The Aral Sea disaster and self-rated health

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Abstract

This study examined the effect of psychosocial factors and environmental perceptions on self-rated health in the environmentally devastated Aral Sea area of Karakalpakstan. Self-rated health was assessed using a questionnaire on 881 randomly selected individuals from three communities. Communities were chosen based on relative differences with regards to economic and ethnic characteristics, and distance from the sea coast. Consistent with mortality rates in the area, the prevalence of ‘poor’ self-rated health was high. Factors negatively associated with self-rated health include psychosocial impacts and reported environmental concern, as well as community of residence and age. These results demonstrate that the population has a poor perception of their own health, a significant finding given that self-rated health is a strong predictor of morbidity and mortality. It is also clear that psychosocial health is strongly associated with health perceptions. Thus, to improve the overall health of this population, health remediation measures must address physical as well as psychosocial health problems.

Keywords: Self-rated health; Aral Sea; Karakalpakstan; Uzbekistan; Environmental disaster

Introduction

Beginning in the 1950s, the Soviets developed and successfully implemented plans for the massive expansion of cotton production in the Aral Sea area (Fig. 1), making it one of the biggest cotton producing areas in the world. This success was made possible through the construction of thousands of kilometers of irrigation canals and the diversion of the waters of the Syr Darya and the Amu Darya rivers away from the Aral Sea. As a result, the Aral Sea, once the fourth largest inland body of water in the world, has been steadily decreasing in size. Today, the sea covers just over a third of the area it covered in 1960 and the salinity of the sea water has risen from 10 g/l to approximately 35 g/l, a level comparable to that of the world’s oceans (Glantz, 1999; Glazovsky, 1995). Salinisation of agricultural land resulting from over irrigation as well as the wind transport of salts from the exposed seabed compounds the environmental problems (Micklin, 1994; Smith, 1991). Glazovsky (1995) reported that an estimated 77% of irrigated land in Karakalpakstan is salinised to a moderate or extreme degree, severely reducing agricultural productivity. Concomitantly, years of chemical dependent agricultural practices have resulted in high levels of pesticides, fertilizers and defoliants in the air, land, water and food chain (Glantz, 1999; Krutov, 1999). According to Glazovsky (1995), up to 54 kg/ha of...
pesticides were used in the Aral Sea basin compared to an average of 3 kg/ha in the former USSR. In a recent study, O’Hara and colleagues (2000) found that airborne dust deposition rates are among the highest in the world, dust found to have high concentrations of organophosphate phosalone and other toxins related to regional agricultural practices.

A wide range of physiological health problems have been reported in the Aral Sea area’s population (Elpiner, 1999; Frost, 1997; Reynolds, 1996). Although good health data is scarce and prevalence estimates may vary, the seriousness of the overall problem is clear. Infant mortality rates are reported to be 60/1000 (Elpiner, 1999) to 90/1000 (McKee and Curtin, 1996) in Karakalpakstan as a whole and as high as 110/1000 in specific areas (Glazovsky, 1995), compared to 48/1000 in Uzbekistan, 24/1000 in Russia and 6/1000 in Canada (World Health Organisation (WHO), 2000). Renal diseases, tuberculosis, typhoid, acute respiratory illness and diarrheal disease are amongst the many health problems faced by the region’s population (Elpiner, 1999; Frost, 1997; Morse, 1994). Although associations between these health problems and the continuing deterioration of the environment are often suggested and indeed makes intuitive sense, much of this is speculative as only descriptive evidence is available to support these assertions (DHS (Demographic and Health Surveys) Macro International Inc. and The Institute of Obstetrics and Gynecology (Uzbekistan), 1997; Frost, 1997; Giebel et al., 1998; Morse, 1994). Few studies have attempted to demonstrate links between the region’s environmental problems and health status with the exception of two studies which demonstrated body burdens of PCB, DDT and organochlorine residues at levels consistent with ongoing DDT and other chemical exposures in the Aralsk region of Kazakhstan (Hooper et al., 1997; Jensen et al., 1997; Zetterstrom, 1999).

Médecins Sans Frontières (MSF) began working in the Aral Sea area in 1997 out of concern for the health of the population affected by the environmental disaster. An initial health assessment in Karakalpakstan (Fig. 1), the area believed to be the most affected by the disaster, indicated a number of acute health problems that required attention in the short term; these included extremely high rates of tuberculosis and anaemia (Médecins San Frontières (MSF), 1999). However, the
lack of understanding of the underlying causes of poor health could not be ignored. While providing medical support to local hospitals and clinics, MSF began to conduct operational research in order to scope out a research agenda for long-term investigation of the environmental disaster and associated social, economic and human health impacts.

