the young  
16 participants.  
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20  
21 **Contributors:** M. Jakobsen has had the main responsibility for the drafting and writing of the  
22 article. Heir was, in collaboration with DeMott and Jakobsen, responsible for the literature  
23 review and the conception and design of the article. DeMott and Jakobsen has been  
24 responsible for all phases of the data collection. Data analysis and interpretation of data was  
25 done in cooperation between Jakobsen, Heir and Wentzel-Larsen. All authors have  
26 contributed to the scientific writing and proof-reading of the article. The paper has been read  
27 and approved by all authors before submission.  
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34

35 **Competing interests:** None  
36

37 **Ethics approval:** Regional Committees for Medical and Health Research Ethics.  
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39 **Data sharing statement:** No additional data are available.  
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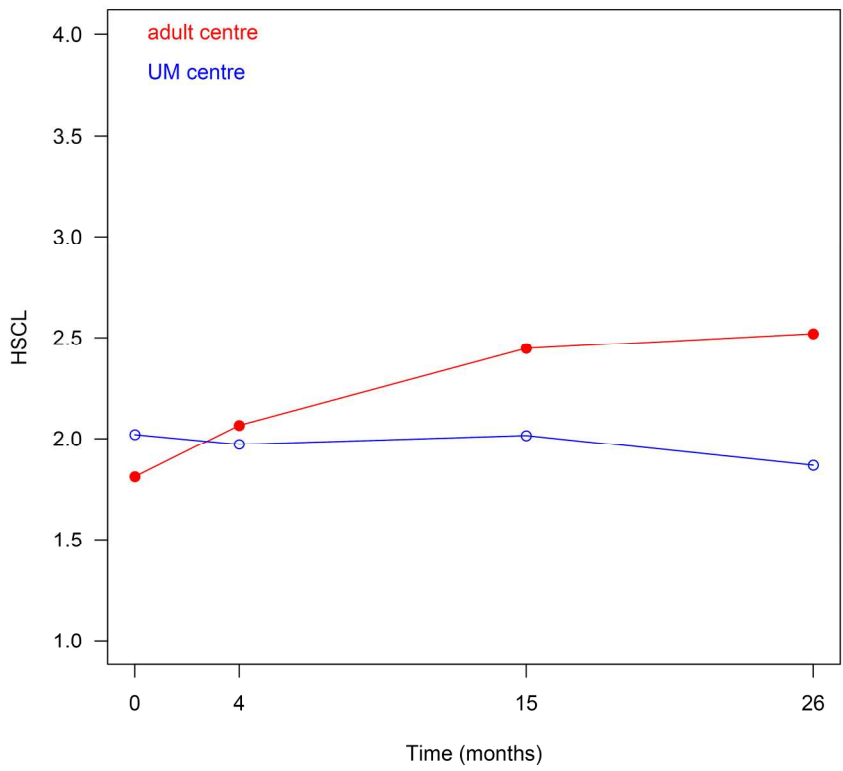
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#### Figure legends:

Fig 1. Course of psychological distress (HSCL) during follow up of asylum seekers placed in asylum centers for adults (n=38) and asylum seekers placed in asylum centers for youth (n=100).

Fig 2. Course of psychological distress (HSCL) during follow up of asylum seekers who received refusal of asylum (n=67) and asylum seekers who received residence permission or time limited asylum (n=64).

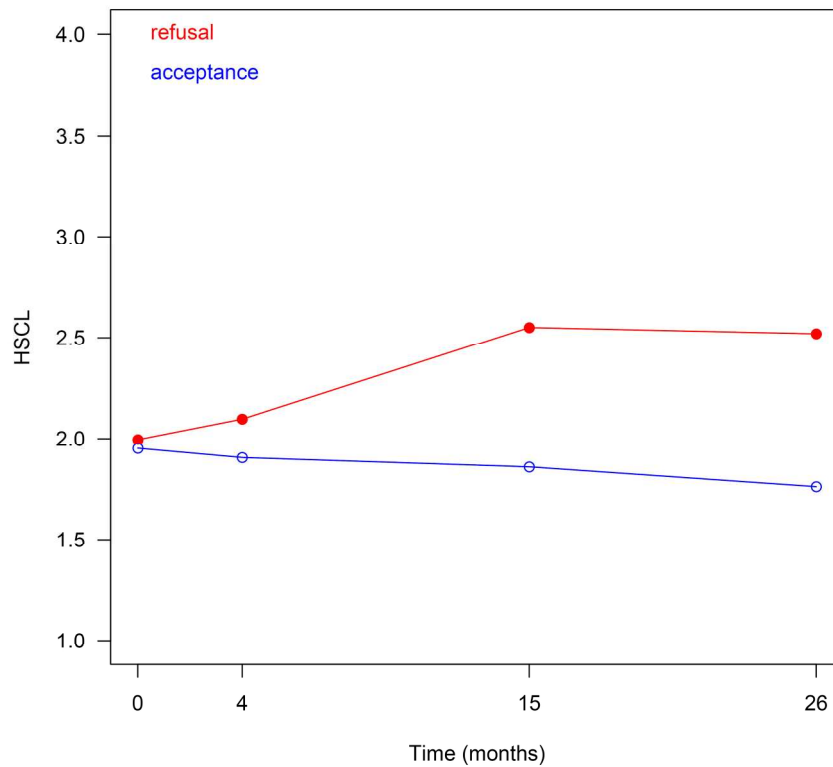
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## STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.	Relevant text from manuscript
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found		Done: Longitudinal study Done: see Abstract
<b>Introduction</b>				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3	Done: see introduction
Objectives	3	State specific objectives, including any prespecified hypotheses	4	Specified hypoth. not possible
<b>Methods</b>				
Study design	4	Present key elements of study design early in the paper	4-5	Done
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5	Done
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed	4	Done: see introduction and methods N.a.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7	Done: see methods (effect modifiers not included)
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7	Done
Bias	9	Describe any efforts to address potential sources of bias	7-8	Done: see statistical methods
Study size	10	Explain how the study size was arrived at	4	Data collection was done in collaboration with immigration authorities. The numbers were determined by new arrivals during the periods we were allowed to be at the centre.
Continued on next page				



Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8	Done: see statistical methods
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7-8	Done
		(b) Describe any methods used to examine subgroups and interactions	7-8	Done
		(c) Explain how missing data were addressed	7-8	Done.
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy		N.a.
		(e) Describe any sensitivity analyses		N.a.
<b>Results</b>				
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4	Done: see methods
		(b) Give reasons for non-participation at each stage	5	Uncertain
		(c) Consider use of a flow diagram		N.a.
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9	Done: see results and table 1
		(b) Indicate number of participants with missing data for each variable of interest		N.a.
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	5	Done: see methods
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time		Done: see tables 2-5
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure		
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures		
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-13	Done
		(b) Report category boundaries when continuous variables were categorized	6-7	Done: see table 1 and measures
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period		N.a.

Continued on next page

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses		N.a.
<b>Discussion</b>				
Key results	18	Summarise key results with reference to study objectives	9	Done
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15-16	Done
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	15-17	Done
Generalisability	21	Discuss the generalisability (external validity) of the study results	16	Done
<b>Other information</b>				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18	Done.

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

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# BMJ Open

## The impact of the asylum process on mental health: a longitudinal study of unaccompanied refugee minors in Norway

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2016-015157.R3
Article Type:	Research
Date Submitted by the Author:	08-May-2017
Complete List of Authors:	Jakobsen, Marianne; Norwegian Centre for Violence and Traumatic Stress Studies, Meyer DeMott, Melinda; Norwegian Centre for Violence and Traumatic Stress Studies Wentzel-Larsen, Tore; Norwegian Centre of Violence and Traumatic Stress Studies, Heir, Trond; Norwegian Centre for Violence and Traumatic Stress Studies; University of Oslo, Institute of Clinical Medicine
<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Mental health
Keywords:	Refugee, Adolescent, Unaccompanied minor, Follow-up study, Norway

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Manuscripts

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## ABSTRACT

**Objectives:** To examine the mental health of unaccompanied refugee minors (UM) prospectively during the asylum-seeking process, with a focus on specific stages in the asylum-process, such as age assessment, placement in a supportive or non-supportive facility, and final decision on the asylum applications.

**Design:** A two and a half year follow-up study of UM seeking asylum in Norway. Data were collected within three weeks (n=138), and at 4 months (n=101), 15 months (n=84) and 26 months (n=69) after arrival.

**Setting:** Initially in an observation and orientation centre for unaccompanied asylum-seeking adolescents, and subsequently wherever the UM were located in other refugee-facilities in Norway.

**Participants:** Male UM from Afghanistan, Somalia, Algeria and Iran.

**Main outcome measures:** Mental health symptoms assessed by Hopkins Symptom Checklist-25, and Harvard Trauma Questionnaire.

**Results:** At the group level the young asylum seekers reported high levels of psychological distress on arrival, and symptom levels that stayed relatively unchanged over time.

According to age-assessment procedures 56% of the population was not recognized as minors. Subsequent placement in a low- support facility was associated with higher levels of psychological distress in the follow-up period. Those who were placed in a reception centre for adults had higher levels of psychological distress symptoms both after 15 months and 26 months compared to the remaining participants who were placed in reception centers for youth. Refusal of asylum was highly associated with higher levels of psychological distress.

**Conclusions:** Mental health trajectory of young asylum-seekers appears to be negatively affected by low support and refusal of asylum.

### **Strengths and limitations of this study.**

x. Strengths include a longitudinal design, with first assessment within three weeks after arrival to the host country, and repeated measures.

x. Use of computer-based assessment with audio-translations throughout the study.

x. Selection of participants was limited to the most common nationality groups arriving in Norway at the time of inclusion.

x. High attrition rate due to the fact that asylum seekers tend to move between and within countries, and that many were told to leave the country.

