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Health-related Quality of life of Gaza Palestinians in the aftermath of the winter 2008–09 Israeli attack on the Strip

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Background: We document the health-related quality of life (HRQoL) of people living in the Gaza Strip 6 months after 27 December 2008 to 18 January 2009, Israeli attack. **Methods:** Cross-sectional survey 6 months after the Israeli attack. Households were selected by cluster sampling in two stages: a random sample of enumeration areas (EAs) and a random sample of households within each chosen EA. One randomly chosen adult from each of 3017 households included in the survey completed the World Health Organization Quality of Life instrument, in addition to reported information on distress, insecurities and threats. **Results:** Mean HRQoL score (range 0–100) for the physical domain was 69.7, followed by the psychological (59.8) and the environmental domain score (48.4). Predictors of lower (worse) scores for all three domains were: lower educational levels, residence in rural areas, destruction to one's private property or high levels of distress and suffering. Worse physical and psychological domain scores were reported by people who were older and those living in North Gaza governorate. Worse physical and environmental domain scores were reported by people with no one working at home, and those with worse standard of living levels. Respondents who reported suffering stated that the main causes were the ongoing siege, the latest war on the Strip and internal Palestinian factional violence. **Conclusion:** Results reveal poor HRQoL of adult Gazans compared with the results of WHO multi-country field trials and significant associations between low HRQoL and war-related factors, especially reports of distress, insecurity and suffering

Introduction

The Gaza Strip occupies 360 km^2 sandwiched between Egypt, Israel and the Mediterranean Sea (MAP1). It is part of historic Palestine and was separated from the West Bank with the creation of the State of Israel in 1948. It was under Egyptian administration until 1967, when it came under Israeli military occupation.

Although Israel withdrew its army and settlers from the Strip in 2005, Israel still controls the Strip's air and sea spaces and external borders—with the exception of the Rafah crossing which is under the joint control of the EU, Egypt and the Palestinian National Authority—creating a largely sealed off and imprisoned occupied territory.[1,2] Movement of people, including medical cases, and goods, including food, fuel and other basic goods, into and out of the Strip by land, sea and air continues to be mainly controlled by Israel, which has implemented a siege on the Strip since 2006, when the Islamic Resistance Movement (Hamas) was elected to power. At the time of the survey, the Egyptian government only opened the Rafah crossing to Egypt The map was removed in the last version sporadically, contributing to the severe limitations on movement of people and goods.

The Israeli attack on the Gaza Strip (27 December 2008 to 18 January 2009) was launched under these pre-existing conditions.[3] It was described by the Israeli press as the harshest military assault on the Strip since Gaza was captured by Israel during the 1967 war.[4] By the end of the campaign, some 1400 Gazans had been killed, including many civilians, and at least 5380 had been injured.[5] The campaign also caused massive destruction of major infrastructure and utilities, resulting in a lack of shelter and energy sources, deterioration of water and sanitation services, food insecurity and overcrowding.[6]

Study aims

This article reports the results of a survey conducted in July–August 2009. It aims to investigate the health-related quality of life (HRQoL) of Gazans in the aftermath of the Israeli army attack and reports of experiences of loss, such as destruction of private property as a result of the war. It further aims to examine the association between HRQoL and selected objective and subjective factors associated with the war and siege conditions. We expect to find an association between low scores of HRQoL domains and reports of destruction of home and property and high levels of distress and human insecurity. The survey employed the World Health Organization's Quality of Life Instrument—WHOQoL—which is useful for exploring the impact of different conditions on health and life satisfaction, and assessing the HRQoL of people living in highly stressful situations, such as migrants and refugees.[7] HRQoL measures were the focus of this study because they complement conventional measures such as mortality and morbidity already reported for the Strip during the winter war, and for Palestinians in general during the four decades of Israeli military occupation. These measures also bring the voice of Gazans into the assessment.

