Title: The levels and trends of hypertension at national and sub-national scale in Iran from 1990 to 2016

Table of Contents

Over view of Study Design

Data Sources

Statistical Analyses

Supplementary Figures:

Supplementary Figure 1 (linear trends): Trends in age-standardized mean systolic and diastolic blood pressure and raised blood pressure by sex and by province in people aged 25 years and older from 1990 to 2016. The lines show the posterior mean estimates and the shaded areas show the 95% UI.

Supplementary Figure 2 (map): Age-standardized mean systolic blood pressure and mean diastolic blood pressure by sex and by province in 1990, 2000, 2010, and 2016 in people aged 25 years and older.

Supplementary Figure 3 (age pattern): The age pattern of prevalence of raised blood pressure by sex at provincial level in people aged 25 years and older in 2016.

Supplementary Figure 4 (map): The percent change in age standardized prevalence of raised blood pressure by sex and by province from 1990 to 2016 in men and women aged 25 years and older.

Supplementary Figure 5: Number of data sources by province and year

Supplementary Table 1: Study characteristics

Supplementary Table 2: Mean systolic and diastolic blood pressure, prevalence of hypertension, and their percent change from 1990 to 2016 by sex and province, with 95% Uncertainty Intervals.

Supplementary Table 3: Names of provinces and their abbreviations

Overview of study design

In this study we aimed to estimate the mean of systolic and diastolic blood pressure and the prevalence of raised blood pressure by sex and age across all provinces of Iran from 1990 to 2016. Raised blood pressure is defined as systolic blood pressure equal or greater than 140 mmHg and/or diastolic blood pressure equal or greater than 90 mmHg or being under treatment for hypertension. The population covered in this study included both sexes, 13 age groups from 25 to over 85 years (5-year categories), 31 provinces, and 27 years from 1990 to 2016.

We used various data sources for this study consisting of a pooled analysis and a comprehensive systematic review and meta-analysis. We also conducted a meta-regression model including Generalized Linear Mixed Model, Age-patio-Temporal, Gaussian Process Regression (ST-GPR), and crosswalk.

Data sources:

1) **Data retrieved through systematic review**
2) **National surveys**
3) **Subnational population-based studies**

Systematic Review

We conducted a comprehensive systematic review. In this review, only population-based studies were included in which, estimates were reported by sex and age, province, either mean SBP and/or DBP. We excluded studies that exclusively reported the prevalence of hypertension or pre-hypertension. In case the reported age range spanned over more than 5 years, the median estimate was used as the age category of that data point. The same strategy was used for year of the data point. Data points with a sample size less than 5 were also excluded. One added value of our study was splitting estimates of the age category of over 65 years into 5-year age categories till 85 years and more.

Data Sources:

We searched three groups of data sources: 1) International databases; 2) Iranian databases; 3) Iranian data sources not indexed.

1) International Databases:

A) PubMed/MEDLINE
B) Web of Science
C) Scopus

2) ***Iranian Databases:***

A) Scientific Information Database (SID)
B) IranMedex (now known as Barekat)
C) Irandoc
D) Iranian journals not available online

Search Strategies:

The adopted methods for systematic review include: defining the data sources and how to reach them, the search strategy for each data source, inclusion and exclusion criteria to select results of studies and reports, and methods for quality assessment, data extraction, and data synthesis.

We searched for related Mesh terms including all subheadings by using international and Iranian databases. The Persian keywords were equivalent to their English words and all probable combinations were considered.

1) ***International Databases:***

A) PubMed/MEDLINE
B) Web of Science
C) Scopus

Search strategy was developed for MEDLINE, accessed via PubMed, based on an analysis of medical subject headings of key articles identified a priori. We used almost the same search terms for Web of Science and Scopus. We conducted a very sensitive search with broad terms in all three databases:

("blood pressure" OR hypertension OR prehypertension OR systolic OR diastolic OR "pulse pressure" OR hypertensive) AND (Iran OR Iranian OR Iranians OR Persia OR Persian OR Persians OR "I.R.Iran")

Filters Included:
1) Humans and adults
2) Publication date from 1990/1/1 to 2017/12/31
3) English and Persian Languages

2) ***Iranian Databases:***

A) Scientific Information Database (SID)
B) IranMedex
C) Irandoc
D) Iranian journals not available online

Both English and Farsi terms were used. English terms consist of entry terms used for international databases. As for the Farsi terms, the English terms were translated to Farsi and all plausible spellings were searched in Iranian search engines.

Selection Criteria:

Inclusion criteria:

We included all cross-sectional studies and results of the first survey of population-based cohort studies that estimated mean systolic and / or diastolic blood pressure. All National, provincial, district and community studies from Jan 1990 to December 2017 that reported systolic blood pressure and/or diastolic blood pressure were included in the study. Studies were included if they have been from a representative sample, including from a national, subnational, or community population, and if the data has been based on measured (vs self-reported) blood pressure. If a published article met the inclusion criteria but did not report data by age and sex, we contacted the corresponding author to encourage him to contribute stratified data. Language of publication was restricted to English and Persian.

Exclusion criteria:

We excluded studies that their sampling method was non-random or their sample wasn't representative of Iran population. We also excluded studies that exclusively reported the prevalence of either hypertension or pre-hypertension

Implementation phases:

I. Study search and selection Process:

Reviewers conducted title scans. If they were accepted, the article was promoted to the next level. The abstract review phase was designed to identify studies reporting the mean ± SD and mean ± SE of systolic and diastolic blood pressure. Abstracts were reviewed independently by two investigators, and were excluded if both investigators agreed that the article met one or more of the exclusion criteria (see inclusion and exclusion criteria listed above). Differences between investigators regarding abstract inclusion or exclusion were resolved through consensus.

Articles promoted on the basis of abstract review underwent another independent parallel review to determine if they should be included for data abstraction. Differences regarding article inclusion were resolved through consensus.

II. Quality assessment

Article quality was assessed by Critical Appraisal Tool (CASP or EBL).

A) The following criteria were considered in quality assessment of blood pressure measurement:

1) Position of patient during blood pressure measurement;
2) Whether the arm has been measured to determine correct cuff size;
3) Training status of person taking blood pressure measurement;
4) Whether activities of participants with the preceding 30 minutes have been asked;
5) Number of times blood pressure has been measured;
6) Resting time between each measurement if more than one measurement made;
7) The time period during which patients had been resting before blood pressure measurement;
8) Type of instrument used for measurement;

B) The following criteria were considered in quality assessment of data source:

1) Response rate;
2) Sample size by gender;
3) Sampling design.

III. Data extraction

Data extraction form was defined by main researchers. Study characteristics and study data were extracted into an excel worksheet.

National Surveys and Subnational Population-based studies:

During the systematic review, we came across published reports of a number of National Surveys and large population-based cohort studies.

Two types of national surveys were available:

First: Seven iterations of NCD surveillance survey (STEPwise) in 2005, 2006, 2007, 2008, 2009, 2011, and 2016.

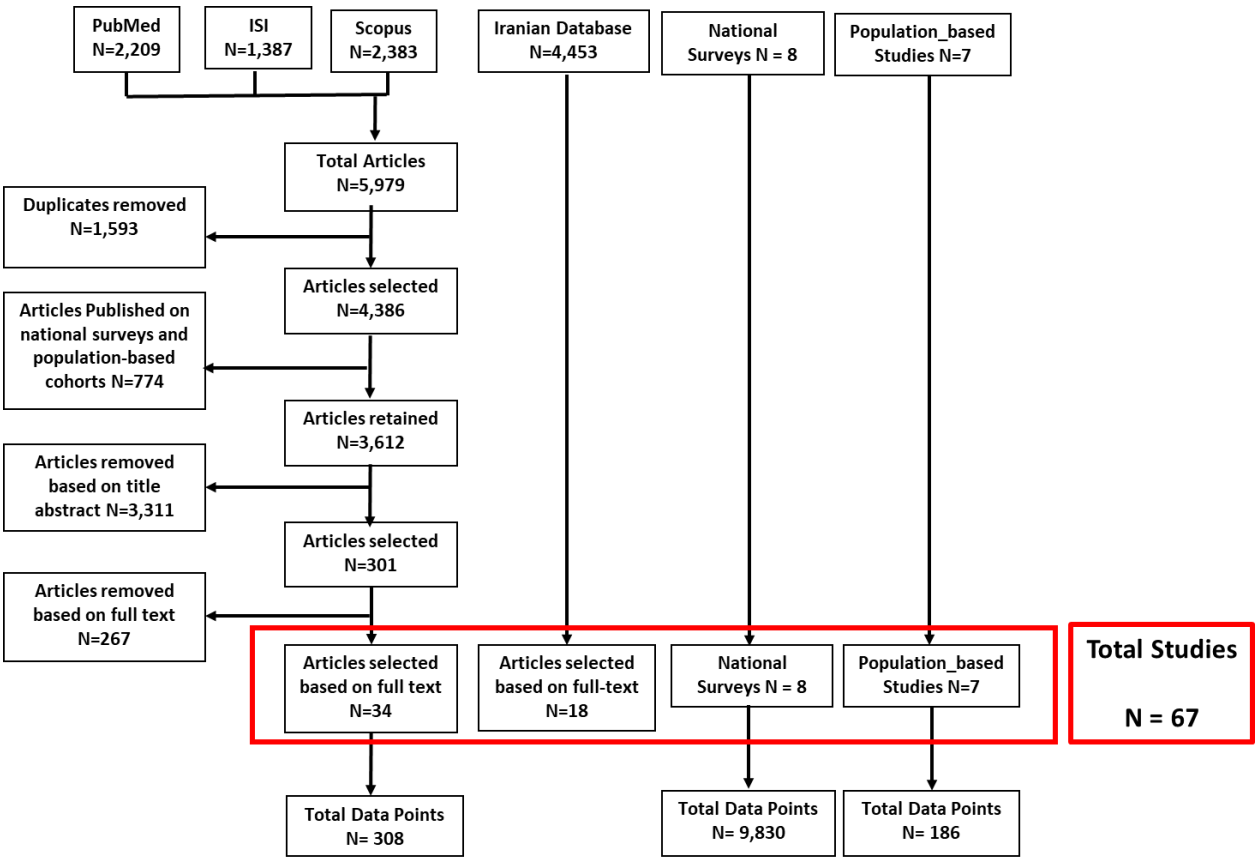
Second: One iteration of National Health Survey (NHS) in 2000

For these national sources, data on mean SBP and DBP were already reported by sex, 5-year age groups, province, and year. In these studies, blood pressure was measured three times. In our estimates we used only the mean of the second and third measurements. No other data cleaning or harmonization was required. Data at Individual level were added.

As for population-based cohort studies, we contacted the principal investigators of these studies to obtain a set of aggregated data which were pooled into our database. These included 7 provincial population based studies:

1) Golestan Cohort Study (GCS)
2) Pars Cohort Study (PCS)
3) Isfahan Healthy Heart Program (IHHP)
4) Tehran Lipid and Glucose Study (TLGS)
5) Kerman Cohort Study (KERCADRS)
6) Mashad Cardiovascular Cohort Study
7) Persian Gulf Healthy Heart Study

For subnational population-based studies, aggregated data were obtained. Estimates were again made by sex and 5-year age groups in defined provinces. In case the recruitment of the study took more than one year, the median over the year range was used.



Data Preparation

In order to estimates the primary outcomes of this study, including: the mean of systolic and diastolic blood pressure, all combined data sources have to be prepared for statistical analysis. Each sex-age-province-year combination in systematic reviews that had not the information of year and province was excluded from analysis. In addition, plausible ranges in age groups and years computed as the median of this range. Studies with sample size less than 5 were also deleted.

In the last stage, according to the rare number of data points in age groups over 65 years, data points were adjusted for these age groups. To be more detailed, we used STEPs 2016 information for older age groups to estimate data points for NCDs studied in 2005, 2006, 2007, 2008, 2009, and 2011.

Covariates: years of schooling, wealth, urbanization

In order to estimate the response variable including the mean of systolic and diastolic blood pressure and the prevalence of raised blood pressure, we used four types of covariates by all sex, age, province and year combinations.

Urbanization covariate is the proportion of the people who live in urban areas. This was calculated by population file in each province. Years of schooling (YOS) and wealth index (WI) were driven from Household Expenditure and Income which were conducted by Statistical Centre of Iran. YOS is defined as the years that each person educated and ranged from 0 to 25 years. WI is categorized as five equal percentiles from the income and assets of each household.

Statistical Analyses

Generalized Linear Mixed Model

We used a Generalized Linear Mixed Model (GLMM) to estimate the mean of SBP and DBP by two sexes, 13 age groups, 31 provinces, over 27 years. In this model we took advantage of including years of schooling, wealth index, and urbanization as fixed-effects and province as random effects of GLMM. The predictions and residuals of our data points were extracted from this model to be used later in Age-Spatio-Temporal Model. This model has been reiterated separately for women and men.

$$Y_{a,y,p} = \beta_{\circ} + \beta_i X_{i_{ayp}} + \beta_j Z_j + \beta_2 \times year + \pi_p + \varepsilon_{a,y,p}$$

Where:

a= age group

y= year index

p= province index

β_i = coefficient on covariate i

$X_{i_{ayp}}$ = covariate i for observation a, y, p

β_j = coefficient on age group

Z_j = age dummy variables

β_2 = coefficient for year

π_p = random intercept on province

$\varepsilon_{a,y,p} \sim N(0, \sigma_{\varepsilon} \bullet I)$

ST-GPR: for mean SBP and DBP estimates

We assumed that the residuals extracted from GLMM have some variations that can't be captured in this model. We used age-Spatio-Temporal model to justify variances and correlations among age groups, time, and provinces. Three weight matrices were developed to multiply by the vector of residuals. In these matrices, adjacent years, age groups and provinces have more weights. These matrices were as follows:

Age matrix:

$$\omega_{a_{i,j}} = \frac{1}{e^{\varpi \times \left| agegroup_i - agegroup_j \right|}}$$

i is prediction age group and j is observation's age group. If I and j be the same age group, the weight receives 1. We had a 13*13 matrix for this component. ϖ was defined as 1, and it can be increases for greater smoothing over age.

Temporal matrix:

$$\omega_{y_{i,j}} = \left(1 - \left(\frac{\left| year_i - year_j \right|}{\arg\max\left(\left| year_i - year_j \right| + 1 \right)} \right)^{\lambda} \right)^3$$

It was a 27*27 matrix with λ = 0.5. Again it can increase or decrease for the amount of smoothing across time.

The age and time weights are multiplied together for each observation, producing a weight for age and year dimensions.

$$\omega_{i,j} = \frac{\omega_{a_{i,j}} \times \omega_{y_{i,j}}}{\sum\left(\omega_{a_{i,j}} \times \omega_{y_{i,j}} \right)}$$

Then the weights are rescaled to reflect geographical proximity to observation being predicted by a spatial 31*31 matrix. The same provinces got the weight 1, adjacent provinces got the weight 0.9 and the other got 0.

In addition to these three type of weights, we defined a weight for each data source. National data sources were received 0.9 of the total weights and the other sub-national and systematic reviews got 0.1.

Once these weights have been calculated, weighting every observation in the dataset relative to the one being predicted, it a simple matter of calculating a weighted average of the residuals from the mixed effects regression. This "predicted residual" is then added back onto the mixed effects prediction, creating an estimate that more closely takes into account aspects of the data that cannot be captured by a simple covariate model.
These adjusted residuals were added to the preceding predictions of GLMM. Therefore, we had estimations for all sex, age, province, and year combinations.

For unifying all data sources and estimating their uncertainty intervals over time, we used Gaussian Process Regression (GPR) that is a Bayesian statistical model with a mean function and a covariance function. Age Spatio-Temporal was used as the prior for mean function and Matern function as a prior for covariance. The Matern function has three parameters. The first parameter quantifies the deviation of data points from mean function. The second parameter identifies the

degree of smoothness across time. The third one specified the correlation of estimates over time. Our posterior which is the mean of SBP and DBP has a normal distribution defined as a Gaussian Process for its mean and the sampling error of data points for its variance component(σ^2). This model is formulated as follows and details about the parameters were previously described.

$$Y \sim Normal(m, \sigma^2)$$

$$m \sim GP(M, C)$$

Where m had the Gaussian Process with Age-Spatial-Temporal as its mean function and Matern for covariance function.

Crosswalk: For hypertension prevalence estimation

Our estimations so far consisted of mean SBP and DBP distribution. In order to interpolate the prevalence of raised blood pressure, we needed a model to convert SBP and DBP to prevalence of hypertension. We used the data of the 7 rounds of STEP in which both SBP and DBP as well as the age-specific prevalence of hypertension were measured and reported. A linear mixed model on the logarithm of prevalence of hypertension was developed using 4 covariates: years of schooling, wealth index, urbanization, and body mass index (BMI) in addition to the mean of SBP and the mean of DBP. Again, all estimates were specific to sex, age, province, and year. For calculating uncertainty interval, we simulated the confidents excluded from previous model and the matrix of variance-covariance of coefficients. We also included the standard error of SBP and DBP GPR estimates.

$$\ln(hypertensi\,on_prevalence_{a,y,p}) = \beta_{\circ} + \beta_i X_{i_{ayp}} + \beta_1 \times SBP + \beta_2 \times DBP + \pi_p + \varepsilon_{a,y,p}$$

Age Standardization of results

In order to remove the age effect, all estimates were age standardized using the population of Iran tabulated by sex, age at national level in 2016.

Sensitivity Analysis

We conducted a sensitivity analysis in two stages. The first stage we randomly masked 10 percent of our data points and then, we repeated all the models for the rest of 90 percent of data. We used four metrics to evaluate the performance of our in-sample validity: Root Mean Square Error (RMSE), Root Median Square Error, Median Relative Error, and Mean Relative Error of prediction models.

In the next stage we calculated the proportion of data points in our masked data set that were located in the 95% Uncertainty Interval of our 90 percent withheld data. For DBP, 96.6 percent

of 10% withheld data hold in 90% prediction of model and its uncertainty. This measure for SBP was 96.75 percent.

outcome	method	Root mean SE	Root median SE	Mean RE	Median RE
DBP	GLMM	0.000570363	0.0018131	0.037787	0.0286263
	ASTM	0.000229987	0.0008650	0.035796	0.0276997
	GPR	0.000137574	0.0000039	0.033303	0.0223225
SBP	GLMM	6.671946	3.9811250	0.03924707	0.03073189
	ASTM	6.227506	3.7416000	0.03665387	0.0291933
	GPR	5.868321	3.0490190	0.03347397	0.02353823

Decomposition analysis

We calculated the percent change in number of adults with hypertension. We decomposed the contribution of increased prevalence, population growth, and change in age structure to the percent change in the number of hypertensive adults. To estimate the contribution of increase in prevalence, we calculated the percent change in number of hypertensives that would occur since 1990 if population remained the same and only prevalence rose to its level in 2016. Vice versa, to estimate the contribution of both population growth and change in age structure, we calculated the percent change assuming the prevalence remained constant and population changed from 1990 to 2016. In order to decompose the contribution of change only due to population growth, we assumed that the age structure remained constant and population growth happened with the same age structure. Finally, to estimate the contribution of change in age structure, we assumed that the population and prevalence remained constant and only the age structure in 1990 changed to the age structure in 2016.

