ORIGINAL ARTICLE

The Prospective Urban Rural Epidemiology (PURE) study: PURE Turkey

The Prospective Urban Rural Epidemiology (PURE) çalışması: PURE Türkiye

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ABSTRACT

Objective: The Prospective Urban Rural Epidemiology (PURE) study is a prospective cohort study that collects data on social, environmental, and individual risk factors and chronic diseases among residents of 25 countries in the range of 35 to 70 years of age, living in rural and urban areas. The PURE study is directed by the Population Health Research Institute of McMaster University in Canada. In Turkey, the study is conducted by the Metabolic Syndrome Society.

Methods: In Turkey, the study is being conducted in 8 cities. The initial fieldwork began in 2008. Questionnaires were completed, and anthropometric measurements, blood and urine samples, handgrip strength evaluations, electrocardiogram readings, and spirometer and body composition measurements were obtained. Each year, participants were followed up via telephone. Every third year, questionnaires, field measurements, and biological data sampling were repeated.

Results: PURE Turkey has 4056 participants (female: 60.7%, male: 39.3%; mean age: 50±9.1 years). Among them, 43.9% had metabolic syndrome and 52.8% were obese. The prevalence of hypertension was 41.1% and proportion of controlled hypertension was 34%. A total of 2098 (51.7%) of the participants had a total cholesterol of ≥200 mg/dL or were using a lipid lowering agent. In patients with diabetes, 79.8% had low-density lipoprotein cholesterol levels ≥100 mg/dL. Although a dramatic change was not observed in those parameters in the follow-up years, the prevalence of diabetes mellitus increased from 13.7% in 2008 to 21% in 2015. The baseline and follow-up data of the PURE study were analyzed with the other countries participating in the study and reported for international publication.

Conclusion: The PURE study is a large, ongoing, prospective epidemiological study that is investigating the "causes of the causes" of noncommunicable diseases in the world. In addition to revealing the health status of nations, the study also has the potential to affect health politics.

ÖZET

Amaç: The Prospective Urban Rural Epidemiology (PURE) çalışması sosyal, çevresel ve kişisel risk faktörleri ile kronik hastalıklar hakkında veri toplamayı amaçlayan, 35–70 yaş arası, şehirde ve kırsalda yaşayan 25 ülkeden katılımcıya sahip prospektif bir çalışmadır. Çalışma Kanada'da McMaster Üniversitesi Population Health and Research Institute tarafından yönetilmektedir. Türkiye'de ise çalışmayı Metabolik Sendrom Derneği yürütmektedir.

Yöntemler: Çalışma için sekiz bölge seçildi. Saha çalışmaları 2008 yılında başlayan çalışmada antropometrik ölçümler, kan ve idrar örnekleri, el kavrama kuvveti, EKG, spirometre ve vücut kompozisyonu ölçümleri alındı. Katılım fazından sonra takip fazında her yıl katılımcılar telefon ile aranarak sağlık durumlarındaki yenilikleri analiz edecek soruları barındıran anketler yöneltildi. Üç yılda bir tekrar sahaya inilerek anketlere ek olarak başlangıçta yapılan antropometrik ölçümler, EKG, spirometre ve kan, idrar örnekleri tekrarlandı.

Bulgular: PURE Türkiye 4056 (%60.7 kadın, %39.3 erkek, ortalama yaş: 50±9.1) katılımcı ile temsil edilmektedir. Katılımcıların %43.9'unda metabolik sendrom vardır, %52.8'i ise obezdir. Hipertansiyon prevelansı %41.1'dir ve kan basıncı kontrolü %34 hastada sağlanmıştır. Toplam 2098 (%51.7) katılımcının total kolesterolü ≥200 mg/dL'dir veya bir lipit düşürücü ilaç kullanmaktadır. Diyabetli hastalar arasında %79.8'inin LDL kolesterol seviyesi ≥100 mg/dL'dir. Yıllar içerisinde bu hastalıklara sahip hasta sayısında ciddi artış görülmemekle birlikte diyabet prevelansı 2008'de %13.7 iken 2015 yılında %21'e çıkmıştır. PURE çalışmasının başlangıç ve takip verileri tüm ülkelerle birlikle analiz edilmekte, uluslararası yayınlar olarak paylaşılmaktadır.

