



The self-reported prevalence and disease burden of asthma in Greece

Georgia Kourlaba, Petros Bakakos, Stelios Loukides, Katerina Vellopoulou, Argyro Solakidi & Nikos Maniadas

To cite this article: Georgia Kourlaba, Petros Bakakos, Stelios Loukides, Katerina Vellopoulou, Argyro Solakidi & Nikos Maniadas (2019) The self-reported prevalence and disease burden of asthma in Greece, Journal of Asthma, 56:5, 478-497, DOI: [10.1080/02770903.2018.1471704](https://doi.org/10.1080/02770903.2018.1471704)

To link to this article: <https://doi.org/10.1080/02770903.2018.1471704>



Accepted author version posted online: 02 May 2018.
Published online: 22 Jun 2018.



Submit your article to this journal [↗](#)



Article views: 61



View Crossmark data [↗](#)



Citing articles: 1 View citing articles [↗](#)

The self-reported prevalence and disease burden of asthma in Greece

Georgia Kourlaba^a, Petros Bakakos^b, Stelios Loukides^c, Katerina Vellopoulou^a, Argyro Solakidi^a, and Nikos Maniatakis^d

^aEVROSTON LP, Athens, Greece; ^b1st Respiratory Medicine Department, National and Kapodistrian University of Athens, Athens, Greece;

^c2nd Respiratory Medicine Department, National and Kapodistrian University of Athens, Chaidari, Greece; ^dDepartment of Health Services Organization and Management, National School of Public Health, Athens, Greece

ABSTRACT

Objectives: The primary objective was to estimate the self-reported prevalence of asthma in Greece. The secondary one was to assess the impact of asthma control on patients' health related Quality-of-Life (HRQoL), productivity loss, daily activities and psychological distress. **Methods:** A population-based, random-digit dialing, telephone nationwide survey was conducted to recruit patients with asthma. Among the responders, 3,946 met the age criterion (≥ 18 years) and completed the screening questions regarding asthma. Of them, 353 subjects reported that they had been diagnosed with asthma sometime in their life and completed the survey. Data on demographic and lifestyle characteristics, asthma control, comorbidities, limitations in daily activities, psychological distress, productivity loss, as well as HRQoL, were collected through telephone interview. **Results:** The lifetime self-reported prevalence of asthma was found to be 9.10% (95% CI: 8.14%–9.94%). Sixty three percent of patients had well-controlled (WC) asthma. Asthma control was associated with gender, age, and specific comorbidities. Moreover, patients with not well-controlled (NWC) asthma were more likely to have missed work and reduced productivity during the past 12 months due to their asthma ($p < 0.01$). Patients with NWC asthma were more likely to declare psychological distress and limitations in their daily living activities. Patients' HRQoL with NWC asthma was significantly worse (0.65 ± 0.24) compared to those with WC asthma (0.86 ± 0.17 , $p \leq 0.001$). **Conclusions:** The results of this survey revealed the link between the asthma control and burden of disease demonstrating the need for the implementation of programs aiming at the management of chronic symptoms related to this condition.

ARTICLE HISTORY

Received 19 January 2018

Revised 17 April 2018

Accepted 28 April 2018

KEYWORDS

Asthma; survey; burden of disease; quality of life; Greece

Introduction

The self-reported prevalence of lifetime asthma is estimated to be 4.5% affecting over 300 million adults worldwide (1,2). The prevalence of asthma increased substantially over the second half of the 20th century, especially in westernized societies. Recent epidemiological data indicates that the prevalence of asthma may have reached a plateau or even declined during the past decade, but these estimates do not come from high quality data (2). In Europe, 5.1% of the adult population reported having been diagnosed with asthma. This ranged from more than 15% in the Netherlands, Sweden, and the United Kingdom to less than 2% in Bosnia Herzegovina, Kazakhstan, and Estonia (1), revealing a great geographic variability.

Worldwide, approximately 180,000 deaths are attributable to asthma each year, although there is considerable regional variation in mortality rates (3). Despite apparent reductions in mortality in some countries and regions of the world, as derived from mortality

data provided by WHO for 46 countries, there was no appreciable change in global asthma mortality rates from 2006 through to 2012 (4).

Apart from the humanistic burden, asthma imposes a substantial economic burden, mainly owing to the indirect costs related to the loss of productivity. Although severe asthmatic patients represent $\leq 10\%$ of all asthmatic patients (5–7), the management of severe asthmatic patients accounts for almost 80% of the total economic burden of asthma. Moreover, it is known that asthma negatively influences patients' health related quality-of-life (HRQoL) (8–12). For these reasons, a variety of effective treatment options exist for patients with asthma to achieve clinical control, including control of symptoms, maintenance of normal activity levels, and to prevent exacerbations. Despite the available therapies, there is substantial evidence demonstrating that asthma control in clinical practice is suboptimal over the last decade (13–16). In Europe, it seems that more than 50% of

asthmatic patients are not well controlled and this percentage varies across countries (13,16,17). Poor asthma control is associated with increased risk of exacerbations, debilitation, impaired HRQoL, increased health-care utilization, and reduced productivity (13,15,18).

Despite the substantial impact that asthma seems to have on patients, healthcare systems and economies, to the best of our knowledge, limited data are available regarding the prevalence of lifetime asthma in adults in Greece (1,19). Moreover, the LIAISON study revealed that Greece was the fifth country with the lowest score at asthma control, following Hungary, Poland, the Netherlands, and France among the 12 countries that participated (16), while data regarding the impact of asthma on patients' HRQoL, daily activities, psychological distress, and productivity loss in Greece are completely lacking.

In this context, the objective of the present study was dual. The primary objective was to estimate the self-reported prevalence of lifetime diagnosed asthma in Greece. The secondary one was to quantify the burden of the disease in terms of HRQoL, daily activities, psychological distress and productivity loss and to assess the impact of asthma control on this burden. The research hypothesis (alternative statistical hypothesis) was that patients with not well-controlled asthma (NWC) are more likely to have missed work, reduced productivity, limited daily activities, greater psychological distress and worse HRQoL compared to patients with well-controlled (WC) asthma.

Materials and methods

Study design and population

A population-based, random-digit dialing (RDD) telephone nationwide survey was conducted between November and December of 2016 to recruit patients with asthma similar to the methodology used to estimate the burden of chronic obstructive pulmonary disease in Greece in 2015 (20). A proportionate, stratified by region, systematic sampling procedure was used to ensure a nationally representative sample of the urban/rural population based on the distribution of the population as obtained from the census of 2011 (www.statistics.gr).

Thirty-two thousand landline-telephone households were conducted, of whom, only 12,202 (38.1%) were handled calls. The rest being rejected due to various reasons (no answer, busy, etc). The contacted persons were interviewed by computer-assisted telephone interviewing (CATI). Only individuals aged greater than 18 years old ($n = 3,966$) were eligible to participate in the survey.

All of the 3,966 eligible individuals were asked to report their age, the geographic area they lived in, their weight and height, and whether they had been diagnosed with asthma or regularly used medication to treat this condition (screening question). Of those eligible individuals, 3,946 answered the screening question (response rate 99.5%). This sample size had been calculated as adequate to estimate an expected 9% asthma prevalence, based on Zervas et al abstract (19), with a precision of 1% at the 95% confidence level with a power of the study more than 80%. Among these individuals, 353 reported that they had been diagnosed with asthma and were interviewed after being informed of the purposes of the study, the confidentiality and anonymity of the answers, and that they could terminate the interview at any time (Figure 1).