References:

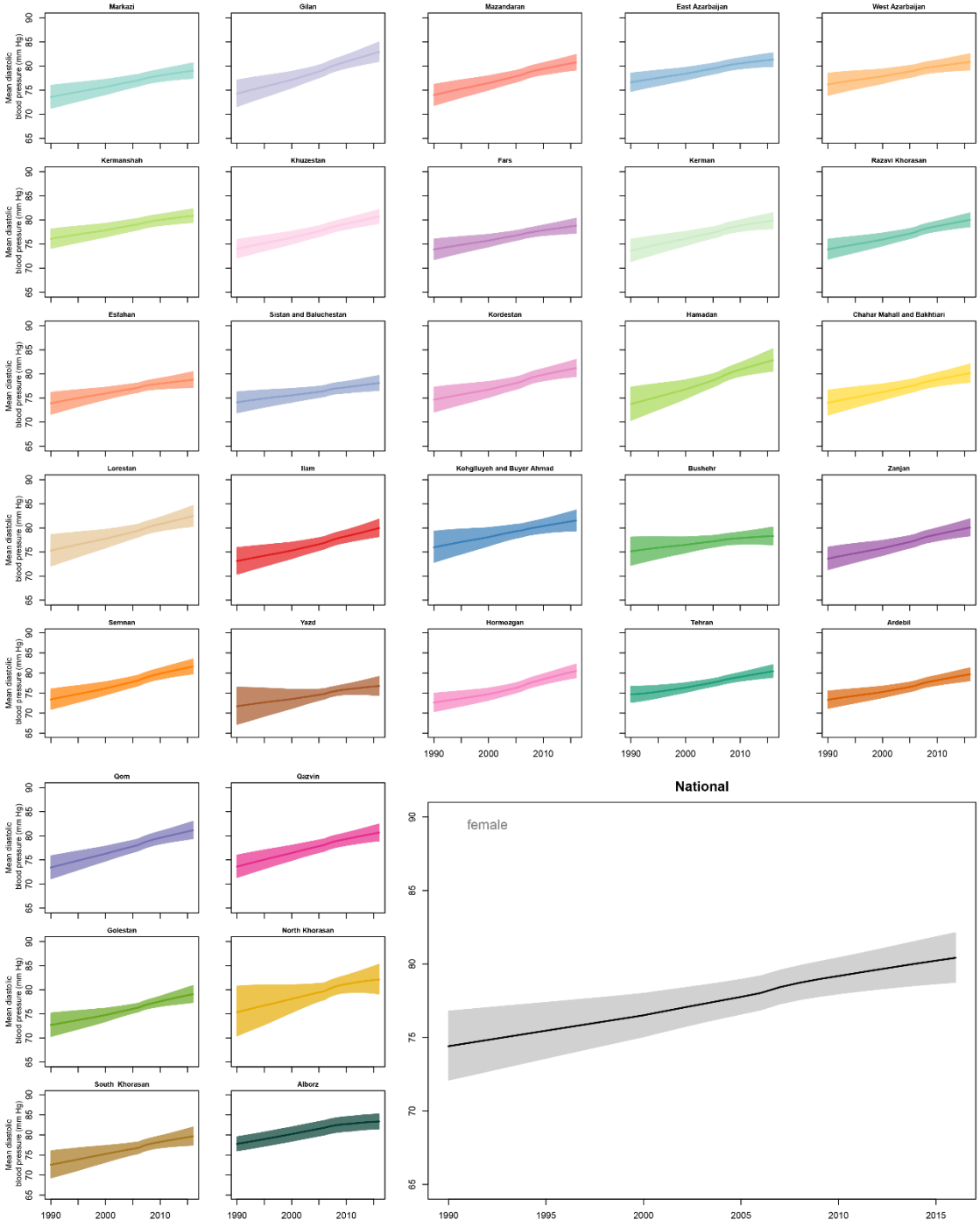
1. Mohammadi Y, Parsaeian M, Mehdipour P, et al. Measuring Iran's success in achieving Millennium Development Goal 4: a systematic analysis of under-5 mortality at national and subnational levels from 1990 to 2015. Lancet Glob Health 2017; 5(5): e537-e44.

2. Foreman KJ, Lozano R, Lopez AD, Murray CJ. Modeling causes of death: an integrated approach using CODEm. Population health metrics 2012; 10: 1.

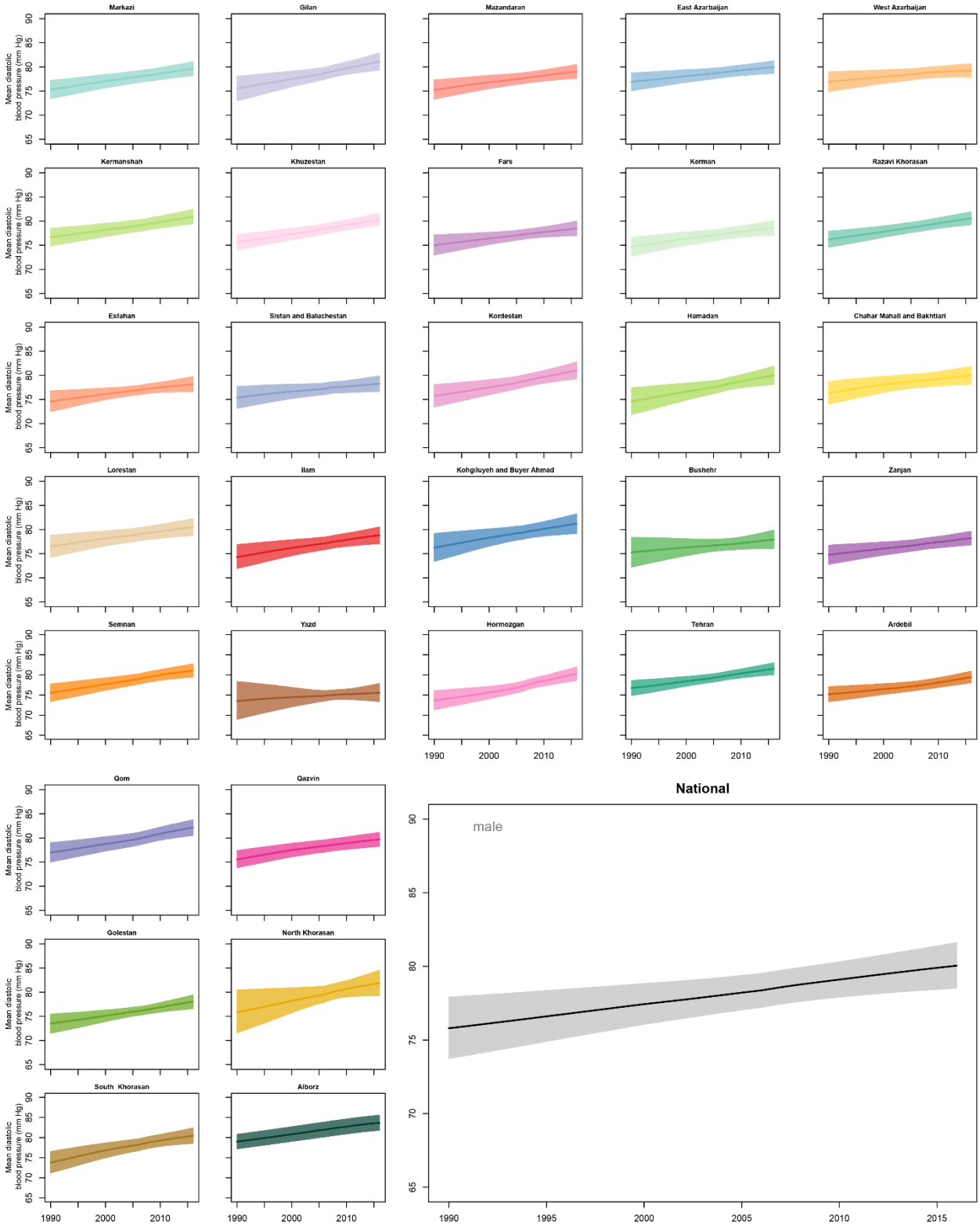
3. Mehdipour P, Navidi I, Parsaeian M, et al. Application of Gaussian Process Regression (GPR) in estimating under-five mortality levels and trends in Iran 1990 - 2013, study protocol. Archives of Iranian medicine 2014; 17(3): 189-92.

4. Rajaratnam JK, Marcus JR, Flaxman AD, et al. Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970-2010: a systematic analysis of progress towards Millennium Development Goal 4. Lancet (London, England) 2010; 375(9730): 1988-2008.

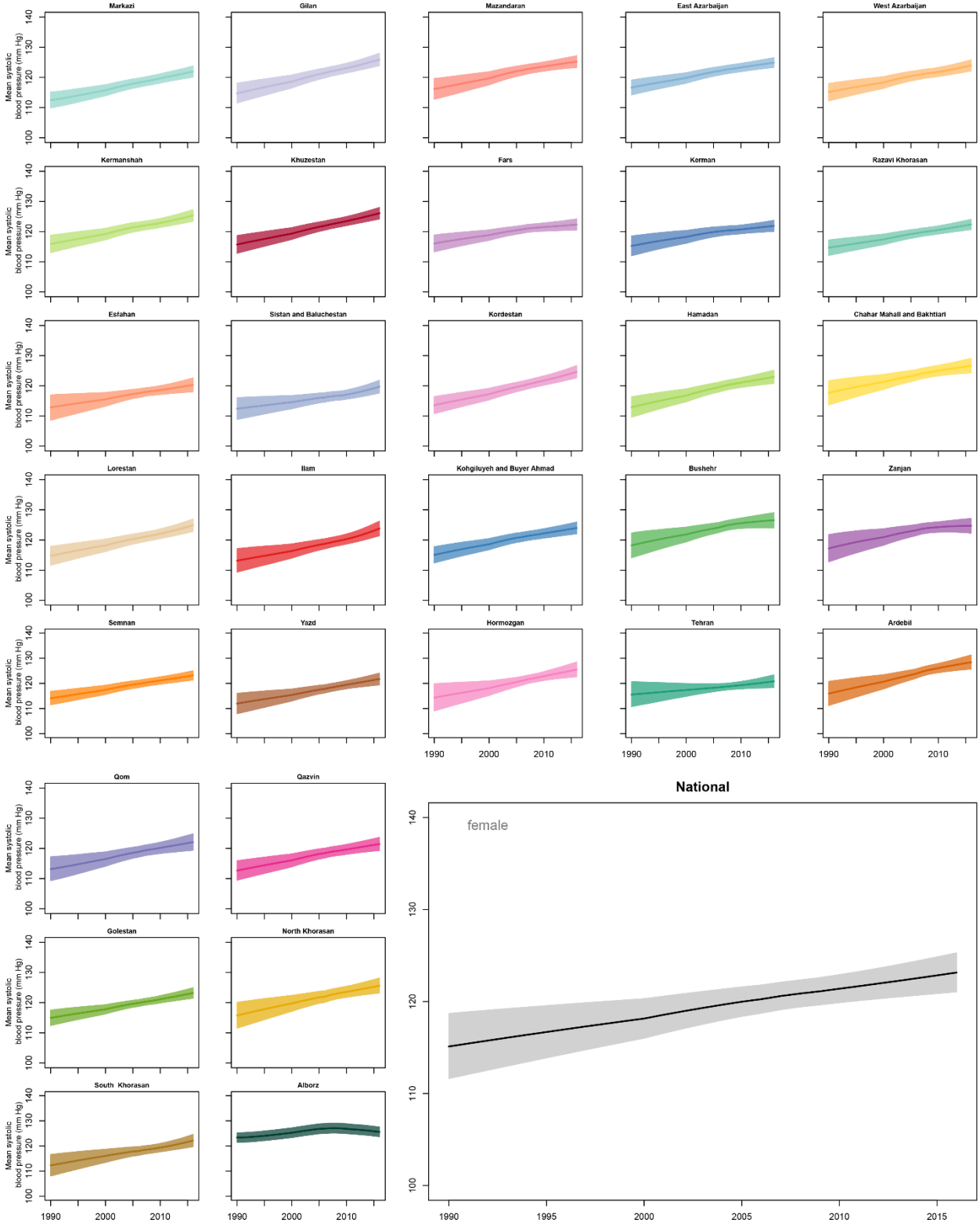
Supplementary Figure 1 (linear trends): Trends in age-standardized mean systolic and diastolic blood pressure and raised blood pressure by sex and by province in people aged 25 years and older from 1990 to 2016. The lines show the posterior mean estimates and the shaded areas show the 95% UI. **Panel A) Diastolic Blood Pressure in Females.**



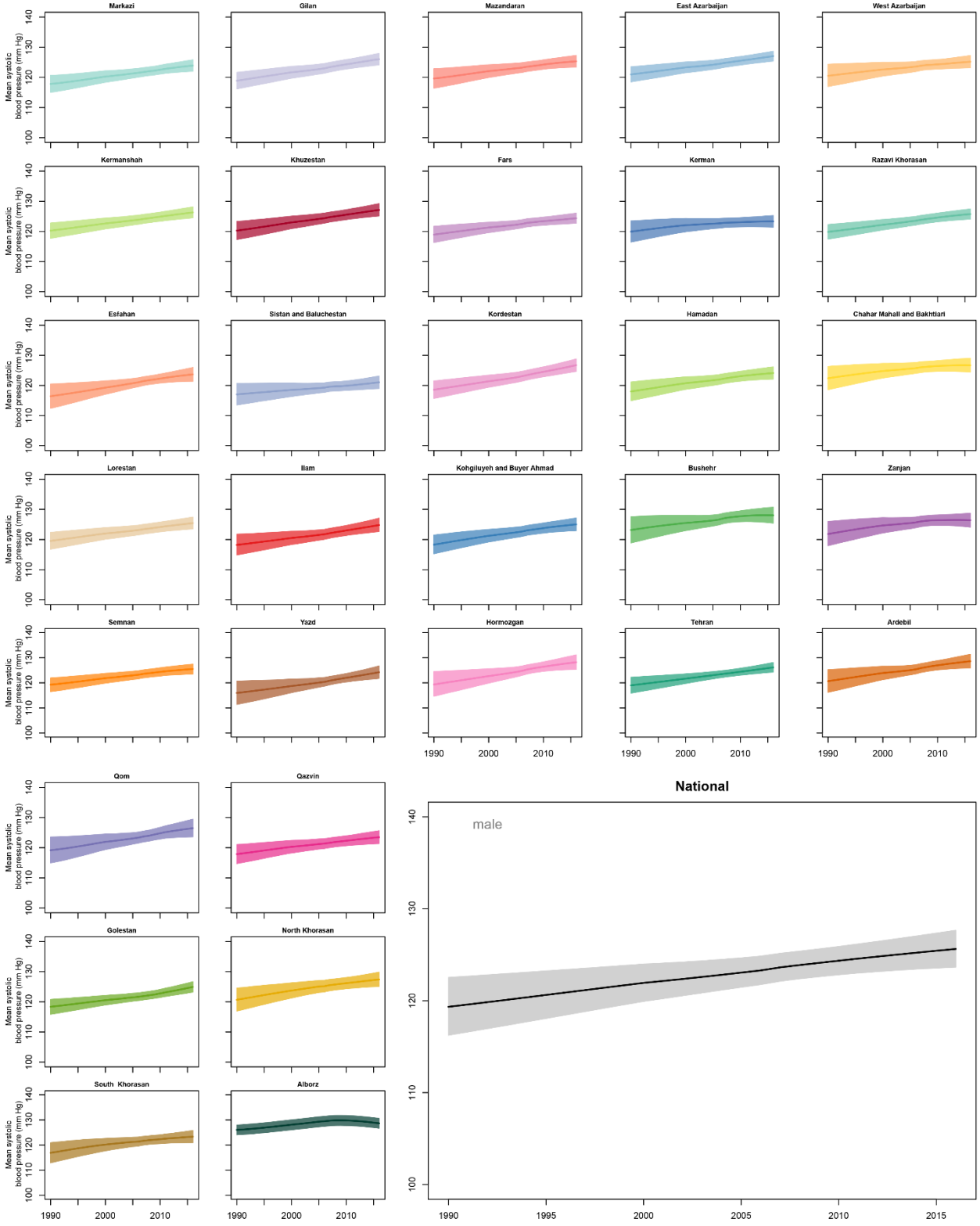
Panel B) Diastolic Blood Pressure in Males



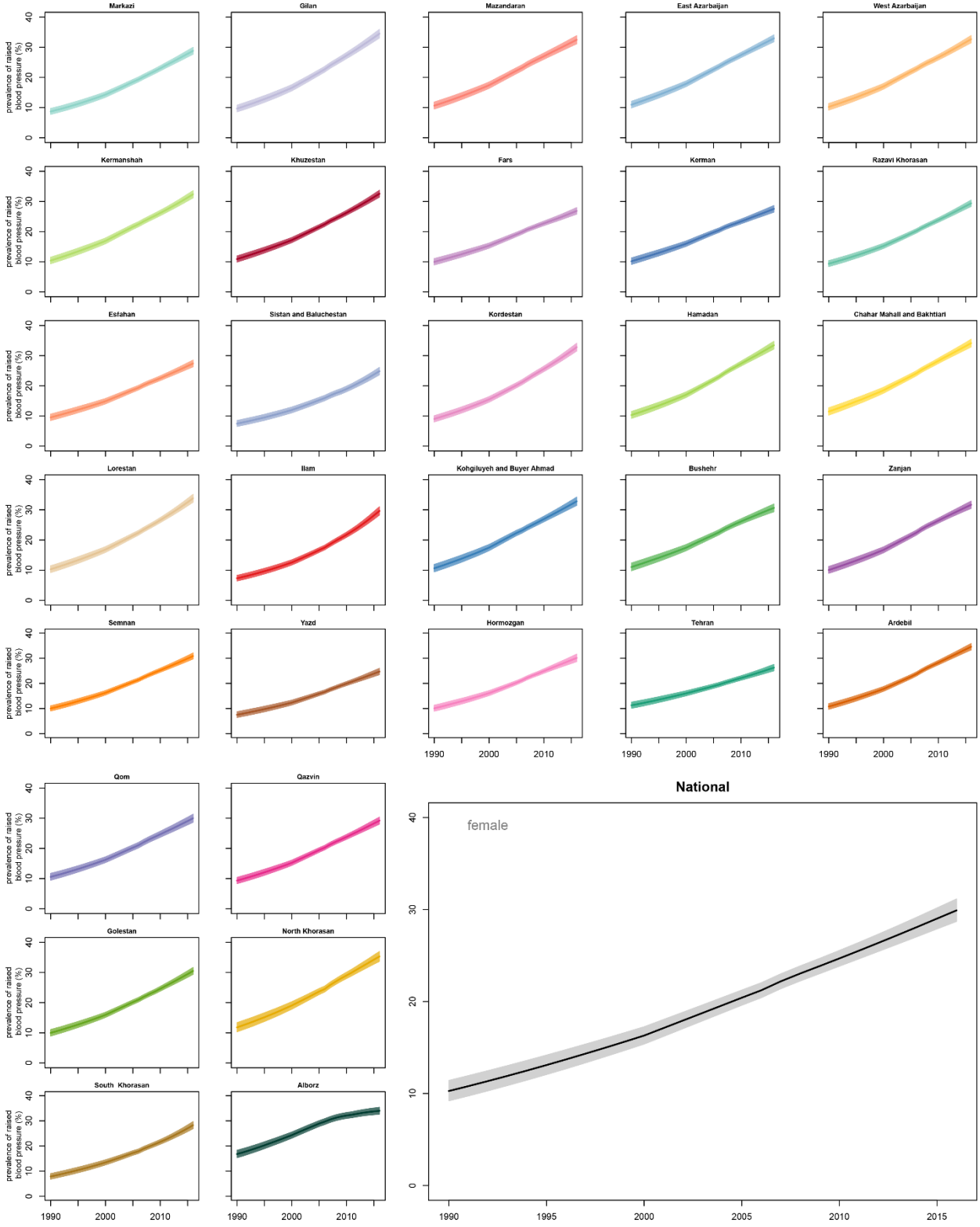
Panel C: Systolic Blood Pressure in Females