Sonuç: Sonuç olarak PURE çalışması ülkemizde ve dünyada halen devam eden, prospektif, geniş katılımlı bir epidemiyolojik çalışmadır ve temel amacı kronik hastalıkların "sebeplerinin sebeplerini" bulmaktır. Ülkelerin sağlık durumlarını göz önüne koymanın yanı sıra sağlık politikalarına yön verme potansiyeli mevcuttur.

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The Prospective Urban Rural Epidemiology (PURE) study is a prospective cohort study that aims to collect data on social, environmental, and individual risk factors and chronic diseases in 25 countries in the world.[1] The principal aim is to examine the impact of urbanization on the development of basic risk factors (physical activity and nutrition changes) and primary risk factors (obesity, hypertension, dysglycemia and dyslipidemia, smoking), and cardiovascular diseases (CVD). The participating countries have been divided into 4 main categories according to income: low, lower-middle, upper-middle, and high. Turkey has been classified as an upper-middle-income country.

The PURE study seeks to examine the relationship between societal influences and the prevalence of risk factors. Social determinants are measured using 4 variables: the built environment, food and nutrition policy, psychosocial/socioeconomic factors, and tobacco. The study collects data on socioeconomic status and environmental construction to ascertain their effects on health status.

Turkey is one of the countries with a growing prevalence of noncommunicable diseases and diabetes, and CVD is the leading cause of mortality and morbidity.[2] PURE Turkey is an investigation of the prevalence of CVD in Turkey and the related risk factors, as well as many other societal influences that may demonstrate a possible association between chronic diseases and urban transition.

METHODS

Professor Salim Yusuf is the lead investigator of the PURE study, and in Turkey, the study is being conducted by Metabolic Syndrome Society. Ethical approval was granted by Marmara University Ethics Committee (approval number: MARSBY-2005-0183). Approval of the Ministry of Health was also obtained.

Sample size

The PURE study initially aimed to recruit 150,000 adults from communities in low-, middle-, and high-income regions of the world. The participants were 4 low-income countries (Bangladesh, India, Pakistan, and Zimbabwe), 7 upper-middle-income countries (Argentina, Brazil, Chile, Malaysia, Poland, South Africa, and Turkey), 3 lower-middle-income countries (China, Colombia, and Iran), and 3 high-income countries (Canada, Sweden, and United Arab Emirates). There are now more countries participating and the total number of individual participants has grown to 225,000. Urban and rural communities that include a group of people who were generally expected to have characteristics in common (sharing culture, socioeconomic status, and use of amenities, goods, and services) and who reside in a defined geographical area were identified in each country.

Abbreviations:

ATP III	*Adult Treatment Panel III*
CVD	*Cardiovascular diseases*
HDL	*High-density lipoprotein*
IDF	*International Diabetes Federation*
LDL	*Low-density lipoprotein*
MetS	*Metabolic syndrome*
PURE	*Prospective Urban Rural Epidemiology*

The sample size consists of participants within the age range of 35 to 70 years living in rural and urban areas. The objective was to have participation from different geographical areas, income groups, and representatives of different lifestyles. An area was defined as rural if the population was fewer than 10,000 and there was no established metropolitan municipality. Turkey is divided into 12 regions based on the European Union Nomenclature of Territorial Units for Statistics classification. After evaluating social and financial data of the Turkish Statistical Institute, the 12 regions were condensed for the study: West/East Marmara, Aegean, West/Central Anatolia, Mediterranean, East/West Black Sea, Northeast Anatolia, and Southeast Anatolia, which were represented by the cities of Kocaeli, Aydin, Nevsehir, Antalya, Samsun, Malatya, and Gaziantep, respectively. These 7 cities were selected using randomization. Istanbul, due to its large population, represents itself, and was selected directly.

Households

For each city, a list was made of the income and population of the towns and villages based on data obtained from local authorities. According to the study protocol, blood samples are to be centrifuged within 2 hours; therefore, the list of towns was revised according to the distance from a centrifuge site. From this list, a town or village was chosen randomly and households were contacted. This random draw was continued until the targeted number of participants for the city was achieved.

The local authority in each neighborhood was visited and informed about the arrival of the study group.

Recruitment of households started with turning either left or right from the town center and continuing in that direction. Each household on the way was visited. If there was no one at home, a second visit was made later. A home was excluded from the research if there was no response on the third attempt, and a non-responder form was completed. A non-responder form was also completed for households in which the residents declined to participate.

Inclusion-exclusion criteria

The inclusion criteria were age between 35 and 70 years, residence in the visited household, and expected continued residence there for at least the next 4 years. The exclusion criteria were the presence of a severe mental disorder, severe frailty or immobility, and inadequate communication skills.