According to the Greek legislation (Law 2328/1995, Presidential Decree 310/1996, Law 3603/2007, Law 2472/1997, Law 3471/2006) there is no need for ethics approval in telephone surveys such the one presented here (Association of Opinion Polls and Survey Organisations – www.sedea.gr). Therefore, the study protocol was not submitted to the ethical committee of any institution for approval, similar to a previous survey (20).

Data collection

Telephone interviews were conducted using a structured questionnaire specifically designed to treat the purposes of the study and had an average duration of 20 min (APPENDIX I). More specifically, collected data included: socio-demographic and anthropometric characteristics, comorbidities, asthma history, smoking habits, and asthma control during the past 4 weeks using the Asthma Control Test (ACT) (21). WC asthma was defined as an ACT score of 20 or more and NWC asthma was defined as an ACT score of 19 or less (22). Moreover, data regarding patients' HRQoL was collected using the EuroQol-5D (EQ-5D) questionnaire, a generic tool for measuring HRQoL, that is valid for the Greek population (23) and has already been used to assess asthmatic patients' HRQoL (24). The European value set was used to convert the health states to the single summary EQ-5D Index that ranges from 0 to 1 (25). Higher values correspond to better health state levels.

Additionally, the impact of asthma control on patients' daily activities and psychological distress during the past 4 weeks was assessed using 6 questions obtained from the adult patient survey tool used in the context of the Improving Chronic Illness Care Evaluation (ICICE)

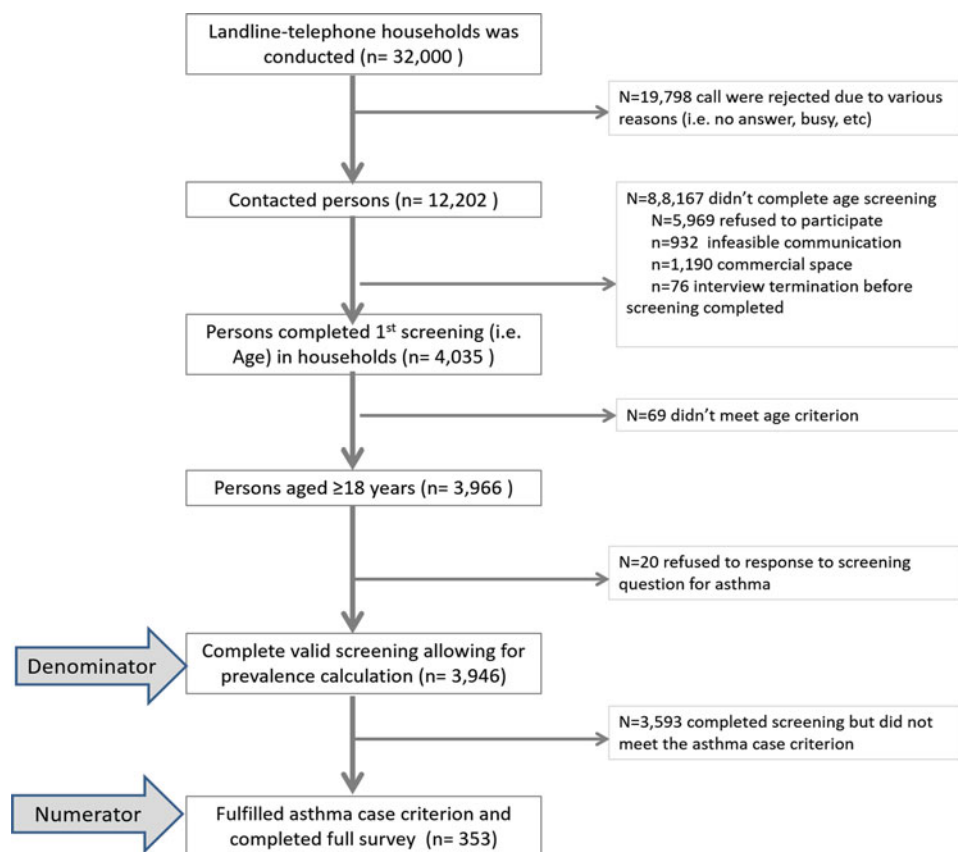


Figure 1. Study-consort diagram.

project (26). The impact of asthma control on productivity loss related to absenteeism and presenteeism was also assessed.

Statistical analysis

The asthma prevalence estimates were weighted to the Greek population as obtained from the latest census (2011) to adjust for differences in age and gender between survey sample and country population. The linearization-based variance estimators were used to take account of survey weights in computing sampling standard errors. Categorical variables are presented as absolute (n) and relative frequencies (%). Continuous variables are summarized as means $\pm$ standard deviation (SD). The chi-square test without the correction of continuity was used to evaluate the associations between categorical variables. The Student's t-test or Mann-Whitney test was used to assess the association between a continuous variable and a binary variable, as appropriate. Using univariate and multiple logistic regression, prevalence odds ratios (PORs) were calculated to investigate the association between demographic characteristics (i.e. gender, age, BMI status and geographic area of residence) and asthma. Moreover, logistic regression was conducted

to identify potential factors related to NWC asthma. The variables explored were age, gender, BMI status, geographic area of residence, comorbidities, years since asthma diagnosis, smoking status, and passive smoking. These variables were selected due to their clinical significance based on the existing literature (16). All variables found to be significantly associated with prevalence of asthma or NWC asthma at the level of 0.1 in univariate analyses were included in the multiple logistic regression.

A Tobit regression model was employed to evaluate factors independently associated with patients' HRQoL (EQ-5D utility values). The Tobit regression model was suitable for two reasons. Firstly, the dependent variable, EQ-5D utility score is censored. Secondly, the data were skewed, and many observations were at the upper limit. Variables that might have had an impact on HRQoL based on existing literature were explored. Those found to be statistically significant associated with HRQoL at the level of 0.1 in univariate analyses were entered in the multiple regression model. The results are presented as b-coefficients and 95% CI.

A probability value of 5% was considered as statistically significant. All statistical calculations were performed using STATA software (version 8, 2003, STATA Corp, College Station, TX, USA).

Results

Self-reported prevalence of asthma

In a nationally representative sample of the total population in terms of age and gender (Table 1, APPENDIX II), the self-reported lifetime prevalence of asthma was found to be 9.10%. Asthma was found to be more prevalent in women, in obese subjects, and in urban areas (Table 1). The prevalence of asthma increases as the individual's age increases, with a prevalence of 7.05% in the population aged 18–29 years and 10.78% in those aged 70+ years (Table 1). Multiple logistic regression revealed that women were 88% more likely to have asthma compared to men [POR (95% CI): 1.88 (1.49–2.37)], subjects living in rural areas were 40% less likely to have asthma compared to those living in urban areas [POR (95% CI): 0.62 (0.46–0.83)], and overweight and obese subjects were 67% [POR (95% CI): 1.67 (1.29–2.17)] and two times [POR (95% CI): 2.17 (1.58–2.98)] more likely to have asthma compared to those with normal weight (Table 1).

Asthma control and socio-demographic, lifestyle, and clinical characteristics of patients

The baseline characteristics of the asthmatic patients recruited through the telephone survey (N = 353) are presented in Table 2 for the total sample and patients with WC and NWC asthma, separately. The majority of patients (65%) reported that they have been diagnosed with asthma more than 10 years ago, while only 2.5% of patients were newly diagnosed. Moreover, most of the patients were non-smokers (42.2%), followed by current smokers (31.2%). About 24% of patients reported that they were free of comorbidities, with hypertension being the most frequent comorbidity (28.6%), followed by allergic rhinitis (26.1%) (Table 2).