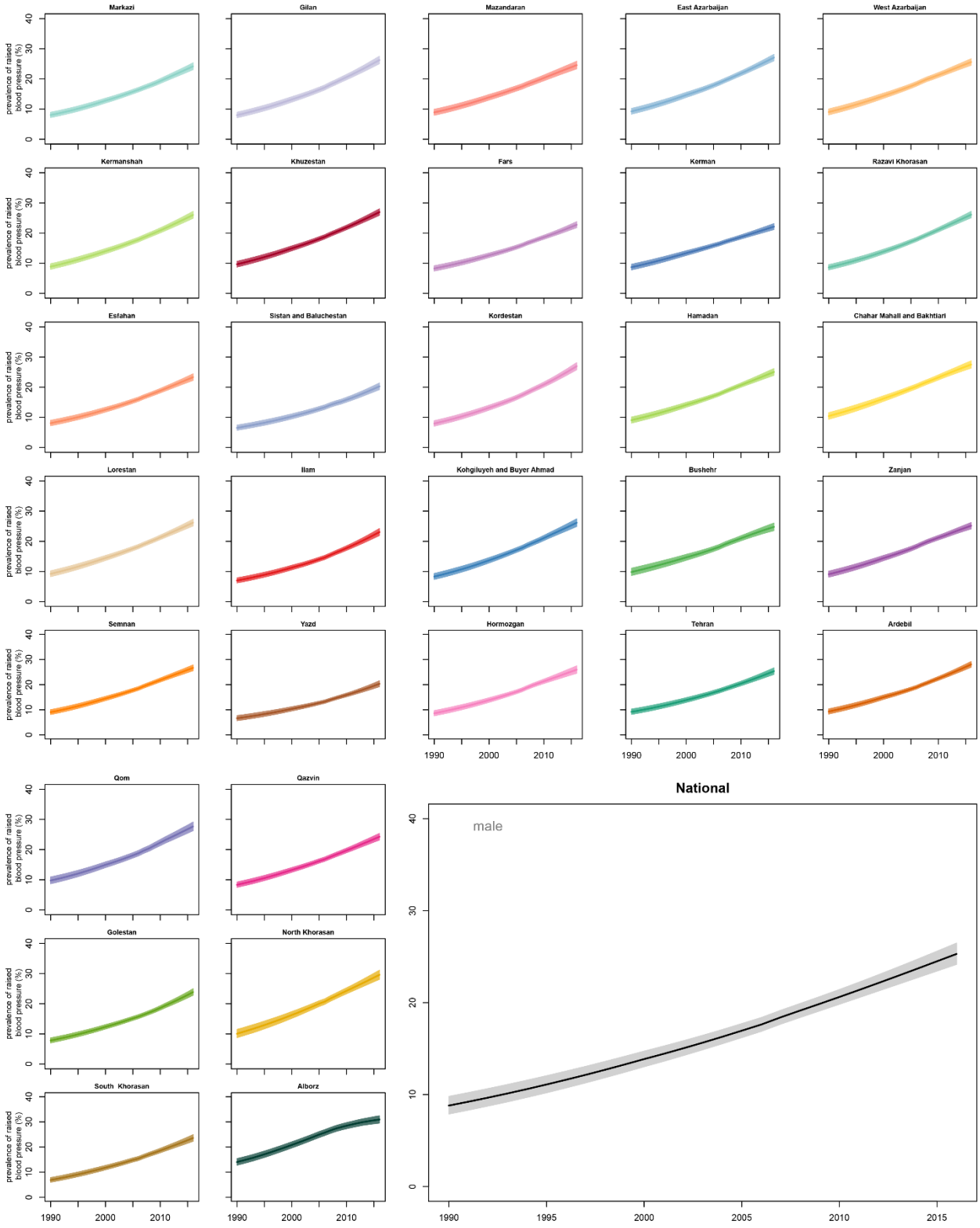
Panel D) Systolic Blood Pressure in Males



Panel E) Prevalence of raised blood pressure in females

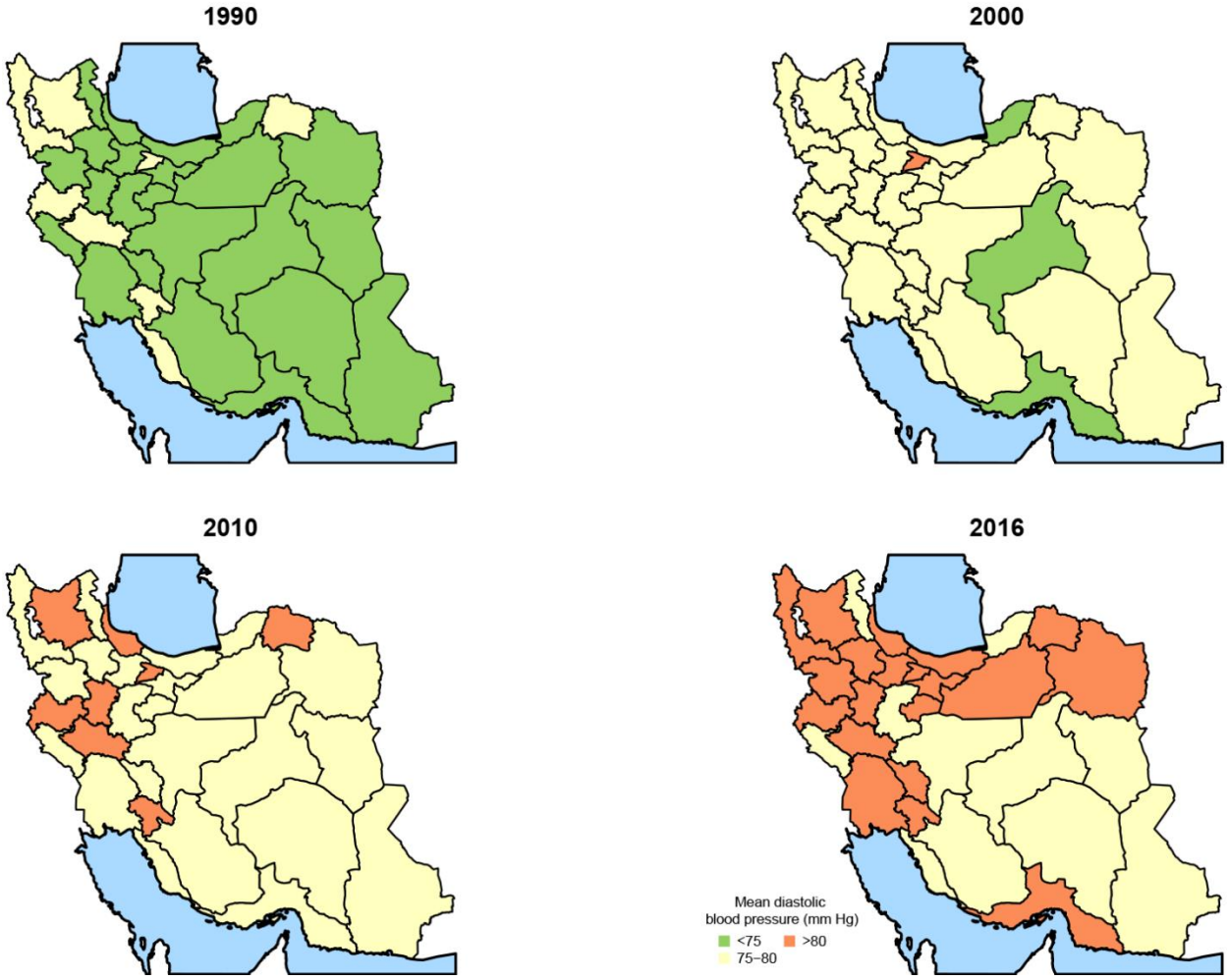


Panel F) Prevalence of raised blood pressure in males

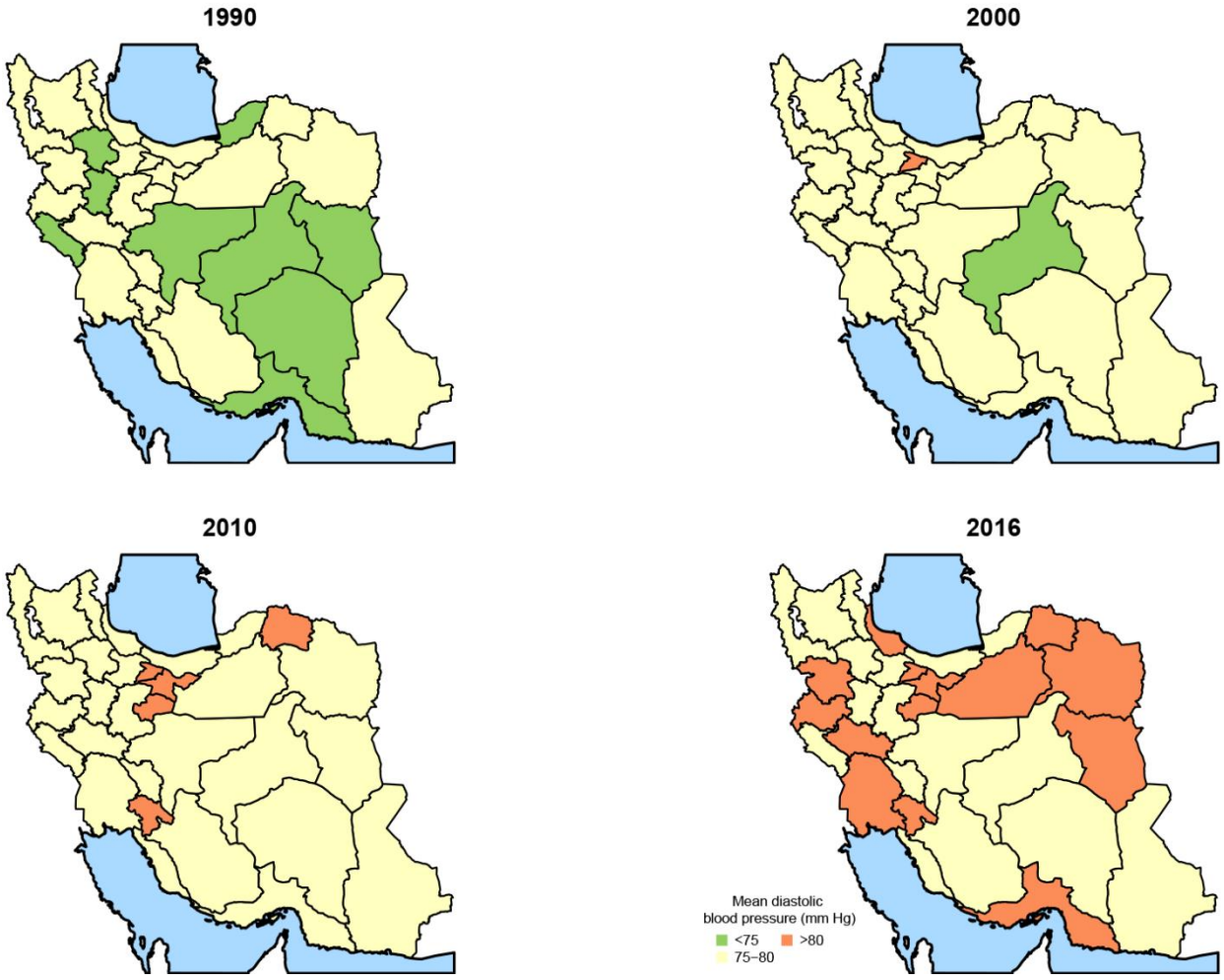


Supplementary Figure 2 (map): Age-standardized mean systolic blood pressure and mean diastolic blood pressure by sex and by province in 1990, 2000, 2010, and 2016 in people aged 25 years and older.

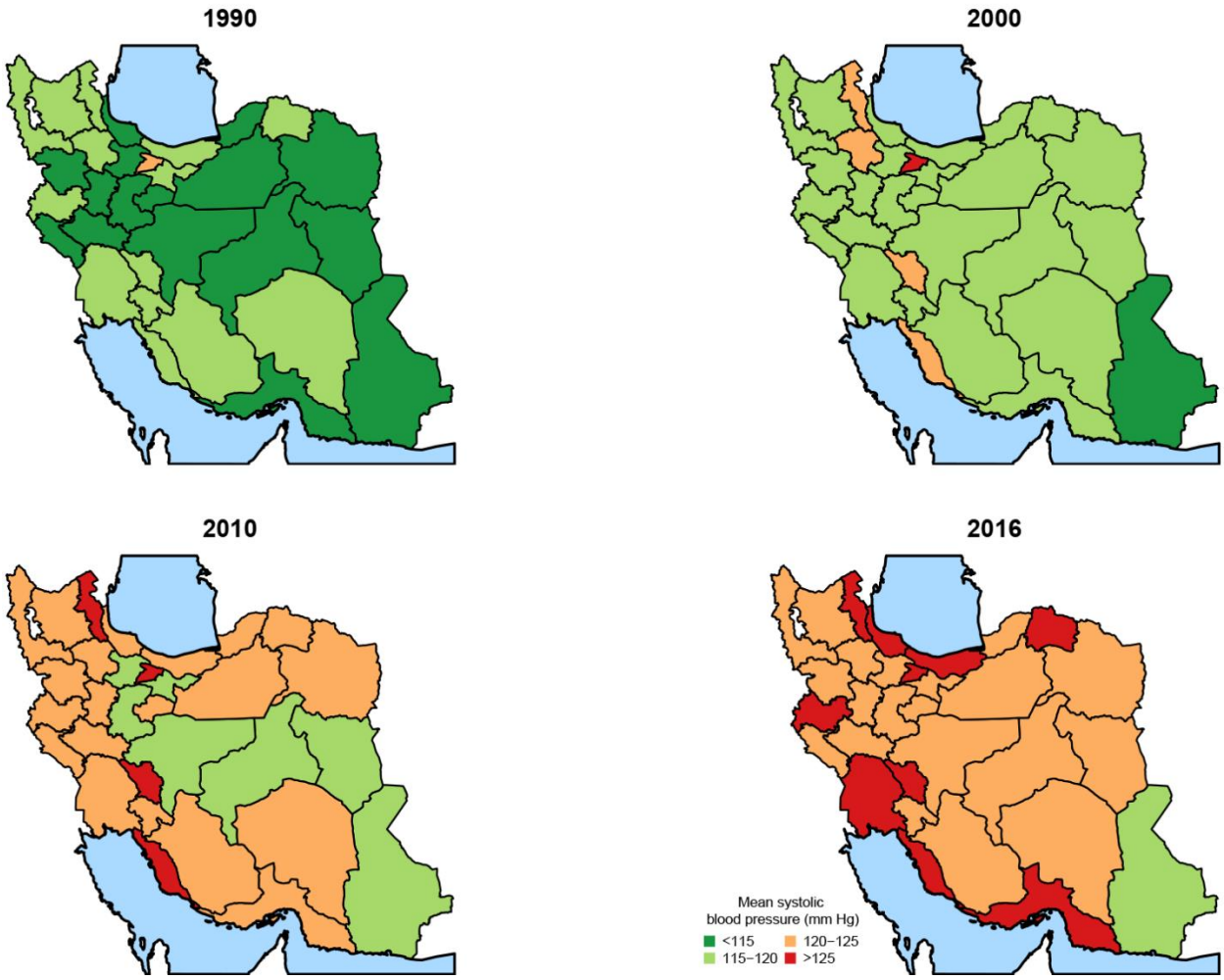
Panel A) Diastolic blood pressure in females



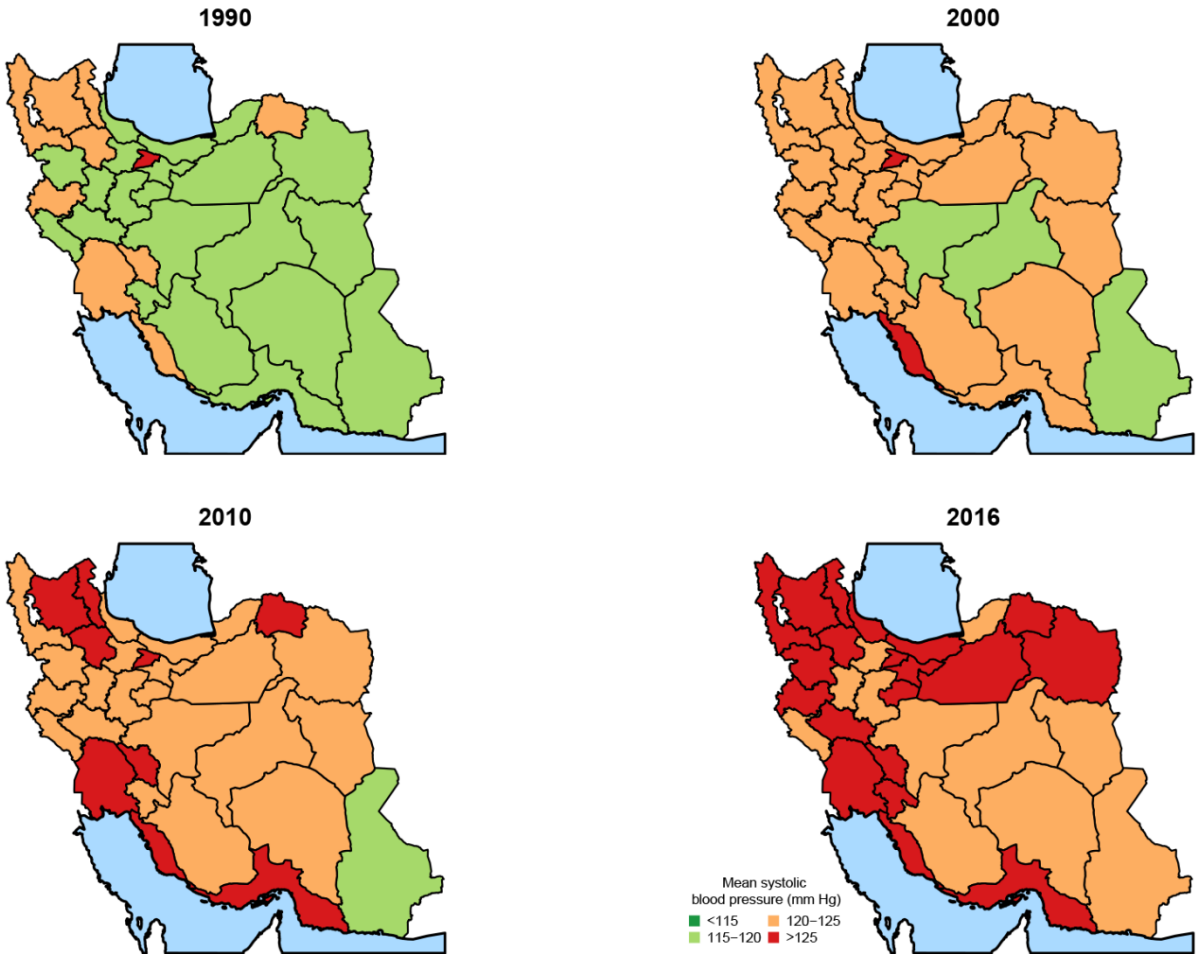
Panel B) Diastolic blood pressure in males