Methodology

A cross-sectional survey of a representative sample of Gaza Strip households was conducted mid-July to mid-August 2009. The sample size was estimated based on the total population of the Strip in 2007, as per the Palestinian Central Bureau of Statistics (PCBS) 2007 Census and adjusted for cluster sampling effect. The calculated number was 3000 households. The sample was derived in two stages, using the 2007 housing and establishment census as a sampling frame.

The Strip was divided into 11 strata, based on governorates and type of locale (urban areas and refugee camps within each of the five governorates, and an additional stratum covering all rural areas.). Out of 1630 enumeration areas (EAs), 63 were selected using systematic random sampling to represent all strata. The second stage was based on the estimated number of households within each EA, which ranged from 46 to 228 households. Eighty households were chosen at random from larger EAs (with an average of 200 households), and either 35 or 50 households from the smaller EAs (with an average of 120 households). Three thousand and thirty households were targeted for interviewing, and fieldworkers visiting a given EA were instructed to select the required number of households using the starting point for the EA provided by PCBS based on the sampling frame information, and then randomly chose the required number of households moving clockwise from the beginning of the EA until the needed number was achieved. As the landscape of the Strip had been deformed during the military attack, selection based on maps was not useful, and so area sampling was used to obtain the needed number of households. Fieldworkers did not include destroyed households in the sample, and continued visiting households until they obtained the specified number within each EA. Families whose homes were destroyed and who were housed with other families or elsewhere were included in the sample separately from the host family. One adult aged $\geq$18 years from each household was randomly selected using the Kish table method,[8] and responded to the HRQoL portion of the survey. Men were selected from households with even numbers and women were selected from households with odd numbers.

The instrument included three sections: one describing household members with questions about demographic, socio-economic and health information on all household members; a household section (housing characteristics, amenities, access to basic services, events taking place during and after the attack and people's crucial needs); and a HRQoL, distress, insecurities and threats section focusing on adults. The instrument was pilot tested on 32 Gaza households, and modified accordingly.

HRQoL was assessed using two instruments: one based on 26 questions of the abbreviated version of the WHOQoL instrument (WHOQoL-Bref [9]), previously adapted to the local context[10,11] and the other based on questions added to the WHOQoL-Bref based on experience conducting HRQoL studies in the occupied Palestinian territory (oPt).

Participants were asked to report on their current crucial survival needs. Fifteen questions were asked covering a range of expected needs and were grouped into four categories: livelihood needs which included cash liquidity, work for cash liquidity, main source of income and work/rehabilitation; basic needs which included regular electrical supply, and availability of clean water and cooking gas; humanitarian needs which included medications, clothes and food; and need to rebuild or fix residence which included residence furnishing, renovation and rebuilding. Scores for each category were the number of needs stated to be crucial.

The principal investigators in Ramallah could not gain entry to the Gaza strip and trained experienced Gaza interviewers using video conferencing. Care was taken to explain the aims of the study, clarify the concepts and terms, and review all the questions contained in the questionnaires. Alpha International, a research and consultancy agency, completed the field work ensuring quality control by appointing an overall coordinator and four field coordinators, and 25 field workers who completed data collection. Data were analysed using the Predictive Analytics Software (PASW) Version 17.[13]

The Study was approved by the Institute of Community and Public Health–Birzeit University Ethical Review Committee. Verbal consent was obtained from the participants after explaining the objectives of the study.

The WHOQoL-Bref questions were grouped into four domains (physical, psychological, social and environmental) using the algorithm proposed by the WHOQoL team, giving domain scores on a scale of 0–100, with higher scores indicating better HRQoL. The WHOQoL-Bref social domain normally contains three questions. However, the question on satisfaction with sex life was not used because of reservations expressed by participants in the focus group discussions during the phase of instrument adaptation and validation.[11] Hence, the results of the social domain score were not reported.