### **INTRODUCTION**

In 2015 more than 88 700 unaccompanied minors (UM) fled to Europe<sup>1</sup>, putting considerable pressure on these countries to provide the necessary resources needed. Separated children that are no longer protected by parents or other caregivers, usually have to be under the age of 18 in order to be given the special protection and care that is granted unaccompanied refugee minors. In the countries of origin for UM the civil registration service of their country often function poorly, and birth certificates can be lost, thrown away or falsified.<sup>2</sup> The scientific basis for assessing age is controversial, in that these tests only determine physical maturity, and are most uncertain from the age of 15 to 21, where natural variation is at its greatest.<sup>3</sup> The consequences for many young asylum seekers assessed to be 18 years or older is that they will no longer be considered as minors, and therefore not receive special protection in accordance with the United Nations.<sup>2</sup>

Most studies investigating UM mental health have a cross-sectional design with a selection of youths with different levels of legal recognition and different durations of time in exile.<sup>4</sup>

These studies show consistently that individual factors such as exposure to violence and other traumatic events prior to migration, correspond to elevated symptoms of psychological distress.<sup>5</sup> In some studies the negative effects of exile related stressors are also described<sup>6</sup>, yet they focus on youths with varying time in exile. There are different asylum-procedures within the different countries<sup>7</sup>, and most UM endure some uncertainty before their legal status is defined. Most countries provide some form of shelter for UM while they are waiting for their case to be processed, but conditions vary greatly. Positive health effects have been shown to be associated with receiving a permanent residence permit<sup>8</sup>, but this process may take months

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3 and sometimes years. The impact of different levels of social support that UM are offered,  
4 especially after the first stage of reception and registration, have not been studied in detail.<sup>9</sup>  
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7 The aim of our study was to examine UM's mental health during the asylum-seeking process,  
8 and more specifically whether the official age assessed, level of support, and the outcome of  
9 the asylum application were associated with UM's mental health at different stages of the  
10 asylum seeking process.  
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## 14 15 16 17 18 19 20 21 **METHODS** 22

### 23 24 25 26 **Participants and procedures** 27

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32 The sample in this study was recruited from an asylum reception centre for unaccompanied  
33 asylum-seeking adolescents between ages 15 and 18 years, which was the only one in Norway  
34 at this time. In this reception centre, all UMs who claimed to be in this age group stayed for  
35 the first weeks while asylum interviews and age-assessment procedures were performed. A  
36 research assistant kept track of all new arrivals, and each time our testing capacity allowed us  
37 to include some new participants, she was instructed to invite the ones who had arrived most  
38 recently. The study was conducted between September 2009 and March 2011. Altogether, the  
39 inclusion periods for this project were 12 weeks in 2009, 8 weeks in 2010, and 21 weeks in  
40 2011. During these time periods young asylum seekers came mainly from Afghanistan and  
41 Somalia. According to the statistics unit at the Norwegian Directorate of Immigration, 406  
42 male UM from these language groups arrived in Norway during the inclusion periods.  
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45 Unaccompanied males that had just arrived were contacted by the research assistant.  
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47 Altogether, 216 adolescents were asked to participate, and 209 returned the informed consent  
48 and attended the study. Some participants were included in an Expressive Arts intervention  
49 group (n=71), that is not part of the present study. The remaining 138 are the focus of this  
50 article. Inclusion in the intervention-group was based on a randomizing –procedure shortly  
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3 after arrival in Norway. The participants in the present article were not significantly different  
4 from the intervention group in any baseline characteristics ( $p \geq .071$ ).  
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7 More about the whole project can be found on our home pages<sup>10</sup>.  
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10 Information to participants included statements that participation would not impact the  
11 chances to stay in the country. Only one contact attempt was made for each individual, and no  
12 payment was offered.  
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15 Participants followed the normal procedures in the asylum process. In Norway all UMs  
16 receive assistance from a multi-disciplinary professional staff (educators, social workers,  
17 psychologists, physicians, and nurses) in the first reception centre while waiting for their  
18 “official-age” to be assigned. Those defined as 18 or older can be moved to adult housing  
19 where less professional assistance is provided. The asylum-seekers considered to be from 15  
20 to 18 years are moved to specialized youth centres, with staff available 24 hours, every day.  
21 The youngest children stay in even more specialized orphanages. There are some exceptions  
22 to this pattern, according to variable housing capacity some 18-year old asylum-seekers are  
23 allowed to stay in the youth centres for some time. The youth centres are located all over  
24 Norway, and have language classes for all inhabitants. Food is prepared and served by the  
25 staff, and there are staff members available day and night. Most centres have recreational  
26 activities, and they give individualised support and medical follow-up if needed. In an adult  
27 centre, the asylum-seekers are left to themselves most of the time. They buy and cook their  
28 own food, have no school or other scheduled activities, and have no guardians or staff  
29 members to ask for advice.  
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41 The first screening procedure was conducted within the first three weeks, and later repeated at  
42 4 months ( $n=101$ ), 15 months ( $n=84$ ) and 26 months ( $n=69$ ) after arrival. At the last  
43 assessment the population was almost halved, mainly because many of the informants were  
44 transported out of the country, or had disappeared from the different living facilities. The  
45 participants who were deported were mostly individuals who had been registered as asylum-  
46 seekers in another European country before coming to Norway, or individuals suspected of  
47 having some connection to illegal activities. The ones who deflected were typically those who  
48 feared deportation after their asylum-applications were turned down. It was, however,  
49 impossible to obtain exact numbers and reasons for the attrition in this project. When we  
50 compared those who have completed all four assessments with those who missed out at one occasion  
51 or more, there were no significant differences in any baseline demographic or symptom variables.  
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## Measures

Demographic data was registered with the aid of interpreters at the initial assessment. We asked for self-reported age, literacy, years of school attendance, and whether their parents were still alive, deceased, or if participants had lost touch with their parents and did not know. Later we registered the results of official age-assessments, especially which participants who were thought to be at least 18 years of age. We also determined the level of care offered according to placement in asylum centres for either adults or for youth. Before the last assessment we registered the legal status, as participants were either given time-limited or permanent permission to stay, or were refused legal residence in the country. New variables of interest such as level of care and legal status were included when they occurred prior to a new assessment.