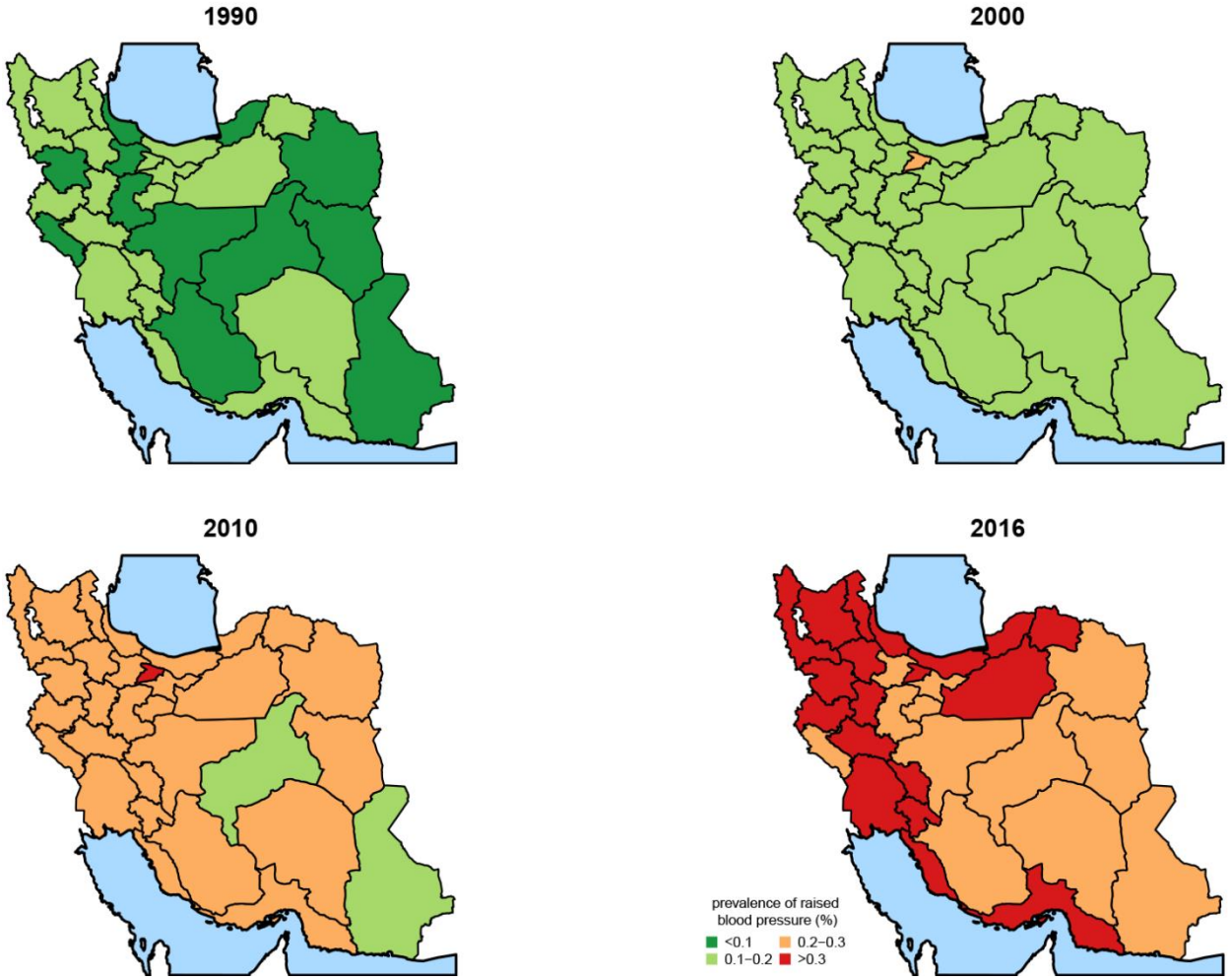
Panel C) Systolic blood pressure in females



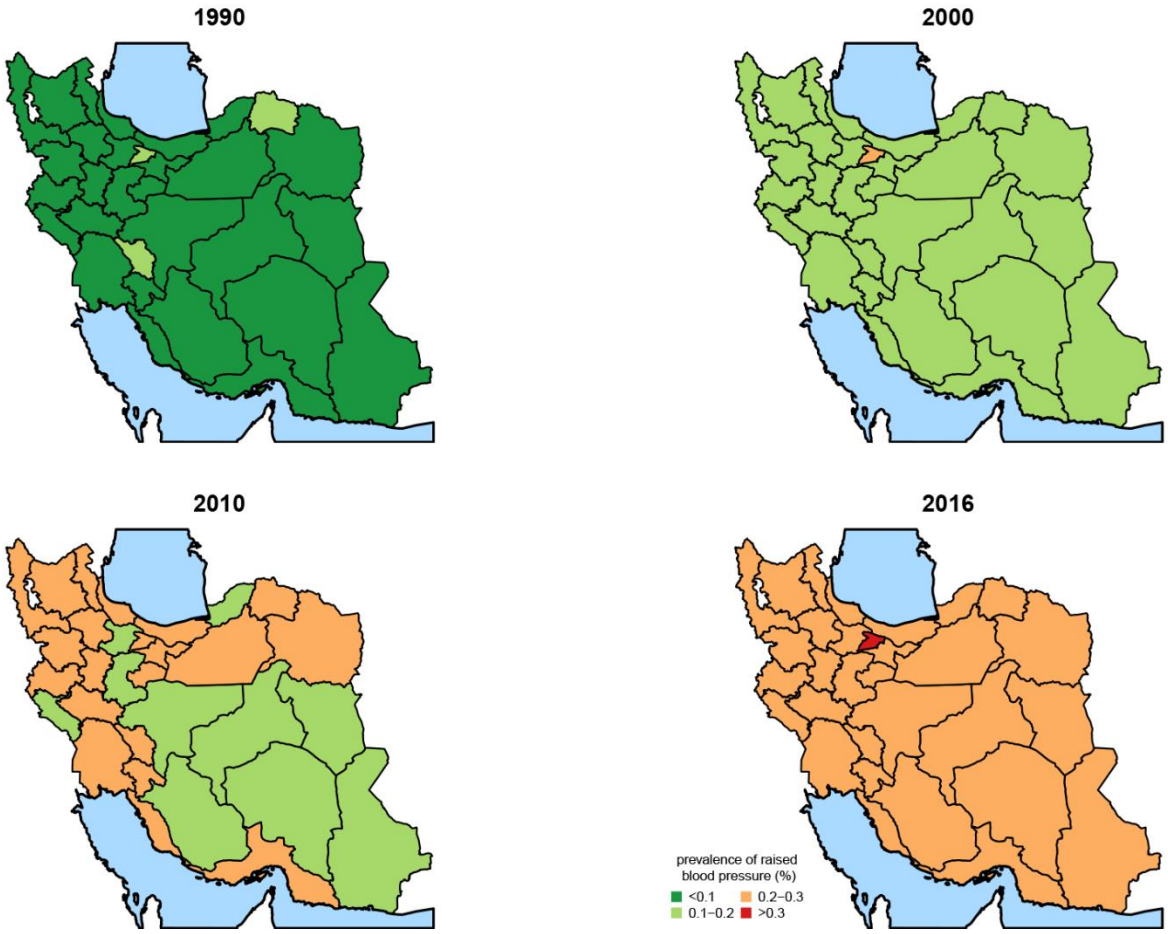
Panel D) Systolic blood pressure in males



Panel E) Prevalence of raised blood pressure in females

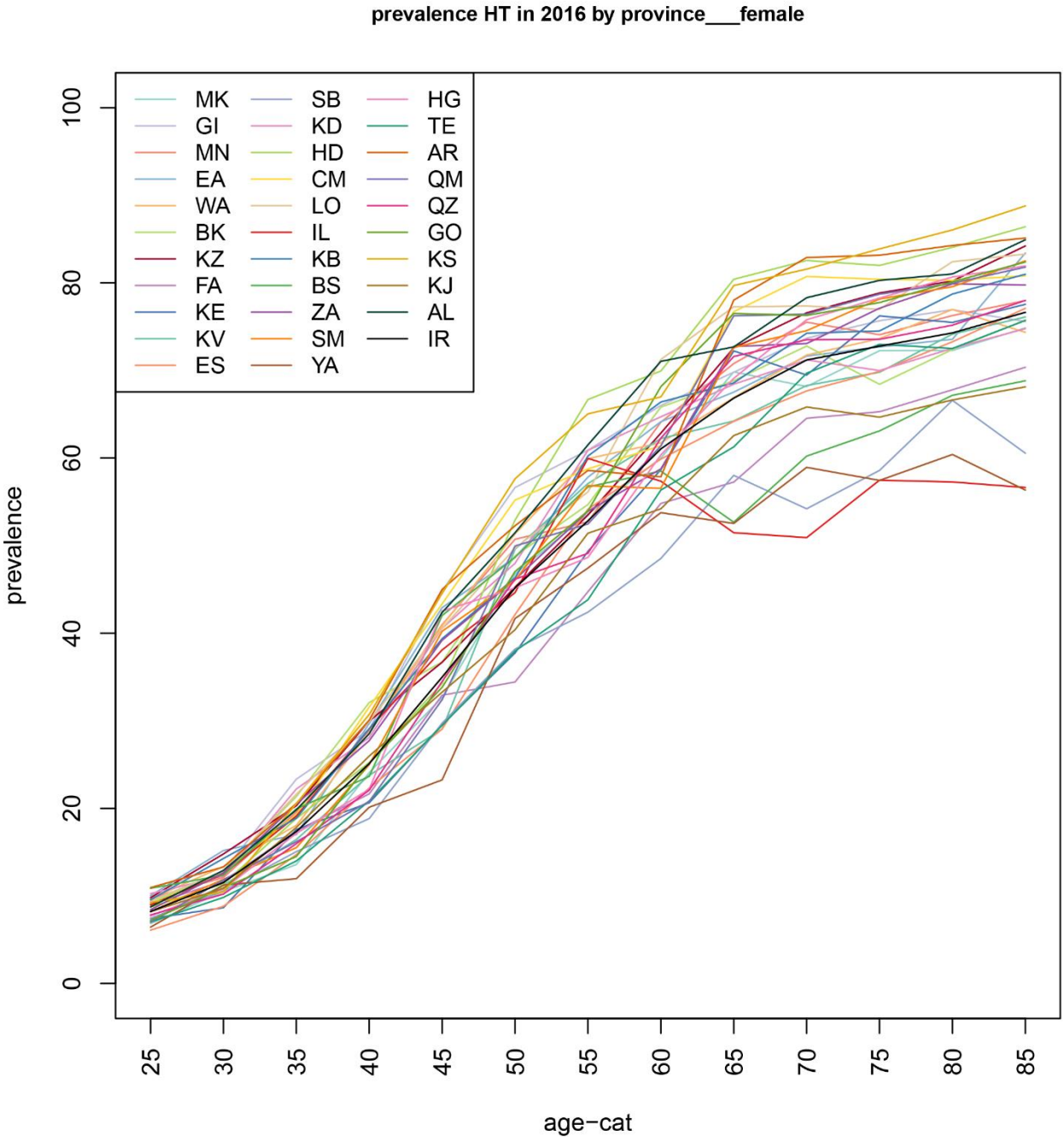


Panel F) Prevalence of raised blood pressure in males

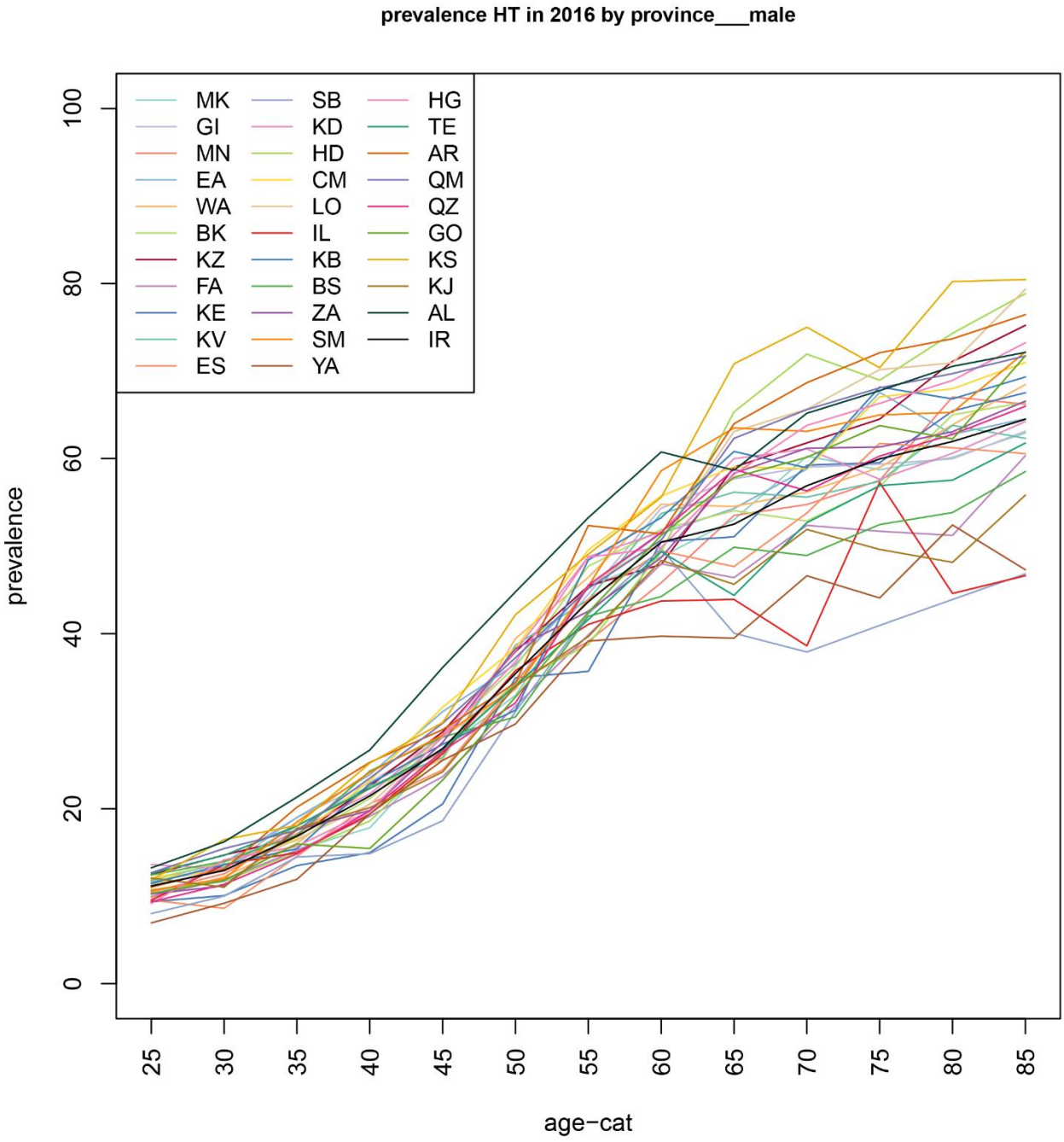


Supplementary Figure 3 (age pattern): The age pattern of prevalence of raised blood pressure by sex at provincial level in people aged 25 years and older in 2016.

