Observatory on Health Geography Mexico State: Mortality 2010

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Abstract

The reason of this article is to analyze the distribution of mortality in the State of Mexico, México in 2010, a topicwithin theobservatoryhealth Geography. The results indicate that mortality rates are highest in rural areas mainly in post-productive population. The fivemost common causes arechronic degenerativetype, whichhavedistinctdistribution patternsin bothurban and ruralareas. It is concluded that health problems in terms of mortality rates occur in urban and rural areas, the group of post-productive population is the most vulnerable. It is recommendedthat strategies andpolicies areformulated with aholistic and integrated approachtolocaland globalscales. Servefor better decision-making and health policyestablishmentin Mexico.

Key words: Observatory Geography of health, human health, mortality.

1. Introduction

Inthe field ofhealth geographyone ofthe main issues isthe analysisof thedistribution of health, mortality, morbidity, infrastructure, vectors that causedifferent diseases andits relationshipwithlocal and global factorsof physicalgeography,environmental, socio-economic, cultural and politicalmainly.Today the Health Geography Is becoming increasingly important, especially in its applicationto detectgeographic areasrelated to healthproblems, bothpreventiveand prospective. TheWorld HealthOrganization(WHO) in 1946defined healthas a "stateof complete physical, mental and social wellbeing and not merelythe absence of disease." Butthe environmentalandgeographicalphysicalalso playan important rolebecauseit islocal and globalconditionslike pollution, deforestation,climatechange, relief and altitudeamong others thatinfluence health.TheWorld HealthOrganizationandthe Pan Americanhealth,promote programsthat affecthealth, healthy places, healthy cities, andlocal studies that allowthe determinationofspecific healthprofilesofpeopleinthe world. It is importantto note that differentbind optionswith whichyou canpromoteproductiveenvironment for university-industry highlight therole of universitiestoopenseveral optionsfor participation.Inthis casetheteacher researcherslinked tothe productive sector, public, private and social, inthe searchfor solutions to theproblems they face.(Rosales, E, 2012)derivedfrom the abovethe interestof researchers fromthe Autonomous UniversityofStateofMexico to developan ObservatoryGeography of Health, in response tothe need forgeographic information, illustrativeofthe incidenceof diseaseslocated and identifiedwithin the areaspecificallyin the Stateof Mexico.

Thepresent studyis an analysis ofthedistribution of mortalityin the State ofMexico, 2010. Its main focusis mortality, by age group, and the fivemost common causes. The scalesof analysis areat the municipal levelwithinthe health jurisdiction.The main objectiveof developingan observatoryHealthGeographyin the Stateof Mexico,is to overseeandmonitor the health ofits population, with the aim ofbetter decision-making in the health sectorfor prevention andhealthsurveythat contributesto achievinga better quality oflife. This observatory generates various productssuch as databases, cartography, digitalatlas, geostatisticalanalysis, viewsand queries, generatingpredictive models, reportsand health indicators, among other Fundamental decision sassertivelyinuseful fordifferentsectors anddifferentareas.

It is important to note that knowledge with the help of the new Geo technologies is essential for management strategies and policies with major impact on health and megastructures called local projects based on the epidemiological, geographical and physical environmental characteristics of the territory and the social, cultural and economic demographic of the population. The topics developed in this observatory are: overall mortality, infant mortality, the distribution patterns of more frequent causes of death, among others. This article presents an analysis of mortality in the State of Mexico in 2010.

2. Results

2.1.Mortality

In 2010, Mexicorecorded a total of592.018deaths, with acrude mortality rateof5.1 (per 1000 population). Of the sixmost common causesfive arechronic degenerativetype: diabetes mellitus(73.85 per 100,000), ischemic heartdisease(63.10), malignant tumors (62.52), cerebrovasculardisease(28.75), cirrhosis and otherchronic liverdiseases(28.88), which togetherindicate48.79% of all deaths(Table1). By 2010, the insured populationcovered to72,514,513people,64.55% saidthatof the total population, covered mainly by48.79% withIMSS, ISSSTE withother institutions9.91%andthe remaining percentage(INEGI 2011). With regard tohumanresources andinstitutionsofsocialmedicine, for 2009had21.06497.499medical staffandmedical units, which means they were90.7physicians per100,000 people and19.59per 10,000medical units. In the State ofMexico, between1970 - 2010, industrial period,was presenteda patternof health and diseasecharacterizedbysignificantand continuousdecreasein overall mortality, showeda shiftfrom infectious tochronicdegenerative, life expectancyincreased from63.32years in 1970to 76 yearsin 2010. Thehigh mortality rateswere recordedmainly in thepopulation groupaged 60and over.