## Exposure

Serious Life Events checklist (SLE) was developed by Tammy Bean and colleagues<sup>11</sup> in order to assess if an adolescent meet the criteria A1 (experienced a traumatic event) in the DSM-IV, for a diagnosis of PTSD. It is a self-report questionnaire which asks whether or not the participant has experienced twelve different kinds of traumatic events, such as separation from family, natural disaster, war and physical or sexual abuse. The instrument was scored by answering yes or no on each item.

## Psychological distress

Hopkins Symptom Checklist-25 (HSCL-25)<sup>12</sup> is a self-administered questionnaire designed to measure anxiety and depression. It has been validated in various clinical and community samples.<sup>13,14</sup> The HSCL-37 A version is an extension of the HSCL-25, and has also been applied in a number of refugee studies with minors.<sup>15,16</sup> The additional 12 items measuring externalizing behavior are not included in this paper. Each item was scored with 1 (not bothered) to 4 (extremely bothered). Scores  $\geq 2.0$  was considered probably clinically significant.<sup>17</sup>

### Post Traumatic Symptom Score (PTSS)

The Harvard Trauma Questionnaire<sup>18</sup> is a comprehensive instrument that was developed to assess potentially traumatic experiences and post-traumatic symptoms in various cultural contexts. Its psychometric properties were first established in a highly traumatized, clinical population, but it has also been evaluated with a larger community sample, and with asylum seeking adolescents<sup>6,19</sup>. The HTQ part IV, comprises 30 symptom items, among which the first 16 items measure “The symptoms of PTSD” according to the DSM–IV.<sup>20</sup> These 16 items are scored with 1 (not at all) to 4 (extremely). Scores  $\geq 2.0$  was considered probably clinically significant.<sup>17</sup>

### Computer-based assessment

The chosen psychometric measurements were combined into a single questionnaire using the program MultiCASI<sup>21</sup>. The questionnaires were filled in by the participants themselves, in their native languages, Dari, Pashto, Farsi or Somali, using laptops with touch-screen function. Translations had been attained from earlier projects, and were controlled by independent, native speaking, interpreters before they were added to the questionnaire. The items appeared one after the other on the screen, together with answering alternatives. All text had a sound-file connected to it that started as soon as the item appeared on the screen. The test could be used with any level of reading competence, and the sound of each item could be activated by touch, as many times as necessary. Items could be skipped and left unanswered, but would then be repeated once more towards the end of the questionnaire. The first introduction to the computer based self-screening was done shortly after arrival, with one language group at the time. An interpreter was present together with maximum five participants, as they were instructed in how to use the touch screen. They were encouraged to ask clarifying questions as they went on with answering the items, all in the same room, with earphones on, in order not to disturb each other. During the following waves of data collection the same questionnaire was used and translating services were not necessary. The results were transported digitally to the SPSS files.

### Data analysis

Differences in HSCL and PTSS between 0, 4, 15 and 26 months were assessed by linear mixed effects models by categorical time, including an inter-individual random effect.

Relationships between HSCL, and PTSS at each time point  $\geq 4$  months and characteristics known at that time point were assessed by unadjusted and linear regression. Specifically, covariates were being literate, parents deceased, number of adverse events and age assessed as  $\geq 18$  years at 4 months. At 15 months, being placed in a reception center for adults or youth, was included, and at 26 months also asylum status; permanent, time limited or refusal of asylum. Due to a low number of missing values in the independent variables in the regression analyses (at most 3 missing values on any independent variable) complete case analysis was considered appropriate. Nonresponse analysis during follow up (4 to 26 months) used a generalized estimating equations (GEE) logistic regression by time and baseline HSCL score, reading ability, category for parents alive and number of serious life events. For descriptive analyses we used the SPSS version 22 for Windows. Beyond this, data was analyzed using R (The R Foundation for Statistical Computing, Vienna, Austria) with the R package nlme for mixed effects models and gee for GEE analyses<sup>22</sup>.

Table 1. Baseline characteristics of male unaccompanied refugee minors at arrival in Norway. Figures are given as number (%) when others not specified.

	N = 138
Age, self-reported (n=130)	
Mean years (SD)	16.22 (0.84)
Range	14 - 20
Age, assessed by authorities (n=132)	
Mean years(SD)	18.22 (2.27)
Range	15 - 27
Nationality	
Afghan	102 (73.9)
Somalian	32 (23.2)
Iranian	3 (2.2)
Algerian	1 (0.7)
Literacy, self-reported (n=136)	50 (36.8)

No loss of parent	30(21.7)
Loss of father	60(43.5)
Loss of mother	4(2.9)
Loss of both parents	25(18.5)
Unknown	16(11.9)
Psychological distress (n=131)	
Mean HSCL (SD)	1.94 (0.58)
Caseness (n $\geq$ 2.0)	29 (21.0)
Posttraumatic stress (n=133)	
Mean PTSS (SD)	2.16 (0.62)
Caseness (n $\geq$ 2.0)	81 (58.7)

## Results

Three fourths of the population came from Afghanistan, while the remaining came from Somalia and Iran (table 1). There were no significant differences between the countries of origin and the variables included in this article. A minority (36%) were able to read in their own language. Mean number of serious life-time events experienced was 6.1 (SD 2.3), range 1-11. Most of the participants (96%) had experienced at least one of the serious life events listed. The most frequently reported experiences were life threatening events (82%), physical abuse (78%), and loss of a close relative (78%). The official age assessment found a mean age of 18.4 years (SD 2.4), range 15-28, which meant that 72 (56%) participants were considered to be adults. Of this “adult” group, 36 participants were allowed to stay at the care centres for adolescents, while the rest had to move to centres for adults. None of the participants received psychiatric treatment during the study. Overall there were no significant changes in the level of symptoms within the study period ( $p \geq .084$ ), neither for HSCL (Table 2) nor for PTSS.