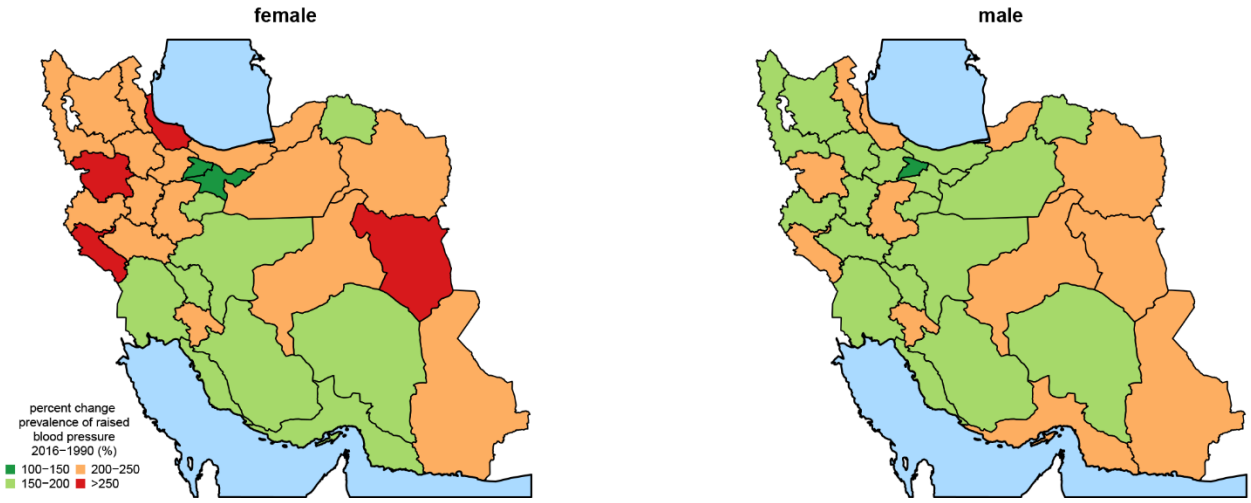
Panel A) Females



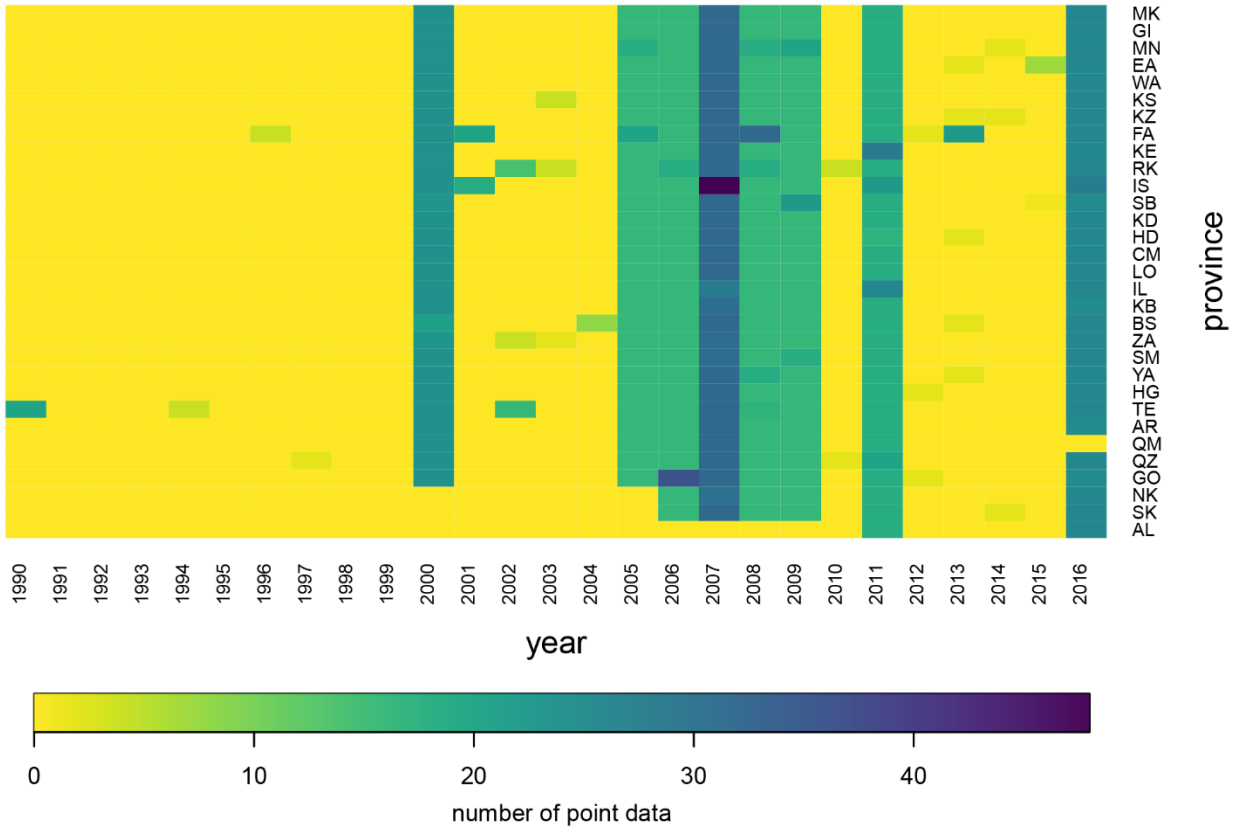
Panel B) Males



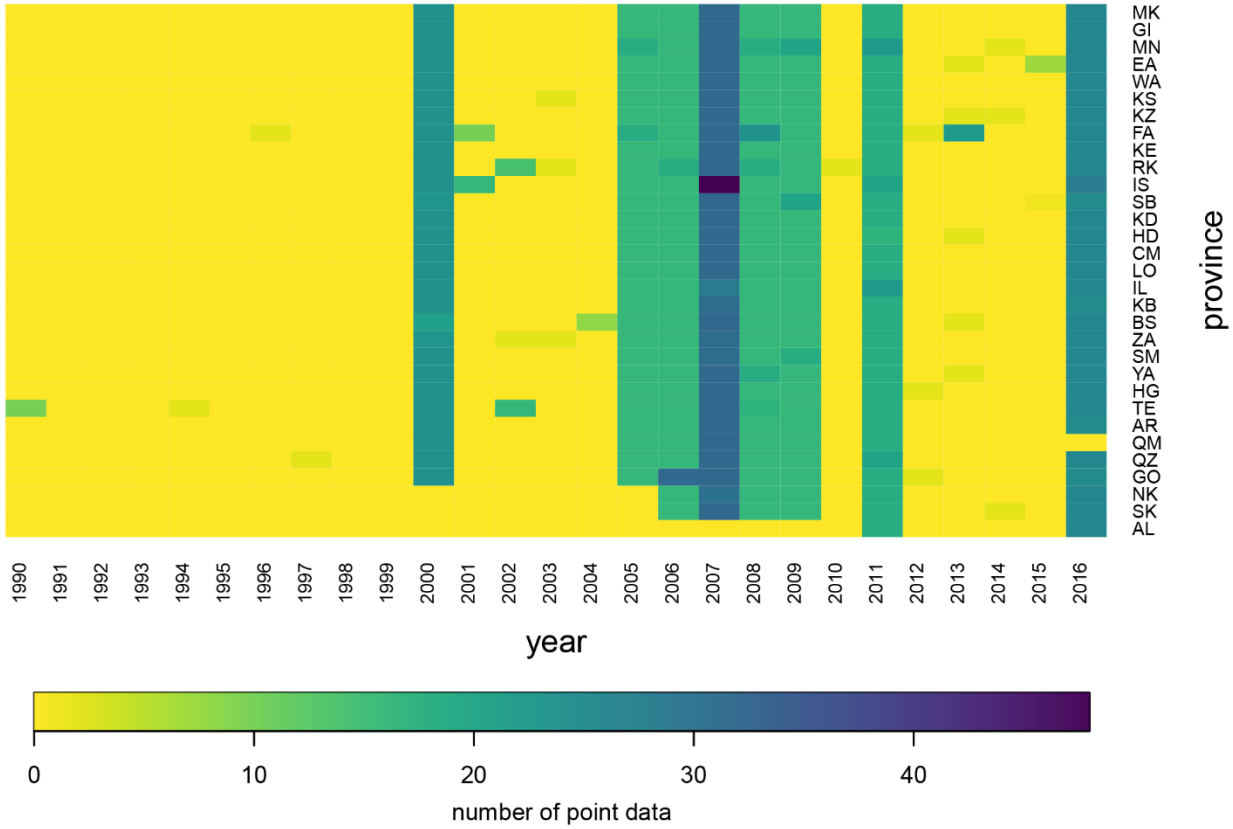
Supplementary Figure 4 (map): The percent change in age standardized prevalence of raised blood pressure by sex and by province from 1990 to 2016 in men and women aged 25 years and older.



Supplementary Figure 5: Number of data sources by province and year
Panel A) Systolic Blood Pressure



Panel B) Diastolic Blood Pressure



Supplementary Table 1: Study Characteristics

	Citation	Year	Province	Sample Size
1	Arefi SH, Bastanhagh MH, Naghavi M, Kassaian SB, Marashie SS, Mortazavi F, Ghiasi G. Prevalence, patient awareness, and control rates of high blood pressure in the adult population of Tehran: a report from the Tehran Blood Pressure Study, 1990-1991. Medical Journal of the I.R.I. 1996. Vol 10 (2). Pages: 124-135.	1990	Tehran	9,692
2	Kaykhaei MA, Hashemi M, Narouie B, Shikhzadeh A, Jahantigh M, Shirzaei E, Rezazehi B, et al. Prevalence of Metabolic Syndrome in Adult Population from Zahedan, Southeast Iran. Iranian J Publ Health, Vol. 41, No.2, Feb 2012, pp.70-76	2009	Sistan and Balouchistan	1,802
3	Peymani P, Heydari ST, Ahmadi SM, Sarikhani Y, Joulaei H, Moghadami M, Faramarzi H, Lankarani K. The Prevalence of High Blood Pressure and Its Relationship with Anthropometric Indicators; a Population Based Study in Fars Province, IR Iran. Int Cardiovasc Res J.2012;6(2):40-5.	2008	Fars	3,916
4	Rafiei M, Boshtam M, Sarraf-Zadegan N, Seirafian S. The Relation between Salt Intake and Blood Pressure among Iranians. Kuwait Medical Journal 2008, 40 (3): 191-195.	2001	Isfahan	912
5	Sharifi F, Mousavinasab N, Mazloomzadeh S, Jaberi Y, Saeini M, Dinmohammadi M, Angomshoaa A. Cutoff point of waist circumference for the diagnosis of metabolic syndrome in an Iranian population. Obesity Research & Clinical Practice (2008) 2, 171-178.	2003	Zanjan	3,277
6	Siadat ZD, Abdoli AR, Shahsanaee A. Association of an adult obesity, blood pressure adulthood socio-economic position. J Res Med Sci. 2012 March; 17(3): 222–228.	2011	Isfahan	479
7	Tabrizi JS, Sadeghi-Bazargani H, Farahbakhsh M, Nikniaz L, Nikniaz Z. Prevalence and Associated Factors of Prehypertension and Hypertension in Iranian Population: The Lifestyle Promotion Project (LPP). PLoS One. 2016 Oct 26;11(10):e0165264.	2015	East Azerbayjan	2818
8	Ghayour-Mobarhan M, Moohebati M, Esmaily H, Ebrahimi M, Parizadeh SM, Heidari-Bakavoli AR, Safarian M, Mokhber N, Nematy M, Saber H, Mohammadi M, Andalibi MS, Ferns GA, Azarpazhooh MR. Mashhad stroke and heart atherosclerotic disorder (MASHAD) study: design, baseline characteristics and 10-year cardiovascular risk estimation. Int J Public Health. 2015 Jul;60(5):561-72	2010	Khorasan Razavi	9,704
9	Babai MA, Arasteh P, Hadibarhaghtalab M, Naghizadeh MM, Salehi A, Askari A, Homayounfar R. Defining a BMI Cut-Off Point for the Iranian Population: The Shiraz Heart Study. PLoS One. 2016 Aug 10;11(8):e0160639.	2012	Fars	12,283

10	Akhlaghi M, Kamali M, Dastsouz F, Sadeghi F, Amanat S. Increased Waist-to-height Ratio May Contribute to Age-related Increase in Cardiovascular Risk Factors. Int J Prev Med. 2016 Apr 27;7:68.	2013	Fars	437
11	Motamed N, Zamani F, Rabiee B, Saeedian FS, Maadi M, Akhavan-Niaki H, Asouri M. The Best Obesity Indices to Use in a Single Factor Model Indicating Metabolic Syndrome: a Population Based Study. Arch Iran Med. 2016 Feb;19(2):110-5.	2009	Mazandaran	6,140
12	Ostovar A, Nabipour I, Larijani B, Heshmat R, Darabi H, Vahdat K, Ravanipour M, Mehrdad N, Raeisi A, Heidari G, Shafiee G, Haeri M, Pourbehi M, Sharifi F, Noroozi A, Tahmasebi R, Aghaei Meybodi H, Assadi M, Farrokhi S, Nemati R, Amini MR, Barekat M, Amini A, Salimipour H, Dobaradaran S, Moshtaghi D. Bushehr Elderly Health (BEH) Programme, phase I (cardiovascular system). BMJ Open. 2015 Dec 16;5(12):e009597.	2013	Bushehr	3,000
13	Hajian-Tilaki K, Heidari B, Hajian-Tilaki A, Firouzjahi A, Bagherzadeh M. The discriminatory performance of body mass index, waist circumference, waist-to-hip ratio and waist-to-height ratio for detection of metabolic syndrome and their optimal cutoffs among Iranian adults. J Res Health Sci. 2014 Autumn;14(4):276-81.	2011	Mazandaran	1,000
14	Ostovaneh MR, Zamani F, Sharafkhah M, Ansari-Moghaddam A, Akhavan Khaleghi N, Saeedian FS, Rohani Z, Motamed N, Maadi M, Malekzadeh R, Poustchi H. Prevalence of metabolic syndrome in Amol and Zahedan, Iran: a population based study. Arch Iran Med. 2014 Jul;17(7):477-82.	2009	Mazandaran	5,826
15	Ostovaneh MR, Zamani F, Sharafkhah M, Ansari-Moghaddam A, Akhavan Khaleghi N, Saeedian FS, Rohani Z, Motamed N, Maadi M, Malekzadeh R, Poustchi H. Prevalence of metabolic syndrome in Amol and Zahedan, Iran: a population based study. Arch Iran Med. 2014 Jul;17(7):477-82.	2009	Sistan and Balouchistan	2,243
16	Khosravi A, Emamian MH, Shariati M, Hashemi H, Fotouhi A. The prevalence of pre-hypertension and hypertension in an Iranian urban population. High Blood Press Cardiovasc Prev. 2014 Jun;21(2):127-35.	2009	Semnan	5,190
17	Mellati AA, Mousavinasab SN, Sokhanvar S, Kazemi SA, Esmailli MH, Dinmohamadi H. Correlation of anthropometric indices with common cardiovascular risk factors in an urban adult population of Iran: data from Zanjan Healthy Heart Study. Asia Pac J Clin Nutr. 2009;18(2):217-25.	2003	Zanjan	2,768
18	Ghayour-Mobarhan M, Shapouri-Moghaddam A, Azimi-Nezhad M, Esmaeili H, Parizadeh SM, Safarian M, Kazemi-Bajestani SM, Khodaei GH, Hosseini SJ, Parizadeh SM, Ferns GA. The relationship between established coronary risk factors and serum copper and zinc concentrations in a large Persian cohort. J Trace Elem Med Biol. 2009;23(3):167-75.	2006	Khorasan Razavi	2,233
19	Esmailzadehha N, Ziaee A, Kazemifar AM, Ghorbani A, Oveisi S. Prevalence of metabolic syndrome in Qazvin Metabolic Diseases Study (QMDS), Iran: a comparative analysis of six definitions. Endocr Regul. 2013 Jul;47(3):111-20.	2011	Qazvin	1,107

20	Hajian-Tilaki K, Heidari B, Hajian-Tilaki A. Solitary and combined negative influences of diabetes, obesity and hypertension on health-related quality of life of elderly individuals: A population-based cross-sectional study. Diabetes Metab Syndr. 2016 Apr-Jun;10(2 Suppl 1):S37-42.	2016	Mazandaran	750
21	Yazdanpanah L, Shahbazian H, Shahbazian H, Latifi SM. Prevalence, awareness and risk factors of hypertension in southwest of Iran. J Renal Inj Prev. 2015 Jun 1;4(2):51-6.	2013	Khuzestan	944
22	Ghaffari S, Pourafkari L, Tajlil A, Sahebihagh MH, Mohammadpoorasl A, Tabrizi JS, Nader ND, Azizi Zeinalhajlou A. The prevalence, awareness and control rate of hypertension among elderly in northwest of Iran. J Cardiovasc Thorac Res. 2016;8(4):176-182.	2015	East Azerbayjan	1,071
23	Shirani S, Heidari K, Sabzghabaee AM, Mirmoghtadaee P, Hoseini L, Aalifar H, Fadaei H, Esnaashari H, Soltani R. The modifiable noncommunicable risk factors among an Iranian population. Southeast Asian J Trop Med Public Health. 2012 Sep;43(5):1227-32.	2007	Isfahan	1,000
24	Azimi-Nezhad M, Ghayour-Mobarhan M, Safarian M, Esmailee H, Parizadeh SM, Rajabi-Moghadam M, Gholami A, Reza Oladi M, Ferns GA. Anthropometric indices of obesity and the prediction of cardiovascular risk factors in an Iranian population. ScientificWorldJournal. 2009 Jun 12;9:424-30.	2008	Khorasan Razavi	4,928
25	Bayani MA, Yazdani E, Karkhah A, Moodi S, Bijani A, Hosseini SR. Prevalence of metabolic syndrome and its components in the Iranian elderly people: Results from AHAP study. Int J Adv Biotechnol Res. 2016;7(4):2235-42.	2014	Mazandaran	1,562
26	Farhangi MA. The prevalence of pre-hypertension and hypertension and their related metabolic or anthropometric parameters in rural elderly population in northwest of Iran. Prog Nutr. 2017;19(1):33-40.	2013	East Azerbayjan	248
27	Heidari Z, Feizi A. The Isfahan comprehensive elderly study: Objectives, research design, methodology, and preliminary results. Journal of Research in Medical Sciences. 2017;22:11.	2016	Isfahan	603
28	Kazemi T, Hajihosseini M, Mashreghimoghadam H, Azdaki N, Ziaee M. Prevalence and Determinants of Hypertension among Iranian Adults, Birjand, Iran. International Journal of Preventive Medicine. 2017;8:4.	2014	South Khorasan	1,286
29	Kalani Z, Salimi T, Rafiei M. Comparison of obesity indexes BMI, WHR and WC in association with hypertension: Results from a blood pressure status survey in Iran. Journal of Cardiovascular Disease Research. 2015;6(2):72-7.	2013	Yazd	1,130
30	Latifi SM, Moradi L, Shahbazian H, Aleali AM. A study of the prevalence of dyslipidemia among the adult population of Ahvaz, Iran. Diabetes and Metabolic Syndrome: Clinical Research and Reviews. 2016;10(4):190-3.	2014	Khuzestan	2,505
31	Mahjoub S, Ahmadi MH, Faramarzi M, Ghorbani H, Moazezi Z. The prevalence of metabolic syndrome according to the Iranian Committee of Obesity and ATP III criteria in Babol, North of Iran. Caspian Journal of Internal Medicine. 2012;3(2):410-6.	2005	Mazandaran	933