The mean $\pm$ SD ACT score of patients was 20.3 $\pm$ 4.5 with 63% of patients having well-controlled asthma. Females were more likely to have NWC asthma ($p = 0.036$) and the proportion of patients with NWC asthma is increasing as they are getting older ($p = 0.001$). Moreover, patients with NWC asthma were more likely to have any comorbidity ($p < 0.001$). Patients with NWC asthma were statistically significantly more likely to suffer from hypertension, chronic obstructive pulmonary disease (COPD), skin allergy or other skin disorders, and depression compared to those with WC asthma ($p < 0.05$). No association between asthma control and BMI status, geographic area of residence, smoking habits, and time passed since asthma diagnosis was detected (Table 2). Multiple logistic regression revealed that patients aged

greater than 50 years old, as well as those with COPD and skin allergy or other disorders, were statistically significantly more likely to have NWC asthma compared to their counterparts (Table 2, APPENDIX II).

Impact of asthma control on work, daily activities, and psychological distress

Patients with NWC asthma were more likely to declare psychological distress (i.e. worries about present or future life, asthma shortening life) and limitations in their daily living activities, such as social life or sports and hobbies compared to those with WC asthma (Table 3). It is worth mentioning that about 63.7% of patients with NWC asthma reported that they were feeling dependent on inhalers to a great extent, whereas the respective percentage in patients with WC asthma reached 32.6% ($p < 0.001$) (Table 3).

Overall, 150 patients (42.5%) reported that they were currently employed, with 10% of them reporting that they have missed work during the past 12 months due to their asthma, with the mean number of days lost being 4.5. Moreover, almost 15% of participating subjects reported that they had reduced productivity for a mean number of 5.5 days. Finally, 11 responders (3.15%) reported that their asthma had caused another member of their household to miss work at least once in the previous year, whereas 3% had retired, on average, 15 years earlier due to their asthma. Finally, patients with NWC asthma were more likely to have missed work and reduced productivity during the past 12 months due to their asthma ($p < 0.01$).

Impact of asthma control on HRQoL

The present survey revealed that patients' HRQoL was 0.79 ± 0.22 . HRQoL of patients with NWC control was significantly worse (0.65 ± 0.24) compared to those with WC asthma (0.86 ± 0.17 , $p \leq 0.001$). HRQoL was also found to be strongly correlated, at a univariate level, with gender, age, BMI status, hypertension, depression, gastro-esophageal reflux, COPD, skin allergy or other skin disorders and years since asthma diagnosis, while no statistically significant association was detected between HRQoL and geographic area of residence and smoking status (Table 4). Multiple Tobit regressions revealed that asthma control remained statistically significantly associated with HRQoL after controlling for the characteristics mentioned above [b-coef (95% CI): 0.166 (0.124–0.208)]. Other characteristics that remained statistically significant factors were patients' gender, depression, gastroesophageal reflux, and years since asthma diagnosis (Table 4).

Table 1. Lifetime prevalence* of asthma in Greece (N = 3,946).

Characteristics	N (%)	Lifetime Asthma			Prevalence odds ratio (95% CI)	
		Prevalence	Lower limit	Higher limit	Crude	Adjusted [†]
Overall	3,946	9.10%	8.14%	9.94%		
Gender						
Male	1,918 (48.6%)	6.66%	5.62%	7.87%	1.00	1.00
Female	2,028 (51.4%)	11.21%	9.90%	12.66%	1.77 (1.41 – 2.22)	1.88 (1.49 – 2.37)
Age (years)						
18 – 29	681 (17.3%)	7.05%	5.35%	9.23%	1.00	1.00
30 – 39	735 (18.6%)	7.89%	6.15%	10.07%	1.13 (0.76 – 1.68)	1.00 (0.67 – 1.51)
40 – 49	714 (18.1%)	8.68%	6.83%	10.98%	1.25 (0.85 – 1.86)	1.07 (0.71 – 1.59)
50 – 59	621 (15.7%)	9.50%	7.43%	12.07%	1.38 (0.93 – 2.06)	1.07 (0.71 – 1.62)
60 – 69	527 (13.4%)	10.25%	7.93%	13.14%	1.51 (1.00 – 2.26)	1.13 (0.74 – 1.73)
70+	668 (16.9%)	10.78%	8.64%	13.37%	1.59 (1.09 – 2.33)	1.20 (0.81 – 1.79)
BMI status						
Normal weight	1763 (44.9%)	6.82%	5.73%	8.09%	1.00	1.00
Overweight	1577 (40.2%)	9.99%	8.55%	11.52%	1.50 (1.17 – 1.93)	1.67 (1.29 – 2.17)
Obese	587 (14.9%)	13.16%	10.65%	16.15%	2.07 (1.53 – 2.80)	2.17 (1.58 – 2.98)
Geographic area of residence						
Urban area (>10,000 residents)	2472 (62.6%)	10.00%	8.88%	11.25%	1.00	1.00
Semi-urban area (2,000 – 10,000 residents)	552 (14.0%)	8.27%	6.22%	10.91%	0.81 (0.58 – 1.13)	0.81 (0.58 – 1.14)
Rural area (<2,000 residents)	922 (23.4%)	6.76%	5.29%	8.60%	0.65 (0.49 – 0.87)	0.62 (0.46 – 0.83)

BMI: Body Mass Index; CI: Confidence Interval.

*Weighted to the latest census data (2011).

[†]Hosmer-Lemeshow $\chi^2(8) = 6.56$ ($p = 0.5848$).

Discussion

The current study is a population-based, RDD, telephone, nationwide survey that sought to estimate the self-reported prevalence and burden of asthma in Greece. This is the first study aiming to evaluate the impact of asthma control in daily activities, psychological distress, work productivity, and HRQoL of asthmatic patients in Greece.

The prevalence of lifetime self-reported asthma in Greece was estimated to be 9.10%, similar to that reported from Zervas' et al. in 2012 and much higher than the 6.6% that was reported in the world health survey in 2002–2003 (1,19). These data confirm the fact that the increase of asthma prevalence has reached a plateau in the past decade in most European countries as reported in chapter 12 of the European Respiratory Society's White Book. When comparing our findings with those of other studies in the literature assessing the self-reported lifetime prevalence of asthma in a population over 18 years of age, the highest prevalence was observed in California (13.6%) (27), followed by the results of a study conducted in the USA (7.20%) (28), and in Germany (5.7%) (29). It should be noted that the prevalence observed in Germany in 2003 was similar to that observed in the National Health Interview and Examination Survey of 1998 (29). This variability in the prevalence of asthma may be attributed to the great variability of known risk factors of asthma like smoking prevalence and indoor and outdoor air pollution. For instance, the smoking prevalence in Greece,

both for males and females, is much higher compared to Germany (30).

Moreover, our study revealed that the prevalence of asthma in Greece was higher among women and among overweight and obese adults; findings similar to those observed in previously conducted surveys in other countries (31,32). The prevalence was found to be lower in rural areas compared to urban ones, a difference that could be attributed to environmental risk exposures like dust mites, high levels of vehicle emissions, and a westernized lifestyle (33).

Overall, the majority (63%) of participants in our study reported that their asthma condition was WC, a finding similar to that observed in an observational study performed in Italy (34), but much higher than that declared in other European studies in which more than half of patients had uncontrolled or partially controlled asthma (13–15,35). This result may be partially attributed to the fact that the majority of asthma patients in Greece are usually followed-up by specialists and are treated with effective treatment approaches, such as inhaled steroids. Asthma control was strongly correlated with gender, age, and comorbidities like hypertension, depression, and COPD. This means that asthma educators may also need to address disease state management for other chronic conditions simultaneously with asthma education for the latter to be successful. The results of our study are partially in agreement with the findings of studies conducted

Table 2. Association between asthma control and socio-demographic, lifestyle and clinical characteristics.

