RESEARCH ARTICLE

AN OMNIBUS APPROACH TO ASSESS THE PREVALENCE, BURDEN AND QUALITY OF LIFE OF MULTIPLE DISEASES IN THE GENERAL POPULATION: THE SNAPSHOT PROGRAM IN THE MIDDLE EAST

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ABSTRACT

Background: There is limited epidemiological data on chronic diseases in the Middle East, and obtaining such data on a large scale and in a standardised manner is challenging. The objective of the SNAPSHOT program was to assess quality of life and to estimate the prevalence and burden of multiple diseases in the adult general population of five Middle Eastern countries using an omnibus approach.

Methods: Large random samples from the general populations of Egypt, Turkey, Saudi Arabia, Kuwait and the United Arab Emirates were interviewed by telephone. Validated questionnaires were administered via a computer-assisted personal interviewing system to identify subjects fulfilling criteria for one of the four diseases of interest (asthma, allergic rhinitis, bipolar disorder and benign prostatic hyperplasia). Respondents who screened positively for a disease of interest were invited to answer further questions on disease burden and healthcare resource utilisation. The three-level EuroQoL EQ-5D questionnaire (EQ-5D-3L) was administered to all subjects in order to collect data on quality of life.

Results: Overall, 33,486 subjects completed the screening questionnaire and 27,882 completed the EQ-5D-3L. At least one of the four diseases was identified in 4,418 subjects (13.2%). The mean EQ-5D-3L utility value was 0.89±0.21. This value differed significantly between countries (Turkey: 0.84±0.24, Egypt: 0.88±0.23; Saudi Arabia: 0.93±0.16; Kuwait: 0.94±0.16; United Arab Emirates: 0.96±0.13), between age groups (18-34: 0.91±0.19; 35-49: 0.90±0.20; ≥50: 0.85±0.25), between genders (men: 0.92±0.18; women: 0.86±0.24), and was significantly lower in subjects who screened positive for any of the four diseases (p <0.0001 for all comparisons; Kruskal-Wallis test).

Conclusions: This program emphasises the benefit of an omnibus approach to collecting population data for multiple diseases in multiple countries. The program also generated reference values for the EQ-5D-3L in the Middle East for the first time. Such programs respond to a need for data to support informed decision-making by healthcare authorities in the region.

***Keywords*:** EuroQoL-5D, Omnibus methodology, Middle East, quality of life, general population

1. BACKGROUND

The availability of recent and reliable epidemiological information on the prevalence and burden of chronic diseases in the general population is crucial for effective planning of public health policy and resource allocation. In the Middle East, expanding universal healthcare coverage and rising healthcare costs have contributed to changes in the decision-making process for healthcare authorities, who increasingly require accurate local data on epidemiology, burden of disease and Health-Related Quality of Life (HRQoL) to inform Health Technology Assessments (HTA) and to improve decision-making.

Omnibus studies allow data to be collected simultaneously about multiple diseases, using a standardised methodology. This methodology provides a powerful approach for generating comparative data on health and disease. An example of such a study is the 2002 World Health Survey (WHS), a household survey of chronic disease (asthma, angina, osteoarthritis and diabetes) conducted in 55 countries, including Turkey, the United Arab Emirates (UAE) and Oman in the Middle East (1). In line with this, and fifteen years after the WHS took place, a large omnibus program of studies (SNAPSHOT) was conducted to collect data on the prevalence and burden of four chronic diseases (asthma, allergic rhinitis, benign prostatic hyperplasia (BPH) and bipolar disorder) in the Middle East and to document their impact on HRQoL. The selection of these diseases was based on the need to respond to emerging HTA requirements for up-to-date epidemiological and HRQoL data.

The primary objective of the program was to estimate the prevalence of asthma, allergic rhinitis, bipolar disorder and BPH within the adult general population of six countries in the Middle East (Egypt, Kuwait, Qatar, Saudi Arabia, Turkey and UAE). Secondary objectives were to document the burden of disease, disease management, and related healthcare resource consumption. Additionally, for the first time, this program collected data from a large general population sample on a HRQoL utility measure to generate reference values in the participating countries.

Many tools have been developed to assess HRQoL in different diseases and settings. One of the most widely used generic measures is the EuroQol five-dimension questionnaire (EQ-5D) (2,3). This questionnaire has been translated and culturally-validated in over 150 languages and has been used in thousands of clinical, cost-effectiveness and population health studies worldwide (4). EQ-5D represents the recommended approach for estimating utility values to support cost-utility analysis (5). Reference data sets are now available for twenty-four countries (6), principally in Europe, but none in the Middle East.

This article provides extensive information on the design, rationale and implementation of the program, as well as reference values for the three level EQ-5D questionnaire (EQ-5D-3L) in each participating country. Detailed information on prevalence and disease burden and the impact of the respective diseases on HRQoL will be presented in other articles devoted to individual diseases.

2. METHODS

The SNAPSHOT program was a cross-sectional, observational, population-based survey conducted in the general population of five countries (Egypt, Saudi Arabia, Turkey, Kuwait and the UAE) to collect data on the prevalence, burden and associated healthcare resource use of four chronic diseases (asthma, allergic rhinitis, BPH and bipolar disorder), using an identical study design and protocol.

The survey was carried out over the telephone via computer-assisted personal interviewing (CAPI) and web-based electronic data capture was used to collect the information. Interviews were carried out by local Contract Research Organisations (CROs). In Turkey the CRO was Omega and in the Arabic-speaking countries the CRO was Infomine Healthcare Research (Egypt). Interviews were conducted by trained staff from the relevant CRO and carried out in Arabic, English or Turkish using translated validated questionnaires. Data management and analysis were performed by MS Health (Morocco).