Data collection

Informed consent was obtained from all of the participants. The PURE questionnaires were translated into Turkish and used to collect the study data. Interviews took place in households, for the most part, and occasionally at a community center or a health facility using the face-to-face method. Interviewers were trained in groups to ask the questions correctly. The variables investigated are presented in Tables 1–3. For the nutrition-related section, validation of the semi-quantitative food frequency questionnaire was conducted and a food atlas was created for participants (Fig. 1).[3]

Participants were also informed about blood tests, and electrocardiography (ECG) and spirometer measurements. Patient consent was obtained at every step. They were also informed that each procedure was to be performed free of charge. An appointment was made at a pre-specified health facility for medical procedures.

Phases

There were 2 initial phases: recruitment and follow-up. The recruitment phase began in 2010 and 4056 participants were included in the study. Of these participants, 2632 lived in urban areas and 1424 lived in rural areas. The total number of households was 2578. After recruitment, the annual follow-up phase began. Each year, participants were called via telephone, and new disease diagnoses and the death or morbidity of household members was determined using the follow-up questionnaires (Table 4). This included inquiries about hospital admissions, diagnosis of atrial fibrillation, cancer, asthma, or pneumonia. Every third year, the follow-up was conducted in the field with questionnaires, as well as taking measurements (ECG, etc.) and biological data sampling. At the time of writing, 3 field follow-ups have been completed.

Questionnaires

Three types of questionnaires were used: community-based, household-based, and individual-based. Community data involved results from the Neighborhood Environment Walkability Scale and The Environmental Profile of a Community's Health (EPOCH) Instrument. Data from household questionnaires were also used to interpret community-level data.

For households, there were 2 main questionnaires: the Family Census Questionnaire and the Household Questionnaire. In addition, there was a non-responder Household Questionnaire form.

Individual data were gathered using the Adult Questionnaire, the International Physical Activity Questionnaire, and the semi-quantitative Food Frequency Questionnaire (validated in Turkish).

Physical examination and other tests

The physical examination included two measurements of resting blood pressure (seated), anthropometric measurements (weight, height, waist, and hip), spirometer (forced expiratory volume in 1 second, forced expiratory vital capacity), and an ECG assessment. A 10-mL fasting blood sample was collected from all consenting participants. Blood and urine samples were centrifuged and transferred to centralized, long-term storage in secure –80°C freezers (bought for the study) at Ankara Duzen Laboratories. Buffy coat for DNA analysis was also obtained. In addition to the elements of the PURE study protocol, glucose, creatinine, alanine aminotransferase, glycated hemoglobin, thyroid-stimulating hormone, lipid profile, and complete blood count data were reported to the participants by mail.

The data were collected according to the study protocol by trained interviewers, and blood pressure measurements were performed by healthcare personnel trained according to the protocol. For each blood pressure measurement, the participants were at rest for ≥5 minutes, without smoking, exercising, or eating in the previous 30 minutes, and without climbing stairs for 15 to 30 minutes prior to measurement. An Omron

Table 1. Environmental and household data variables

Demographic characteristics	Environmental characteristics	Traffic and crime	Satisfaction from habitat	Household data	Household living conditions	Household income and wealth indicators	Accidents and injuries in the last year	Crimes against anyone in the household in the last 12 months
City	Ability to shop regularly	Traffic security in the neighborhood	Use of public transport	Individuals living in household	Roof type	Presence of welfare indicators	Motor vehicle accident as a passenger	Armed robbery
Urban/Rural	Traffic rate and intensity	Traffic intensity	Time to go to work or school	Number -Age	Presence of electricity	Mean household income	Motor vehicle accident as a driver	Violent assault
Income of the site	Environmental pollution	Use of crosswalks	Access to shopping mall	-Relativeness -Sex	Primary source of fuel to cook	Presence of agricultural land and quantity	Physical assault	Murder
Age-sex	Street lighting	Security regarding crime	Number of people known	-Tobacco use -Educational status	Source of heat	Cooking conditions (floor, ventilation)	Domestic violence	Car theft
Marital status	Opportunity to communicate with people		Ease in walking	-Presence of specific diseases (HT, DM, stroke, CVD, Tb, malaria, cancer, HIV, injury)	Source of drinking water	Frequency of food shortness	Broken bone-Fracture site	Burglary
Educational status/ profession	Crime rate		Access to attraction center		Time to access water if there is no regular water	Clothing shortage		Theft
Job status	Desolateness		Protection against threat of crime			Uneasiness to pay the bills		Rape
	Presence of loose dogs		Traffic speed					Exploitation of women
	Increase in crime rate in the last five years and if any, the nature of it		Eligibility to raise children	Death of the household member in the last two years and if any, age, relation, sex, tobacco consumption, educational status of the member, presence of specific diseases (HT, DM, stroke, CVD, Tb, malaria, cancer, HIV, injury) in the 12 months prior to death				Exploitation of children
	Opportunity to obtain basic needs in the neighborhood		Eligibility to live					Sexual exploitation of children
	Construction status of the neighborhood							Other