Characteristic	Total sample N = 353		Not well-controlled N = 126	Well-Controlled N = 221	p-value
	n	(%)	(%)	(%)	
Gender					0.036
Males	127	35.98%	29.03%	70.97%	
Females	226	64.02%	40.36%	59.64%	
Age (years)					0.001
18-29	48	13.60%	19.57%	80.43%	
30-39	58	16.43%	19.30%	80.70%	
40-49	62	17.56%	33.87%	66.13%	
50-59	59	16.71%	45.61%	54.39%	
60-69	54	15.30%	44.44%	55.56%	
70+	72	20.40%	49.30%	50.70%	
Geographic Area of residence					0.347
Urban area (>10,000 residents)	247	69.97%	38.02%	61.98%	
Semi-urban area (2,000 – 10,000 residents)	45	12.75%	26.67%	73.33%	
Rural area (<2,000 residents)	61	17.28%	36.67%	63.33%	
BMI status					0.656
Normal weight	120	33.99%	35.04%	64.96%	
Overweight	156	44.19%	35.06%	64.94%	
Obese	77	21.81%	40.79%	59.21%	
Comorbidities					
Hypertension	101	28.61%	37.30%	23.98%	0.008
Allergic rhinitis	92	26.06%	30.95%	22.17%	0.071
COPD	61	17.28%	27.78%	10.86%	<0.001
Obesity	49	13.88%	15.87%	12.67%	0.406
Skin allergy or other skin disorders	48	13.60%	19.84%	9.95%	0.010
Diabetes Mellitus	40	11.33%	11.90%	11.31%	0.868
Depression	36	10.20%	15.87%	6.79%	0.007
Gastroesophageal reflux	35	9.92%	13.49%	7.24%	0.056
No comorbidity	85	24.08%	12.70%	31.22%	<0.001
Years since asthma diagnosis					0.163
≤5.0	54	15.34%	33.96%	66.04%	
5.1-10.0	71	20.17%	27.14%	72.86%	
>10	227	64.49%	39.46%	60.54%	
Smoking status					0.194
Current smoker	110	31.16%	34.26%	65.74%	
Ex-Smoker	94	26.63%	30.43%	69.57%	
Non-Smoker	149	42.21%	41.50%	58.50%	
Passive smoker					0.789
No	217	61.36%	37.59%	62.41%	
Yes	136	38.64%	35.68%	64.32%	

BMI: body mass index; COPD: chronic obstructive pulmonary disease.

in Europe in which asthma control was associated with gender, age, and specific comorbidities (13,16). However, our study, as opposed to the LIAISON study, did not reveal a significant association between asthma control and smoking (16). This discrepancy could be attributed to the different smoking habits between Greek patients and those from the European countries that participated in the LIAISON study (16) as well as to the potential lack of power in our study due to a small patient population.

Our study revealed that Greek patients with asthma have similar HRQoL compared to that of asthmatic patients reported in other countries (36-38). In Greece, the HRQoL of asthmatic patients seems to be similar to, or much improved, compared to that of other patient populations. For instance, the HRQoL was 0.76 for patients with Coronary Artery Disease at admission (39), 0.72 for patients with Coronary Heart Disease post-discharge

(39), 0.66 ± 0.31 for community based populations with chronic diseases, 0.70 ± 0.33 for patients with one hospitalization, 0.56 ± 0.32 for patients with more than one hospitalization during the past year(23), 0.67 for patients with heart failure, 0.64 for patients with peripheral artery disease, and 0.61 for patients with cardiovascular disease (39). On the other hand, asthmatic patients' HRQoL was found to be worse compared to that of the Greek population without chronic disease (0.87 ± 0.20) (23). Additionally, the results of the present study are in line with those of other studies, revealing a strong correlation of asthma control with HRQoL (16,40,41).

Apart from the impact of asthma on HRQoL, our study revealed its substantial impact on productivity. Almost 10% of participants still in working age reported that they missed an average of 4.5 working days during the past 12 months. Moreover, almost 15% of subjects

Table 3. Association between limitations in activities of daily living, psychological distress, productivity and health-related quality of life and asthma control.

Limitations in activities of daily life, psychological distress, productivity loss and health-related quality-of-life	Total sample N = 353	Not well-controlled N = 126	Well-Controlled N = 221	p-value
During the past 4 weeks, how often did asthma interfere with your social life?				<0.001
Not at all	67.42%	34.92%	85.52%	
A little/somewhat/A great deal	32.58%	65.08%	14.48%	
During the past 4 weeks, how often were you restricted in the sports, hobbies, or other recreations you engaged in because of your asthma?				<0.001
Not at all	63.08%	27.27%	81.82%	
A little/somewhat/A great deal	36.92%	72.73%	18.18%	
During the past 4 weeks, how often were you limited in going certain places because you were afraid of getting an asthma attack and not being able to get help?				<0.001
Not at all	66.19%	45.60%	77.83%	
A little/somewhat/A great deal	33.81%	54.40%	22.17%	
During the past 4 weeks, how often were you worried about your present or future life because of asthma?				<0.001
Not at all	51.28%	25.60%	65.00%	
A little/somewhat/A great deal	48.72%	74.40%	35.00%	
During the past 4 weeks, how often did you worry about asthma shortening your life?				<0.001
Not at all	58.05%	36.29%	70.18%	
A little/somewhat/A great deal	41.95%	63.71%	29.82%	
During the past 4 weeks, how often did you feel dependent on your asthma sprays?				<0.001
Not at all	52.12%	26.98%	67.42%	
A little/somewhat/A great deal	47.88%	73.02%	32.58%	
In the past year, did you miss any days of work due to asthma?				0.004
No	89.33%	78.57%	94.34%	
Yes	10.67%	21.43%	5.66%	
Did your health problem affect your ability to produce work output in a high-quality or timely manner?				<0.001
No	84.46%	60.98%	93.33%	
Yes	15.54%	39.02%	6.67%	

reported reduced productivity for an average of 5.5 days. Worldwide, the average number of absent days per employee per year associated with an asthma condition ranges significantly (42), from 2.6 days in the USA to 13 days in Canada (43), indicating that the impact of asthma on productivity in Greece is relatively low compared to that in other countries. Not surprisingly, the proportion of subjects reporting that they had missed work or had lower productivity whilst at work is higher in subjects with NWC disease. These results are aligned to those reported in the aforementioned European survey (13).

The limitations of this study that mainly come from the study design should be acknowledged. It is widely known that telephone surveys may lead to non-representative samples for the following reasons: a) the households without telephone services are automatically excluded

(44,45) and b) the response rate seems to be lower than that of face-to-face surveys indicating that the former are vulnerable to a greater non-response bias (44,46). However, comparing our sample with the total Greek population in terms of gender and age distribution, it is apparent that the representativeness was achieved. Apart from the low response rate, telephone surveys may suffer from poor response quality compared to face-to-face surveys (45). Firstly, the responder must retrieve all relevant to question information from memory, integrate that information (47) into a summary judgment, and report that judgment accurately. Additionally, since questions are worded in a short and simple way, respondents may not understand the question and consequently may not be able to answer adequately.

Despite the limitations that may occur due to the sampling procedure of an epidemiologic study, the findings of

Table 4. Health-related Quality of Life by asthmatic patients' characteristics and asthma control.