2.1. Feasibility study

Prior to initiating the main program, a feasibility study was performed in all participating countries to investigate the performance of telephone random dialling for recruiting subjects, and to assess the acceptability of the questionnaires.

2.2. Enrolment into the SNAPSHOT program

A target sample of 10,000 subjects from the adult general population of each country was defined to enable the estimate of prevalence and burden of the diseases with a satisfactory precision. To generate the population, a random stratified sampling method was used. The recruitment strata were defined according to the gender, age and regional structure in each country, applying the most recent national census data. In order to recruit sufficient subjects to determine the prevalence of BPH with the required precision, additional weight was given to the stratum of men ≥50 years of age.

An assisted random-digit dialling procedure was used to generate blocks of telephone numbers (both landline and mobile numbers were included) which were explored according to the pre-specified screening procedure. In order to maximise the opportunity for contact each number was dialled up to fifteen times, with calls attempted on different days and varying times including weekends and evenings.

If telephone contact was established, the interviewer assessed the eligibility of the telephone number (home landlines or mobiles were considered eligible; business numbers were considered ineligible). If a number was established as eligible, the interviewer then assessed the eligibility of the respondent to participate in the program by determining the respondent's age, gender and region of residence. All subjects ≥18 years of age and residing in the country for over six months were eligible, unless the pre-specified strata for age, gender and region were full. If the subject was eligible, the interview began. If the respondent agreed to continue the interview but asked to be called back later, up to ten attempts were made after which this was classified as a call-back failure and classed as a refusal. If the subject was not eligible, this was documented and the telephone call ended. If no contact was made after 15 attempts outcomes were categorised as unattributed, out-of-service, fax, or unreachable.

In order to optimise response rates, successive blocks of numbers were defined and a new block could only be released once the previous block had been completed. This process was repeated until the target of 10,000 subjects in each country was achieved.

2.3. Conduct of the interview

At the beginning of the interview, standardised general information about the research was provided by the interviewer. Subjects were specifically informed that the program was voluntary, confidential and anonymous. No gifts or incentives were offered to participating subjects.

During the first part of the telephone call, the interviewee was invited to respond to a screening questionnaire, screening for the four diseases of interest. If the interviewee did not want to answer, the contact was documented as a refusal and the interview ended. If a subject was identified as fulfilling the screening criteria for at least one of the four diseases, a second disease-specific questionnaire was administered. For all subjects the interview ended with the EQ-5D-3L questionnaire. The full interview was conducted during a single telephone call (Figure 1).

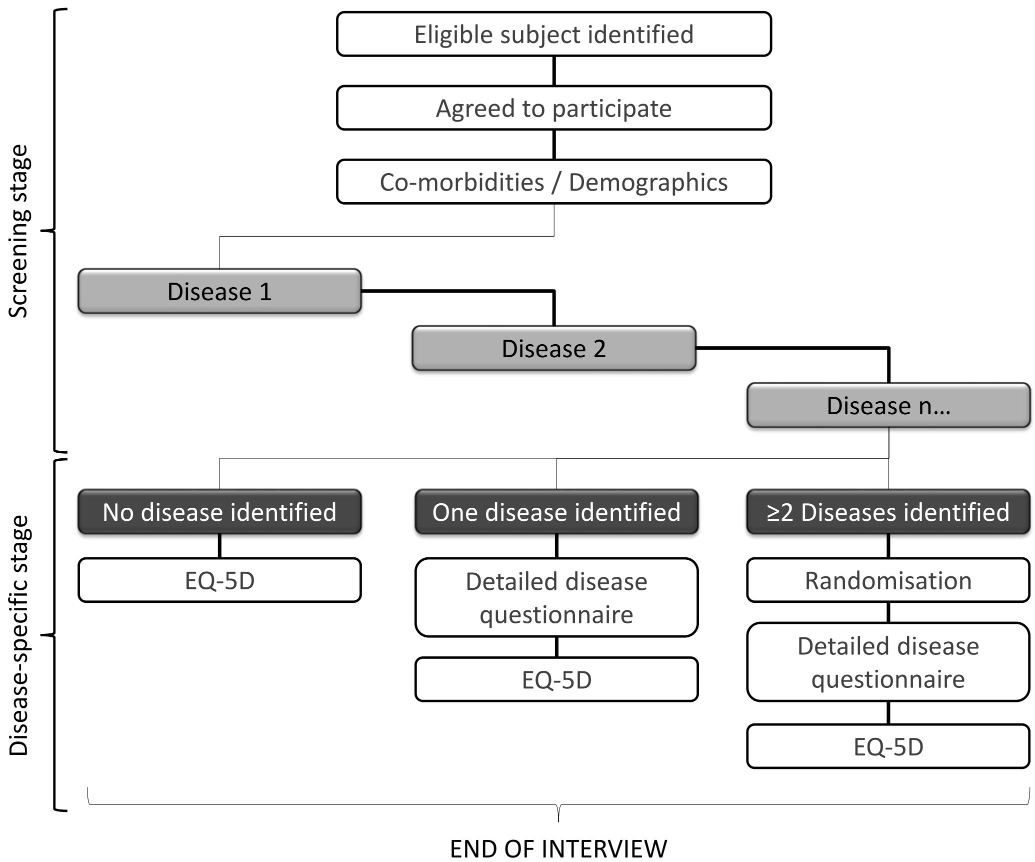

Figure 1: Overview of the screening process.