**Table 2. Mixed effect coefficients (MEC) for time modelling the course of psychological distress (HSCL) and posttraumatic stress (PTSS) in unaccompanied refugee minors after arrival in host country.**

	HSCL			PTSS		
	MEC	95% CI	P	MEC	95% CI	P
Time			.136			.725
4 mo vs 0 mo	0.04	-0.09, 0.16	.557	0.02	-0.12, 0.15	.811
15 mo vs 0 mo	0.14	0.01,0.27	.037	0.03	-0.11, 0.17	.671
26 mo vs 0 mo	-0.02	-0.16, 0.13	.831	-0.06	-0.21, 0.09	.441

HSCL : Hopkins symptom checklist

PTSS : Posttraumatic stress symptom checklist

Tables 3-5 show the associations between variables of interest, and symptoms of psychological distress at different test points. Outcome of age assessment, which was known shortly after the first assessment, had no significant association with psychological distress at 4 months (table 3). However, those who were estimated to be 18 years or older, had higher levels of symptoms at 15 months (table 4) and at 26 months (table 5), but not when adjusted for the outcome of the asylum-applications at the 26 month assessment.

**Table 3. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, related to course of psychological distress (HSCL) in young male asylum seekers 4 months after arrival in host country; results unadjusted and adjusted for the other variables.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.348	0.115,0.581	.004	0.262	0.006, 0.518	.045

Parents deceased			.245			.457
Unknown vs both alive	0.175	-0.232,0.581	.396	0.146	-0.254, 0.545	.472
One dead vs both alive	0.146	-0.166,0.457	.355	0.182	-0.119, 0.483	.234
Both dead vs both alive	-0.172	-0.564,0.219	.384	-0.053	-0.442, 0.337	
Adverse events	0.066	0.015,0.116	.012	0.046	-0.006, 0.098	.084
Age assessed $\geq 18$ years	0.126	-0.118,0.370	.308	0.068	-0.191, 0.326	.604

HSCL: Hopkins symptom checklist

**Table 4. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, in addition to asylum-seeker facilities, related to course of psychological distress (HSCL) in young male asylum seekers 15 months after arrival in host country; results unadjusted and adjusted for the other variables.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.054	-0.254,0.363	.727	0.008	-0.296, 0.313	.957
Parents deceased			.134			.073
Unknown vs both alive	0.240	-0.278,0.757	.359	0.346	-0.133, 0.825	.154
One dead vs both alive	0.253	-0.141,0.646	.206	0.317	-0.051, 0.684	.090
Both dead vs both alive	0.581	0.097,1.065	.019	0.626	0.157, 1.094	.010
Adverse events	0.039	-0.030,0.107	.262	0.054	-0.010, 0.119	.099
Age assessed ≥18 years	0.522	0.238,0.805	<0.001	0.375	0.058, 0.692	.021
Adult reception center	0.464	0.136,0.792	.006	0.354	0.011, 0.695	.043

HSCL: Hopkins symptom checklist

**Table 5. Regression coefficients for literacy, pre-migration bereavement, serious life-events and post-migration age assessment, asylum-seeker facilities, in addition to asylum-status, related to course of psychological distress (HSCL) in young male asylum seekers 26 months after arrival in host country; results unadjusted and adjusted for the other variables.**

	Unadjusted			Adjusted		
	Coef.	95% CI	P	Coef.	95% CI	P
Being literate	0.025	-0.305,0.355	.881	-0.040	-0.322, 0.242	.777
Parents deceased			.043			.038
Unknown vs both alive	0.591	0.021,1.162	.042	0.562	0.076, 1.047	.024
One dead vs both alive	0.261	-0.130,0.652	.187	0.384	0.049, 0.719	.025
Both dead vs both alive	0.670	0.160,1.180	.011	0.532	0.088, 0.976	.020
Adverse events	-0.059	-0.126,-0.008	.083	-0.041	-0.097,0.016	.155
Age assessed ≥18 years	0.392	0.086,0.697	.013	-0.070	-0.428, 0.288	.696
Adult reception center	0.717	0.372,1.063	<.001	0.272	-0.169,0.712	.222
Asylum status (vs acceptance)			<.001			.017
Time-limited asylum	-0.035	-0.391,0.320	.844	-0.103	-0.498, 0.292	.602
Refusal of asylum	0.787	0.402,1.172	<.001	0.590	0.122, 1.059	.015