A significant component of the operational research to date has been the investigation of psychosocial health and well-being in the region (Crighton et al., 2002). As such, MSF researchers documented self-reported health status and its determinants in three communities (Muynak, Kungrad and Shumanay; Fig. 1) in the Aral Sea region. The findings, reported below, demonstrate how this population has been impacted by this environmental disaster.

A conventional method for measuring health in a general population is to ask individuals to rate their own health on a scale ranging from ‘poor’ to ‘excellent’ (Department of Health, 1998; National Opinion Research Center (NORC), 1998; Statistics Canada, 1998). This method of measuring health status in a population has been shown to be relatively easy to measure, insensitive to semantic variations in the questions, and a highly accurate predictor of mortality and morbidity (Idler and Benyamini, 1997; Kaplan et al., 1996). In a review of 27 community studies comparing self-rated health and mortality (Idler and Benyamini, 1997, p. 26) found that “in all but four of the 27 studies, self-rated health holds an independent effect when all covariates are entered”. Also, the results almost always show “a dose response pattern such that the probability of death is highest for the category of extreme ‘poor’ health, less for ‘fair’ health, and so on”. Although never tested in the Karakalpak context, the self-rated health measure has been found to be a reliable tool within a wide range of European, Asian and North American cultural and social contexts (Carlson, 1998, 2000; Idler and Benyamini, 1997; Jylha et al., 1998; Power et al., 1998). It was anticipated, therefore, that it would be a useful measure in this context as well.

A variety of subjective and objective issues are considered by respondents when asked to report self-rated health (Carlson, 2000). These range from the presence or absence of illness, the duration and severity of symptoms, as well as a variety of other circumstances such as life-style, and mental and physical fitness. As such, the self-rated health measure is seen as addressing health from a broad perspective similar to that adopted by the World Health Organisation (World Health Organisation (WHO), 1948) where health is defined as: “a state of complete physical, mental, and social well-being and not merely the absence of disease or injury”.

Recent studies have demonstrated the importance of social and economic factors in determining self-rated health. In a 25 country study in Eastern and Western Europe, Carlson (1998) found that income and level of life control were the most important determinants of self-rated health. Similarly, Bobak et al. (1998), in a Russian national study, reported that the break-up of the Soviet Union and the associated social disruption (i.e. the collapse of social institutions and informal social networks) has resulted in a perceived loss of control and, in turn, has had significant health impacts. Also, recent research has concluded that higher education is inversely correlated with self-rated health (Bobak et al., 1998; Carlson, 2000; Kennedy et al., 1998). Lower education commonly means fewer opportunities for employment, lower income, a less healthy lifestyle, increased stress and fewer coping skills. Other studies of US and European populations have found that age is inversely related to self-rated health and that women commonly report lower self-rated health than men (Fernandez de la Hoz and Leon, 1996; Kawachi et al., 1999; Power et al., 1998).

As part of a larger research program examining psychosocial impacts associated with the Aral Sea disaster, the results reported in this paper focus on self-reported health status and its determinants in a Karakalpak population. To date, little health research of any type has been done in the Aral Sea area and no research has examined the possible impacts that the region’s environmental problems have had on self-rated health. The larger study revealed that psychosocial impacts in the Karakalpak population, as measured using the somatic symptom checklist of the Symptom Checklist 90 (SCL-90), were significant (48% of respondents reported SCL-90 scores above the cut-point score indicating a probable case of emotional distress manifest in somatic symptoms (Derogatis et al., 1973) and were found to be closely associated with environmental concerns and environment-related health concerns. Given the importance of psychosocial health as a component of overall health (World Health Organisation (WHO), 1999), it was expected that self-rated health status would be low and associated with psychosocial factors.

Methods

A cross-sectional parallel case study design was used to investigate the relationships between self-reported health and perceived environmental exposures, measures of psychosocial impacts, as well as socio-demographic factors. Given the exploratory nature of this research, study communities were selected to maximise site differences. Site selection considerations included distance from the former shore of the Aral Sea, ethnic composition and economic base, and urban/rural characteristics. Distance from the Sea was a consideration because it was thought that distance might lead to
differential (perceived) exposure, and hence evoke different responses. Sites were also selected based on the availability of accurate population lists for sampling. An attempt was also made to select communities where MSF had a working presence, and where trust had been gained among the population so as to maximise participation in the study and at the same time contribute to presently existing MSF data. The three study communities were located in Shumanay, Kungrad and Muynak districts (Fig. 1).