Characteristic	Mean ± SD	p-value	Adjusted b-coef (95% CI)	p-value
Gender				
Male	0.84 (0.20)	<0.001	Ref	—
Female	0.75 (0.23)		− 0.057 (−0.097; −0.016)	0.006
Age (years)				
18-29	0.87 (0.18)*†	<0.001	Ref	—
30-39	0.85 (0.19)*†		0.015 (−0.055; 0.086)	0.668
40-49	0.80 (0.20)		0.009 (−0.061; 0.080)	0.785
50-59	0.78 (0.22)		0.025 (−0.051; 0.100)	0.520
60-69	0.71 (0.22)		− 0.021 (−0.100; 0.059)	0.612
70+	0.73 (0.25)		0.009 (−0.068; 0.086)	0.821
Geographic Area		0.449		
Urban	0.78 (0.22)	0.019	—	—
Semi-urban/rural	0.80 (0.22)		—	—
BMI status				
Normal weight	0.81 (0.22)	<0.001	Ref	—
Overweight	0.79 (0.22)		− 0.006 (−0.052; 0.040)	0.805
Obese	0.73 (0.21)‡		− 0.038 (−0.095; 0.019)	0.199
Hypertension				
No	0.81 (0.20)	<0.001	Ref	—
Yes	0.71 (0.25)		− 0.035 (−0.084; 0.015)	0.169
Allergic Rhinitis		0.164		
No	0.79 (0.22)	0.003	—	—
Yes	0.76 (0.22)		—	—
COPD				
No	0.80 (0.22)	0.002	Ref	—
Yes	0.71 (0.22)		− 0.019 (−0.072; 0.034)	0.494
Skin allergy or other skin disorders				
No	0.80 (0.22)	0.587	Ref	—
Yes	0.69 (0.22)		− 0.033 (−0.091; 0.024)	0.258
Diabetes Mellitus				
No	0.79 (0.22)	<0.001	—	—
Yes	0.77 (0.21)		—	—
Depression				
No	0.81 (0.20)	<0.001	Ref	—
Yes	0.58 (0.25)		− 0.155 (−0.221; −0.090)	<0.001
Gastroesophageal reflux				
No	0.80 (0.22)	<0.001	Ref	—
Yes	0.64 (0.20)		− 0.100 (−0.167; −0.034)	0.003
Years since asthma diagnosis				
≤5	0.87 (0.17)	<0.001	Ref	—
5.1-10	0.82 (0.19)		− 0.065 (−0.129; 0.000)	0.050
>10	0.75 (0.23)†		− 0.090 (−0.146; −0.035)	0.002
Smoking status				
Current smoker	0.79 (0.21)	0.824	—	—
Ex-Smoker	0.79 (0.23)		—	—
Non-Smoker	0.78 (0.22)		—	—
Controlled asthma		<0.001		
Suboptimal asthma control	0.65 (0.24)	<0.001	Ref	—
Controlled	0.86 (0.17)		0.166 (0.124; 0.208)	<0.001

SD: standard deviation; CI: confidence interval; BMI: body mass index; COPD: chronic obstructive pulmonary disease.

*p < 0.05 compared with 60–69.

†p < 0.05 compared with 70+.

‡p < 0.05 compared with normal weight.

§p < 0.05 compared with ≤5.

The Likelihood-ratio chi2 for the multiple Tobit model was 151.78 (p < 0.001).

the present study indicate that asthma affects almost 9% of the adult population in Greece and its impact on productivity, everyday life, and HRQoL is not negligible. Lack of asthma control leads to deterioration of patients' HRQoL. Given the high percentage of asthmatic patients in Greece being not well-controlled, it is apparent that interventions aiming at managing chronic symptoms related to this condition may reduce the overall burden of asthma in Greece.

Acknowledgments

Authors would like to thank Hellenic Thoracic Society that sponsored this study.

Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

Funding

Hellenic Thoracic Society This study was funded by Hellenic Thoracic Society.

References

- To T, Stanojevic S, Moores G, Gershon AS, Bateman ED, Cruz AA, Boulet LP. Global asthma prevalence in adults: Findings from the cross-sectional world health survey. *BMC Public Health*. 2012;12:204. doi:10.1186/1471-2458-12-204. PMID:22429515.
- Anandan C, Nurmatov U, van Schayck OC, Sheikh A. Is the prevalence of asthma declining? Systematic review of epidemiological studies. *Allergy*. 2010; 65(2): 152–67. doi:10.1111/j.1398-9995.2009.02244.x. PMID:19912154.
- Braman SS. The global burden of asthma. *Chest*. 2006;130(1 Suppl):4S–12S. doi:10.1378/chest.130.1_suppl.4S. PMID:16840363.
- Ebmeier S, Thayabaran D, Braithwaite I, Bénomara C, Weatherall M, Beasley R. Trends in international asthma mortality: Analysis of data from the WHO Mortality Database from 46 countries (1993–2012). *Lancet*. 2017;390(10098):935–45. doi:10.1016/S0140-6736(17)31448-4. PMID:28797514.
- Hekking PP, Wener RR, Amelink M, Zwinderman AH, Bouvy ML, Bel EH. The prevalence of severe refractory asthma. *J Allergy Clin Immunol*. 2015;135(4):896–902. doi:10.1016/j.jaci.2014.08.042. PMID:25441637.
- Antonicelli L, Bucca C, Neri M, De Benedetto F, Sabbatani P, Bonifazi F, Eichler HG, Zhang Q, Yin DD. Asthma severity and medical resource utilisation. *Eur Respir J*. 2004;23(5):723–9. doi:10.1183/09031936.04.00004904. PMID:15176687.
- Godard P, Chanez P, Siraudin L, Nicoloyannis N, Duru G. Costs of asthma are correlated with severity: A 1-yr prospective study. *Eur Respir J*. 2002;19(1):61–7. doi:10.1183/09031936.02.00232001. PMID:11843329.
- Gonzalez-Barcala FJ, de la Fuente-Cid R, Tafalla M, Nuevo J, Caamano-Isorna F. Factors associated with health-related quality of life in adults with asthma. A cross-sectional study. *Multidiscip Respir Med*. 2012;7(1):32. doi:10.1186/2049-6958-7-32.
- Sundberg R, Palmqvist M, Tunsater A, Toren K. Health-related quality of life in young adults with asthma. *Respir Med*. 2009;103(10):1580–5. doi:10.1016/j.rmed.2009.04.023. PMID:19481434.
- Oh EG. The relationship between disease control, symptom distress, functioning, and quality of life in adults with asthma. *J Asthma*. 2008;45(10):882–6. doi:10.1080/02770900802252069. PMID:19085577.
- Strine TW, Mokdad AH, Balluz LS, Berry JT, Gonzalez O. Impact of depression and anxiety on quality of life, health behaviors, and asthma control among adults in the United States with asthma, 2006. *J Asthma*. 2008;45(2):123–33. doi:10.1080/02770900701840238. PMID:18350404.
- Juniper EF, Svensson K, Mörk AC, Ståhl E. Measuring health-related quality of life in adults during an acute asthma exacerbation. *Chest*. 2004;125(1):93–7. doi:10.1378/chest.125.1.93. PMID:14718426.
- Demoly P, Annunziata K, Gubba E, Adamek L. Repeated cross-sectional survey of patient-reported asthma control in Europe in the past 5 years. *Eur Respir Rev*. 2012;21(123):66–74. doi:10.1183/09059180.00008111. PMID:22379176.
- Rabe KF, Vermeire PA, Soriano JB, Maier WC. Clinical management of asthma in 1999: The Asthma Insights and Reality in Europe (AIRE) study. *Eur Respir J*. 2000;16(5):802–7. doi:10.1183/09031936.00.16580200. PMID:11153575.
- Partridge MR, van der Molen T, Myrseth SE, Busse WW. Attitudes and actions of asthma patients on regular maintenance therapy: The INSPIRE study. *BMC Pulm Med*. 2006;6:13. doi:10.1186/1471-2466-6-13. PMID:16772035.
- Braido F, Brusselle G, Guastalla D, Ingrassia E, Nicolini G, Price D, Roche N, Soriano JB, Worth H, LIAISON Study Group. Determinants and impact of suboptimal asthma control in Europe: The INTERNATIONAL CROSS-SECTIONAL AND LONGITUDINAL ASSESSMENT ON ASTHMA CONTROL (LIAISON) study. *Respir Res*. 2016;17(1):51. doi:10.1186/s12931-016-0374-z. PMID:27179604.
- Demoly P, Paggiaro P, Plaza V, Bolge SC, Kannan H, Sohler B, Adamek L. Prevalence of asthma control among adults in France, Germany, Italy, Spain and the UK. *Eur Respir Rev*. 2009;18(112):105–12. doi:10.1183/09059180.00001209. PMID:20956130.
- Demoly P, Gueron B, Annunziata K, Adamek L, Walters RD. Update on asthma control in five European countries: Results of a 2008 survey. *Eur Respir Rev*. 2010;19(116):150–7. doi:10.1183/09059180.00002110. PMID:20956184.
- Zervas EL, Loukides S, Kostikas K, Bakakaos P, Tzortzaki E, Gaga M. Asthma and asthma-like symptoms in Greece. The Greece asthma national prevalence survey, in European Respiratory Society Annual Congress 2012/2012.
- Kourlaba G, Hillas G, Vassilakopoulos T, Maniadakis N. The disease burden of chronic obstructive pulmonary disease in Greece. *Int J Chron Obstruct Pulmon Dis*. 2016;11:2179–89. doi:10.2147/COPD.S110373. PMID:27672323.
- Schatz M, Mosen DM, Kosinski M, Vollmer WM, Magid DJ, O'Connor E, Zeiger RS. Validity of the asthma control test completed at home. *Am J Manag Care*. 2007;13(12):661–7. PMID:18069909.
- Nathan RA, Sorkness CA, Kosinski M, Schatz M, Li JT, Marcus P, Murray JJ, Pendergraft TB. Development of the asthma control test: A survey for assessing asthma control. *J Allergy Clin Immunol*. 2004;113(1):59–65. doi:10.1016/j.jaci.2003.09.008. PMID:14713908.
- Kontodimopoulos N, Pappa E, Niakas D, Yfantopoulos J, Dimitrakaki C, Tountas Y. Validity of the Euro-QoL (EQ-5D) instrument in a Greek general population. *Value Health*. 2008;11(7):1162–9. doi:10.1111/j.1524-4733.2008.00356.x. PMID:18489492.
- Velasco Garrido M, Bittner C, Harth V, Preisser AM. Health status and health-related quality of life of municipal waste collection workers – a cross-sectional survey. *J Occup Med Toxicol*. 2015;10:22. doi:10.1186/s12995-015-0065-6. PMID:26155300.
- Greiner W, Weijnen T, Nieuwenhuizen M, Oppe S, Badia X, Busschbach J, Buxton M, Dolan P, Kind P, Krabbe P, et al. A single European currency for EQ-5D health states. Results from a six-country study. *Eur J Health Econ*. 2003;4(3):222–31. doi:10.1007/s10198-003-0182-5. PMID:15609189.