Human insecurity (HI), individual distress (ID) and standard of living (STL) scores were constructed using factor analysis. Exploratory factor analyses were conducted using principal component extraction with varimax rotation. Items with loadings under 0.4 were excluded from the model. The variables included are detailed in the Supplementary Appendix S1. The scores were combined using a weighted average, with weights obtained from the principal component analysis loadings (Supplementary Appendix S1). Cronbach's α was 0.76 for the STL score, 0.85 for the ID score and 0.83 for the HI score. The individual distress, human insecurity and standard of living/ amenities measures were previously validated in the Palestinian context.[11,12]

A multi-colinearity test between distress and insecurity on the one hand and the psychological domain on the other was conducted using the variance inflation factors test (VIF), and we found no significant colinearity between the two independent variables. This implies that the psychological domain and the distress and human insecurity scales are related but do not measure the same thing.

We conducted descriptive analyses of the study population, the extent of destruction due to war and people's crucial needs. A private property destruction variable was computed by counting the number of positive answers for destruction to: home, family property/commercial project facility, crops/agricultural products, animal products and private car. A neighbourhood destruction variable was computed by counting the number of positive answers for destruction to schools and universities, clinics, commercial shops, roads and infrastructure, and public gardens and recreational areas. These variables were recoded as: reporting at least one type of destruction or reporting no destruction.

The associations between the dependent and independent variables were tested using bivariate analyses and multiple regressions to adjust for other variables. Four multiple regressions were performed, one for each WHOQOL-Bref domain as the dependent variable. Independent variables included in the models were conventionally used factors including age, sex, educational attainment, residence, household member employment and household standard of living, and reported war and siege-related factors including: reports of private property destruction (mainly homes) and neighbourhood destruction and personal suffering, ID and HI (measured by reports of fears and threats). The

Table 1 Respondent characteristics, Gaza Strip 2009

	n (%) (*n* = 3017)
Sex	
Male	1524 (50.5)
Female	1493 (49.5)
Governorate	
North Gaza	553 (18.3)
Deir al-Balah	1020 (14.1)
Gaza City	439 (36.0)
Khan Younis	642 (20.2)
Rafah	362 (11.4)
Locality	
Urban	2463 (81.6)
Rural	86 (2.8)
Camp	468 (15.5)
Education	
Below secondary	1506 (49.9)
Secondary completed	903 (29.9)
Post-secondary	608 (20.2)
Household employment	
No one working	720 (23.9)
At least one part time	536 (17.8)
At least one full time	1762 (58.4)
Standard of living (measured on as scale from 0 to 9)	
<2	894 (29.6)
3	727 (24.1)
4–5	787 (26.1)
>6	609 (20.2)

Table 2 Distribution of reported infrastructural and physical destruction, distress, suffering and insecurity, Gaza Strip, 2009

	n (%) (*n* = 3017)
Private property destruction (at least some property destroyed)	
Yes	1258 (41.7)
No	1759 (58.3)
Home destruction	
Yes	1184 (39.2)
Yes complete destruction	39 (1.3)
Yes minor to partial destruction	1145 (37.9)
Neighbourhood destruction (at least one property destroyed)	
Yes	953 (31.6)
No	2064 (68.4)
Suffering	
Suffering not part of life	373 (12.4)
Suffering part of life	2644 (87.6)
Sources of suffering[a] (Proportion of those reporting score of >8)	
Siege	2459 (93.0)
The latest war on Gaza	2300 (87.0)
Internal Palestinian fights	2204 (83.4)
Individual distress	
Least distress	397 (13.2)
Low distress	1146 (38.0)
Moderate distress	1065 (35.3)
High distress	408 (13.5)
Fears and threats/human insecurity	
Least insecurity	60 (2.0)
Low insecurity	336 (11.3)
Moderate insecurity	1246 (41.9)
High insecurity	1334 (44.8)
Livelihood needs[b] (Reports of at least one crucial need)	
Cash liquidity, work for cash liquidity, main source of income and work rehabilitation	2242 (74.3)
Basic needs (Reports of at least one crucial need)	
Electricity supply, clean water, and cooking gas	1635 (54.2)
Humanitarian aid (Reports of at least one crucial need)	
Medication, cloth and food	1313 (43.5)
Home rebuild (Reports of at least one crucial need)	
Residence furnishing, renovation and building materials	1274 (42.2)