By 2010, the StateofMexico reporteda totalof68.286deaths, witha mortality rateof4.2 (per 1000 population) lower than the national. The distribution ofoverall mortalityin 2010,was presentedin a different forminthe state context: municipalities that reportedmortality ratesarehigh and very highmainly locatedsouthwest ofthe state,as well as smallgroupsscatterednorthwest, north andsoutheast, it ismostly ruralmunicipalities. Those withloweraverage mortalityratesand averagerates,are foundscattered inrural and urbanareas. Those withlow mortality ratesandvery low, are distributed mainlyin metropolitan areasof the Valleyof Mexico(MCMA) andToluca(ZMT), with urban characteristics, (Figure 1).

The fivemost common causes arechronic degenerativetype: diabetes mellitus, 77 per 100,000, higher than the national average,ischemic heartdisease, lower than the national44.8, 51.8cancersbelowthe national average,cirrhosis andother chronicliver, 26.5 below thenationalstroke, 22.58lower thannationaltogether indicatethat54.5%of total mortality(table 2 and Figure 2).

2.2. Mortality by age group

By 2000 there was a change in mortality by age group, throughout the twentieth century the highest rates were recorded in the age group of children, but as of this year, the age group registered the highest increase is the post-productive age group (65 and over) with 449.2 per 10,000 inhabitants, while the rate decreased to 216.1 children per 10,000 live births (Santana, M. 2009).

By 2010, there was a slight increase in the death rate in the age group posproductiva (65 years and over) with 452.2 per 10,000 population, infant mortality fell significantly to 3.82 for each birth (Figure 3).

The distribution of mortality rates in the age group of 60 years or more has the following distribution pattern: municipalities with rates half high, high and very high mainly located to the west of the State of Mexico (ZMT), and the northeast. Municipalities with low average mortality rates, low and very low are located primarily on the east, west and south center of this state (Figure 4).

2.3. Distribution of the most frequent causes of death, 2010.

First most frequent cause of death: diabetes mellitus

In Mexico, in 2010, diabetes mellitus was the leading cause of mortality with 82.964 deaths (14.01% of total mortality), with a rate of 73.85 per 100,000 population (Table 1).

In the State ofMexico, from the year2000 becomesthefirstdeaths, up significantly from6.210for the year2000 to 11.683in 2010, with rates of47.4and 77per 100,000inhabitants, respectively, bywhatrates increasedover 38%in a decade, and deathsrose13.16% in the last two years(2008and 2010)(Table2).

The distribution ofspecificdeath ratesfrom diabetesmellitus,was presentedin a different formin the contextstate, municipal levelthose withthe highest rates ofmortalityare mainly locatedto the west ofthe cityof Mexico, southeast ofthe entity anddisintegratedasmunicipalities distributedin metropolitan areasofMexico CityandToluca. Those withhighmortality ratesandhighhalfare mainly located inbothmetropolitan areas (Figure 5).

Alevel ofHealth Regulatoryjurisdictionmortality rateswerehigher thanthestate: TenangoValley, Nezahualcoyotl, BazTlalnepantla, Ecatepec, Toluca, Naucalpan deJuárez, whichrecordedmortality rates(110.2, 107.8, 99.5, 82.57,81, 81, per 100,000 populationrespectively. Five ofthe six jurisdictionsare partof the metropolitan areasof the Valleyof Mexico andToluca. contrastingThesejurisdictionsrecordedlow ratesofdiabetes mellitusareIxtlahuaca, Tejupilco, Tenancingo, andValleyBravo, locatedwest of theentity, (Figure 10).

Second most common: ischemic heartdisease

The causes ofsuchdeathsareof different nature: thedemographicthatmainly affecttheelderlypopulation, geographical andphysicalclimateand altitudeasthedegree ofsocioeconomicmarginalization, urban and ruralcharacteristics, andtheculturallifestylesspecificallyabout diet,smoking anda sedentary lifestyle, among others. In Mexicoin 2010, ischemic heartdiseaseappeared asthe secondcause of death, with70.888cases(11.97% of total mortality), with a rate of63.10per 100,000 people.