26. RAND Corporation. Asthma surveys: Baseline interview: Adult asthma patients (Age 18+). 2001 [cited 2017 May 23]; Available from: <https://www.rand.org/health/projects/ice/tools.html>.
27. Von Behren J, Kreutzer R, and Hernandez A. Self-reported asthma prevalence in adults in California. *J Asthma*. 2002;39(5):429–40. doi:10.1081/JAS-120004036. PMID:12214897.
28. Rhodes L, Moorman JE, Redd SC, Mannino DM. Centers for Disease, C. and Prevention, Self-reported asthma prevalence and control among adults—United States, 2001. *MMWR Morb Mortal Wkly Rep*. 2003;52(17):381–4. PMID:12765201.
29. Hoffmann F. Prevalence of asthma among German adults: Analysis of the German National Telephone Survey. *J Asthma*. 2007;44(6):433–6. doi:10.1080/02770900701421922. PMID:17654128.
30. Zatonski W, Przewoźniak K, Sulkowska U, West R, Wojtyła A. Tobacco smoking in countries of the European Union. *Ann Agric Environ Med*. 2012;19(2):181–92. PMID:22742786.
31. Ebell M, Marchello C, O'Connor J. The burden and social determinants of asthma for adults in the state of Georgia. *J Ga Public Health Assoc*. 2017;6(4):426–34. PMID:28936486.
32. Greenblatt R, Mansour O, Zhao E, Ross M, Himes BE. Gender-specific determinants of asthma among U.S. adults. *Asthma Res Pract*. 2017;3:2. doi:10.1186/s40733-017-0030-5. PMID:28138394.
33. Jie Y, Isa ZM, Jie X, Ju ZL, Ismail NH. Urban vs. rural factors that affect adult asthma. *Rev Environ Contam Toxicol*. 2013;226:33–63. PMID:23625129.
34. Allegra L, Cremonesi G, Girbino G, Ingrassia E, Mar-sico S, Nicolini G, Terzano C, PRISMA. Real-life prospective study on asthma control in Italy: Cross-sectional phase results. *Respir Med*. 2012;106(2):205–14. doi:10.1016/j.rmed.2011.10.001. PMID:22035853.
35. Cazzoletti L, Marcon A, Janson C, Corsico A, Jarvis D, Pin I, Accordini S, Almar E, Bugiani M, Carolei A, et al. Asthma control in Europe: A real-world evaluation based on an international population-based study. *J Allergy Clin Immunol*. 2007;120(6):1360–7. doi:10.1016/j.jaci.2007.09.019. PMID:17981317.
36. Szende A, Leidy NK, Ståhl E, Svensson K. Estimating health utilities in patients with asthma and COPD: Evidence on the performance of EQ-5D and SF-6D. *Qual Life Res*. 2009;18(2):267–72. doi:10.1007/s11136-008-9429-z. PMID:19105049.
37. Burstrom K, Johannesson M, Diderichsen F. Swedish population health-related quality of life results using the EQ-5D. *Qual Life Res*. 2001;10(7):621–35. doi:10.1023/A:1013171831202. PMID:11822795.
38. Doz M, Chouaid C, Com-Ruelle L, Calvo E, Brosa M, Robert J, Decuyper L, Pribil C, Huerta A, Detournay B. The association between asthma control, health care costs, and quality of life in France and Spain. *BMC Pulm Med*. 2013;13:15. doi:10.1186/1471-2466-13-15. PMID:23517484.
39. Spiraki C, Kaitelidou D, Papakonstantinou V, Prezerakos P, Maniadaakis N. Health-related quality of life measurement in patients admitted with coronary heart disease and heart failure to a cardiology department of a secondary urban hospital in Greece. *Hellenic J Cardiol*. 2008;49(4):241–7. PMID:18935711.
40. Apfelbacher CJ, Jones C, Hankins M, Smith H. Validity of two common asthma-specific quality of life questionnaires: Juniper mini asthma quality of life questionnaire and Sydney asthma quality of life questionnaire. *Health Qual Life Outcomes*. 2012;10:97. doi:10.1186/1477-7525-10-97. PMID:22906054.
41. Williams SA, Wagner S, Kannan H, Bolge SC. The association between asthma control and health care utilization, work productivity loss and health-related quality of life. *J Occup Environ Med*. 2009;51(7):780–5. doi:10.1097/JOM.0b013e3181abb019. PMID:19528828.
42. Nurmagambetov TA, Barnett SB, Jacob V, Chattopadhyay SK, Hopkins DP, Crocker DD, Dumitru GG, Kinyota S, Task Force on Community Preventive Services. Economic value of home-based, multi-trigger, multicomponent interventions with an environmental focus for reducing asthma morbidity a community guide systematic review. *Am J Prev Med*. 2011;41(2 Suppl 1):S33–47. doi:10.1016/j.amepre.2011.05.011. PMID:21767734.
43. Sadatsafavi M, Rousseau R, Chen W, Zhang W, Lynd L, FitzGerald JM. The preventable burden of productivity loss due to suboptimal asthma control: A population-based study. *Chest*. 2014;145(4):787–93. doi:10.1378/chest.13-1619. PMID:24337140.
44. Weeks MF, Kulka RA, Lessler JT, Whitmore RW. Personal versus telephone surveys for collecting household health data at the local level. *Am J Public Health*. 1983;73(12):1389–94. doi:10.2105/AJPH.73.12.1389. PMID:6638234.
45. Holbrook AL, Green MC, Krosnick JA. Telephone versus face-to-face interviewing of national probability samples with long questionnaires: Comparisons of respondent sat- isficing and social desirability response bias. *Public Opin- ion Quarterly*. 2003;67:79–125. doi:10.1086/346010.
46. Hox Jj, De Leeuw ED. A comparison of nonresponse in mail, telephone, and face-to-face surveys:Applying multi- level modeling to meta-analysis. *Qual Quant*. 1994;28:329– 44. doi:10.1007/BF01097014.
47. World Health Organization. The atlas of heart disease and stroke. Deaths from stroke. 15 January 2010.