2.4. Data Collection

The screening interview was based on four individual validated disease-specific diagnostic questionnaires that were administered consecutively in the same fixed order. These questionnaires were the Score for Allergic Rhinitis (SFAR) questionnaire for allergic rhinitis (7), the Asthma Insights and Reality (AIR) questionnaire for asthma (8), the Mood Disorder Questionnaire (MDQ) for bipolar disorder (9) and the International Prostate Symptom Score (IPSS) for BPH (10). The IPSS was only administered to men over 50 years old and was completed by a series of questions designed to exclude alternative diagnoses (11). These disease-specific questionnaires collected detailed information on burden of disease and healthcare resource consumption. In order to limit the duration of the interview, should a respondent fulfil the screening criteria for more than one disease, they were randomised by the CAPI system to respond to only one of the disease-specific questionnaires.

The EQ-5D questionnaire (© EuroQol Research Foundation. EQ-5D™ is a trade mark of the EuroQol Research Foundation) was used to assess the quality of life of the respondents capturing the impact of a disease on physical, mental, and social functioning. The complete questionnaire is comprised of a five item health status measure (EQ-5D) and a visual analogue rating scale (EQ-VAS). There are two versions of the EQ-5D; one based on three response modalities (EQ-5D-3L) and one based on five response modalities (EQ-5D-5L). This program used the EQ-5D-3L version (see appendix for the complete questionnaire). Utility value sets for the EQ-5D have been generated in a number of countries, but not yet in the Middle East region. In the absence of country specific data for the Middle East, and on the advice of the EuroQol Research Foundation, the EQ-5D-3L utility values presented here have been calculated based on the UK value sets (12).

2.5. Statistical analysis

Data presentation is principally descriptive and no *a priori* hypotheses were tested in the program. Categorical data are presented as frequency counts (%) and continuous data as means with standard deviations (SD) and 95% confidence intervals (CI) when appropriate. Associations between EQ-5D-3L utility values and EQ-VAS with country, age, gender and disease status were evaluated by the Kruskal-Wallis test. Two-sided tests were used in all cases and a probability threshold of 0.05 was considered significant. All statistical analyses were performed using SAS® Version 9.4 (SAS, Cary, USA).

2.6. Ethical approval

The program followed Guidelines for Good Epidemiological Practice (GEP) and pertinent local rules and regulations for each participating country. The protocol and amendments were submitted to the appropriate independent ethics committee in each country for approval. Since subjects were only required to reply to a questionnaire, only oral consent to be interviewed in the survey was required. It was not possible to link the telephone number dialled and the respondent's data in the program database. Participants taking part in the program were not exposed to any direct health risk and participation in the program did not influence the medical management of the patient.

3. RESULTS

Ethical approvals were obtained for all countries except Qatar. Therefore, it was decided not to proceed with implementation of the program in this country. Enrolment in the program started in July 2014, and the target sample of 10,000 completed interviews was achieved in Egypt and Turkey during the last quarter of 2015. In Saudi Arabia, Kuwait and UAE, the target sample size could not be reached despite extensive efforts to accelerate subject enrolment. Therefore, it was decided to stop recruitment in February 2016 and pool subjects recruited in Saudi Arabia and the two Gulf countries to generate one large 'Gulf Cluster'. The combined number of interviews conducted to date in Saudi Arabia, Kuwait and UAE showed that the program objectives could be achieved from a sample size perspective. The database was locked on 11th April 2016.

3.1. Recruitment

The overall subject flow through the recruitment process is shown in Figure 2. A total of 2,132,872 telephone numbers were generated and contact was established with a total of 148,552 respondents, of whom 37,740 were eligible to participate in the program. Finally, 33,486 eligible subjects accepted to participate in the program, completed all the screening questionnaires and thus constituted the screening population.

Among the 32,310 screening failures, subjects who refused to participate accounted for 56% (n=18,079) and call-back failures accounted for 44% (n=14,231). The greatest loss of subjects occurred before confirmation of number or subject eligibility; they represented 79% of refusals and 97% of call-back failures. All screening failures, even those lost before eligibility assessment, were taken into account in the response rate calculation. The overall response rate was 50.9%. At a country level it varied by a factor of almost two, from 35.3% in Kuwait, 40.0% in UAE and 40.6% in Saudi Arabia to 58.9 % and 67.4% in Turkey and Egypt respectively.