CVD: Cardiovascular disease; DM: Diabetes mellitus; HT: Hypertension; Tb: Tuberculosis.

Table 2. Medical data variables

Medical history	Medical history 2	Family history of first degree relatives	Tobacco use	Alcohol use	Sleep patterns	Nutrition
Limitation of movement/ Disability situation	Regular drug use	In father, mother, brother and sister	Age of initiation	Age of initiation	Time of transition to sleep	Nutritional habits (milk and dairy products, fruit, vegetable, legume, meat and egg, bread and cereals, nuts, drinks, sweets and snacks)
Use of glasses	-For hypertension	-Diabetes	Daily consumption	Frequency of high in alcohol drink (raki, rum, whiskey, gin, vodka etc.) consumption	Wake-up time	Total calorie intake
Use of hearing aids	-For cholesterol -For stroke	-Chronic heart disease -Hypertension	Duration of use	Wine consumption frequency	Daytime sleeping habit and if any, duration	Food content
Diabetes	-For diabetes	-Stroke	When it was quitted (in years and months)	Beer consumption frequency		Type of fat used
Hypertension	-For asthma	-Cancer, if present site	Passive smoking in the last 12 months	Average consumption		Frequency of eating outside
Stroke	-For other reasons		Frequency of exposure to smoke in the last 12 months	Duration of consumption		Vitamin use
Presence of chronic bronchitis symptoms				Duration of absence (in years and months)		
Heart spasm/MI/ coronary artery disease	Drugs used in the last month (preparations and generic names)					
Hepatitis/jaundice	Use of birth control pills (in women)					
Cancer -If known, site of the cancer	Menstruation (in women) Number of boys given birth (in women)					
Asthma	Number of girls given birth (in women)					
Tuberculosis	Breast-feeding (in women)					
Malaria						
HIV/AIDS						

MI: Myocardial infarction.

Table 3. Physical measurements and blood tests

Physical measurements	- Height - Weight	- Blood pressure - Heart rate	- Waist circumference - Hip circumference	- Upper right arm circumference - Right thigh circumference - Head circumference	- Body muscle ratio - Body fat ratio	- Non-dominant hand maximum grip strength - Dominant hand maximum grip strength
ECG	- Pathological Q - ST elevation - ST depression	- T inversion - R>S in V1 or V2	- Left ventricular hypertrophy - Left axis deviation - Intraventricular conduction defect	QT interval - Abnormal cardiac rhythm - Other anomalies		
Breath Test	FEV1	FVC	PEFR			
Biological specimens	- Blood and urine specimens from each participant to be stored in -80°C freezer.	- Buffy coat				

ECG: Electrocardiogram; FEV1: Forced expiratory volume in 1 second; FVC: Forced expiratory vital capacity; PEFR: Peak expiratory flow rate.

Deluxe ComFit Cuff (Omron Healthcare, Inc., Lake Forest, IL, USA) was used to take 2 measurements from the right arm. The definition of hypertension was a systolic blood pressure of ≥140 mm Hg and a diastolic blood pressure of ≥90 mm Hg. If the participant was already taking an antihypertensive agent, he/she was considered a hypertensive participant.

Patients who declared that they had diabetes and patients already using a glucose-lowering agent were accepted as patients with diabetes. Patients with a fasting glucose level of ≥126 mg/dL were also accepted as patients with diabetes.

Table 4. Diseases and medical events investigated in the annual follow-up conversations

Diseases and medical events investigated at annual follow-up	
Hospital admission	Hypertension
Deaths	Diabetes
Myocardial infarction	Cancer
Stroke	Tuberculosis
Angina	HIV/AIDS
Heart failure	Malaria
Atrial fibrillation	Chronic obstructive pulmonary disease
Other heart diseases	Asthma
	Pneumonia
	Other lung diseases

A multifaceted approach was used with respect to disease diagnoses. In addition to the patient's statement about a diagnosis, the study investigators asked a set of exploratory questions. To finalize the disease diagnosis, medical documents of the patients were obtained from either the patients or from the medical facilities by the PURE Turkey headquarters.