32	Motamed N, Perumal D, Zamani F, Ashrafi H, Haghjoo M, Saeedian FS, et al. Conicity index and waist-to-hip ratio are superior obesity indices in predicting 10-year cardiovascular risk among men and women. Clinical Cardiology. 2015;38(9):527-34.	2008	Mazandaran	3,199
33	Tabari MG, Naseri F, Paad E, Majidi F, Marjani A. Prevalence of metabolic syndrome in baluch women in Chabahar. International Journal of Osteoporosis and Metabolic Disorders. 2015;8(2):27-34.	2015	Sistan and Balouchistan	320
34	Veghari G, Sedaghat M, Banihashem S, Moharloei P, Angizeh A, Tazik E, et al. The prevalence of metabolic syndrome in the north of Iran. An epidemiologic comparative study. Journal of Cardiovascular Disease Research. 2015;6(4):172-5.	2012	Golestan	248
35	Azizi A, Abbasi MR, Abdoli GR. The prevalence of hypertension and its association with age, sex, and body mass index in people over 15 years old covered by Kermanshah University of Medical Sciences in 2003. Iranian Journal of Endocrinology and Metabolism. 2008;10(4):323-330.	2003	Kermanshah	5,147
36	Dabbaghmanesh MH, Mostafavi H, Zare N. The level of hypertension, its risk factors, and its control among adults in Fars. Hormozgan Medical Journal. 2007.;11(1):41-49.	2001	Fars	3,245
37	Esmailzadeh A, Azadbakhsh L. The comparative evaluation of anthropometric meafurement in predicting hypertension in Tehranian women. Medical Journal of Tehran University of Medical Sciences. 2008;66(6):413-420.	2008	Tehran	926
38	Farshidi H, Zare S, Bushehri E. The association between hypertension and anthropometric measurements in adults in Bandar Abbas. Hormozgan Medical Journal. 2006;10(10):111-118.	2006	Hormozgan	2,087
39	Ghazanfari Z, Mohammad Alizadeh S, Aziz zadeg Forouzi M, Bahaoddini N. The prevalence of risk factors of cardiovascular diseases in Kerman. Nursing Journal. 2010;3(1):29-32.	2004	Kerman	400
40	Keshavarzi S, Zare N. Evaluating the risk factors of high systolic and diastolic blood pressure in adolescents and adults in the city of Shiraz. The Horizon of Knowledge. 2011;17(2):22-28.	2005	Fars	3,997
41	Mostafavi H. Hypertension in the city of Shiraz. Jondi-Shapour Medical Joural. 2002;33(3):26-32.	1996	Fars	4,045
42	Navaei L, Mehrabi Y, Azizi F. The epidemiological assessment of hyperlipidemia, obesity, and hypertension in villages of Tehran province. The Iranian Journal of Endocrinology and Metabolism. 2000;2(4):253-262.	1994	Tehran	2,705
43	Paknahad Z, Saboktakin M. Investigating the association of blood pressure with body mass index in villages of Isfahan. 2010;6(3):506-512.	2006	Isfahan	1,493
44	Peyman H, Yaghoubi M, Seyyed Mohammadi A, Delpisheh A. Prevalence of chronic diseases in the elderly in the city of Ilam. Salmand.2011;6(22):7-13.	2007	Ilam	211
45	Pejhan A, Najjar L, Heidari A, Hajizadeh S, Rakhshani MH. Blood pressure in the city of Sabzevar in 2003. Journal of the Rafsanjan University of Medical Sciences.2005;4(2):95-102.	2003	Khorasan Razavi	844
46	Shamsi A, Ebadi A. The risk factors of cardiovascular diseases in the elderly. Nursing Journal. 2011;3(4):187-192.	2010	Tehran	383

47	Safari_Moradabadi A, Ghanbarnejad A, Nikparvar M, Dadipour S, Fallahi S. The prevalence of hypertension in adults older than 30 years in Bandar Abbas. Hormozgan Medical Journal. 2014;18(3):201-209.	2012	Hormozgan	1531
48	Safari_Moradabadi A, Ghanbarnejad A, Nikparvar M, Dadipour S, Fallahi S. The prevalence of hypertension in adults older than 30 years in Bandar Abbas. Hormozgan Medical Journal. 2014;18(3):201-209.	2012	Hormozgan	1531
49	Cheraghi P, Mihandoost Yeganeh Z, Doosti Irani A, Sangestani M, Cheraghi Z, Khezeli M. Study on the prevalence of hypertension and its associated factors in the elderly population. Elderly nursing quarterly. 2015;1(3):73-86.	2015	Hamadan	476
50	Hosseinkhani Z, Ziayi A, Qorbani A, Javadi A. The prevalence of risk factors of cardiovascular diseases among adults in the city of Qazvin. Medical Journal of Mashhad University of Medical Sciences. 2013;56(5):275-282.	2010	Qazvin	1400
51	Boskabadi MH, Emadzadeh M, Hassanzadeh AA, Salimi N, Ghomami G, Mazloum R, Hajizadeh S. The prevalence of hypertension in adults over 18 years old in the city of Mashad. Physiology and Pharmacology. 2005;9(2):195-202.	2002	Khoarsan Razavi	704
52	Kalani Z, Abdi H, Shahbazi L, Salimi T, Aminipour MR. Hypertension in the city of Yazd. Payesh. 2010;10(1):101-107.	2009	Yazd	1130

Supplementary Table 2: Mean systolic and diastolic blood pressure, prevalence of hypertension, and their percent change from 1990 to 2016 by sex and province, with 95% Uncertainty Intervals.

Panel A) Systolic Blood Pressure in Females

Province	1990	2000	2010	2016	1990-2000	2000-2010	2010-2016	1990-2016
Markazi	112·46(109·89-115·16)	115·73(113·89-117·59)	119·67(118·13-121·19)	121·93(120·1-123·8)	0·03(-0·01-0·07)	0·03(0-0·06)	0·02(-0·01-0·05)	0·08(0·04-0·13)
Gilan	114·71(111·52-118·08)	118·61(116·47-120·79)	123·08(121·47-124·72)	125·9(123·87-128·02)	0·03(-0·01-0·08)	0·04(0·01-0·07)	0·02(-0·01-0·05)	0·1(0·05-0·15)
Mazandaran	116·17(112·77-119·64)	119·68(117·51-121·9)	123·61(122·07-125·14)	125·22(123·28-127·19)	0·03(-0·02-0·08)	0·03(0-0·06)	0·01(-0·01-0·04)	0·08(0·03-0·13)
Azerbaijan, East	116·63(114·21-119·12)	119·82(118·08-121·56)	123·28(121·91-124·69)	124·89(123·29-126·57)	0·03(-0·01-0·06)	0·03(0-0·06)	0·01(-0·01-0·04)	0·07(0·04-0·11)
Azerbaijan, West	115·15(112·21-118·01)	118·32(116·34-120·27)	121·83(120·31-123·33)	123·98(122·12-125·84)	0·03(-0·01-0·07)	0·03(0-0·06)	0·02(-0·01-0·05)	0·08(0·03-0·12)
Kermanshah	115·91(113·02-118·82)	119·19(117·25-121·09)	122·87(121·37-124·38)	125·34(123·43-127·29)	0·03(-0·01-0·07)	0·03(0-0·06)	0·02(-0·01-0·05)	0·08(0·04-0·13)
Khuzestan	115·71(112·81-118·68)	119·34(117·4-121·32)	123·49(121·99-125·01)	126·09(124·17-128·02)	0·03(-0·01-0·08)	0·03(0·01-0·06)	0·02(-0·01-0·05)	0·09(0·05-0·13)
Fars	116·05(113·27-118·87)	118·82(117·08-120·57)	121·5(120·15-122·88)	122·33(120·48-124·2)	0·02(-0·02-0·06)	0·02(0-0·05)	0·01(-0·02-0·03)	0·05(0·01-0·1)
Kerman	115·24(111·99-118·56)	118·25(116·13-120·38)	120·72(119·29-122·19)	121·91(120·05-123·76)	0·03(-0·02-0·07)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·06(0·01-0·11)
Khorasan, Razavi	114·65(112·11-117·24)	117·42(115·68-119·18)	120·54(119·19-121·92)	122·37(120·68-124·08)	0·02(-0·01-0·06)	0·03(0-0·05)	0·02(-0·01-0·04)	0·07(0·03-0·11)
Isfahan	112·84(108·56-117·02)	115·51(113·21-117·77)	118·58(117·12-120·06)	120·32(118·03-122·6)	0·02(-0·03-0·08)	0·03(-0·01-0·06)	0·01(-0·02-0·05)	0·07(0·01-0·13)
Sistan and Baluchistan	112·41(108·85-116·08)	114·58(112·38-116·77)	117·08(115·57-118·61)	119·7(117·61-121·84)	0·02(-0·03-0·07)	0·02(-0·01-0·06)	0·02(-0·01-0·05)	0·06(0·01-0·12)
Kordestan	113·57(110·79-116·43)	117·23(115·32-119·18)	121·72(120·18-123·3)	124·64(122·64-126·72)	0·03(-0·01-0·08)	0·04(0·01-0·07)	0·02(-0·01-0·05)	0·1(0·05-0·14)
Hamadan	112·91(109·59-116·36)	116·77(114·69-118·99)	121·06(119·45-122·7)	122·96(120·77-125·16)	0·03(-0·01-0·09)	0·04(0-0·07)	0·02(-0·02-0·05)	0·09(0·04-0·14)
Chahar Mahaal and Bakhtiari	117·67(113·62-121·7)	121·27(118·79-123·78)	125·02(123·27-126·81)	126·65(124·26-129·12)	0·03(-0·02-0·09)	0·03(0-0·07)	0·01(-0·02-0·05)	0·08(0·02-0·14)
Lorestan	114·75(111·63-117·9)	118·23(116·16-120·3)	122·06(120·44-123·68)	124·87(122·8-126·99)	0·03(-0·01-0·08)	0·03(0-0·06)	0·02(-0·01-0·05)	0·09(0·04-0·14)
Ilam	113·15(109·35-117·16)	116·35(113·99-118·7)	120·3(118·67-122·01)	123·8(121·41-126·25)	0·03(-0·03-0·09)	0·03(0-0·07)	0·03(0-0·06)	0·09(0·04-0·15)
Kohgiluyeh and Boyer-Ahmad	115·07(112·4-117·79)	118·59(116·76-120·47)	122·19(120·63-123·76)	124(122·05-125·95)	0·03(-0·01-0·07)	0·03(0-0·06)	0·01(-0·01-0·04)	0·08(0·04-0·12)
Bushehr	118·21(114·09-122·34)	121·86(119·38-124·28)	125·58(123·83-127·3)	126·54(123·98-129·09)	0·03(-0·02-0·09)	0·03(0-0·07)	0·01(-0·03-0·04)	0·07(0·01-0·13)
Zanjan	117·21(112·77-121·81)	120·93(118·24-123·72)	124·28(122·57-126·04)	124·69(122·27-127·17)	0·03(-0·03-0·1)	0·03(-0·01-0·07)	0(-0·03-0·04)	0·06(0-0·13)
Semnan	114·11(111·49-116·86)	117·41(115·58-119·26)	121·14(119·67-122·61)	123·15(121·33-125·03)	0·03(-0·01-0·07)	0·03(0-0·06)	0·02(-0·01-0·04)	0·08(0·04-0·12)
Yazd	111·97(107·94-116·04)	115·37(112·97-117·77)	119·45(117·84-121·09)	121·74(119·4-124·1)	0·03(-0·03-0·09)	0·04(0-0·07)	0·02(-0·01-0·05)	0·09(0·03-0·15)

Hormozgān	114·3(109·03-119·86)	118·09(115·17-120·98)	122·85(121·12-124·66)	125·44(122·6-128·5)	0·03(-0·04-0·11)	0·04(0-0·08)	0·02(-0·02-0·06)	0·1(0·02-0·18)
Tehran	115·53(110·74-120·67)	117·35(114·85-119·94)	119·28(117·81-120·74)	120·82(118·31-123·38)	0·02(-0·05-0·08)	0·02(-0·02-0·05)	0·01(-0·02-0·05)	0·05(-0·02-0·11)
Ardabil	115·92(111·2-120·77)	120·65(117·78-123·46)	126·06(124·23-127·93)	128·38(125·65-131·29)	0·04(-0·02-0·11)	0·04(0·01-0·09)	0·02(-0·02-0·06)	0·11(0·04-0·18)
Qom	113·17(109·33-117·22)	116·46(114·07-118·84)	120·17(118·31-122·05)	122·09(119·38-124·84)	0·03(-0·03-0·09)	0·03(0-0·07)	0·02(-0·02-0·06)	0·08(0·02-0·14)
Qazvin	112·65(109·45-115·91)	116·06(113·9-118·19)	119·65(118·04-121·35)	121·45(119·31-123·68)	0·03(-0·02-0·08)	0·03(0-0·07)	0·02(-0·02-0·05)	0·08(0·03-0·13)
Golestan	114·95(112·42-117·51)	117·78(116·24-119·32)	121·11(119·87-122·31)	123·19(121·46-124·95)	0·02(-0·01-0·06)	0·03(0-0·05)	0·02(-0·01-0·04)	0·07(0·03-0·11)
Khorasan, North	115·74(111·53-120·06)	119·74(117·11-122·39)	123·57(121·76-125·43)	125·6(123·19-128·17)	0·03(-0·02-0·1)	0·03(-0·01-0·07)	0·02(-0·02-0·05)	0·09(0·03-0·15)
Khorasan, South	112·26(108·04-116·6)	116·04(113·45-118·69)	119·34(117·65-121·01)	122·15(119·72-124·61)	0·03(-0·03-0·1)	0·03(-0·01-0·07)	0·02(-0·01-0·06)	0·09(0·03-0·15)
Alborz	123·39(121·48-125·28)	125·24(123·34-127·19)	126·83(124·93-128·84)	125·58(123·69-127·53)	0·02(-0·02-0·05)	0·01(-0·02-0·04)	-0·01(-0·04-0·02)	0·02(-0·01-0·05)
Iran	115·11(111·63-118·7)	118·15(116·01-120·31)	121·39(119·87-122·92)	123·15(121·05-125·29)	0·03(-0·02-0·08)	0·03(0-0·06)	0·01(-0·02-0·05)	0·07(0·02-0·12)

Panel B) Systolic Blood Pressure in Males

Province	1990	2000	2010	2016	1990-2000	2000-2010	2010-2016	1990-2016
Markazi	117·81(115·03-120·63)	120·25(118·37-122·15)	122·53(121·08-124)	123·91(122·04-125·8)	0·02(-0·02-0·06)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·05(0·01-0·09)
Gilan	118·88(116·16-121·63)	121·67(119·72-123·65)	124·31(122·77-125·9)	126·05(124·14-127·93)	0·02(-0·02-0·06)	0·02(-0·01-0·05)	0·01(-0·01-0·04)	0·06(0·02-0·1)
Mazandaran	119·61(116·41-122·87)	122·05(119·95-124·16)	124·23(122·7-125·78)	125·31(123·39-127·27)	0·02(-0·02-0·07)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·05(0-0·09)
Azerbaijan, East	120·96(118·5-123·5)	123·3(121·55-125·11)	125·51(124·09-126·91)	127·03(125·41-128·65)	0·02(-0·02-0·06)	0·02(-0·01-0·04)	0·01(-0·01-0·04)	0·05(0·02-0·09)
Azerbaijan, West	120·51(116·95-124·34)	122·61(120·43-124·98)	124·31(122·75-125·9)	125·17(123·17-127·24)	0·02(-0·03-0·07)	0·01(-0·02-0·05)	0·01(-0·02-0·04)	0·04(-0·01-0·09)
Kermanshah	120·25(117·73-122·78)	122·64(120·83-124·43)	124·89(123·38-126·37)	126·3(124·51-128·12)	0·02(-0·02-0·06)	0·02(-0·01-0·05)	0·01(-0·01-0·04)	0·05(0·01-0·09)
Khuzestan	120·26(117·31-123·3)	122·99(120·94-125·07)	125·55(123·93-127·21)	127·12(125·13-129·21)	0·02(-0·02-0·07)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·06(0·01-0·1)
Fars	118·94(116·34-121·7)	121·3(119·6-123·05)	123·39(122·05-124·75)	124·37(122·7-126·06)	0·02(-0·02-0·06)	0·02(-0·01-0·04)	0·01(-0·02-0·03)	0·05(0·01-0·08)
Kerman	119·94(116·49-123·49)	122·06(119·89-124·29)	123·05(121·52-124·58)	123·32(121·39-125·26)	0·02(-0·03-0·07)	0·01(-0·02-0·04)	0(-0·03-0·03)	0·03(-0·02-0·08)
Khorasan, Razavi	119·83(117·44-122·29)	122·2(120·5-123·93)	124·6(123·18-126·06)	125·74(124·08-127·45)	0·02(-0·01-0·06)	0·02(-0·01-0·05)	0·01(-0·02-0·03)	0·05(0·01-0·09)
Isfahan	116·45(112·42-120·47)	119·3(117·09-121·54)	122·29(120·8-123·78)	123·68(121·41-125·98)	0·02(-0·03-0·08)	0·03(-0·01-0·06)	0·01(-0·02-0·04)	0·06(0·01-0·12)
Sistan and Baluchistan	117·04(113·54-120·7)	118·55(116·36-120·8)	119·91(118·38-121·49)	121·07(119-123·16)	0·01(-0·04-0·06)	0·01(-0·02-0·04)	0·01(-0·02-0·04)	0·03(-0·01-0·08)
Kordestan	118·6(115·72-121·5)	121·39(119·42-123·43)	124·54(122·9-126·17)	126·73(124·68-128·81)	0·02(-0·02-0·07)	0·03(0-0·06)	0·02(-0·01-0·05)	0·07(0·03-0·11)

Hamadan	118·01(114·97-121·16)	120·77(118·73-122·86)	123·08(121·46-124·71)	124·12(122·12-126·17)	0·02(-0·02-0·07)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·05(0·01-0·1)
Chahar Mahaal and Bakhtiari	122·4(118·61-126·31)	124·8(122·48-127·3)	126·45(124·71-128·23)	126·69(124·42-129·04)	0·02(-0·03-0·07)	0·01(-0·02-0·05)	0(-0·03-0·03)	0·04(-0·01-0·09)
Lorestan	119·55(116·83-122·37)	122·01(120·11-123·96)	124·16(122·57-125·79)	125·46(123·54-127·44)	0·02(-0·02-0·06)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·05(0·01-0·09)
Ilam	118·23(114·89-121·77)	120·54(118·36-122·75)	123·02(121·39-124·68)	124·83(122·69-127·11)	0·02(-0·03-0·07)	0·02(-0·01-0·05)	0·01(-0·02-0·05)	0·06(0·01-0·11)
Kohgiluyeh and Boyer-Ahmad	118·31(115·29-121·5)	121·24(119·2-123·38)	123·8(122·15-125·48)	125·03(122·96-127·15)	0·02(-0·02-0·07)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·06(0·01-0·1)
Bushehr	123·17(118·89-127·55)	125·52(122·98-128·06)	127·73(125·94-129·52)	128·04(125·46-130·74)	0·02(-0·04-0·08)	0·02(-0·02-0·05)	0(-0·03-0·04)	0·04(-0·02-0·1)
Zanjan	121·85(117·97-125·99)	124·69(122·19-127·27)	126·42(124·72-128·16)	126·41(124·12-128·69)	0·02(-0·03-0·08)	0·01(-0·02-0·05)	0(-0·03-0·03)	0·04(-0·01-0·09)
Semnan	119·25(116·49-121·91)	121·84(119·87-123·75)	124·34(122·71-125·96)	125·49(123·51-127·41)	0·02(-0·02-0·06)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·05(0·01-0·09)
Yazd	115·97(111·41-120·69)	118·72(116·09-121·46)	121·99(120·33-123·68)	124·21(121·75-126·73)	0·02(-0·04-0·09)	0·03(-0·01-0·07)	0·02(-0·02-0·05)	0·07(0·01-0·14)
Hormozgān	119·32(114·65-124·46)	122·67(119·89-125·58)	126·39(124·57-128·29)	128·18(125·37-131·11)	0·03(-0·04-0·1)	0·03(-0·01-0·07)	0·01(-0·02-0·05)	0·07(0·01-0·14)
Tehran	118·97(115·9-122·19)	121·66(119·75-123·56)	124·4(123·03-125·79)	126·13(124·27-128·08)	0·02(-0·02-0·07)	0·02(0-0·05)	0·01(-0·01-0·04)	0·06(0·02-0·11)
Ardabil	120·65(116·21-125·22)	123·9(121·27-126·58)	126·95(125·14-128·81)	128·59(125·95-131·33)	0·03(-0·03-0·09)	0·02(-0·01-0·06)	0·01(-0·02-0·05)	0·07(0·01-0·13)
Qom	119·16(114·97-123·56)	121·95(119·39-124·55)	124·79(122·89-126·74)	126·49(123·62-129·45)	0·02(-0·03-0·08)	0·02(-0·01-0·06)	0·01(-0·02-0·05)	0·06(0-0·13)
Qazvin	117·87(114·74-121·05)	120·32(118·26-122·42)	122·32(120·68-123·95)	123·49(121·37-125·63)	0·02(-0·02-0·07)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·05(0-0·09)
Golestan	118·36(115·88-120·78)	120·54(118·94-122·12)	122·76(121·45-124·1)	124·94(123·24-126·66)	0·02(-0·02-0·05)	0·02(-0·01-0·04)	0·02(-0·01-0·04)	0·06(0·02-0·09)
Khorasan, North	120·67(116·94-124·54)	123·74(121·26-126·29)	126·18(124·35-128·06)	127·43(125·12-129·83)	0·03(-0·03-0·08)	0·02(-0·02-0·06)	0·01(-0·02-0·04)	0·06(0-0·11)
Khorasan, South	116·89(112·91-120·93)	120·18(117·69-122·62)	122·32(120·57-124·07)	123·32(120·96-125·8)	0·03(-0·03-0·09)	0·02(-0·02-0·05)	0·01(-0·03-0·04)	0·06(0-0·11)
Alborz	126·04(124·07-127·96)	128·1(126·08-130·01)	129·77(127·78-131·73)	128·66(126·71-130·59)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	-0·01(-0·04-0·02)	0·02(-0·01-0·05)
Iran	119·34(116·25-122·53)	121·94(119·93-123·98)	124·35(122·82-125·9)	125·63(123·65-127·66)	0·02(-0·02-0·07)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·05(0·01-0·1)