These questions were then grouped into the four categories listed above by counting the number of reports of crucial needs
a: Participants were asked to report (on a scale from 0 to 10) the extent to which suffering was due to siege, occupation, latest war on the Gaza Strip and Palestinian factional violence
b: Fifteen questions were asked covering a range of expected needs with the options: crucial, medium, minimal and no need at all

regression coefficients, standard errors and *P*-values were reported for the final model which included all factors. Sampling weights were calculated and provided by the Palestinian Central Bureau of Statistics. Sampling methodology was accounted for in each analysis step using sampling weights and adjusting for clustering. Analysis used the Complex Samples module in PASW.[13]

Results

Three thousand and seventeen household questionnaires were completed out of 3102 households visited (response rate: 97%): 52 households refused to respond and 33 individuals did not agree to complete the HRQoL portion of the study. A total of 18 631 persons lived in the 3017 households, of whom 41% were children under the age of 15 years.

One thousand five hundred and twenty-four men and 1493 women completed the HRQoL questionnaire (table 1). Respondents age ranged between 18 and 90 years, with a median age of 33 years. Half of the respondents reported having less than secondary education. In all, 2.8% resided in rural areas, 82% in urban areas and 15% in refugee camps. Fifty-eight per cent reported at least one member of their households working full time at the time of survey, 18% with at least one member working part time and 24% with no one working at home. Thirty-nine per cent of households were reported as partially or completely destroyed as a result of the military attack on the Strip (table 2), 1.3% reported complete and 38% partial home destruction. Thirty-two per cent reported complete or partial destruction of their neighbourhood (including roads, schools, shops and other public facilities).

Of the respondents, 87.6% (95% CI 86.3–88.9) reported that suffering, regardless of source, is part of their life. Those reporting suffering as part of their life were asked to report on scale from 0 to 10, the extent of which suffering was due to selected items. Scores of 8 and higher were reported by 93.0% (95% CI 92.0–94.0) of respondents who reported suffering partly due to ongoing siege, 87.0% (95% CI: 85.6–88.4) that it was partly due to the Israeli attack and 83.4% (95% CI: 81.8–85.0) that it was partly due to Palestinian factional fighting.

Most respondents (86.7%) reported moderate (41.9%) and high (44.8%) levels of human insecurity, and almost half (48.8%) reported moderate (35.3%) and high (13.5%) levels of Individual Distress. Of them, 74.3% (95% CI 72.5–76.1) reported that their most crucial needs concerned livelihood, and 54.2% (95% CI 51.8–56.6) reported that livelihood needs were continuous electrical supply, clean water and cooking gas. Humanitarian needs such as food aid, clothes and medication were reported as crucial needs by 43.5% (95% CI 40.8–46.2) of participants. The need to rebuild and fix homes was reported by 42.2% (95% CI 39.5–44.9) of respondents as one of their most crucial need.

The physical domain had the highest mean score (mean = 69.7, SD = 17.7), indicating better physical HRQoL compared with the other domains, followed by the psychological domain score (mean = 59.8, SD = 16.0). The lowest (worst) score was for the environmental domain (mean = 48.4, SD = 14.3).

Table 3 presents regression results with the domain scores as dependent variables. Older persons ($P < 0.001$), women ($P < 0.001$), those residing in rural areas ($P < 0.001$) and those residing in the North of the Strip ($P < 0.001$) had lower (worse) HRQoL scores compared with younger persons, men, those residing in urban areas and those residing in other governorates of the Strip, respectively. Higher (better) physical domain scores were found among those with higher educational levels ($P < 0.001$), and among those living in households with at least one employed member (either full time or part time) ($P < 0.001$). Respondents reporting private property destruction ($P = 0.046$) and those reporting high distress had lower (worse) scores ($P < 0.001$).