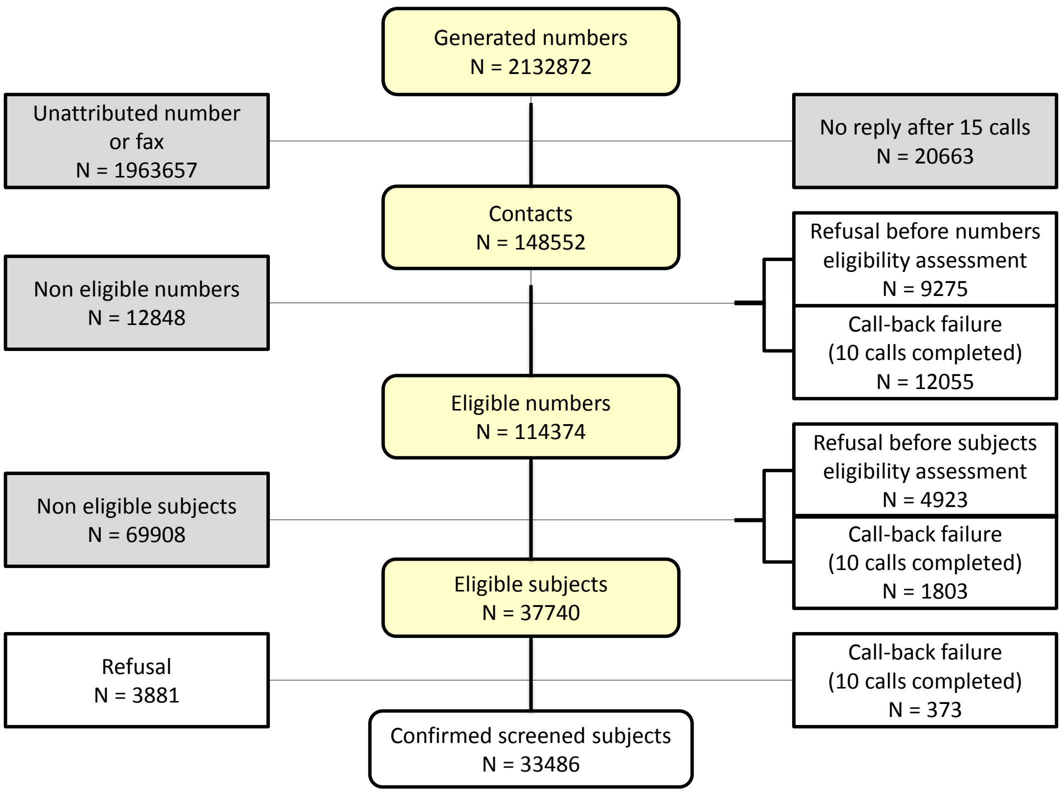

Figure 2: Flow of subjects through the recruitment process. The grey boxes represent excluded numbers or subjects, and the white boxes represent the groups of potentially eligible numbers or subjects taken into account in the calculation of the response rate.

The socio-demographic characteristics of the screened subjects are presented in Table 1. The alignment of gender and age distributions was a consequence of the stratified sampling method used to recruit eligible subjects, although some imbalance arose in Saudi Arabia, Kuwait and the UAE since certain strata had not been completed before recruitment was stopped.

Table 1: Socio-demographic characteristics of the program population (screened subjects); N = 33,486.

		Overall	**Egypt**	**Kuwait**	**Saudi Arabia**	**Turkey**	**UAE**
		N=33,486	**N=10,014**	**N=1,771**	**N=8,190**	**N=10,000**	**N=3,511**
Gender n (%)	Count	33,486	10,014	1,771	8,190	10,000	3,511
	Men	19,610 (58.6%)	5,747 (57.4%)	1,109 (62.6%)	5,044 (61.6%)	5,339 (53.4%)	2,371 (67.5%)
	Women	13,876 (41.4%)	4,267 (42.6%)	662 (37.4%)	3,146 (38.4%)	4,661 (46.6%)	1,140 (32.5%)
Age group n (%)	Count	33,486	10,014	1,771	8,190	10,000	3511
	18-34 years	15,959 (47.7%)	4,978 (49.7%)	840 (47.4%)	4,358 (53.2%)	3,926 (39.3%)	1,857 (52.9%)
	35-49 years	9,921 (29.6%)	2,453 (24.5%)	669 (37.8%)	2,760 (33.7%)	2,723 (27.2%)	1,316 (37.5%)
	≥50 years	7,606 (22.7%)	2,583 (25.8%)	262 (14.8%)	1,072 (13.1%)	3,351 (33.5%)	338 (9.6%)
Marital status n (%)	Count	32,349	9,814	1,707	7,975	9,522	3,331
	Married	23,424 (72.4%)	7,360 (75.0%)	1,242 (72.8%)	5,469 (68.6%)	7,060 (74.1%)	2,293 (68.8%)
	Separated / divorced/ widowed	1,573 (4.9%)	522 (5.3%)	95 (5.6%)	336 (4.2%)	520 (5.5%)	100 (3.0%)
	Never married	7,352 (22.7%)	1,932 (19.7%)	370 (21.7%)	2,170 (27.2%)	1,942 (20.4%)	938 (28.2%)
Last grade of school n (%)	Count	31,711	9,755	1,683	7,898	9,079	3,296
	No high school	10,476 (33.0%)	3,003 (30.8%)	246 (14.6%)	1,622 (20.6%)	5,401 (59.5%)	204 (6.2%)
	High school graduate	11,781 (37.2)	4,111 (42.2%)	725 (43.1%)	3,336 (42.2%)	2,578 (28.4%)	1,031 (31.3%)
	College graduate	9,454 (29.8%)	2,641 (27.0%)	712 (42.3%)	2,940 (37.3%)	1,100 (12.2%)	2,061 (62.5%)
Employment status n (%)	Count	32,290	9,735	1,679	7,869	9,721	3,286
	Employed (full or part-time)	18,623 (57.7%)	5,592 (57.4%)	1,272 (75.8%)	4,848 (61.6%)	4,299 (44.2%)	2,612 (79.5%)
	Unemployed	9,733 (30.1%)	3,040 (31.6%)	295 (17.6%)	2,242 (28.5%)	3,620 (37.3%)	536 (16.3%)
	Retired	2,332 (7.2%)	579 (6.0%)	47 (2.8%)	206 (2.6%)	1,462 (15.0%)	38 (1.2%)
	Student	1,602 (5.0%)	524 (5.4%)	65 (3.9%)	573 (7.3%)	340 (3.5%)	100 (3.04%)