The study location in Shumanay, located furthest from the Aral Sea, is made up of six health administration areas called FAPs in Duslyk Bairogy collective farm, all of which are sparsely populated, rural, and have few services. Agricultural work is the principal occupation here. Shumanay is located near the Turkmenistan border and subsequently has a large Turkmen population (Table 1). The site in Kungrad is comprised of several FAPs in Kungrad New Town which is relatively modern and Russian in its appearance. It is a densely populated urban area with an economy based on agriculture, industry and civic administration. The Muynak sites, located closest to the former sea coast, are comprised of three collective farms, Porlatau, Shegerlyk, and Uchsay, which correspond to FAP administrative areas. The economies are based largely on farming or fishing (Porlatau, for example, is located near a large lake). Uchsay is located on the former banks of the Aral Sea, whereas the other two are located approximately 20 km to the South. The disappearance of the Aral Sea, which began in the early 1960s, most obviously affected Muynak district, as Muynak was inherently dependent on the sea for food, jobs transportation and recreation. This is demonstrated by the disappearance of the Aral Sea fishing industry, the regular closures of the fish packing plant as well as by the mass out-migration of residents from the district between 1960 and 1970 when the population fell from 30,100 to 21,600 (Muynak Rayon statistics, 1999).

An interviewer-administered questionnaire was conducted in the three communities. The questionnaire (based on Elliott, 1992) consisted of five sections: (1) individual perceptions and attitudes of the region and its environmental status; (2) the role of social support networks (families, neighbours, institutions, etc.) in coping with the environmental disaster; (3) standardised measures of psychosocial health and well-being including the General Health Questionnaire (GHQ-20; Goldberg, 1972), the somatic symptom checklist (SCL-90; Derogatis et al., 1973), and a subset of items from the Critical Life Events Scale (Holmes and Rahe, 1967); (4) a combination of closed and open-ended questions to assess individuals’ concerns, health experiences, and perceptions of attribution (i.e. links between environment and health status); and (5) standard socio-demographic variables as a check on the representativeness of the sample as well as for use in the subsequent bivariate and multivariate analyses.

The major outcome measure, self-rated health status, was measured in terms of responses to the question: “compared to other people your own age, would you say that your health is excellent, very good, good, fair or poor?” Following the method used in several recent studies (Carlson, 2000; Kawachi et al., 1999; Kennedy et al., 1998) the variables were dichotomised: categories “very good” and “good”, were collapsed as ‘good’; “fair” and “poor” were collapsed as “poor” (no respondents in this study reported “excellent” health). The questionnaire was translated from English into Karakalpak and Russian, and back-translated into English prior to administration to the local population by interviewers from the Karakalpak Branch of the Academy of Science.

A sample of 1118 individuals (aged 18 and above) across the three study communities was randomly drawn from population lists. The lists included all people within their administrative jurisdictions. The sample represented approximately 5% of the adult population

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Shumanay (n = 301)</th>
<th>Kungrad (n = 273)</th>
<th>Muynak (n = 307)</th>
<th>All sites (n = 881)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Female</td>
<td>52</td>
<td>55</td>
<td>56</td>
<td>54</td>
</tr>
<tr>
<td>Mean age</td>
<td>39</td>
<td>39</td>
<td>38</td>
<td>39</td>
</tr>
<tr>
<td>Mean #/household</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
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<tr>
<td>% households w/</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Children &lt;5 years*</td>
<td>50</td>
<td>51</td>
<td>59</td>
<td>53</td>
</tr>
<tr>
<td>Mean # years living in area</td>
<td>29</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Ethnicity***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Karakalpak</td>
<td>26</td>
<td>22</td>
<td>52</td>
<td>34</td>
</tr>
<tr>
<td>% Kazakh</td>
<td>7</td>
<td>42</td>
<td>47</td>
<td>32</td>
</tr>
<tr>
<td>% Uzbek</td>
<td>25</td>
<td>34</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>% Turkmen</td>
<td>41</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>% Completed intermediate education Employment status***</td>
<td>70</td>
<td>84</td>
<td>80</td>
<td>78</td>
</tr>
<tr>
<td>% Full time</td>
<td>50</td>
<td>37</td>
<td>37</td>
<td>41</td>
</tr>
<tr>
<td>% Unemployed</td>
<td>7</td>
<td>26</td>
<td>33</td>
<td>22</td>
</tr>
<tr>
<td>% Reporting being ‘always able to make ends meet’***</td>
<td>19</td>
<td>26</td>
<td>10</td>
<td>18</td>
</tr>
</tbody>
</table>