Table 3 Regression models for WHOQoL domain scores with conventional and war and siege related factors, Gaza Strip 2009

	Physical		Psychological		Environmental	
Independent variables	**Coefficient (SE)**	***P*-value**	**Coefficient (SE)**	***P*-value**	**Coefficient (SE)**	***P*-value**
Age	−0.38 (0.02)	<0.001	−0.17 (0.02)	<0.001	−0.03 (0.02)	0.076
Sex: male reference	−2.72 (0.53)	<0.001	0.00 (0.47)	0.996	0.17 (0.43)	0.69
Type of locality—urban reference						
Rural	−7.67 (1.77)	<0.001	−3.17 (1.54)	0.039	−3.38 (1.42)	0.018
Camp	0.01 (0.76)	0.989	0.86 (0.66)	0.192	−1.75 (0.61)	0.004
Governorate—North Gaza reference						
Gaza City	5.53 (0.8)	<0.001	2.82 (0.7)	<0.001	−2.25 (0.64)	<0.001
Deir al-Balah	7.56 (1)	<0.001	3.98 (0.87)	<0.001	1.32 (0.8)	0.101
Khan Younis	4.94 (0.92)	<0.001	3.12 (0.8)	<0.001	−0.06 (0.74)	0.936
Rafah	6.17 (1.03)	<0.001	3.72 (0.9)	<0.001	−0.24 (0.83)	0.775
Years of education	0.34 (0.08)	<0.001	0.38 (0.07)	<0.001	0.16 (0.06)	0.013
Standard of living	0.10 (0.15)	0.493	0.59 (0.13)	<0.001	1.44 (0.12)	<0.001
Household employment—None						
Part time	3.63 (0.85)	<0.001	1.47 (0.74)	0.047	1.45 (0.68)	0.034
Full time	2.56 (0.7)	<0.001	1.72 (0.61)	0.005	3.45 (0.56)	<0.001
Neighbourhood destruction	0.10 (0.59)	0.859	0.83 (0.55)	0.129	−0.27 (0.51)	0.588
Private property destruction	1.26 (0.63)	0.046	−0.95 (0.51)	0.063	−1.41 (0.47)	0.003
Suffering	−0.36 (0.83)	0.666	−2.92 (0.72)	<0.001	−3.26 (0.67)	<0.001
Insecurity	−0.82 (0.4)	0.038	0.15 (0.35)	0.663	−3.28 (0.32)	<0.001
Distress	−7.4 (0.33)	<0.001	−8.98 (0.29)	<0.001	−5.65 (0.27)	<0.001
R^2 Adjusted for conventional and war related variables	0.339		0.384		0.347	
R^2 Adjusted for conventional variables only[a]	0.22		0.166		0.179	
R^2 Adjusted for war related variables only[b]	0.008		0.018		0.025	
R^2 Adjusted for war related psychological measures only[c]	0.192		0.32		0.263	

a: Conventional variables include age, sex, type of locality, governorates, years of education, standards of living and household employment
b: War-related variables include neighbourhood destruction and private property destruction
c: War-related psychological measures include suffering, insecurity and distress

Higher (better) HRQoL psychological domain scores (table 3) were related to being younger ($P<0.001$), having higher levels of education ($P<0.001$), residing in urban areas compared with rural areas ($P=0.002$), having a higher STL ($P<0.001$) and living in households with at least one member employed full- or part-time member ($P<0.001$). Lower (worse) psychological domain scores were related to reporting higher levels of suffering ($P<0.001$) and higher levels of distress ($P<0.001$).

Higher (better) HRQoL environmental domain scores (table 3) were related to higher levels of education ($P<0.001$) (table 3), higher STL ($P<0.001$) and living in households with at least one member employed member ($P<0.001$). Lower (worse) scores were found among rural ($P<0.001$) and refugee camp dwellers ($P<0.034$) compared with urban dwellers. Lower (worse) environmental domain scores were related to reporting at least one private property damaged during the war ($P<0.001$) and reporting high levels of suffering ($P<0.001$), human insecurity ($P<0.001$) and individual distress ($P<0.001$).