Overview of PURE analysis and publications

The baseline and follow-up data of all of the countries participating in the PURE study were analyzed and reported in international publications. Data regarding our country are stored in our own data pool and analyzed. Some of the data from the baseline and third-year follow-up have been shared as abstracts at various conferences (see text for supplementary data). Here, instead of reporting all of the results, we have shared some of the striking findings of the overall PURE study and the PURE Turkey results.

RESULTS

The PURE Turkey analysis was conducted with 4056 participants. The mean age of the participants was 50±9.1 years. There were 2462 female participants and 1594 male participants (60.7% vs. 39.3%). Elementary school was the highest level of education achieved for 57.7% (n=2340) of the total cohort. Two

Figure 1. Images from the food atlas.

percent had a history of stroke and 5.6% had a coronary heart disease history. In all, 55.4% had never smoked, whereas 27.9% were current smokers, and 16.7% were former smokers. Furthermore, 88.2% had never consumed alcohol, 5.2% had in the past, and 6.6% were current consumers of alcohol.

The prevalence of hypertension was 41.1%. In 66% of the patients with hypertension, blood pressure control was not achieved. Hypertension awareness was observed in 63.3%. Participants living in urban areas represented 39.6% of the participants, and 46.6% of the rural residents had a hypertension diagnosis. Among female participants, 52% had hypertension, and 48% of the males were hypertensive.

The diabetes prevalence was 13.7%. In rural areas, the prevalence was 12.6%, while it was 15.8% in ur-

ban areas. Glycemic control had been achieved in 25%, whereas it had not been in 75.1% of the patients. The frequency of prediabetes was 9.4%: in rural areas it was 9.2% and in urban areas it was 9.6%. Diabetes awareness was determined to be 87.4%. A diabetes diagnosis was most frequently seen in the 60-64 age group (29.4%). Follow-up data showed that in 2015, the prevalence of diabetes mellitus had increased to 21%.

There were 2098 (51.7%) participants with a total cholesterol ≥200 mg/dL or using a lipid-lowering agent. The mean high-density lipoprotein (HDL) cholesterol level was 46.2±13.2 mg/dL in rural areas and 47.6±14 mg/dL in urban locations. The rate of low HDL cholesterol level (<40 mg/dL in males and <50 mg/dL in females) was 53.5%. In patients with diabetes, 79.8% had a low-density lipoprotein (LDL) cholesterol level ≥100 mg/dL.

According to the Adult Treatment Panel III (ATP III) criteria, 36.7% of the participants had metabolic syndrome (MetS), whereas according to the International Diabetes Federation (IDF) criteria 43.9% had MetS. Among female patients, 39.3% had MetS according to the ATP III criteria and it was 44.8% according to the IDF criteria, whereas in males, the rate was 30.2% and 40.7%, respectively. When urban and rural regions were compared with regard to MetS, 34.6% of the participants living in rural areas and 34.8% of those living in urban locations had MetS according to the ATP III criteria. Using the IDF criteria, the rate was 42.6% and 42.9%, respectively. According to body mass index, 52.8% of the participants were obese. The mean waist circumference of males was 95±12 cm, and it was 90±12 cm for female participants in the study.

The initial data of the PURE Turkey study have demonstrated that obesity is an epidemic in Turkey. With more than half of the cohort classified as obese, it is no surprise that the frequency of MetS was 42.7%.

DISCUSSION

PURE aimed to illuminate differences between urban and rural environments. It is often acknowledged that urban transition has increased the incidence of noncommunicable disease, and individuals who live in cities and other industrialized areas have more risk factors. Analysis of worldwide PURE data has shown that although cardiovascular risk factors are less prominent in countries with a lower income, the rates of CVD and mortality are higher than in high-income countries.[4] The event rates are higher in rural areas of low- and middle-income countries, whereas they are lower in the rural areas of high-income countries. This underlines the fact that there are country-specific dynamics affecting CVD risk factors.