*p-Value<0.05; **p-value<0.01; ***p-value<0.001.
of the selected communities. Potential respondents were visited up to three times in order to maximise the chances of finding them at home or at a convenient time to participate in the survey. Interviews took approximately 45 min to conduct. Between May and June, 1999, 881 interviews were completed representing response rates of 80% (Shumanay), 74% (Kungrad) and 83% (Muynak); the average response rate for the entire sample was 79%. Interviws were conducted in either Karakalpak or Russian by specially trained researchers from the Karakalpak Academy of Science.

The samples included 54% females and differed little with regards to mean age, family size, or length of time living in the area (Table 1). Variation regarding ethnic composition between sites was found, the most notable being the large Turkmen population in Shumanay and the large Kazakh populations in Muynak and Kungrad. Differences in ethnic composition by site were expected given the recognised geographic variation in ethnic distribution existing in Karakalpakstan (Frost, 1997), and the relative location of the three sites to Turkmenistan and Kazakhstan (Fig. 1). Respondents in Shumanay were least likely to have completed intermediate education, while Muynak respondents were most likely to report having children in their home < 5 years old, be unemployed and unable to make ends meet. The high reported rate of unemployment and inability to make ends meet in Muynak can likely be attributed to the decimation of the fishing industry following the retreat of the sea.

The sample profile is similar to UNDP data with regards to age, gender and ethnic composition, with the exception that Turkmen are slightly over represented and Uzbeks are slightly under represented (United Nations Development Program (UNDP), 1996).

Logistic regression models were generated by site, and for all three sites combined. Models were run using a forward stepwise selection algorithm. Variables were determined to contribute to the model if the significance level for the Wald inclusion test statistic was at or below 0.05. Due to its a priori importance, the site variable (proxy measure of exposure) was forced into the combined site model regardless of its contribution. Independent variables used in the analysis include individual characteristics, exposure (as determined by distance from the Aral Sea), social network characteristics, health and well-being variables, and perceptions of the disaster.

**Results**

The majority of respondents reported their health to be either fair (43%) or good (44%), with 12% reporting poor health and only 1% reporting very good health (Table 2). No one reported excellent health. There were no statistically significant differences in self-rated health found between sites (chi-square test: p = 0.06).

The logistic regression model self-rated health for the Shumanay site (Table 3) had a $\rho^2$ of 0.15. The positive predictive value of this model was 71% and the negative predictive value was 67%. The model had a specificity of 66% and a sensitivity of 72%, and correctly classified 69% of respondents. Based on the significant single effects in the model, Shumanay respondents were more likely to rate their health as ‘poor’ if they had an intermediate or higher level of education, scored above cut-point on the SCL-90, and were concerned about the region’s environmental problems. Of particular importance in this model is the strong negative relationship between the SCL-90 score (an indicator of emotional distress) and the outcome variable.

The model self-rated health for Kungrad had a $\rho^2$ of 0.19. The positive predictive value of this model was 78% and the negative predictive value was 67%. This model had a specificity of 74% and a sensitivity of 72%, and correctly classified 73% of respondents. Kungrad respondents were more likely found to rate their health as ‘poor’ if they had an intermediate or higher level of education, scored above the SCL-90 general cut-point, and were concerned about the region’s environmental problems.

The model self-rated health for the Muynak site had a $\rho^2$ of 0.26. The positive predictive value was 76% and the negative predictive value was 69%. The model had a specificity of 71% and sensitivity of 75%, and correctly classified 73% of respondents. Muynak respondents were more likely to report ‘poor’ health if they were older, scored above the SCL-90 cut-point, reported experiencing more stressful life events, and had a moderate to extreme level of environment-related health concern. Those living in the area longer or those who reported that their health had been influenced by the