Symptoms & Effects (Clinical and Financial) of Asthma

RESEARCH QUESTIONNAIRE – SEPTEMBER 2016

Good morning/good evening. My name is and I work in MRB, which is an independent research company and is currently conducting a survey regarding the health issues.

1. Initially, I would like to ask if there are anyone older than 18 years old in your household?

Yes ☐ No ☐ I do not reply ☐

If «NO» or «NOT REPLY» ->SAY THANK YOU AND HANG UP

If «YES» -> ASK TO TALK TO THE PERSON WITH THE LATEST BIRTHDAY (last-birthday method) and read the information statement.

If this person is not present or willing to talk -> SAY THANK YOU AND HANG UP

PLEASE READ: We would like to assure you that all the provided information will remain confidential, without the possibility of identification of specific responder. Our practices are legal and attuned with the principles and provisions of the Data Protection Authority, and each of your answers will be presented together with the replies of the other respondents. The duration of the overall survey will not exceed the **15 minutes**.

Considering all we have mentioned; would you like to participate in this survey?

Thank you in advance for your participation.

In case of patient's inability to be interviewed (e.g., old, etc)

Could we ask some questions to a person who is responsible for the patient's care?

☐ Yes (CONTINUE)

☐ No (Say "Thank you" and end the interview)

A. DEMOGRAPHICS	
A1. Gender of the patient	Male ☐ Female ☐
A2. Age of the patient (NOTE THE EXACT AGE HERE) _____	☐ 18 – 29 ☐ 30 – 39 ☐ 40 – 49 ☐ 50 – 59 ☐ 60 – 69 ☐ 70+
A3. In which from the following regions belongs the location of your household based on the distribution of population?	☐ Athens ☐ Thessaloniki ☐ Urban area (over 10,000 residents) ☐ Semi-Urban areas (2,000 – 10,000 residents) ☐ Rural Area (up to 2,000 residents)
A4. Weight	 (in kg)
A5. Height	 (in m)

B. CLINICAL HISTORY	
B1. Have you been diagnosed or do you regularly use medication for Asthma;	Yes ☐ No ☐ Do not reply ☐
<i>IF the answer is "I DON'T REPLY": SAY THANK YOU AND HANG UP (NOT COUNT IN THE DENOMINATOR FOR PREVALENCE)</i> If the answer is "No": SAY "THANK YOU" AND HANG UP (COUNT IN THE DENOMINATOR) If the answer is "Yes": Move on to the rest of the questionnaire (COUNT IN CONTACTS)	
B2a. Which year have you been diagnosed with Asthma?	.....
B2b. If she/he doesn't remember the exact year of diagnosis, we ask how many years have passed since the date of the diagnosis.	☐ ≤ 1 year ☐ 1,1-5 years ☐ 5,1-10 years ☐ >10 years
B2c. During the past 12 months, did you have any asthma symptoms (e.g. coughing, wheezing, shortness of breath, and chest pressure)?	Yes ☐ No ☐
B3a. Have you been diagnosed or do you regularly use medication for the following diseases?	☐ COPD ☐ Hypertension ☐ Diabetes ☐ Myocardial Infarction ☐ Heart Failure ☐ Allergic Rhinitis ☐ Rhinitis ☐ Cancer ☐ Rheumatoid Arthritis ☐ Gastroesophageal reflux disease ☐ Depression ☐ Obesity ☐ Skin allergies or diseases

C. SMOKING HABITS	
C1. In which of the following categories do you belong based on your smoking habits?	☐ Current smoker (presently smoking cigarettes/cigars/pipe at least once a day) ☐ Former smoker (not currently smoking, but had smoked at least 100 cigarettes in their lifetime and at some point smoked on a daily basis) ☐ Non-smoker (smoked fewer than 100 cigarettes in their lifetime or never smoked at all)
<i>«Note: If the answer is “Current smoker, go to question C2 & then to question C4a. If the answer is “Former smoker” go to question C3 and then to question C4a.</i>	
C2. How many cigarettes do you smoke on average every day?	 cigarettes/day
C3. How much time has passed since smoking cessation?	.....
C4. Do you live or/and work in a space with current smokers? (passive smoker)	Yes ☐ No ☐
C5. Do you live or/and work in a space with environmental smoke/dust or fumes exposures?	Yes ☐ No ☐

D. Control of Asthma (ACT)

The following five questions aim to appraise to what extent your asthma is under control.

D1. In the <u>past 4 weeks</u>, how much of the time did your asthma keep you from getting as much done at work, school or at home.	1. All of the time 2. Most of the time 3. Some of the time 4. A little of time 5. None of the time
D2. During the past 4 weeks, how often have you had shortness of breath?	1. More than once a day 2. Once a day 3. 3-6 times a week 4. Once or twice a week 5. Not at all
D3. During the <u>past 4 weeks</u>, how often did your asthma symptoms (wheezing, coughing, shortness of breath, chest tightness or pain) wake you up at night or earlier than usual in the morning?	1. 4 or more nights a week 2. 2 or 3 nights a week 3. Once a week 4. Once or twice 5. Not at all
D4. During the <u>past 4 weeks</u>, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?	1. 3 or more times per day 2. 1 or 2 times per day 3. 2 or 3 times per week 4. Once a week 5. Not at all
D5. How would you rate your asthma control during the <u>past 4 weeks</u>?	1. Not controlled at all 2. Poorly controlled 3. Somewhat controlled 4. Well controlled 5. Completely controlled

E. IMPACT ON THE DAILY LIFE ACTIVITIES

The following questions concern the impact of asthma on your daily activities the past 4 weeks:

E3. During the past 4 weeks, how often did asthma interfere with your social life?

Not at all ☐ A little ☐ Somewhat ☐ A great deal ☐

E5. During the past 4 weeks, how often were you restricted in the sports, hobbies, or other recreations you engaged in because of your asthma?