HSCL: Hopkins symptom checklist



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3 One third of the participants were placed in a reception centre for adults. Figure 1 shows the  
4 trajectories of psychological distress for participants placed in a reception centre for adults or  
5 for youth. Those who were placed in a reception centre for adults had higher levels of  
6 psychological distress symptoms both at 15 months (table 4) and 26 months (table 5)  
7 compared to the remaining participants who were placed in reception centres for youth.  
8 However, when adjusted for the outcome of the asylum application at the 26 month  
9 assessment, the difference was not significant.  
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15 Final decision on the asylum claims was given between the last two test points. Refusal was  
16 highly associated with higher levels of psychological distress. Achieving time limited  
17 residence permission was not significantly different compared to permanent asylum (table 5).  
18 Trajectories of psychological distress for those who received refusal or acceptance of their  
19 asylum application are illustrated graphically in figure 2. Refusal was related to the official  
20 determined age of the asylum seeker. Among the participants who were considered to be 18  
21 or more, 52 out of 72(72.2%) were refused, compared to 15 out of 59(25.4%) among the  
22 participants who were considered to be under 18 (7 missing).  
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29 The symptom scores of the PTSS (not illustrated in the tables) showed a similar association as  
30 the HSCL-scores, with higher levels of PTSD-symptoms for those placed in a reception center  
31 for adults at 15 months (adjusted difference 0.34, 95% CI 0.06 to 0.63,  $p=0.017$ ), as well as  
32 higher symptom scores for those who received a negative result for the asylum application at  
33 26 months (adjusted difference 0.60, 95% CI 0.24 to 0.95,  $p=0.001$ ).  
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39 Loss to follow-up was not significantly related to initial levels of distress. Also, none of the  
40 baseline covariates were significantly related to nonresponse.  
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## 47 **DISCUSSION**

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49 The present study is a follow-up of unaccompanied refugee minors with four waves of  
50 assessment from within three weeks after arrival to more than two years spent in the host  
51 country. At the group level the young asylum seekers reported high levels of psychological  
52 distress on arrival, and symptom levels that stayed relatively unchanged over time. A low  
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3 level of support during the asylum process and a negative outcome of the asylum application  
4 were associated with higher levels of psychological distress.  
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7 Determination of the legal status of the asylum seekers involved age assessment procedures,  
8 with x-rays and dental examinations for all participants in this study. This resulted in a  
9 considerable gap between self reported age and the official age estimates designated by the  
10 immigration authorities. On the basis of these examinations 55% of the asylum seekers were  
11 considered to be at least the age of 18, and thus did not achieve a UM status. They risked  
12 being moved to a facility for adults, with low levels of support and care, and limited access to  
13 education and leisure activities. Also, the likelihood of being granted asylum was related to  
14 age, as illustrated by the numbers of children and adults in our study who got refusal of their  
15 claims.  
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23 The results from our study is in agreement with other studies that have found that high-  
24 support housing, with sufficient supervision, was associated with lower levels of  
25 psychological symptoms<sup>5</sup>. Others have also described problems directly connected to the  
26 asylum process, and have registered them as components in a list of post-migration stressors<sup>9</sup>.  
27 A weakness with most of these studies, are cross-sectional designs where there are no base-  
28 line measurements. Only a few studies have repeated assessments<sup>6</sup> where problems directly  
29 connected to the asylum process, such as age-assessment procedures, lack of adequate  
30 housing, low support, etc., have been evaluated. The complexity of factors contributing to the  
31 increasing health risk, make it difficult to draw specific conclusions within the total burden of  
32 stressors.  
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41 In all studies with UM, it is likely that there will be some uncertainty concerning the  
42 participants' true chronological age<sup>3</sup>. Defined to be overage, in the present study, was not  
43 significantly related to the symptom scores at the 4 month assessment, and there was no  
44 indication that this process was stressful in itself. The age designated by the authorities,  
45 determined what type of housing and level of care that was offered during the remaining  
46 asylum-procedure. This meant that many of the participants had to live in a reception centre  
47 for adults, where they had no guardian, no school, had to cook for themselves, and budget  
48 their benefits. Our findings that this group had higher levels of psychological distress, add  
49 further evidence that living conditions in the asylum seeking period may influence the mental  
50 health of young refugees.<sup>6,9</sup> It was probably known in the community and among the youth  
51 that being categorized as an adult increased the risk of asylum refusal. This factor is  
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3 impossible to separate from the expectations associated with the placement in youth or adult  
4 reception-centres. There should be a cautious interpretation of the results because of this  
5 clustering of risk factors. It is also possible that the asylum interviews were more adversarial  
6 for those who had adverse age assessments. These interviews happened early in the asylum-  
7 trajectories, but these official age assessments may have been used to question testimonial  
8 credibility in the asylum process.  
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12 The outcome of the individual asylum applications was revealed to the asylum seekers  
13 between one and two years after the arrival, and the negative impact of refusal was as  
14 expected since several studies have found that difficulties obtaining legal residence are  
15 associated with a range of psychological problems for this group<sup>6</sup>. We also know that  
16 longitudinal studies indicate a trend towards reduction of mental health symptoms for  
17 resettled refugees over time.<sup>23</sup> In a follow-up study of 131 young refugees in Denmark, the  
18 long term effects of pre-migration adversity were mediated by a variety of factors connected  
19 to social life.<sup>24</sup> Another study suggests positive health effects upon receiving permanent  
20 residence mediated through improved living conditions.<sup>25</sup> This, in association with our  
21 findings, emphasizes the importance of a supportive post-migration environment for all  
22 refugees with pre-migratory experiences of serious trauma and human rights violations.  
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32 Strengths of our study include a longitudinal design, with first assessment within three weeks  
33 after arrival to the host country, and repeated measures. We used computer-based assessment  
34 with the same audio-translations throughout the study, and did not need to use interpreters in  
35 order to complete the psychometric measures at follow-up. Due to a random selection of  
36 participants we consider the sample to be representative for the refugees arriving to Norway  
37 in the first decade of the century. However, selection of participants was limited to the most  
38 common nationality groups arriving in Norway in this period, and may limit the  
39 generalization of our findings to refugees in general.  
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46 High attrition rate due to the fact that asylum seekers tend to move between and within  
47 countries, and that many were told to leave the country, may have biased our findings. It is  
48 also possible that our research team was not viewed as independent from the authorities, even  
49 though we stressed this fact when we informed about the project. Finally, we have no data as  
50 to whether poor mental health might have affected the likelihood of asylum. Mental health is  
51 generally not an issue in the processing of asylum applications in Norway. Also, the baseline  
52 levels of mental health did not differ between participants that later received asylum and those  
53 who did not.  
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## Implications