<table>
<thead>
<tr>
<th>Rating</th>
<th>Shumanay (n = 301)</th>
<th>Kungrad (n = 272)</th>
<th>Muynak (n = 307)</th>
<th>All sites (n = 880)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># (%)</td>
<td># (%)</td>
<td># (%)</td>
<td># (%)</td>
</tr>
<tr>
<td>Excellent</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Very good</td>
<td>8 (3)</td>
<td>3 (1)</td>
<td>1 (0)</td>
<td>12 (1)</td>
</tr>
<tr>
<td>Good</td>
<td>127 (42)</td>
<td>126 (46)</td>
<td>138 (45)</td>
<td>391 (44)</td>
</tr>
<tr>
<td>Fair</td>
<td>140 (47)</td>
<td>111 (41)</td>
<td>125 (41)</td>
<td>376 (43)</td>
</tr>
<tr>
<td>Poor</td>
<td>26 (9)</td>
<td>32 (12)</td>
<td>43 (14)</td>
<td>101 (12)</td>
</tr>
<tr>
<td>Total</td>
<td>301 (100)</td>
<td>272 (100)</td>
<td>307 (100)</td>
<td>880 (100)</td>
</tr>
</tbody>
</table>

*Deviations from the total (n = 881) caused by the exclusion from analysis of cases with missing data on characteristics concerned

\[ p-value < 0.05; **p-value < 0.01; ***p-value < 0.001. \]
environmental problems were less likely to report ‘poor’ health. Again a strong negative relationship is seen between SCL-90 scores and self-rated health; that is, those scoring above the cut-point on the SCL-90 are more likely to report lower self-rated health status.

The combined model of self-rated health (Table 3) had a $\rho^2$ of 0.19. The positive predictive value of this model was 73% and the negative predictive value was 69%. The model had a specificity of 69% and a sensitivity of 74%, and correctly classified 71% of respondents. Respondents were more likely to report ‘poor’ health if they lived in Shumanay rather than Muynak, were older, had an intermediate level of education or higher, had someone that they could count on to help them when they have problems, scored above the SCL-90 cut-point, had experienced more stressful life events and were concerned about the region’s environmental problems. The significant interaction effects in the model indicate that respondents were less likely to report ‘poor’ health if they were older and had environmental concerns.

**Discussion**

This research has uncovered several important findings regarding the level of self-rated health and its determinants within the Karakalpak environmental and cultural context. First, consistent with mortality rates in the Aral Sea area (United Nations Development Program (UNDP), 1996), the prevalence of ‘poor’ self-rated health is high. Second, psychosocial health (as indicated by the SCL-90 scores) and reported environmental concern were found to be negatively associated with self-rated health. Also, contrary to expectations, negative associations between relative distance of the study sites from the Aral Sea and self-rated health were found.

In the Karakalpak sample, over half of the respondents reported that their health was either ‘fair’ or ‘poor’
This finding contrasts those of studies done in Western nations (Fernandez de la Hoz and Leon, 1996; Health and Welfare Canada, 1987; Kawachi et al., 1999; Kennedy et al., 1998). In Canada, for example, a national health survey revealed that 88% of respondents reported their health to be between ‘excellent’ and ‘good’ and only 12% reported their health to be ‘fair’ or ‘poor’ (Health and Welfare Canada, 1987). This contrast is not entirely a surprise given the desperate socioeconomic, health-care and environmental circumstances in Karakalpakstan relative to Canada.

Self-rated health conditions in Karakalpakstan are comparable to those of Russia, and several Eastern and Central European countries (Bobak et al., 1998; Carlson, 2000; Nazarova, 2000). The poor status of the latter is reported to be largely the result of factors associated with the social and economic transition that these countries have been experiencing over the past decade (Bobak et al., 2000; Carlson, 2000). Karakalpakstan, however, is experiencing a similar transition and, in addition, is facing a multitude of extreme environmental problems. Yet self-rated health status is at a level similar to countries where no comparable environmental problems exist. A possible explanation for this difference rests in the strong informal social networks which exist in Karakalpak society. It is frequently reported that social support has a positive effect on health (Bertazzi et al., 1989; Carlson, 1998; Lepore, 1997; Welin et al., 1985). Results from the larger psychosocial study (Crighton et al., 2002) revealed that approximately 80% of respondents speak to their neighbours on a daily basis and 70% help or receive help from the neighbours more than twice a week, suggesting a high level of informal social capital. The importance of social capital is demonstrated in this study by the finding that in the combined model, individuals who reported ‘having someone to help them’ when they need it, were two times less likely to report poor self-rated health than those without (Table 3).