Yearly household income n (%)	Count	31,276	9,596	1,641	7,718	9,125	3,196
	Below minimum wage	6,508 (20.8%)	3,465 (36.1%)	185 (11.3%)	1,094 (14.2%)	1,427 (15.6%)	337 (10.5%)
	Minimum wage	16,050 (51.3%)	4,110 (42.8%)	1,147 (69.9%)	5,469 (70.9%)	3,023 (33.1%)	2,301 (72.0%)
	≥2 × minimum wage	8,718 (27.9%)	2,021 (21.1%)	309 (18.8%)	1,155 (15.0%)	4,675 (51.3%)	558 (17.5%)
Health system coverage n (%)	Count	31,672	9,552	1630	7,674	9,647	3,169
	Public/Social security	12,852 (40.1%)	2,033 (21.3%)	504 (30.9%)	1,331 (17.3%)	8,211 (85.1%)	773 (24.4%)
	Private/Insured	5,224 (16.5%)	737 (7.7%)	307 (18.8%)	2,441 (31.8%)	292 (3.0%)	1,447 (45.7%)
	Personal finances	1,187 (3.8%)	678 (7.1%)	39 (2.4%)	411 (5.4%)	3 (0.03%)	56 (1.8%)
	Other	68 (0.2%)	4 (0.04%)	0	4 (0.05%)	60 (0.6%)	0
	Not insured	12,341 (39.0%)	6,100 (63.9%)	780 (47.9%)	3,487 (45.4%)	1,081 (11.2%)	893 (28.2%)

3.2. Outcome of screening

Out of the 33,486 subjects who completed all the screening questionnaires, a total of 5,132 positive screens were obtained, with at least one of the four diseases being detected in 4,418 (13%) subjects. More than one disease was detected in 669 subjects, and these subjects were randomised to be administered a single detailed disease questionnaire. Of the subjects who screened positive with at least one disease 2,266 (51%) completed the detailed disease questionnaire.

3.3. EQ-5D health states

The full EQ-5D-3L questionnaire was completed by 27,882 (83.2%) subjects. The EQ-5D dimension with the highest proportion of poor health modalities was the pain/discomfort dimension. The proportion of subjects reporting problems was consistently higher in Turkey compared to the other countries and lower in the Gulf countries, notably in the UAE. For example, 29.4% of the Turkish population reported pain or discomfort compared to 7.3% in the UAE. For the self-care dimension, where the proportion of patients reporting problems was lowest, this proportion was 4.9% in Turkey and 0.8% in the UAE (data not shown).

3.4. EQ-VAS

The EQ-VAS was scored by 27,907 (83.3%) subjects overall. Mean EQ-VAS scores are presented by country, age and gender in Table 2. The mean EQ-VAS score differed significantly between countries, being lowest in Turkey (74.3) and highest in the UAE (83.3). Mean scores were significantly lower in women than in men in all countries and declined with age in all countries except Kuwait.

3.5. EQ-5D utility values

Full data on all five questions of the EQ-5D-3L was available for 28,306 subjects (ranging from 1,327 subjects in Kuwait to 9,302 in Turkey), and these subjects constituted the study set for determination of utility values. Utility values were compared by country, by gender and by age group (Table 3). The mean EQ-5D-3L utility score for the overall population was 0.89±0.21, ranging from 0.84±0.24 in Turkey to 0.96±0.13 in the UAE. In general, a significantly higher (p <0.001) EQ-5D-3L utility score was documented in men than in women (0.92 versus 0.86), a trend that was consistent across all the countries studied. Overall, the EQ-5D-3L utility score decreased with age (p <0.001), ranging from 0.91±0.19 between 18 and 35 years of age to 0.85±0.25 over the age of 50. However, at a country level this was not consistent.

Subjects identified as having at least one of the diseases of interest reported a significantly lower (p <0.0001) mean EQ-5D-3L utility score (0.77±0.31) than those with none of the diseases of interest (0.90±0.19). This relationship was observed for all five participating countries (Figure 3a). A similar observation was made for the mean EQ-VAS scores (70.1±20.4 in subjects with identified diseases; 78.6±17.2 in subjects with no identified diseases; p<0.0001; Figure 3b).

Table 2: EQ-VAS scores for the screening population. *Probability values were calculated using the Kruskal-Wallis test.

			Overall	***Egypt***	***Kuwait***	***Saudi Arabia***	***Turkey***	***UAE***
			N=33,486	***N=10,014***	***N=1,771***	***N=8,190***	***N=10,000***	***N=3,511***
All		Count	27,907	8,414	1,311	6,469	9,007	2,706
		Mean ± SD	78.0 ± 17.6	75.6 ± 18.0	81.4 ± 15.0	82.6 ± 15.7	74.3 ± 18.4	83.3 ± 15.6
		CI 95%	[77.8;78.2]	[75.3;76.0]	[80.6;82.2]	[82.3;83.0]	[73.9;74.7]	[82.7;83.9]
		P-value*	<0.0001					
Gender	**Men**	Count	16401	4793	832	4039	4868	1869
		Mean ± SD	80.2 ± 16.3	77.9 ± 16.9	82.0 ± 14.3	83.7 ± 14.9	77.5 ± 17.0	84.0 ± 15.2
		CI 95%	[80.0;80.5]	[77.4;78.4]	[81.0;82.9]	[83.3;84.2]	[77.0;78.0]	[83.3;84.7]
	Women	Count	11506	3621	479	2430	4139	837
		Mean ± SD	75.5 ±18.7	73.4 ±18.9	80.5 ±15.9	81.3 ±16.6	71.8 ±18.6	82.2 ±16.6
		CI 95%	[75.13;75.8]	[72.82;74.0]	[79.1;82.0]	[80.7;82.0]	[71.3;72.4]	[81.06;83.3]
	P*-values		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Age	**18-34 years**	Count	13658	4414	665	3521	3628	1430
		Mean ± SD	79.5 ± 17.4	76.4 ± 18.6	81.2 ± 15.9	83.3 ± 15.7	77.3 ± 17.4	83.5 ± 15.8
		CI 95%	[79.2;79.7]	[75.8;76.9]	[80.0;82.4]	[82.8;83.9]	[76.7;77.8]	[82.7;84.4]
	35-49 years	Count	8332	2121	472	2240	2461	1038
		Mean ± SD	78.2 ± 17.1	74.9 ± 17.7	81.5 ± 13.9	82.4 ± 15.2	74.3 ± 18.0	83.3 ± 15.1
		CI 95%	[77.8;78.6]	[74.2;75.6]	[80.2;82.8]	[81.8;83.0]	[73.6;75.0]	[82.3;84.2]
	≥50 years	Count	5917	1879	174	708	2918	238
		Mean ± SD	74.0 ± 18.2	74.6 ±17.2	81.6 ±13.0	80.0 ± 16.1	70.8 ± 19.1	82.1 ± 14.5
		CI 95%	[73.6;74.5]	[73.8;75.4]	[79.7;83.6]	[78.8;81.2]	[70.1;71.5]	[80.2;84.0]
	P*-values		<0.0001	<0.0001	0.6833	<0.0001	<0.0001	0.0587