Hypertension is a health burden to many countries, including Turkey. A report of world PURE data analysis indicated that the hypertension prevalence is 40.8%, and that only 32.5% of patients had reached blood pressure targets.[5] The figures are similar in Turkey. For both Turkey and the world, better follow-up of hypertension is clearly needed. One of the main reasons for the low rate of blood pressure control in the world is the affordability of medications. Analysis of world PURE data has shown that the proportion of communities with 4 drug classes available for hypertension was 13% in low-income countries, whereas it was 94% in high-income countries.[6] Another analysis revealed that drugs for secondary prevention are also unavailable and unaffordable in most countries, even upper-middle-income countries.[7] In low income countries the proportion of patients with cardiovascular disease on three medications was alarmingly low (0-2.5%). For Turkey it was 12%[8] Turkey is one of the upper middle income countries of the study. The proportion of participants with cardiovascular disease who were taking three or more secondary prevention medications differed in this income group from 7% (Malaysia) to 26.7% (Poland). Due to the fact that in Turkey medications are free of charge for most of the population reasons for this low rate should be well investigated. A better training for physicians regarding cardiovascular diseases may improve the rate as well as increasing awareness of the population for benefits of the drugs can have beneficial effects.

An interesting finding of the PURE study was the relationship between urinary potassium excretion and blood pressure. Mente et al.[9] reported a decrease in blood pressure with increased potassium intake. This effect of potassium was also notable in mortality analysis of PURE participants: there was a decreased cardiovascular event rate with increased potassium consumption. This report has also particularly pointed out a different view with regard to sodium consumption. Analysis revealed that sodium excretion of less than 3 g per day was associated with higher mortality rates compared with the reference of 4-5.99 g.[10]

Analysis of PURE countries has shown a 3.2% rate of CVD and a 1.6% rate of stroke in upper-middle-income countries. The prevalence of stroke in Turkey is slightly higher and almost twice as high for CVD.[11] This report demonstrates the need for interventions to increase secondary prevention rates worldwide. Almost 1 out of 3 people in Turkey smoke. Although smoking is a major modifiable risk factor for CVD, analysis of worldwide PURE data revealed that even in patients with established CHD, 18.5% continued to smoke. Only 4% of this cohort has embraced a healthier lifestyle.[12]

Alcohol consumption is also a modifiable risk factor for death. The Turkish population has a lower rate of alcohol use compared to the other participating countries. While the association between alcohol consumption and mortality differs according to region, a high intake has been associated with high mortality rates.[13]

Diet is a key component of cardiovascular health. In Turkey, half of the cohort had high cholesterol with low HDL cholesterol levels. Lifestyle and dietary changes are often recommended to patients with these results. Analysis of the international PURE cohort has revealed that a greater intake of total fat, saturated fatty acids, and carbohydrates was associated with higher blood pressure, while a greater protein intake was associated with lower blood pressure.[14] Replacement of saturated fatty acids with carbohydrates was associated with adverse effects on lipids; however, replacement of saturated fatty acids with unsaturated fats improved LDL cholesterol and blood pressure, but seemed to worsen other HDL cholesterol and triglycerides. A point worth mentioning is that in the PURE cohort, the ratio of apolipoprotein B to apolipoprotein A was the best indicator of the effect of saturated fatty acids on CVD. Mortality and diet analysis of the world PURE data was consistent with these findings.[15] A high carbohydrate intake was associated with a greater risk of total mortality (hazard ratio: 1.28). Fat was not associated with CVD, myocardial infarction, or CVD mortality, and saturated fat had an inverse association with stroke. These results challenge what is already known about diet and cardiovascular health. However for fruit, vegetable and legume consumption, a decreased rate of mortality (non-cardiovascular) was reported, which is consistent with literature.[16] Also in agreement with general knowledge was the finding that physical activity was related to a lower risk of mortality and major CVD events.[17]

The PURE study has explored different associations regarding CVD, as well as validating what is already known. Reduced grip strength has been linked to mortality and CVD. The PURE study has demonstrated this association in the largest reported population and announced that grip strength is a predictor of mortality.[18]

Although PURE has recruited households instead of volunteering individuals, PURE Turkey has more female participants than males. This is a limitation of our cohort.

CONCLUSION

The PURE study is a large, ongoing, prospective, international epidemiological study providing data on the health status of the world. It compares regions, nations, and urban and rural environments, along with evaluating demographic, anthropometric, genetic, and environmental factors. PURE Turkey has one of the largest cohorts in the study according to population. Analysis of this cohort has provided and will provide more insight on CVD and other chronic diseases in Turkish population.

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Supplementary data: Abstracts of the PURE Turkey analysis presented in congresses

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