Emotional distress as measured with the somatic symptom checklist of the SCL (Derogatis et al., 1973) was found to be a highly significant factor negatively affecting self-rated health in each of the four models. In Muynak, for example, individuals scoring above the cut-point were almost eight times more likely to report ‘poor’ health compared to those who scored below the cut-point. This finding is consistent with past studies which revealed that psychosocial factors are significant determinants of poor self-rated health (Bobak et al., 1998; Power et al., 1998). The explanatory variable ‘environmental concern’ was similarly found in the combined model to be a highly significant factor associated with self-rated health. Individuals reporting environmental concern were approximately five times more likely to report poor health than those not reporting environmental concern. Although the descriptive analysis revealed no significant differences between sites with regards to levels of self-rated health, when all covariates were controlled for in the combined sites model (Table 3), it was found the Shumanay respondents were over five times more likely than Muynak respondents to report ‘poor’ health. Given the close proximity of Muynak to the former Seacoast and the dramatic impact that its disappearance has had, it was expected that the prevalence of poor self-rated health would be greatest there. This, however, was not found to be the case. A possible explanation for this finding may be the mass out-migration which occurred in the Muynak region between 1960 and 1970, the period when the sea began receding from the Muynak shores. As an action such as moving is believed to be an important indicator of psychosocial impacts (Elliott, 1992) and indirectly self-rated health (Skinner, 1996), it may be hypothesised that many of those most affected by the environmental problems migrated out, leaving behind a somewhat less concerned and less impacted population. Also, given that environmental problems have likely been noticeable in Muynak for a longer time than in other areas, it could be argued that Muynak residents have had more time to adapt to the new conditions and psychosocial impacts have diminished. In other words, site may be a proxy for temporality: the population living furthest away (i.e. Shumanay residents) have experienced environmental problems for the least amount of time and therefore have had the least amount of time to adapt. A further possible explanation may be that environmental problems are actually worse in Shumanay than in Muynak although there is no evidence to suggest this.

Previous studies have consistently reported that increased education has a positive effect on self-reported health (Appels et al., 1996; Bobak et al., 2000; Carlson, 2000; Nazarova, 2000; Power et al., 1998). According to Carlson (2000, p. 1366) “lower education will be accompanied by worse jobs, a higher risk of unemployment, less material prosperity, which in turn create tensions in the family and finally result in poor health”. Although this may be true, it was revealed in this population that increased education, in fact, increased the likelihood of reporting poor health. A possible explanation for this finding may have to do with the positive relationship which exists between education and awareness about region’s environmental problems. Although most people living in Karakalpakstan are well aware of their local environmental problems, better educated individuals are more aware and more concerned (Crighton et al., 2002) and thereby face greater psychosocial impacts and worse health.

The limitations of the study must also be noted. Firstly, the causal relationship of self-rated health to the environmental disaster or other factors cannot be established with certainty due to the cross-sectional
nature of the analysis. Longitudinal research is required to minimise this problem in the future. Secondly, uncertainty exists as to whether results can be generalised across the Republic given that the sample was drawn from only three areas in Karakalpakstan. Attempts to minimise this uncertainty included the use of a relatively large, geographically and ethnically mixed sample. Finally, the self-rated health measure and standardised psychosocial health measures have not been validated in the cultural context of Karakalpakstan or Central Asia. The lack of appropriate reference values makes it difficult to interpret our findings. Nevertheless, in the case of the self-rated health measure, the consistency between the high rate of ‘poor’ self-rated health and the region’s high mortality rate (United Nations Development Program (UNDP), 1996) supports the validity of this indicator as a reflection of more objective health measures. Results revealed that the SCL-90 was also a useful instrument in this context as demonstrated by: firstly, the finding that the relatively high SCL-90 scores are consistent with the severe nature of the region’s environmental problems (Crighton et al., 2002); and, secondly, by the fact that scores are comparable to those of a population which faced the potentially very serious environmental exposure following the Three Mile Island nuclear accident (Baum et al., 1983). Nevertheless, further investigation is required to test the reliability and validity of the self-rated health measure, the standardised psychosocial measures and the survey instrument as a whole in the Central Asian context.

The findings from this study demonstrate that the determinants of self-reported health within a cultural and environmental context such as that of Karakalpakstan, are not well understood and require further study. Indeed, they underscore the need for empirical data which help us to understand the role of the physical environment as a determinant of population health (Evans et al., 1994; Federal/Provincial Territorial Advisory Committee on Population Health, 1999). It is clear, however, that a large proportion of the population studied perceive their health to be ‘poor’ which is a significant finding given that self-rated health is a strong predictor of morbidity and mortality. It is also clear that psychosocial health is strongly associated with health perceptions. Thus, if there is to be any hope of improving the overall health of the Karakalpak population, health remediation measures must address not only physical but also psychosocial health problems.

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