In the State ofMexico, ischemic heartdisease, for 2000and 2010became thesecond leading cause ofmortality, with rates of34.95and44.8per 100,000 population, so there has been anincrease in the ratesof21.99%in a decadeanddeathsincreased by22.7%inthe last two years(2008and 2010).

By 2010, there was an increaseinmortality ratesof44.80per 100,000 population,with6.801deathsindicating the9.95% of totalmortality.Specificmortality ratesforischemic heartdisease, have a disperseddistribution patternat thestate level, and veryhigh ratesare highestin the northeast, northwest, southeast, some municipalities inthe metropolitan areasof the Valleyof Mexico andTolucaandsouthwestin dispersed form. This indicatesthat it isurban and ruralareas(Figure 6).

Alevel ofHealth Regulatoryjurisdictionjurisdictions thatreportedmortality rateswerehigher thanthestate: Tlalnepantla(77.84 per 100,000), Naucalpan(64.10), Jilotepec(61.77), Nezahualcoyotl(55.99), Tejupilco(54.73), Ecatepec(51.81), andVallede Bravo(50.94), fourof the sevenjurisdictionshaveurban characteristicsand belong to theMetropolitan Areaof Mexico, in contrast tothe jurisdiction ofIxtlahuacawhich recordedthe lowest rate (24.37). In relationtothe remaining jurisdictions, likeJilotepecthisis located northof the Stateof Mexico, is characterized asprimarilyrural,withdegree ofmarginalizationmedium and low, the altitudevariesfrom 2001 to3000 m. In winterthere is thepresence ofpolarair masses(north wind) thatcome from Canadaand the UnitedStates.Whatcan affectmortalitymainly inthe adult population.TejupilcojurisdictionsandValle de Bravo, islocatedsouthwest ofthe state,withhighdegree ofmarginalizationand under, are characterized byruraland show variabilityofaltitudes(Figure 10).

Thethird most common causeofmortalityfrom malignant tumors By 2010in Mexico45.548caseswheremalignant tumorsindicating the7.69% of all deaths, with a rate of40.55per 100,000 population.In the State ofMexico, the number ofdeaths from malignant neoplasmsfor 2000and2010 were3370 and7873cases, with mortality ratesof25.73and51.87per 100,000inhabitants, respectively, indicating that it has increasedsignificantly. Rates increasedover 50%in the last decade, while inthe last two years(2008-2010) the number of deathsincreased by10.18%.

Specificmortality ratesfrom malignant tumorsshow adistribution patternconcentratedsouthwest ofthe entity(with rural characteristics) anddispersed invariousareasto the eastandcenter(formingpart ofthe metropolitan areasof the Valleyof Mexico andToluca, andasnorthernMexico state. indicating thatthis isurban and ruralareas(figure 7).Alevel ofhealth regulationjurisdictionsmortality ratesrecordedoverthestateare:Tlalnepantla(90.78 per 100,000), Naucalpan(73.14), Nezahualcoyotl(66.84), Tejupilco(65.88), Tenancingo(58.73) andEcatepec(52.94) .

Of the sixjurisdictionshaveurban characteristicsandfourbelong to theMetropolitan Areaof Mexico, the other twoare locatedsouthwest ofthe entity. Incontrast toIxtlahuacaandAmecamecajurisdictionsthat recordedthe lowest ratesfrom malignant neoplasms (Figure 10).

The fourthmost common cause ofmortalityfrom cerebrovascular disease.

According to WHO, thestrokeis"rapidly developing clinicalsymptomsindicativeof alocalor generalizeddisorderof cerebral function, with symptoms lasting24 hours or longeror leading todeathwith noapparent causeotherthanthevascular".

Themodifiable riskfactorsincludehypertension, diabetes, hypercholesterolemia, obesity and physical inactivity, alcohol consumption, smoking andaddictive drugs, oral contraceptives. Notmodifiableage, sex, race, genetic elements (Wikipedia Foundation,2008).A sedentary lifestyleorlack ofphysical activityis one of themain risk factorsfor developingheart diseaseandstroke.In Mexico, in this year ofstudy, suchwas the fifthcauseof death, with32.306cases(5.4% of total mortality), with a rate of28.75per 100,000 people, indicating a smallincrease over the2005.