Table 3: Utility values for the EQ-5D-3L in the screening population. *Probability values were calculated using the Kruskal-Wallis test

			Overall	***Egypt***	***Kuwait***	***Saudi Arabia***	***Turkey***	***UAE***
			N=33,486	***N=10,014***	***N=1,771***	***N=8,190***	***N=10,000***	***N=3,511***
All		Count	28,306	8,446	1,327	6,495	9,302	2,736
		Mean ± SD	0.89 ± 0.21	0.88 ± 0.23	0.94 ± 0.16	0.93 ± 0.16	0.84 ± 0.24	0.96 ± 0.13
		CI 95%	[0.89;0.90]	[0.88;0.89]	[0.93;0.94]	[0.93;0.93]	[0.84;0.85]	[0.96;0.97]
		P-value*	<0.0001					
Gender	**Men**	Count	16,606	4,814	841	4,055	5,006	1,890
		Mean ± SD	0.92 ± 0.18	0.92 ± 0.19	0.94 ± 0.16	0.94 ± 0.15	0.89 ± 0.20	0.97 ±0.11
		CI 95%	[0.92;0.92]	[0.91;0.92]	[0.93;0.95]	[0.93;0.95]	[0.89;0.90]	[0.96;0.97]
	Women	Count	11,700	3,632	486	2,440	4,296	846
		Mean ± SD	0.86 ± 0.24	0.85 ± 0.25	0.93 ± 0.17	0.92 ± 0.17	0.81 ± 0.26	0.95 ±0.15
		CI 95%	[0.86;0.87]	[0.85;0.86]	[0.91;0.94]	[0.91;0.92]	[0.80;0.81]	[0.94;0.96]
	P*-values		<0.0001	<0.0001	0.0047	<0.0001	<0.0001	<0.0001
Age	**18-34 years**	Count	13,766	4,430	674	3,530	3,687	1,445
		Mean ± SD	0.91 ± 0.19	0.89 ± 0.21	0.94 ± 0.15	0.93 ± 0.16	0.89 ± 0.20	0.96 ±0.12
		CI 95%	[0.91;0.91]	[0.88;0.89]	[0.93;0.95]	[0.92;0.93]	[0.88;0.90]	[0.95;0.97]
	35-49 years	Count	8,443	2,130	479	2,251	2,533	1,050
		Mean ± SD	0.90 ± 0.20	0.88 ± 0.24	0.93 ± 0.18	0.93 ± 0.15	0.85 ± 0.23	0.96 ±0.12
		CI 95%	[0.89;0.90]	[0.87;0.89]	[0.91;0.95]	[0.93;0.94]	[0.84;0.86]	[0.96;0.97]
	≥50 years	Count	6,097	1,886	174	714	3,082	241
		Mean ± SD	0.85 ± 0.25	0.89 ± 0.23	0.94 ± 0.16	0.93 ± 0.16	0.79 ± 0.28	0.95 ±0.17
		CI 95%	[0.84;0.85]	[0.88;0.90]	[0.92;0.96]	[0.92;0.94]	[0.78;0.80]	[0.92;0.97]
	P* values		<0.0001	<0.0001	0.4391	0.3167	<0.0001	0.5792