Not at all ☐ A little ☐ Somewhat ☐ A great deal ☐

F. PSYCHOLOGICAL BURDEN

The following questions concern the extent to which asthma affects your psychological condition.

TH1. During the past 4 weeks, how often were you limited in going certain places because you were afraid of getting an asthma attack and not being able to get help?

Not at all ☐ A little ☐ Somewhat ☐ A great deal ☐

TH2. During the past 4 weeks, how often were you worried about your present or future life because of asthma?

Not at all ☐ A little ☐ Somewhat ☐ A great deal ☐

TH3. During the past 4 weeks, how often did you worry about asthma shortening your life?

Not at all ☐ A little ☐ Somewhat ☐ A great deal ☐

TH4. During the past 4 weeks, how often did you feel dependent on your asthma sprays?

Not at all ☐ A little ☐ Somewhat ☐ A great deal ☐

G. TREATMENT ADHERENCE

The following question is about adherence to your asthma medication.

I1. Which of the following statements best describes how often you take your asthma medication?

- ☐ I take it everyday
- ☐ I take it sometimes
- ☐ I used to, but I do not take it anymore
- ☐ I take it only on symptoms
- ☐ I have never taken

I. EVALUATION OF YOUR HEALTH STATUS (EQ-5D)

Which one from the following statements describes better your health status?

J1. Mobility	☐ I have no problems in walking about ☐ I have some problems in walking about ☐ I am confined to bed
J2. 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
J3. Usual Activities (<i>e.g. work, study, housework, family or leisure activities</i>)	☐ 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
J4. Pain/Discomfort	☐ I have no pain or discomfort ☐ I have moderate pain or discomfort ☐ I have extreme pain or discomfort
J5. Anxiety/Depression	☐ I am not anxious or depressed ☐ I am moderately anxious or depressed ☐ I am extremely anxious or depressed

K. EVALUATION OF WORKING ABILITY & EXPENDITURE

The following questions aim to explore the impact of your health status on the ability to work and on your expenses:

L1. Are you currently employed (working for pay)?

Yes ☐ No ☐

L2. Define whether you were working full or part time, the past 6 months.

☐ Fulltime

☐ Part time

«**NOTE:** If the answer is NO, go to the question ... »

During the last 12 months:

L3a. Did you miss any days of work due to asthma?

Yes ☐ No ☐

L3b. If Yes, how many days?

..... days

L4a. Did your health problem affect your ability to produce work output in a high-quality or timely manner? (You were not attentive; you didn't accomplish all your tasks, etc.)

Yes ☐ No ☐

L4b. If Yes, how many days, did you have reduced productivity;

..... days

L4c. How much has your average productivity during these days been affected?

(Select a number from 0 to 9, 0: it was not affected. 9: it was affected)

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

L5a. Did a family member had to miss any days of work because of your asthma?

Yes ☐ No ☐

L5b. If Yes, how many days?

..... days

L6a. If you are not currently working, please define if this is because of early retirement due to asthma

Yes ☐ No ☐

L6b. In case of early retirement due to asthma, please mention your age of retirement.

..... years

L. EVALUATION OF OTHER EXPENSES (DIRECT NON-MEDICAL)

The following questions aim to estimate the amount of money you spent out-of-pocket for asthma.

M1a. Did you have to spend any money out-of-pocket during the past 12 months as copayment for your asthma medication?	Yes ☐ No ☐
M1b. If yes, how much money (approximately)?	€
M2b. Did you have to spend any money out-of-pocket, during the past 12 months, as copayment to laboratory/ diagnostic tests?	Yes ☐ No ☐
M2b. If yes, how much money (approximately)?	€
M3a. Did you have to spend any money out-of-pocket, during the past 12 months, for physician visits for your asthma?	Yes ☐ No ☐
M3b. If yes, how much money (approximately)?	€
M4a. Did you have to spend any money out of pocket , during the past 12 months for transport because of asthma?	Yes ☐ No ☐
M4b. If yes, how much money (approximately)?	€
M5a. Did you have to spend any money out of pocket, during the past 12 months, for home equipment relative to asthma?	Yes ☐ No ☐
M5b. If yes, how much money (approximately)?	€
M6a. Did you have to spend any money out-of-pocket for home assistance (from healthcare professional or other)?	Yes ☐ No ☐
M6b. If yes, how much money (approximately)?	€

M. HEALTHCARE RESOURCE UTILIZATION		
How many times during the past 12 months you had to (because of asthma):		
N1. Visit the doctor to his/her private office?	.....	
N2. Visit a hospital/health center outpatient clinic?	.....	
N3. Visit a hospital emergency department?	.....	
During the past 12 months:		
N4a. Did you had to be hospitalized because of asthma?	Yes ☐ No ☐	
N4b. If yes, how many times?	.....	
N4c. Length of stay per hospitalization?	 days	
N5. Are you, currently, using nebulizer?	Yes ☐ No ☐	
How many times during the past 12 months did you undergo any of the following Lab/Diagnostic tests?		
N6. Peak flow meter (plastic portable device in which you blow the air)	.....	
N7. Spirometry	.....	
N8. Oxymetry	.....	
N10. Blood test	.....	
N11. Test of allergic reaction(skin prick or RAST test)	.....	
N12. Blood gas	.....	
N13. Did you take any antibiotics, during the past 12 months for any condition related asthma?	Yes ☐ No ☐	
N14. Did you take any oral steroids, during the past 12 months for your asthma?	Yes ☐ No ☐	
N15. Finally, could you mention which of the following medicines did you take during the past 12 months for asthma, and how many times per day? (eg: 2 x 2, 2 x 3 etc);		
SPONTANEOUS REPLIES		
		Daily Dose
SYMBICORT	1	
RELVAR	2	
XOLAIR	3	
FOSTER	4	
PULMOTON	5	
SINGULAIR	6	
ASMANEX	7	
SPYRIVA	8	
ROLENIUM	9	
SERETIDE	10	
Other	.....	

THANK YOU FOR YOUR PARTICIPATION

Table 1. Comparison of the age and gender distribution of our sample with that of general population in Greece.

	Asthma Survey Data (n = 3,946)	General population*
Age		
18-29	17.30%	15.54%
30-39	18.60%	18.81%
40-49	18.10%	18.19%
50-59	15.70%	16.01%
60-69	13.40%	13.04%
70+	16.90%	18.41%
Gender		
Male	48.60%	48.47%
Female	51.40%	51.53%

*Based on census 2011.

Table 2. Patients' characteristics associated with not well-controlled asthma: Results of multiple logistic regression.

Patients' characteristics	OR (95% CI)	p-value
Gender		
Male	Ref	—
Female	1.52 (0.91; 2.54)	0.105
Age (years)		
18-29	Ref	—
30-39	0.93 (0.34; 2.54)	0.894
40-49	1.75 (0.69; 4.41)	0.235
50-59	2.95 (1.15; 7.55)	0.024
60-69	2.32 (0.87; 6.18)	0.093
70+	2.83 (1.10; 7.27)	0.030
COPD		
No	Ref	—
Yes	2.62 (1.42; 4.83)	0.002
Hypertension		
No	Ref	—
Yes	1.14 (0.65; 2.01)	0.654
Depression		
No	Ref	—
Yes	1.73 (0.79; 3.75)	0.168
Skin allergy or other skin disorders		
No	Ref	—
Yes	2.03 (1.02; 4.03)	0.043

CI: confidence Interval; COPD: chronic obstructive pulmonary disease.
Hosmer and Lemeshow's $\chi^2(8)$: 9.35 ($p = 0.3135$).