In the State ofMexico, before 1980the causeofcerebrovascular diseasedid not appearwithin the firstten causes. For1980 and 1990, this causewas the tenthplace with1.242and1.905deaths, with rates of16.41and 19.4per 100,000, respectively. Soin a decadeincreased significantlythe numberof deathsandthe mortality rate. In 2000he becamethe fifth leading causeofmortality, with rates of19.41per 100,000 and2.543deathswere recorded, higher than those recordedin previous decades. By 2010there were6.850cases(10.03% of totalmortality), witha mortality rateof 22.5per 100,000, higher than 2000.This indicatesthat this causehas increased significantly. Rates increased13.7%in a decadeanddeathsincreased by102.5% in the last two years(2008and 2010).The distribution ofcerebrovascular diseasespecific mortalityshows a pattern ofconcentration distributioninthe northwest andsouthwest, as well as small areasto the northeast andsoutheast(including in the metropolitan areaofMexico City, (Figure 8).Alevel of jurisdictionthosemortality ratesrecordedoverthestatewere:Tejupilco(43.07), Jilotepec(38.56), Tenancingo(37.40), Tlalnepantlade Baz(30.26), Nezahualcoyotl(28.58), Atlacomulco(27.80), Ixtlahuaca(27.49), TenangoValley(26.42) andNaucalpan(24.89). Of the ninejurisdictionsthree are partof theMetropolitan Areaof Mexico(Figure10). The fifthmost commoncause of deathisfrom cirrhosis and otherchronic liverdiseases.Some causesare: poor diet, microbial infections, lack of exercise, alcohol abuse andliver toxicproducts(botanical-SL onlinefrom 1999 to 2008). In Mexico, in 2010, liver diseasesoccupied thefifth leading causeof deathwith28.369cases(4.79% of total mortality), with a rate of25.25per 100,000 people, which indicates a decreasecompared to 2005.

In the State ofMexico, before 1960, the causeofliver diseasewas not listedamong the tenmost common causes. For this year, thisresultwas sixthplace witha rate of44.1per 100,000 population, with 838deaths. By 1970ranked seventh, with1264deathsand a rate of32.9per 100,000inhabitants. For 1980did not appearwithin the firstten causes. By 1990ranked fourthwith3.616deathsand a rate of36.83. For the year 2000came to occupythe third leading causeofmortality, withrate4.374and33.39deathsper 100,000 population. By 2010there were4.523cases(5.897% of total mortality), with a rateof 25.5per 100,000 populationthan the nationalequal, indicating a decreaseof thecause of death. Ratesdeclined23.6%in a decadeanddeathsdecreased by18.3%inthe last two years(2008and 2010)(Table2). Specificmortality ratesfrom cirrhosis and otherchronic liverdiseases, have a distribution patternconcentratednorthwest ofthe state,includingthe areaMazahua, anddisaggregated townssoutheast, central and south central. This isprimarily ruralareaswithhighmarginalization(Figure 9).

Alevel ofhealth regulatoryjurisdiction, thosewith mortality ratesabove thestateare characterized bymainlyruralcharacteristics, theseare: Vallede Bravo: (72.72 per 100, 000 population), Ixtlahuaca(68.24), Atlacomulco(56.80) ,Jilotepec(49.34), Tenancingo(47.93), TenangoValley(30.11), Tejupilco(29.39), Xonacatlán(26.73), none of whichbelongsto the metropolitan areasof the Valleyof MexicoandToluca(figure 10).Overalljurisdictionsreportedhigher death ratesin thestatein four ofthe most common causesare: AtlacomulcoTenangoValley, Tejupilco, Naucalpan, Tlalnepantla, Ecatepecand Nezahualcoyotl. Of thesethree correspond totheMetropolitan AreaofMexico andtheremainingthreeare locatedwest ofthe state,primarilyin the southwest.What it meansto behuman healthpriorityboth in urbanas inrural areas.In relationto the jurisdictionsthat reportedmortality rateslower thanthestatein allcauses are: Atizapan, CuautitlanIzcalli, Amecameca, ZumpangoandTexcoco, which means they are the bestin health, andthat arepart ofthe ZMVM.

Table 1. Mortality rates of the most common causes, 2010 (per 100,000 population).