Our study shows that young asylum-seekers may spend considerable time in a safe Western country, without recovering from the distress they have when they arrive in the host country. A reason for the continuing psychological health problems in this non-clinical group of youth can possibly be found in the living conditions and the level of care that is provided.

Adolescence is a challenging transition-period for most people. Fleeing to a foreign country without parents or other caregivers makes this life-period even more challenging for young refugees, and puts a considerable responsibility on the receiving countries. The burden of increasing numbers of asylum-seekers challenges the political intentions of the UN Convention on the Rights of the Child (CRC) to always give precedence to “the best interest of the child”.<sup>26</sup> It is emphasized that safety and dignity in the use of medical assessments should be applied as a supplement to evaluations of the physical appearance and the psychological maturity of the child.

An important objection to the use of dental/bone-age assessments is their lack of precision, especially around the time of puberty. The tests have been criticized for their large margins of error, and their inadequacy in determining chronological age.<sup>3</sup> Professionals in various countries have differed with some doctors refusing to take part in such tests, while others have argued that these assessments are the best practice available.

Needs of vulnerable adolescents and young adults in a stressful life-situation deserve high priority and should be a main focus regardless of the outcome of age assessments.<sup>27</sup> It is noteworthy that access to psychiatric care was not evident for any of the participants although a majority of this sample had symptom levels suggesting a positive diagnosis of PTSD. This may reflect a lack of resources available for this population or reluctance to ask for health care.

In our society turning 18 is usually considered a transition point from child to adult. Yet with the limitations of the age determining process we cannot know for certain that this milestone has been reached. The consequences of this uncertainty can have legal, social and material implications.<sup>28</sup> If a child is put under difficult living-conditions, where previous human support and education is withdrawn, this can have unintended negative effects on these young individuals transitioning into adulthood. Some child protection services argue that vulnerable

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3 young adults are still in need of support and care after the age of 18<sup>29</sup>, and need to receive  
4 specialised care into their twenties.<sup>30</sup> Future studies should focus on how mental health and  
5 resilience evolve over a longer time span, and evaluate specific interventions and appropriate  
6 levels of care for young refugees.  
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16 participants.  
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20  
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22 article. Heir was, in collaboration with DeMott and Jakobsen, responsible for the literature  
23 review and the conception and design of the article. DeMott and Jakobsen has been  
24 responsible for all phases of the data collection. Data analysis and interpretation of data was  
25 done in cooperation between Jakobsen, Heir and Wentzel-Larsen. All authors have  
26 contributed to the scientific writing and proof-reading of the article. The paper has been read  
27 and approved by all authors before submission.  
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35 **Competing interests:** None  
36

37 **Ethics approval:** Regional Committees for Medical and Health Research Ethics.  
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39 **Data sharing statement:** No additional data are available.  
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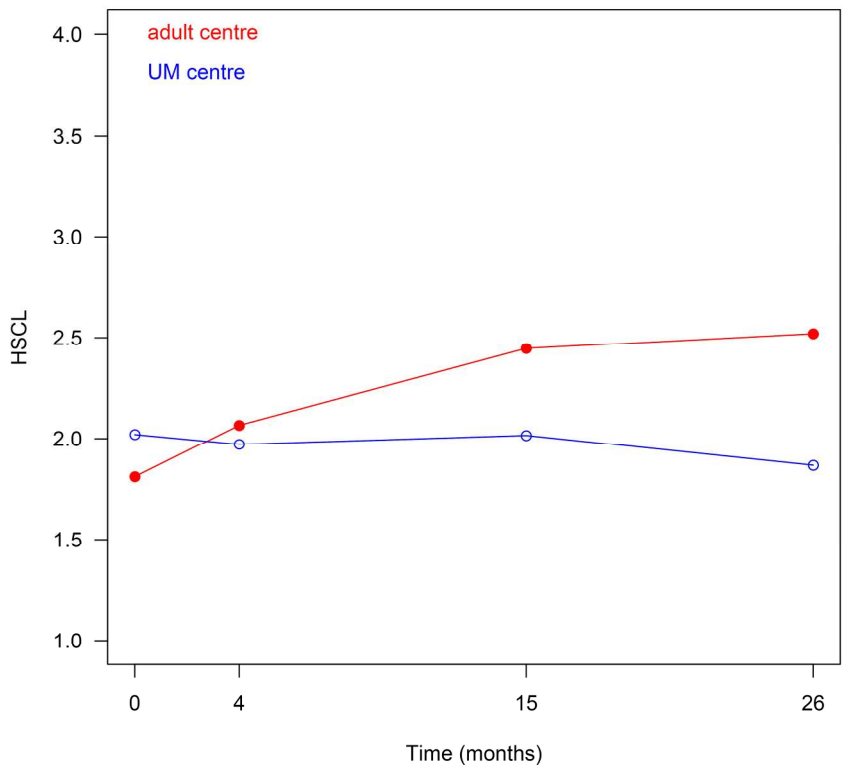
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#### Figure legends:

Fig 1. Course of psychological distress (HSCL) during follow up of asylum seekers placed in asylum centers for adults (n=38) and asylum seekers placed in asylum centers for youth (n=100).

Fig 2. Course of psychological distress (HSCL) during follow up of asylum seekers who received refusal of asylum (n=67) and asylum seekers who received residence permission or time limited asylum (n=64).

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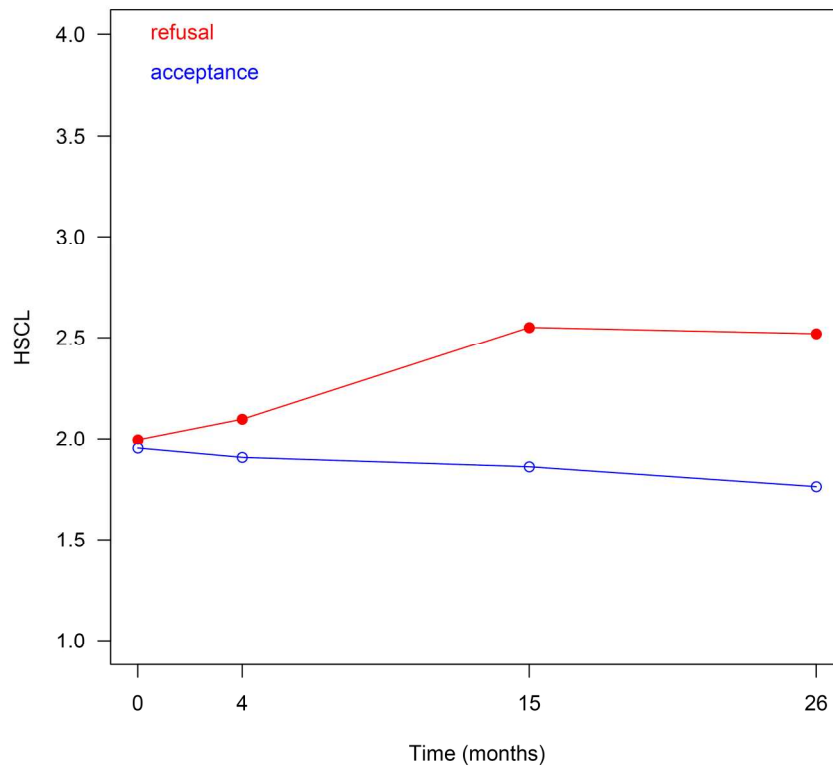


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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.	Relevant text from manuscript
<b>Title and abstract</b>	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	<u>1</u>	Done: Longitudinal study
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	<u>2</u>	Done: see Abstract
<b>Introduction</b>				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3	Done: see introduction
Objectives	3	State specific objectives, including any prespecified hypotheses	4	Specified hypoth. not possible
<b>Methods</b>				
Study design	4	Present key elements of study design early in the paper	4-5	Done
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5	Done
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	4	Done: see introduction and methods
		<i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls		
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed		N.a.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7	Done: see methods (effect modifiers not included)
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7	Done
Bias	9	Describe any efforts to address potential sources of bias	7-8	Done: see statistical methods
Study size	10	Explain how the study size was arrived at	4	Data collection was done in collaboration with immigration authorities. The numbers were determined by new arrivals during the periods we were allowed to be at the centre.

Continued on next page

Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8	Done: see statistical methods
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7-8	Done
		(b) Describe any methods used to examine subgroups and interactions	7-8	Done
		(c) Explain how missing data were addressed	7-8	Done.
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy		N.a.
		(e) Describe any sensitivity analyses		N.a.
<b>Results</b>				
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4	Done: see methods
		(b) Give reasons for non-participation at each stage	5	Uncertain
		(c) Consider use of a flow diagram		N.a.
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9	Done: see results and table 1
		(b) Indicate number of participants with missing data for each variable of interest		N.a.
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	5	Done: see methods
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time		Done: see tables 2-5
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure		<u>N.a.</u>
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures		<u>N.a.</u>
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-13	Done
		(b) Report category boundaries when continuous variables were categorized	6-7	Done: see table 1 and measures
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period		N.a.

Continued on next page

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses		N.a.
<b>Discussion</b>				
Key results	18	Summarise key results with reference to study objectives	9	Done
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15-16	Done
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	15-17	Done
Generalisability	21	Discuss the generalisability (external validity) of the study results	16	Done
<b>Other information</b>				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18	Done.

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

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