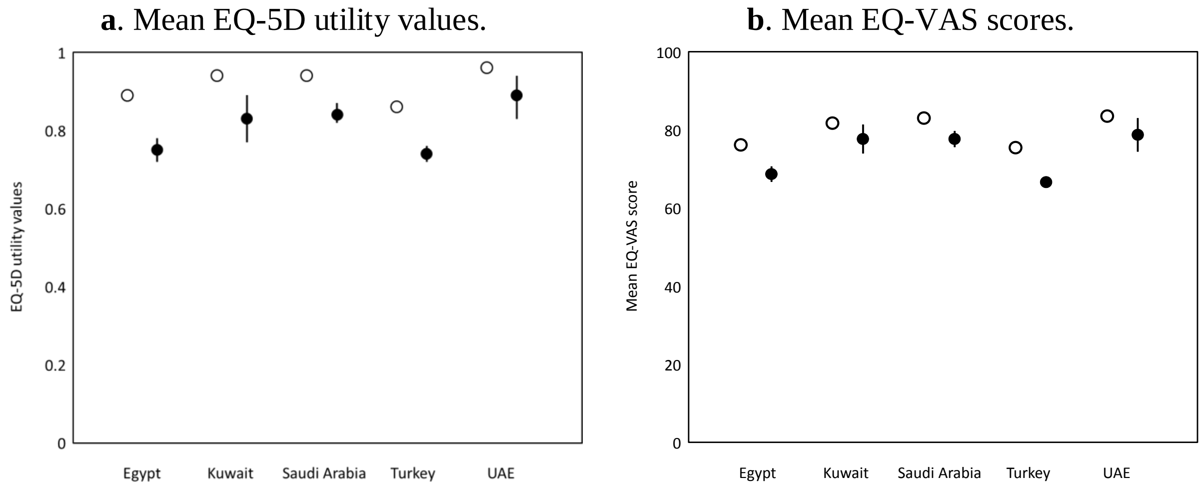

Figure 3: Mean EQ-5D-3L utility values (a) and mean EQ-VAS scores (b) in subjects screening positive (filled symbols) or negative (open symbols) for at least one disease in the screening population of each of the five participating countries.

4. DISCUSSION

The SNAPSHOT program represents one of the rare initiatives aimed at providing standardised estimates of prevalence, burden of disease, healthcare resource consumption and HRQoL across several countries in the Middle East using the same standardised methodology within an omnibus approach. A total of 33,486 screening interviews were performed, which will enable the overall program objectives to be addressed, in particular the estimation of general population reference values for the EQ-5D-3L in five countries in the Middle East.

Stratification of recruitment enabled representativeness of the program population in terms of gender, age and region to be ensured. Telephone interview was the most practical way to obtain a large general population sample in a reasonable timeframe. Postal surveys are generally subject to inclusion bias in emerging countries (literacy rates). Face-to-face interviews would have been impractical outside urban areas due to the low population density of many regions of participating countries.

With respect to the prevalence assessment, case definition was based on validated questionnaires. Although this may limit the accuracy of the responses compared to a physician-ascertained diagnosis, this method allows the findings to be generalised to the national population. In countries where access to healthcare may not be universal, it would not be possible to achieve such representativeness by recruiting patients through clinicians. The screening questionnaires used in the SNAPSHOT program have all been validated and used previously in general population surveys in other regions of the world, and this will facilitate comparison of the data obtained with previous studies.

With respect to the EQ-5D, although this was originally designed as a paper form for subjects to complete themselves (2), it has also been administered by telephone interview in a large number of major studies, for example in the National Health Measurement Study in the United States (13). It is possible that telephone administration of the EQ-5D may elicit responses that are slightly different from those elicited by self-administration, but these differences are expected to be minor (14).

The overall response rate was 50.9%. This figure masked large differences between Egypt (67.4%) and Turkey (58.9%), where the response rates were close to anticipated rates, and Saudi Arabia (40.6%) and Kuwait/UAE (38.3%). However, a conservative approach was used to calculate the response rate due to the combination of refusals and call-back failures, and the inclusion of subjects prior to confirmation of eligibility. Loss of potential participants arose from two sources. Firstly, subjects who refused to participate (56%), among whom 79% were not even confirmed as eligible. Secondly, failures to call-back (44%), among whom 97% were not even confirmed as eligible. The response rate would have been 56.5% assuming that the distribution of eligible/non-eligible subjects was identical for respondents and non-respondents. If call-back failures were excluded from the calculation, the response rate would have been 70.6%.

This program has provided the first general population references for EQ-5D-3L utility values in five countries in the Middle East. The sample sizes were towards the upper end of the range reported in previous general population surveys with the EQ-5D (6). Since specific value sets have not been generated for the Middle East region those originally generated in the UK were used. However, it is possible that values attached to different health states, may not be identical. In the future, it will be important to generate specific value sets for Middle Eastern countries. In this respect, it is of note that, whereas mean EQ-VAS scores in the Middle East were similar to or lower than those reported in European populations (15), the mean utility value scores were higher. It was also observed that mean EQ-VAS and utility value scores were around ten percent lower in Turkey than in the peninsular Arabian countries, which may reflect cultural or linguistic differences in values. This between-country difference is of similar magnitude to that observed between subjects with or without a screened disease.

The EQ-5D has previously been used in clinical, epidemiological or economic studies in Turkey, Egypt, Saudi Arabia and Jordan, for example in studies of diabetes (16), chronic pain (17-19) cancer (20, 21) or chronic diseases (22). However, no general population references were available for these countries.

Based on findings in other countries with the EQ-5D and other quality of life measures, it would be expected that scores would be lower in women than in men, would decrease with age and would be lower in subjects with identified diseases than in those without (15). The expected relationship with gender was observed both for the EQ-VAS score and for the utility metric. A progressive reduction in score was observed with age in Turkey, but no such relationship was observed for the other countries. This unanticipated finding may reflect a cohort effect with the dramatic social changes that have occurred in the region over recent decades, which may result in younger generations having different expectations and standards pertaining to health than their elders. It should be noted that the differences in utility values between men and women in the SNAPSHOT program are more pronounced than those reported previously in European countries, whereas the differences between age groups are smaller (23). With regard to disease status, the subjects in our program who screened positively for at least one of the four diseases of interest had a significantly lower score on the EQ-VAS and the utility metric than in the remaining subjects.

The program has several strengths. It is a cross sectional, population-based program with a large sample size using consistent methodology across all countries. In addition, the case definitions used were based on validated disease-specific questionnaires, and HRQoL has been assessed using the EQ-5D questionnaire, which has been validated and used widely, enabling comparison with data collected elsewhere.