Mostfrequent cause	Mexico (Deaths)	Mexico (Rate)	State of Mexico (Deaths)	State of Mexico (Rate)
Diabetes Mellitus	82 964	73.85	11 683	77
Ischaemicheartdisease	70 888	63.10	6801	44.8
Malignancies *	70 240	62.52	7873	51.87
Cerebrovascular disease	32 306	28.75	6850	22.5
Cirrhosis and other chronic liver diseases	32 453	28.88	4023	26.05
Assault (homicide)	25 757	22.92	2118	13.96
Total	592 018	5.3 **	68 286	4.2 **
Total population	112 336,538		15175862	

Source: On the basis of the Institute of Health of Mexico, 2010 SINAIS, National Institute of Geography and Statistics, INEGI, 2010.* Calculations based on sources listed above.
Mortality rates **.

Table 2. State of Mexico. Mortality rates of the most common causes per 100,000

Year	Diabetes mellitus	Malignant	Ischemicheartdisease	Cerebrovascular Disease	Cirrhosis and other chronic liver diseases
1960	**	21.0*	68.6		44.1
1970	**	**	59.6		32.9
1980	**	23.04	59.5	16.41	**
1990	29.39	36.42	47.8	19.40	36.83
2000	47.4	25.73	34.95	19.41	33.39
2005	63.32	30.55	37.49	20.76	32.28
2010	77.00	40.55	44.8	22.5	25.5

Source: On the basis of the Government of the State of Mexico (1963).Socioeconomic Overview 1963, State Government of Mexico (1975). Socioeconomic Overview 1975, INEGI (1986), Statistical Yearbook of the State of Mexico, INEGI(1998), Vital Statistics of the State of Mexico, Folder Number 1, Institute of Health of Mexico, ISEM (2007). M. Santana (2009). INEGI 2010.Notes: Tumors (malignant and non-malignant).** Not reported in the 10 leading causes

Table 3. State of Mexico. Mortality rates of the five most common causes, 2010 For health jurisdiction (per 100,000 population).

Healthjurisdiction	General	Diabetes Mellitus	DiseasesIschemicheart	Malignancies	Cerebrovascular disease	Cirrhosis and other liver diseases
1. Atlacomulco	50.44	67.12	28.20	43.69	27.80	56.80
2. Ixtlahuaca	45.53	49.91	24.37	37.05	27.49	68.24
3. Jilotepec	51.99	60.12	61.77	48.92	38.56	49.34
4. Tenango Valley	50.39	110.21	42.04	51.69	26.42	30.11
5. Toluca	43.78	81.01	43.88	49.36	19.05	25.79
6. Xonacatlán	40.53	72.47	33.75	47.53	16.95	26.73
7. Tejupilco	55.44	50.68	54.73	65.88	43.07	29.39
8. Tenancingo	52.41	51.35	41.08	58.73	37.40	47.93
9. Valle de Bravo	49.04	51.99	50.94	40.40	24.59	72.72
10. Atizapán de Zaragoza	40.36	67.14	44.18	47.53	20.76	17.65
11. Cuautitlán	38.29	68.14	38.65	47.93	17.17	18.30
12. Naucalpan	52.54	81.13	64.10	73.14	24.89	21.25
13. Teotihuacan	40.30	66.13	48.89	47.95	14.73	20.37
14. Tlalnepantla	60.37	99.51	77.84	90.78	30.26	23.18
15. Zumpango	34.30	63.15	33.15	39.80	17.45	17.33
16. Amecameca	37.85	75.37	31.92	37.00	21.47	21.83
17. Ecatepec	45.61	82.57	51.81	52.94	22.49	20.27
18. Nezahualcóyotl	54.49	107.81	55.99	66.84	28.58	25.87
19. Texcoco	38.54	73.50	34.00	42.93	16.04	25.31
20. Whole	44.69	76.98	44.81	51.86	22.57	26.51

Source: Prepared based on the Institute of Health of Mexico, 2010 SINAIS, National Institute of Geography and Statistics, INEGI, 2010.