Table 3 shows the proportions of variability in HRQoL scores explained by the associated variables (R^2) for all regression models. R^2 for the final model including all selected measures was 0.339 for the physical domain (with 0.22 explained by conventional factors, 0.192 by psychological measures related to the war and siege, and 0.008 by measures related to destruction due to war); 0.384 for the psychological domain (with 0.166 by the conventional factors, 0.320 by psychological measures related to the war and siege and 0.018 explained by measures related to destruction due to war); and 0.347 for the environmental domain (with 0.179 by the conventional factors, 0.263 by psychological measures related to the war and siege and 0.025 by measures related to destruction due to war).

Discussion

The WHOQoL-Bref tool used in this study had been validated on general and sick populations internationally,[6] regionally[14] and locally. As with the Palestinian 2005 study,[11] the results of this study indicate that the three WHOQoL-Bref domains scores reported by Gazans (physical, psychological and environmental) were much lower than those reported internationally by the WHOQoL-Bref field trial results.[9] For example, the lowest mean score reported for the psychological domain was 65 for Malaysians in the field trials compared with 59 for Gazans. Furthermore, the lowest mean environmental score was reported by Romanians (65), and then Turks (67) and Israelis (67) compared with 48 for Gazans in this study.[9] Almost half of the respondents reported moderate or high levels of distress, high levels of human insecurity (87%) and high levels of suffering (88%). An explanation of these findings may relate to a mix of the destruction of the latest war, the ongoing siege, the long-term exposure to chronic political violence, and the social, psychological, economic and physical damage due to constant and politically unstable conditions and violations of human rights experienced by Gazans especially during the past few years.

The population suffered severe psychological injury, stress and grief on a broad scale.[15–17] Ninety-three percent of those reporting that suffering is part of their life reported that the extent of suffering due to the siege was the highest. However, there were other important sources of suffering identified by respondents, including the latest military attack on the Gaza Strip (as reported by at 87% of the respondents) and Palestinian factional violence, reported by 83% of respondents.

As expected, the physical, psychological and environmental QOL domain scores declined with age and improved with increasing education.[17,18] Women reported worse QOL scores compared with men and the difference was statistically significant for the physical domain. Worse QOL scores for all three domains were found among people residing in rural areas compared with urban and refugee camps dwellers. The proportion of people living in rural areas in the Gaza Strip is very small (2.7%)[19] and reports indicat[20] that rural areas are the most economically disadvantaged.[21] Rural areas have also been particularly negatively affected by Israeli army invasions where agricultural land was destroyed.[22]

Refugee camp dwellers reported worse environmental domain scores compared with urban and rural dwellers. Worse quality-of-life scores for the three domains were found among those residing in the North Gaza

governorate compared with the other governorates. This governorate and Gaza City were the hardest hit by the attack on the Strip (Map 1).[7] The second lowest QOL scores were registered for those residing in the Khan Younis governorate. Khan Younis is the largest governorate in the Strip and contains the largest percentage of agricultural land. According to the latest labor force survey, the Khan Younis governorate has the highest level of unemployment in the Strip (49.3%).[20] These contextual factors might partially explain the low HRQoL scores in the Khan Younis governorate. However, further research is needed to better understand the variations among governorates noted in this study.