Panel C) Diastolic Blood pressure in Females

Province	1990	2000	2010	2016	1990-2000	2000-2010	2010-2016	1990-2016
Markazi	73·57(71·21-76)	75·64(74·05-77·24)	78·02(76·76-79·31)	79·03(77·43-80·66)	0·03(-0·03-0·08)	0·03(-0·01-0·07)	0·01(-0·02-0·05)	0·07(0·02-0·13)
Gilan	74·25(71·57-77·09)	77·13(75·45-78·89)	80·91(79·53-82·33)	82·92(80·94-85)	0·04(-0·02-0·1)	0·05(0·01-0·09)	0·02(-0·02-0·07)	0·12(0·05-0·19)
Mazandaran	73·96(71·81-76·19)	76·45(75-77·98)	79·42(78·19-80·69)	80·75(79·15-82·39)	0·03(-0·02-0·09)	0·04(0-0·08)	0·02(-0·02-0·05)	0·09(0·04-0·15)
Azerbaijan, East	76·62(74·71-78·54)	78·39(77·06-79·71)	80·55(79·39-81·7)	81·31(79·88-82·75)	0·02(-0·02-0·07)	0·03(0-0·06)	0·01(-0·02-0·04)	0·06(0·02-0·11)

Azerbaijan, West	76·18(73·89-78·52)	77·85(76·34-79·38)	79·95(78·71-81·24)	80·82(79·14-82·55)	0·02(-0·03-0·07)	0·03(-0·01-0·06)	0·01(-0·03-0·05)	0·06(0·01-0·12)
Kermanshah	76·09(74·11-78·12)	77·85(76·44-79·3)	80·01(78·84-81·21)	80·87(79·47-82·31)	0·02(-0·02-0·07)	0·03(-0·01-0·06)	0·01(-0·02-0·04)	0·06(0·02-0·11)
Khuzestan	73·99(72·11-75·94)	76·31(74·98-77·66)	79·21(78·05-80·37)	80·7(79·27-82·15)	0·03(-0·01-0·08)	0·04(0-0·07)	0·02(-0·01-0·05)	0·09(0·04-0·14)
Fars	73·89(71·77-76·04)	75·72(74·41-77·03)	77·86(76·76-78·95)	78·81(77·24-80·36)	0·02(-0·02-0·07)	0·03(0-0·06)	0·01(-0·02-0·05)	0·07(0·02-0·12)
Kerman	73·63(71·35-76·01)	76·1(74·64-77·64)	78·82(77·6-80·03)	79·88(78·18-81·52)	0·03(-0·02-0·09)	0·04(0-0·07)	0·01(-0·02-0·05)	0·08(0·03-0·14)
Khorasan, Razavi	73·9(71·85-76·01)	75·94(74·62-77·3)	78·72(77·65-79·79)	80·02(78·58-81·48)	0·03(-0·02-0·08)	0·04(0-0·07)	0·02(-0·02-0·05)	0·08(0·03-0·13)
Isfahan	73·9(71·63-76·18)	75·93(74·66-77·24)	77·99(76·88-79·12)	78·78(77·15-80·46)	0·03(-0·02-0·08)	0·03(0-0·06)	0·01(-0·02-0·05)	0·07(0·01-0·12)
Sistan and Baluchistan	74·1(71·92-76·27)	75·56(74·1-76·98)	77·24(76·05-78·48)	78·12(76·57-79·7)	0·02(-0·03-0·07)	0·02(-0·01-0·06)	0·01(-0·02-0·05)	0·05(0-0·11)
Kordestan	74·65(72·08-77·25)	76·76(75·13-78·43)	79·83(78·55-81·14)	81·2(79·44-83)	0·03(-0·03-0·09)	0·04(0-0·08)	0·02(-0·02-0·06)	0·09(0·03-0·15)
Hamadan	73·73(70·36-77·27)	76·8(74·82-78·79)	80·91(79·5-82·38)	82·86(80·59-85·25)	0·04(-0·03-0·12)	0·05(0·01-0·1)	0·02(-0·02-0·07)	0·12(0·04-0·21)
Chahar Mahaal and Bakhtiari	73·99(71·44-76·61)	76·22(74·55-77·93)	78·85(77·44-80·28)	80·17(78·27-82·09)	0·03(-0·03-0·09)	0·03(-0·01-0·08)	0·02(-0·03-0·06)	0·08(0·02-0·15)
Lorestan	75·29(72·09-78·6)	77·75(75·82-79·7)	80·79(79·36-82·24)	82·45(80·28-84·65)	0·03(-0·04-0·11)	0·04(0-0·08)	0·02(-0·02-0·07)	0·1(0·02-0·17)
Ilam	73·11(70·39-75·93)	75·29(73·6-77·04)	78·27(76·97-79·61)	79·97(78·19-81·83)	0·03(-0·03-0·09)	0·04(0-0·08)	0·02(-0·02-0·06)	0·09(0·03-0·16)
Kohgiluyeh and Boyer-Ahmad	75·96(72·85-79·34)	78·09(76·23-80·06)	80·38(78·9-81·88)	81·52(79·36-83·7)	0·03(-0·04-0·1)	0·03(-0·01-0·07)	0·01(-0·03-0·06)	0·07(0-0·15)
Bushehr	75·14(72·24-78·1)	76·48(74·81-78·15)	77·89(76·6-79·18)	78·31(76·45-80·18)	0·02(-0·04-0·08)	0·02(-0·02-0·06)	0·01(-0·03-0·05)	0·04(-0·02-0·11)
Zanjan	73·6(71·32-76·01)	75·78(74·26-77·42)	78·64(77·3-80·02)	80·08(78·34-81·89)	0·03(-0·02-0·09)	0·04(0-0·08)	0·02(-0·02-0·06)	0·09(0·03-0·15)
Semnan	73·43(70·94-76·02)	76·15(74·52-77·83)	79·85(78·46-81·25)	81·6(79·78-83·48)	0·04(-0·02-0·1)	0·05(0·01-0·09)	0·02(-0·02-0·06)	0·11(0·05-0·18)
Yazd	71·71(67·2-76·45)	73·51(71·14-75·95)	75·92(74·61-77·28)	76·76(74·41-79·14)	0·03(-0·07-0·13)	0·03(-0·02-0·09)	0·01(-0·04-0·06)	0·07(-0·03-0·18)
Hormozgān	72·64(70·37-74·97)	74·73(73·2-76·26)	78·46(77·15-79·8)	80·52(78·82-82·23)	0·03(-0·02-0·08)	0·05(0·01-0·09)	0·03(-0·01-0·07)	0·11(0·05-0·17)
Tehran	74·68(72·69-76·74)	76·36(75·16-77·59)	79·04(77·96-80·17)	80·45(78·92-82·09)	0·02(-0·02-0·07)	0·04(0-0·07)	0·02(-0·02-0·05)	0·08(0·03-0·13)
Ardabil	73·34(71·18-75·51)	75·29(73·86-76·75)	78·19(76·95-79·44)	79·69(78·06-81·3)	0·03(-0·02-0·08)	0·04(0-0·08)	0·02(-0·02-0·06)	0·09(0·03-0·14)
Qom	73·43(71·07-75·86)	76·28(74·74-77·85)	79·58(78·29-80·95)	81·15(79·41-83·01)	0·04(-0·01-0·1)	0·04(0·01-0·08)	0·02(-0·02-0·06)	0·11(0·05-0·17)
Qazvin	73·6(71·34-76)	76·42(74·86-78·04)	79·34(78·01-80·66)	80·66(78·94-82·44)	0·04(-0·01-0·09)	0·04(0-0·08)	0·02(-0·02-0·06)	0·1(0·04-0·16)
Golestan	72·69(70·29-75·19)	74·75(73·38-76·18)	77·59(76·54-78·67)	79·09(77·36-80·88)	0·03(-0·02-0·08)	0·04(0-0·07)	0·02(-0·02-0·06)	0·09(0·03-0·15)
Khorasan, North	75·34(70·4-80·75)	78·08(75·23-81·02)	81·19(79·37-83·01)	82·13(79·13-85·3)	0·04(-0·07-0·15)	0·04(-0·02-0·1)	0·01(-0·05-0·07)	0·09(-0·02-0·21)
Khorasan, South	72·56(69·29-76·05)	75·24(73·16-77·36)	78·25(76·76-79·8)	79·66(77·43-81·96)	0·04(-0·04-0·12)	0·04(-0·01-0·09)	0·02(-0·03-0·07)	0·1(0·02-0·18)
Alborz	77·76(76·03-79·54)	80·19(78·4-81·98)	82·7(80·87-84·56)	83·34(81·51-85·21)	0·03(-0·01-0·08)	0·03(-0·01-0·08)	0·01(-0·04-0·05)	0·07(0·02-0·12)

Iran	74·41(72·1-76·8)	76·51(75·05-78)	79·18(77·97-80·43)	80·42(78·75-82·13)	0·03(-0·02-0·08)	0·03(0-0·07)	0·02(-0·02-0·05)	0·08(0·03-0·14)

Panel D) Diastolic Blood Pressure in Males

province	1990	2000	2010	2016	1990-2000	2000-2010	2010-2016	1990-2016
Markazi	75·33(73·46-77·2)	77·05(75·66-78·44)	78·62(77·38-79·86)	79·61(78·16-81·06)	0·02(-0·02-0·07)	0·02(-0·01-0·06)	0·01(-0·02-0·05)	0·06(0·01-0·1)
Gilan	75·52(72·98-78·07)	77·5(75·89-79·12)	79·7(78·43-81·02)	81·09(79·34-82·89)	0·03(-0·03-0·08)	0·03(-0·01-0·07)	0·02(-0·02-0·06)	0·07(0·02-0·14)
Mazandaran	75·25(73·33-77·3)	76·83(75·49-78·26)	78·19(77·06-79·38)	79·03(77·63-80·49)	0·02(-0·02-0·07)	0·02(-0·02-0·05)	0·01(-0·02-0·04)	0·05(0-0·1)
Azerbaijan, East	76·9(75·09-78·75)	78·11(76·82-79·42)	79·29(78·2-80·37)	79·92(78·64-81·24)	0·02(-0·02-0·06)	0·02(-0·02-0·05)	0·01(-0·02-0·04)	0·04(0-0·08)
Azerbaijan, West	76·92(74·88-78·97)	77·97(76·59-79·38)	78·94(77·8-80·09)	79·24(77·85-80·65)	0·01(-0·03-0·06)	0·01(-0·02-0·05)	0(-0·03-0·04)	0·03(-0·01-0·08)
Kermanshah	76·66(74·85-78·52)	78·17(76·82-79·53)	79·8(78·57-81·05)	80·92(79·48-82·4)	0·02(-0·02-0·06)	0·02(-0·01-0·06)	0·01(-0·02-0·05)	0·06(0·01-0·1)
Khuzestan	75·57(74·01-77·18)	77·33(76·12-78·53)	79·18(78·13-80·23)	80·39(79·18-81·63)	0·02(-0·01-0·06)	0·02(-0·01-0·05)	0·02(-0·01-0·04)	0·06(0·03-0·1)
Fars	75(72·97-77·14)	76·4(75·15-77·68)	77·73(76·68-78·82)	78·45(76·99-79·98)	0·02(-0·03-0·06)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·05(0-0·1)
Kerman	74·67(72·74-76·61)	76·35(74·99-77·74)	77·81(76·64-79·02)	78·58(77·14-80·06)	0·02(-0·02-0·07)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·05(0·01-0·1)
Khorasan, Razavi	76·22(74·59-77·91)	77·82(76·65-79·02)	79·56(78·48-80·68)	80·59(79·27-81·94)	0·02(-0·02-0·06)	0·02(-0·01-0·05)	0·01(-0·02-0·04)	0·06(0·02-0·1)
Isfahan	74·59(72·49-76·8)	76·14(74·95-77·38)	77·51(76·44-78·58)	78·15(76·59-79·72)	0·02(-0·02-0·07)	0·02(-0·01-0·05)	0·01(-0·03-0·04)	0·05(0-0·1)
Sistan and Baluchistan	75·38(73·16-77·71)	76·66(75·18-78·15)	77·68(76·42-78·9)	78·25(76·64-79·86)	0·02(-0·03-0·07)	0·01(-0·02-0·05)	0·01(-0·03-0·05)	0·04(-0·01-0·09)
Kordestan	75·7(73·46-78·05)	77·49(75·97-79·09)	79·66(78·34-80·99)	81(79·29-82·77)	0·02(-0·03-0·08)	0·03(-0·01-0·07)	0·02(-0·02-0·06)	0·07(0·02-0·13)
Hamadan	74·59(71·88-77·41)	76·63(74·89-78·41)	78·77(77·41-80·11)	79·97(78·08-81·91)	0·03(-0·03-0·09)	0·03(-0·01-0·07)	0·02(-0·03-0·06)	0·07(0·01-0·14)
Chahar Mahaal and Bakhtiari	76·3(73·99-78·72)	78·09(76·44-79·81)	79·26(77·79-80·75)	79·97(78·16-81·82)	0·02(-0·03-0·08)	0·01(-0·03-0·06)	0·01(-0·03-0·05)	0·05(-0·01-0·11)
Lorestan	76·48(74·27-78·78)	78·15(76·6-79·73)	79·63(78·2-81·05)	80·49(78·74-82·25)	0·02(-0·03-0·07)	0·02(-0·02-0·06)	0·01(-0·03-0·05)	0·05(0-0·11)
Ilam	74·3(71·93-76·87)	76·2(74·59-77·9)	77·89(76·51-79·23)	78·84(77·08-80·53)	0·03(-0·03-0·08)	0·02(-0·02-0·06)	0·01(-0·03-0·05)	0·06(0-0·12)
Kohgiluyeh and Boyer-Ahmad	76·22(73·42-79·16)	78·31(76·56-80·14)	80·13(78·65-81·64)	81·22(79·18-83·25)	0·03(-0·03-0·09)	0·02(-0·02-0·07)	0·01(-0·03-0·06)	0·07(0-0·13)
Bushehr	75·27(72·21-78·37)	76·29(74·58-78·1)	77·16(75·91-78·46)	77·94(76·09-79·9)	0·01(-0·05-0·08)	0·01(-0·03-0·05)	0·01(-0·03-0·05)	0·04(-0·03-0·11)
Zanjan	74·77(72·8-76·75)	76·08(74·71-77·43)	77·39(76·21-78·57)	78·23(76·81-79·64)	0·02(-0·03-0·06)	0·02(-0·02-0·05)	0·01(-0·02-0·04)	0·05(0-0·09)
Semnan	75·56(73·41-77·77)	77·7(76·19-79·25)	79·98(78·67-81·3)	81·08(79·47-82·75)	0·03(-0·02-0·08)	0·03(-0·01-0·07)	0·01(-0·02-0·05)	0·07(0·02-0·13)
Yazd	73·5(68·97-78·36)	74·45(72·07-76·88)	75·2(73·9-76·49)	75·55(73·37-77·87)	0·01(-0·08-0·11)	0·01(-0·04-0·06)	0(-0·04-0·05)	0·03(-0·06-0·13)

Hormozgān	73·64(71·37-76·07)	75·61(74·06-77·17)	78·53(77·25-79·82)	80·28(78·59-82)	0·03(-0·03-0·08)	0·04(0-0·08)	0·02(-0·02-0·06)	0·09(0·03-0·15)
Tehran	76·75(74·88-78·63)	78·42(77·21-79·62)	80·36(79·26-81·47)	81·52(80·06-83·01)	0·02(-0·02-0·06)	0·02(0-0·06)	0·01(-0·02-0·05)	0·06(0·02-0·11)
Ardabil	75·19(73·33-77·07)	76·47(75·14-77·81)	78·08(76·9-79·29)	79·46(78·03-80·93)	0·02(-0·03-0·06)	0·02(-0·01-0·06)	0·02(-0·02-0·05)	0·06(0·01-0·1)
Qom	76·97(75·04-79·02)	78·76(77·3-80·26)	80·88(79·55-82·24)	82·17(80·53-83·79)	0·02(-0·02-0·07)	0·03(-0·01-0·06)	0·02(-0·02-0·05)	0·07(0·02-0·12)
Qazvin	75·56(73·84-77·4)	77·49(76·1-78·89)	78·93(77·64-80·21)	79·71(78·26-81·15)	0·03(-0·02-0·07)	0·02(-0·02-0·05)	0·01(-0·02-0·05)	0·05(0·01-0·1)
Golestan	73·5(71·52-75·45)	75·12(73·92-76·31)	76·86(75·86-77·84)	78·04(76·6-79·44)	0·02(-0·02-0·07)	0·02(-0·01-0·05)	0·02(-0·02-0·05)	0·06(0·02-0·11)
Khorasan, North	75·81(71·6-80·43)	78·21(75·74-80·89)	80·69(79-82·39)	81·86(79·27-84·57)	0·03(-0·06-0·13)	0·03(-0·02-0·09)	0·01(-0·04-0·07)	0·08(-0·01-0·18)
Khorasan, South	73·78(71·2-76·53)	76·8(74·97-78·65)	79·27(77·79-80·76)	80·45(78·55-82·4)	0·04(-0·02-0·1)	0·03(-0·01-0·08)	0·01(-0·03-0·06)	0·09(0·03-0·16)
Alborz	78·98(77·21-80·79)	80·82(79·06-82·68)	82·73(80·92-84·6)	83·66(81·83-85·56)	0·02(-0·02-0·07)	0·02(-0·02-0·07)	0·01(-0·03-0·06)	0·06(0·01-0·11)
Iran	75·79(73·75-77·91)	77·44(76·06-78·83)	79·1(77·91-80·31)	80·05(78·52-81·61)	0·02(-0·02-0·07)	0·02(-0·01-0·06)	0·01(-0·02-0·05)	0·06(0·01-0·11)