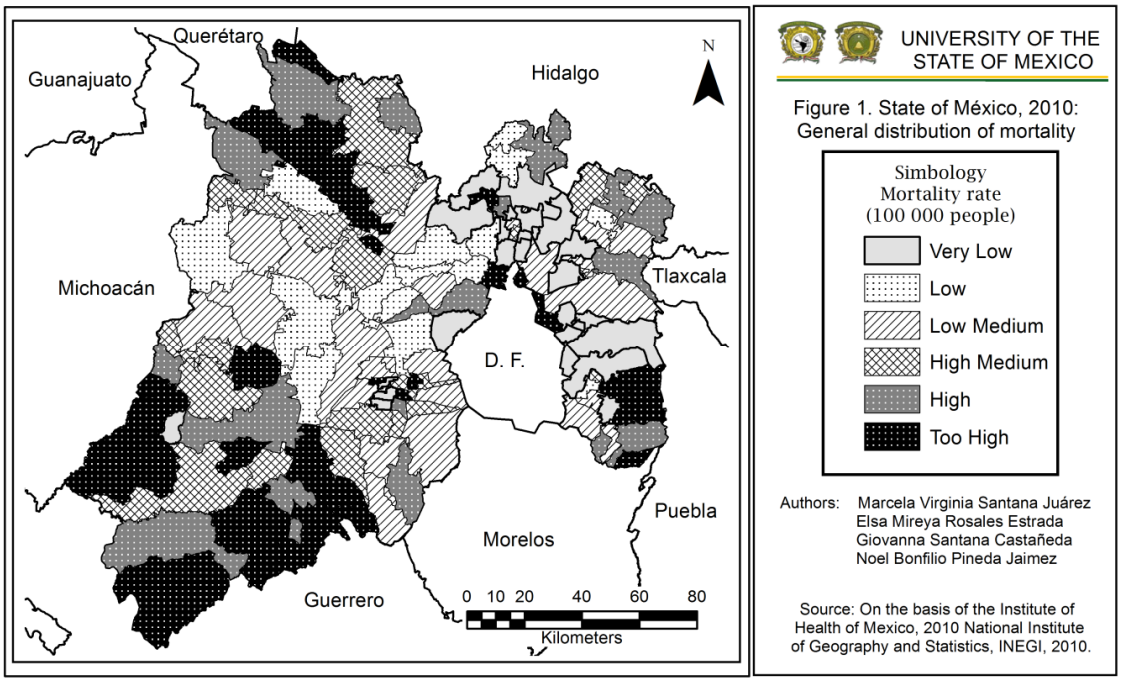
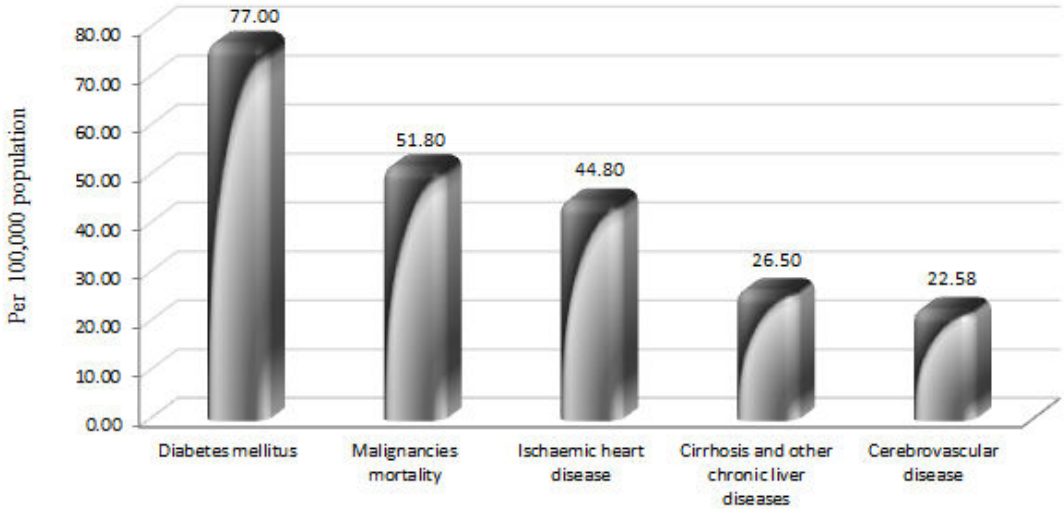
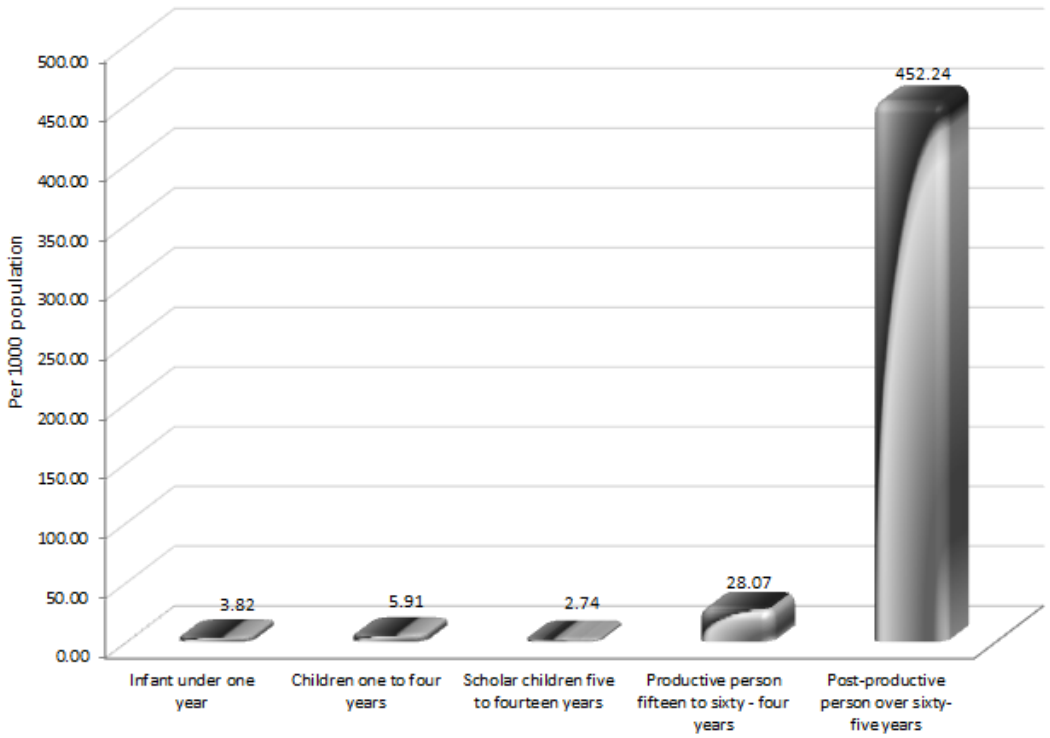