Our analysis found that the siege and war were important causes of suffering. In addition, between 40% and 50% of respondents reported at least one crucial need among each of the basic needs, the humanitarian aid needs and the home rebuilding needs. Livelihood needs—means of earning income—were even greater, where at least one need was reported as crucial by three quarters of the Gazans. Yet, these needs are not being provided. Although the key electrical lines have been repaired since the war, ~10% of Gazans did not have access to electricity at all, and the remaining 90% suffered from daily power cuts of 4–8 h in December 2009.[23]

The situation has worsened since 2009, with reports indicating that power cuts have increased to 8–12 h daily, exacerbating the already difficult living conditions and disrupting almost all aspects of daily life.[24] Cement, glass, steel, wood, generators and high voltage cables in addition to other materials were listed as high-priority materials needed for the reconstruction of the Gaza Strip.[23] The UNRWA Commissioner General reported that, even after the 'easing' of the siege in mid-2010, the situation remained 'extremely difficult'.[24]

Significant associations were found between poor HRQoL and reported war- and siege-related associated factors, especially when reported distress, human insecurity and suffering were included in the model. Local idioms of distress, which primarily rely on meanings couched in culture, are difficult to translate into English and are not redundant. In fact, what is measured pertains to Arabic words expressing emotions/distress and so on, and have been derived from repeated tests in the field. As our analyses show, the use of the subjective measure was very useful in interpreting the results.

Finally, our analysis reveals the importance of combining conventional associated factors/determinants of HRQoL with measures related to political violence (the war and siege) when working to understand the causes of low life quality among populations living in conflict or people surviving the consequences of natural disasters such as the earthquake in Haiti and Tsunami in Japan.

Our results underscore the value of bringing people's voices into health assessments in future studies in the oPt as well as other conflict affected zones.

Conclusion

The findings reveal significant associations between low HRQoL reports and selected conventional factors such as age, sex, educational levels and residence of participants. In addition, significant associations were found between poor HRQoL and reported war- and siege-related associated factors, especially reported distress, human insecurity and suffering.

We found that the main reported cause of suffering of Gazans is the Israeli imposed siege, followed by the effects of the Israeli attack on the strip and the internal Palestinian factional violence We also found that the main crucial need reported by Gazans was livelihoods rather than humanitarian aid, a need also expressed by Haitians following the earthquake of 2010.[25] These results underscore the importance of humanitarian and international aid going beyond the provision of handouts, and working by helping people in helping themselves, and by providing people living in disaster and conflict areas with the means through which they can rebuild their lives.

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Key points

- Living conditions under the siege imposed on the Gaza Strip continues to be a major cause of suffering for Gazans and prevent crucial needs from being fulfilled.
- The results emphasize the importance of using objective (conventional) and locally developed subjective indicators in order to assess health status, and in order to inform policies and interventions.

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Improving shop floor compliance with age restrictions for alcohol sales: effectiveness of a feedback letter intervention

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Purpose: In this study, we investigated the effects and handling of an intervention to increase compliance with age limits regarding alcohol sales. The intervention tested in this field experiment was a feedback letter sent to alcohol outlets about their individual compliance results based on a mystery shopping study. **Method:** We measured compliance in 146 alcohol outlets (cafeterias, supermarkets, bars, liquor stores and youth centres) in one region in the Netherlands with 15-year-old mystery shoppers. About half ($n = 72$) of the outlets received the intervention letter (the experimental group). After this intervention, we measured compliance again ($n = 138$). Then we sent the same letter to the control group and interviewed all the outlets regarding their handling of the intervention ($n = 106$). **Results:** After the experimental group received the letter, compliance increased significantly (from 18.1% to 32.4%). In the control group, compliance did not change. Of the outlets interviewed, 81% stated that they had received the letter, and the action most commonly taken was to bring the letter to the attention of their staff. **Conclusions:** Positive feedback letters are more often copied and shared integrally with personnel, compared with negative letters. Compliance with respect to underage alcohol sales can be improved, although compliance levels remain low in the Netherlands.

Introduction

Alcohol consumption is often associated with positive effects such as relaxation and partying, but it is well known that it also may have very negative consequences. Excessive alcohol use may cause health problems such as liver and heart diseases, strokes, intoxication, and mental health problems, as well as societal problems such as crime, rape, (traffic) accidents and violence.[1–7]

In many countries (including the Netherlands), alcohol is the most widely abused substance among adolescents.[8–10] In addition to the problems listed above, adolescents who consume alcohol may engage in