Panel E) Prevalence of raised blood pressure in females

province	1990	2000	2010	2016	1990-2000	2000-2010	2010-2016	1990-2016
Markazi	0·09(0·08-0·1)	0·14(0·13-0·15)	0·23(0·22-0·24)	0·29(0·28-0·3)	0·64(0·38-0·96)	0·61(0·46-0·78)	0·25(0·16-0·35)	2·31(1·85-2·87)
Gilan	0·1(0·09-0·11)	0·17(0·16-0·18)	0·27(0·26-0·28)	0·34(0·33-0·36)	0·72(0·44-1·04)	0·65(0·49-0·82)	0·27(0·17-0·37)	2·58(2·07-3·18)
Mazandaran	0·11(0·1-0·12)	0·17(0·16-0·18)	0·27(0·26-0·28)	0·32(0·31-0·34)	0·64(0·38-0·94)	0·55(0·41-0·71)	0·2(0·11-0·3)	2·05(1·63-2·55)
Azerbaijan, East	0·11(0·1-0·12)	0·18(0·17-0·19)	0·27(0·27-0·28)	0·33(0·32-0·34)	0·63(0·41-0·9)	0·53(0·41-0·66)	0·2(0·12-0·28)	2·01(1·63-2·45)
Azerbaijan, West	0·1(0·09-0·11)	0·17(0·16-0·18)	0·27(0·26-0·28)	0·33(0·31-0·34)	0·67(0·42-0·96)	0·56(0·43-0·71)	0·23(0·14-0·31)	2·2(1·78-2·69)
Kermanshah	0·1(0·09-0·12)	0·17(0·16-0·18)	0·26(0·25-0·27)	0·32(0·31-0·34)	0·63(0·39-0·91)	0·55(0·42-0·69)	0·24(0·15-0·33)	2·12(1·71-2·59)
Khuzestan	0·11(0·1-0·12)	0·17(0·16-0·18)	0·26(0·25-0·27)	0·33(0·31-0·34)	0·58(0·37-0·82)	0·53(0·41-0·65)	0·24(0·16-0·32)	1·99(1·63-2·4)
Fars	0·1(0·09-0·11)	0·15(0·15-0·16)	0·23(0·22-0·23)	0·27(0·26-0·28)	0·54(0·31-0·8)	0·48(0·36-0·62)	0·18(0·1-0·27)	1·69(1·33-2·12)
Kerman	0·1(0·09-0·11)	0·16(0·15-0·17)	0·23(0·23-0·24)	0·28(0·26-0·29)	0·57(0·34-0·85)	0·46(0·34-0·59)	0·18(0·1-0·27)	1·71(1·35-2·14)
Khorasan, Razavi	0·09(0·08-0·1)	0·15(0·14-0·16)	0·24(0·23-0·25)	0·29(0·28-0·3)	0·63(0·39-0·91)	0·56(0·44-0·7)	0·23(0·15-0·32)	2·14(1·73-2·62)
Isfahan	0·1(0·09-0·11)	0·15(0·14-0·16)	0·23(0·22-0·23)	0·27(0·26-0·29)	0·56(0·32-0·86)	0·51(0·38-0·66)	0·22(0·13-0·31)	1·88(1·48-2·35)
Sistan and Baluchistan	0·07(0·07-0·08)	0·12(0·11-0·13)	0·19(0·18-0·2)	0·25(0·24-0·26)	0·61(0·3-0·99)	0·58(0·39-0·8)	0·31(0·19-0·45)	2·33(1·79-3)
Kordestan	0·09(0·08-0·1)	0·15(0·15-0·16)	0·26(0·25-0·26)	0·33(0·32-0·34)	0·72(0·45-1·04)	0·65(0·51-0·82)	0·28(0·19-0·38)	2·64(2·13-3·24)

Hamadan	0·1(0·09-0·11)	0·17(0·16-0·18)	0·27(0·27-0·28)	0·33(0·32-0·35)	0·66(0·41-0·95)	0·6(0·47-0·74)	0·22(0·14-0·31)	2·25(1·8-2·77)
Chahar Mahaal and Bakhtiari	0·11(0·1-0·13)	0·19(0·18-0·2)	0·28(0·27-0·29)	0·34(0·33-0·35)	0·62(0·38-0·9)	0·53(0·4-0·66)	0·21(0·13-0·29)	1·98(1·59-2·45)
Lorestan	0·1(0·09-0·11)	0·17(0·16-0·18)	0·27(0·26-0·27)	0·34(0·33-0·35)	0·63(0·39-0·93)	0·58(0·45-0·72)	0·27(0·19-0·36)	2·28(1·84-2·81)
Ilam	0·07(0·06-0·08)	0·13(0·12-0·13)	0·22(0·21-0·23)	0·3(0·28-0·31)	0·72(0·42-1·09)	0·73(0·56-0·93)	0·36(0·25-0·48)	3·06(2·42-3·83)
Kohgiluyeh and Boyer-Ahmad	0·11(0·09-0·12)	0·17(0·16-0·19)	0·27(0·26-0·28)	0·33(0·31-0·34)	0·64(0·38-0·96)	0·54(0·41-0·69)	0·22(0·13-0·31)	2·09(1·64-2·62)
Bushehr	0·11(0·1-0·12)	0·17(0·16-0·19)	0·26(0·25-0·27)	0·31(0·29-0·32)	0·58(0·33-0·89)	0·5(0·36-0·64)	0·17(0·09-0·26)	1·77(1·37-2·25)
Zanjan	0·1(0·09-0·11)	0·17(0·16-0·18)	0·26(0·26-0·27)	0·32(0·3-0·33)	0·66(0·4-0·98)	0·58(0·45-0·73)	0·2(0·12-0·28)	2·15(1·72-2·67)
Semnan	0·1(0·09-0·11)	0·16(0·15-0·17)	0·25(0·24-0·26)	0·31(0·3-0·32)	0·62(0·39-0·9)	0·55(0·43-0·69)	0·22(0·14-0·31)	2·08(1·68-2·56)
Yazd	0·07(0·06-0·09)	0·12(0·11-0·13)	0·2(0·19-0·21)	0·25(0·23-0·26)	0·65(0·31-1·07)	0·61(0·44-0·82)	0·24(0·13-0·36)	2·3(1·7-3·05)
Hormozgān	0·1(0·09-0·11)	0·16(0·15-0·17)	0·25(0·24-0·26)	0·3(0·29-0·32)	0·6(0·34-0·92)	0·55(0·41-0·7)	0·21(0·11-0·32)	1·99(1·53-2·54)
Tehran	0·11(0·1-0·13)	0·16(0·15-0·17)	0·22(0·21-0·23)	0·26(0·25-0·28)	0·42(0·2-0·69)	0·38(0·25-0·53)	0·19(0·09-0·3)	1·33(0·99-1·73)
Ardabil	0·11(0·1-0·12)	0·18(0·17-0·19)	0·28(0·27-0·29)	0·35(0·33-0·36)	0·65(0·41-0·93)	0·59(0·46-0·73)	0·22(0·15-0·31)	2·21(1·79-2·7)
Qom	0·11(0·09-0·12)	0·16(0·15-0·17)	0·25(0·24-0·26)	0·3(0·29-0·31)	0·54(0·3-0·81)	0·52(0·38-0·68)	0·22(0·12-0·32)	1·84(1·44-2·31)
Qazvin	0·09(0·08-0·1)	0·15(0·14-0·16)	0·24(0·23-0·25)	0·29(0·28-0·3)	0·63(0·39-0·94)	0·56(0·43-0·71)	0·23(0·14-0·32)	2·13(1·7-2·65)
Golestan	0·1(0·09-0·11)	0·16(0·15-0·17)	0·25(0·24-0·25)	0·3(0·29-0·32)	0·6(0·36-0·88)	0·54(0·42-0·68)	0·24(0·16-0·33)	2·06(1·65-2·55)
Khorasan, North	0·12(0·1-0·13)	0·19(0·18-0·2)	0·29(0·28-0·3)	0·35(0·34-0·37)	0·62(0·34-0·96)	0·52(0·38-0·69)	0·22(0·12-0·32)	2(1·52-2·58)
Khorasan, South	0·08(0·07-0·09)	0·13(0·12-0·14)	0·22(0·21-0·23)	0·28(0·27-0·3)	0·71(0·38-1·12)	0·61(0·43-0·81)	0·31(0·19-0·44)	2·59(1·98-3·35)
Alborz	0·17(0·15-0·18)	0·24(0·23-0·26)	0·32(0·31-0·33)	0·34(0·33-0·35)	0·45(0·26-0·66)	0·32(0·21-0·44)	0·06(-0·02-0·14)	1·02(0·79-1·3)
Iran	0·1(0·09-0·11)	0·16(0·15-0·17)	0·25(0·24-0·26)	0·3(0·29-0·31)	0·59(0·35-0·87)	0·51(0·38-0·66)	0·21(0·12-0·31)	1·91(1·51-2·38)

Panel F) Prevalence of raised blood pressure in males

Province	1990	2000	2010	2016	1990-2000	2000-2010	2010-2016	1990-2016
Markazi	0·08(0·07-0·09)	0·13(0·12-0·14)	0·19(0·19-0·2)	0·24(0·23-0·25)	0·59(0·34-0·88)	0·51(0·36-0·67)	0·25(0·15-0·37)	2·01(1·58-2·51)
Gilan	0·08(0·07-0·09)	0·13(0·12-0·14)	0·21(0·2-0·21)	0·26(0·25-0·28)	0·65(0·38-0·97)	0·56(0·4-0·74)	0·27(0·17-0·39)	2·29(1·8-2·86)
Mazandaran	0·09(0·08-0·1)	0·14(0·13-0·15)	0·2(0·19-0·21)	0·25(0·23-0·26)	0·56(0·31-0·86)	0·46(0·31-0·63)	0·21(0·1-0·33)	1·76(1·35-2·25)
Azerbaijan, East	0·09(0·08-0·1)	0·15(0·14-0·16)	0·22(0·21-0·23)	0·27(0·26-0·28)	0·59(0·36-0·87)	0·49(0·36-0·63)	0·24(0·15-0·33)	1·93(1·55-2·38)
Azerbaijan, West	0·09(0·08-0·1)	0·14(0·14-0·15)	0·21(0·21-0·22)	0·26(0·25-0·27)	0·6(0·35-0·89)	0·48(0·34-0·63)	0·2(0·11-0·3)	1·84(1·45-2·3)
Kermanshah	0·09(0·08-0·1)	0·14(0·13-0·15)	0·21(0·2-0·22)	0·26(0·25-0·27)	0·58(0·34-0·86)	0·49(0·35-0·65)	0·25(0·15-0·35)	1·93(1·53-2·4)
Khuzestan	0·1(0·09-0·11)	0·15(0·14-0·16)	0·22(0·21-0·23)	0·27(0·26-0·28)	0·55(0·33-0·8)	0·46(0·34-0·6)	0·23(0·15-0·33)	1·79(1·44-2·2)
Fars	0·08(0·07-0·09)	0·13(0·12-0·13)	0·19(0·18-0·19)	0·23(0·22-0·24)	0·53(0·3-0·81)	0·47(0·34-0·62)	0·22(0·13-0·32)	1·76(1·38-2·21)
Kerman	0·09(0·08-0·1)	0·13(0·13-0·14)	0·19(0·18-0·19)	0·22(0·21-0·23)	0·54(0·31-0·81)	0·4(0·28-0·54)	0·18(0·09-0·28)	1·55(1·2-1·97)
Khorasan, Razavi	0·09(0·08-0·1)	0·14(0·13-0·15)	0·21(0·2-0·22)	0·26(0·25-0·27)	0·61(0·38-0·88)	0·52(0·39-0·67)	0·24(0·15-0·33)	2·03(1·64-2·49)
Isfahan	0·08(0·07-0·09)	0·13(0·12-0·13)	0·19(0·18-0·2)	0·23(0·22-0·24)	0·55(0·31-0·84)	0·5(0·36-0·66)	0·24(0·14-0·35)	1·89(1·47-2·38)
Sistan and Baluchistan	0·07(0·06-0·07)	0·1(0·1-0·11)	0·16(0·15-0·17)	0·2(0·19-0·21)	0·58(0·29-0·94)	0·54(0·35-0·75)	0·28(0·16-0·42)	2·11(1·6-2·73)
Kordestan	0·08(0·07-0·09)	0·13(0·12-0·14)	0·21(0·2-0·22)	0·27(0·26-0·28)	0·66(0·4-0·98)	0·58(0·43-0·75)	0·29(0·19-0·4)	2·39(1·91-2·96)
Hamadan	0·09(0·08-0·1)	0·14(0·13-0·15)	0·21(0·2-0·21)	0·25(0·24-0·26)	0·56(0·32-0·85)	0·46(0·34-0·6)	0·21(0·12-0·31)	1·76(1·37-2·23)
Chahar Mahaal and Bakhtiari	0·1(0·09-0·12)	0·16(0·15-0·17)	0·23(0·22-0·24)	0·28(0·26-0·29)	0·56(0·33-0·83)	0·43(0·31-0·57)	0·18(0·1-0·28)	1·64(1·28-2·06)
Lorestan	0·09(0·08-0·1)	0·14(0·14-0·15)	0·21(0·21-0·22)	0·26(0·25-0·27)	0·57(0·34-0·84)	0·47(0·35-0·61)	0·23(0·14-0·33)	1·84(1·46-2·29)
Ilam	0·07(0·06-0·08)	0·11(0·11-0·12)	0·18(0·17-0·19)	0·23(0·22-0·24)	0·61(0·34-0·94)	0·57(0·41-0·75)	0·3(0·19-0·42)	2·29(1·78-2·89)
Kohgiluyeh and Boyer-Ahmad	0·08(0·07-0·09)	0·14(0·13-0·15)	0·21(0·2-0·22)	0·26(0·25-0·27)	0·65(0·38-0·98)	0·54(0·39-0·71)	0·24(0·14-0·35)	2·15(1·67-2·72)
Bushehr	0·1(0·09-0·11)	0·15(0·14-0·16)	0·21(0·2-0·22)	0·25(0·24-0·26)	0·5(0·24-0·81)	0·43(0·29-0·59)	0·18(0·08-0·29)	1·52(1·13-2)
Zanjan	0·09(0·08-0·1)	0·14(0·14-0·15)	0·21(0·2-0·22)	0·25(0·24-0·26)	0·59(0·35-0·88)	0·47(0·34-0·61)	0·19(0·1-0·28)	1·78(1·39-2·23)
Semnan	0·09(0·08-0·1)	0·14(0·14-0·15)	0·22(0·21-0·23)	0·27(0·26-0·28)	0·6(0·36-0·88)	0·51(0·38-0·66)	0·22(0·13-0·32)	1·95(1·55-2·43)
Yazd	0·07(0·06-0·08)	0·1(0·1-0·11)	0·16(0·15-0·17)	0·2(0·19-0·22)	0·57(0·24-0·98)	0·54(0·36-0·74)	0·28(0·16-0·42)	2·08(1·5-2·8)
Hormozgān	0·09(0·08-0·1)	0·14(0·13-0·15)	0·21(0·2-0·22)	0·26(0·25-0·27)	0·62(0·34-0·94)	0·54(0·39-0·71)	0·22(0·11-0·34)	2·03(1·54-2·62)

Tehran	0·09(0·08-0·1)	0·14(0·13-0·15)	0·2(0·2-0·21)	0·25(0·24-0·27)	0·51(0·26-0·81)	0·48(0·32-0·65)	0·24(0·13-0·36)	1·76(1·35-2·26)
Ardabil	0·09(0·08-0·1)	0·15(0·14-0·16)	0·22(0·22-0·23)	0·28(0·27-0·29)	0·61(0·37-0·91)	0·5(0·37-0·64)	0·25(0·16-0·35)	2·02(1·61-2·51)
Qom	0·1(0·09-0·11)	0·15(0·14-0·16)	0·22(0·21-0·23)	0·28(0·26-0·29)	0·53(0·29-0·83)	0·49(0·34-0·66)	0·24(0·13-0·37)	1·84(1·41-2·35)
Qazvin	0·08(0·07-0·09)	0·13(0·12-0·14)	0·2(0·19-0·2)	0·24(0·23-0·25)	0·59(0·35-0·87)	0·49(0·35-0·64)	0·23(0·13-0·34)	1·91(1·51-2·39)
Golestan	0·08(0·07-0·09)	0·12(0·12-0·13)	0·19(0·18-0·19)	0·24(0·23-0·25)	0·58(0·34-0·86)	0·51(0·37-0·66)	0·28(0·18-0·39)	2·06(1·63-2·55)
Khorasan, North	0·1(0·09-0·11)	0·16(0·15-0·17)	0·24(0·23-0·25)	0·3(0·28-0·31)	0·62(0·32-0·98)	0·49(0·34-0·66)	0·22(0·11-0·33)	1·94(1·45-2·55)
Khorasan, South	0·07(0·06-0·08)	0·12(0·11-0·13)	0·19(0·18-0·19)	0·24(0·22-0·25)	0·71(0·4-1·11)	0·58(0·4-0·78)	0·27(0·15-0·41)	2·43(1·85-3·14)
Alborz	0·14(0·13-0·15)	0·21(0·2-0·22)	0·28(0·27-0·3)	0·31(0·3-0·32)	0·48(0·28-0·72)	0·37(0·24-0·51)	0·09(-0·01-0·19)	1·2(0·92-1·53)
Iran	0·09(0·08-0·1)	0·14(0·13-0·15)	0·21(0·2-0·21)	0·25(0·24-0·26)	0·57(0·33-0·87)	0·49(0·35-0·64)	0·23(0·13-0·34)	1·87(1·46-2·36)

Supplementary Table 3: Names of provinces and their abbreviations

Name of province	Abbreviation
Markazi	MK
Alborz	AL
Ardabil	AR
Bushehr	BS
Chahar Mahaal and Bakhtiari	CM
East-Azerbaijan	EA
Fars	FA
Gilan	GI
Golestan	GO
Hamadan	HD
Hormozgan	HG
Ilam	IL
Isfahan	IS
Kerman	KE
Kermanshah	KS
Khuzestan	KZ
Kohgiluyeh and Boyer-Ahmad	KB
Kurdistan	KD
Lorestan	LO
Mazandaran	MN
North-Khorasan	NK
Qazvin	QZ
Qom	QM
Razavi-Khorasan	RK
Semnan	SM
Sistan and Baluchistan	SB
South-Khorasan	SK
Tehran	TE
West-Azerbaijan	WA
Yazd	YA
Zanjan	ZA