Figura 2. State of Mexico. Most frequent causes of death 2010.



Source: On the basis of the Institute of Health of México, 2010; National Institute of Geography and Statistic, INEGI, 2010.

Figure 3. State of Mexico. Mortality by age group. 2010



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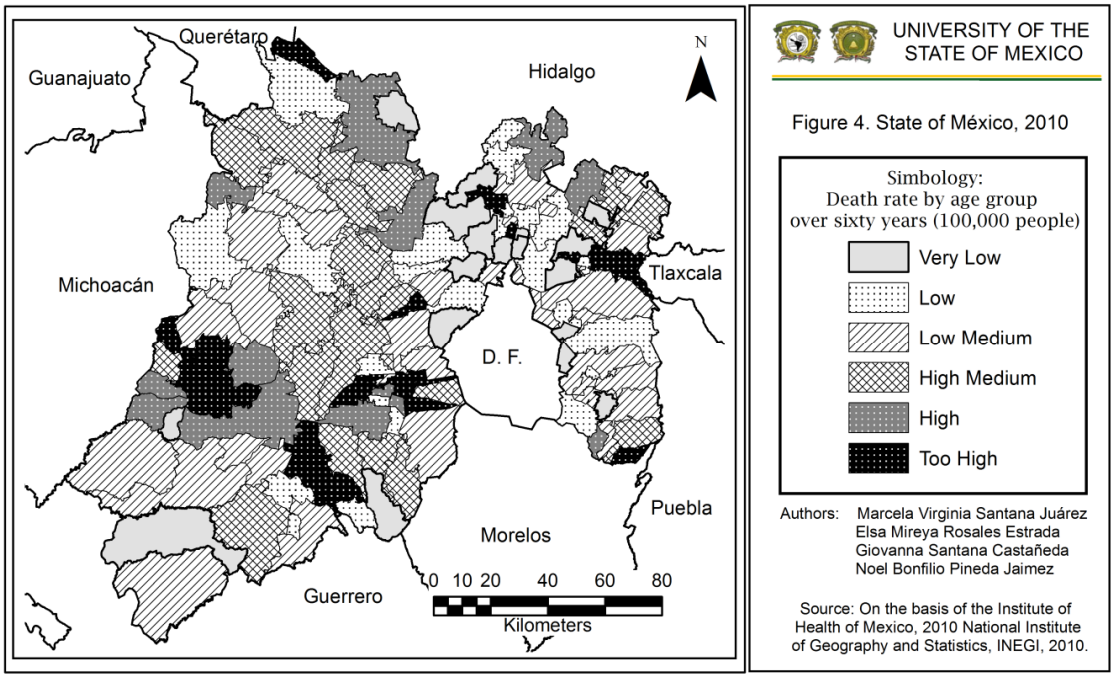