Omnibus programs such as this, which use a common methodology to collect data in multiple countries and on multiple diseases, allow pertinent comparisons to be made between countries and between diseases. This represents a powerful approach for generating standardised epidemiological data on important health indicators such as prevalence, quality of life and healthcare resource utilisation. Multidimensional programs such as SNAPSHOT which are conducted on a large scale involve significant time and resources to set up and implement. However, it would be relatively straightforward to implement the same program in further groups of countries once the data acquisition system has been validated. Given the rapidly evolving social and demographic structure of Middle Eastern countries, it will be useful to repeat the SNAPSHOT program at regular intervals in order to document the evolution of key indicators over time, as is done, for example, with the World Health Organisation's episodic Global Burden of Disease surveys (24). In this context, it will also be important to establish large longitudinal cohorts in the Middle East, in which epidemiological trends can be followed over time, such as have been developed elsewhere, for example the Framingham Heart Study in the USA (25), the GAZEL project in France (26) and the British Birth Cohorts (27).

Several of the principal limitations of this program have already been discussed above. In addition, stopping the program in the Arabian countries before the target sample of 10,000 individuals in Saudi Arabia and 10,000 in Kuwait/UAE led to some imbalance in the demographic structure of the sample with respect to the target strata. This is addressed by adjusting for age and gender when estimating the prevalence of the diseases of interest. Moreover, several difficulties were encountered in the implementation of the SNAPSHOT program, which would merit being addressed in future studies. Firstly, it was difficult to align the timing of approval from the Ethics Committees in the different participating countries and this led to the exclusion of one of the countries originally planned to participate in the program. In such multi-country epidemiological studies, it is important that data be collected simultaneously in all participating countries in order to optimise comparison of the findings between countries. Secondly, less than seven percent of the telephone numbers generated resulted in a contact, due to the extremely high proportion of unattributed numbers. In certain countries, it may be possible to restrict random number generation to number sequences that are actually attributed by telephone operators.

In conclusion, this program emphasises the benefit of an omnibus approach to collecting population data for multiple diseases in multiple countries. Similar approaches would no doubt be useful to document the epidemiology of other chronic diseases in the Middle East. The program provides general population references for EQ-5D-3L rating scores and utility values for five countries in the region which will be useful as benchmarks for evaluating the impact of diseases and of health policies on HRQoL. In addition, the data generated could inform future HTA submissions supporting policy makers with local data to enhance evidence based decision-making.

5. ABBREVIATIONS

Abbreviation	Definition
AIR	Asthma Insights and Reality
BPH	Benign Prostatic Hyperplasia
CAPI	Computer Assisted Personal Interview
CI	Confidence Interval
CRO	Contract Research Organisation
EQ-5D	EuroQol Five-Dimension questionnaire
GEP	Good Epidemiological Practice
HRQoL	Health Related Quality of Life
HTA	Health Technology Assessment
IPSS	International Prostate Symptom Score
MDQ	Mood Disorder Questionnaire
SD	Standard Deviation
SFAR	Score For Allergic Rhinitis
TTO	Time Trade Off
UAE	United Arab Emirates
USA	United States of America
VAS	Visual Analogue Scale
WHS	World Health Survey

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Competing interests:

AEH, FA, LT and DDP are employees of and shareholders in GlaxoSmithKline, which funded the SNAPSHOT program. AL is a director of MS Health, the clinical and epidemiological research company that implemented this program on behalf of GlaxoSmithKline. The authors declare that they have no further conflicts of interest.

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**Formerly employed at GlaxoSmithKline*

APPENDIX

Health Questionnaire

English version for the UK

(Validated for Ireland)

By placing a tick in one box in each group below, please indicate which statements best describe your own health state today.

Mobility

I have no problems in walking about ☐

I have some problems in walking about ☐

I am confined to bed ☐

Self-Care

I have no problems with self-care ☐

I have some problems washing or dressing myself ☐

I am unable to wash or dress myself ☐

Usual Activities *(e.g. work, study, housework, family or leisure activities)*

I have no problems with performing my usual activities ☐

I have some problems with performing my usual activities ☐

I am unable to perform my usual activities ☐

Pain / Discomfort

I have no pain or discomfort ☐

I have moderate pain or discomfort ☐

I have extreme pain or discomfort ☐

Anxiety / Depression

I am not anxious or depressed ☐

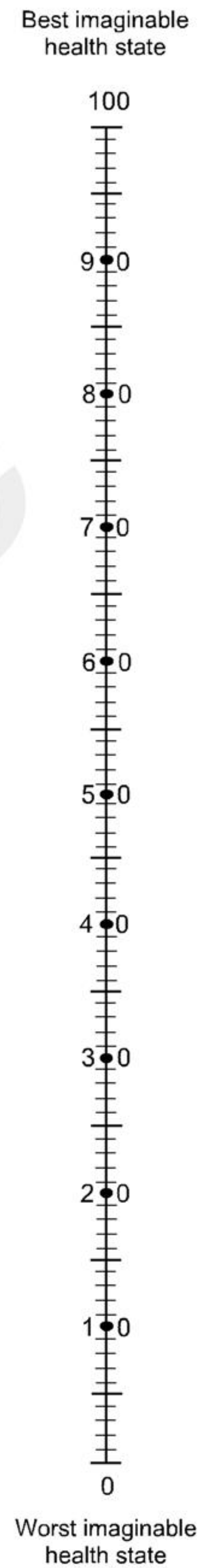
I am moderately anxious or depressed ☐

I am extremely anxious or depressed ☐

To help people say how good or bad a health state is, we have drawn a scale (rather like a thermometer) on which the best state you can imagine is marked 100 and the worst state you can imagine is marked 0.

We would like you to indicate on this scale how good or bad your own health is today, in your opinion. Please do this by drawing a line from the box below to whichever point on the scale indicates how good or bad your health state is today.

Your own health state today



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