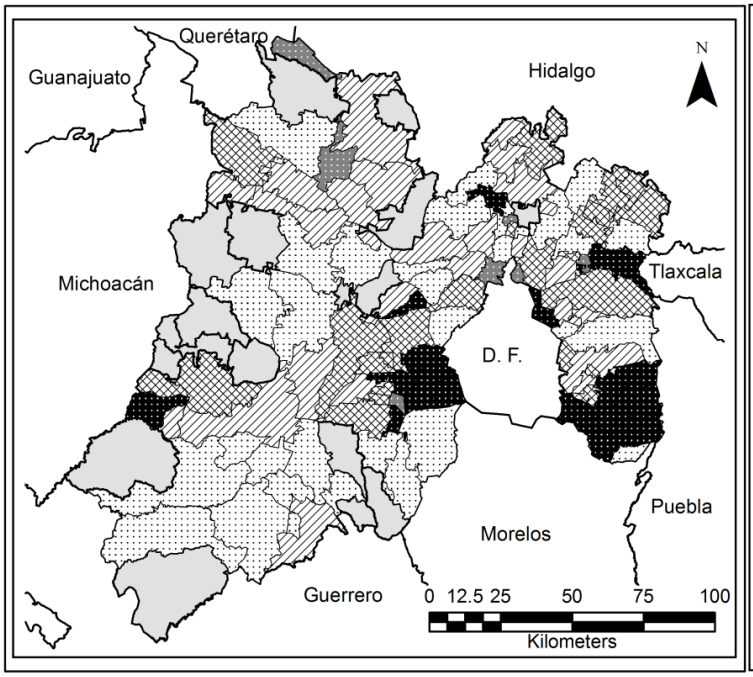

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Figure 5. State of México, 2010: Distribution of diabetes mellitus mortality.

Simbology
Mortality rate
(100 000 people)

- Very Low
- Low
- Low Medium
- High Medium
- High
- Too High

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Source: On the basis of the Institute of Health of Mexico, 2010 National Institute of Geography and Statistics, INEGI, 2010.

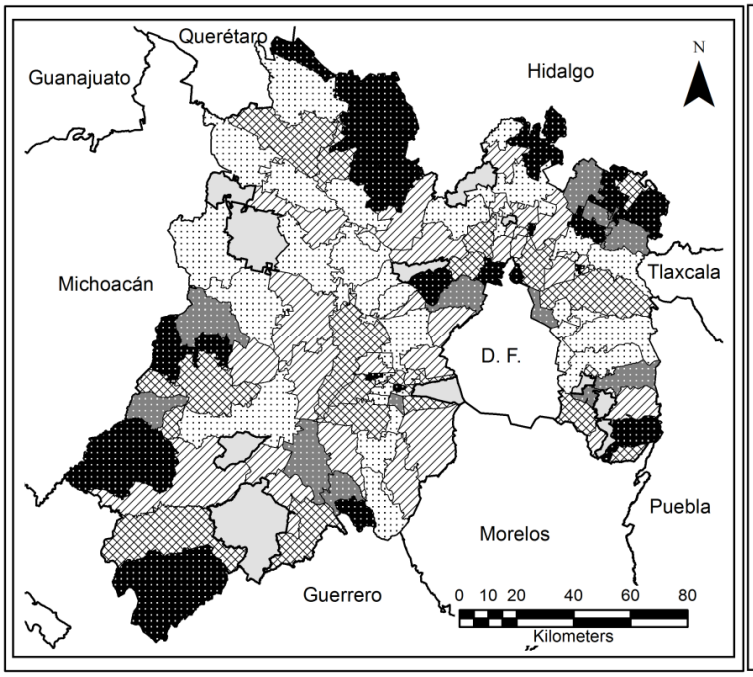

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Figure 6. State of México, 2010: Ischaemic heart disease.

Simbology
Mortality rate
(100 000 people)

- Very Low
- Low
- Low Medium
- High Medium
- High
- Too High

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Source: On the basis of the Institute of Health of Mexico, 2010 National Institute of Geography and Statistics, INEGI, 2010.

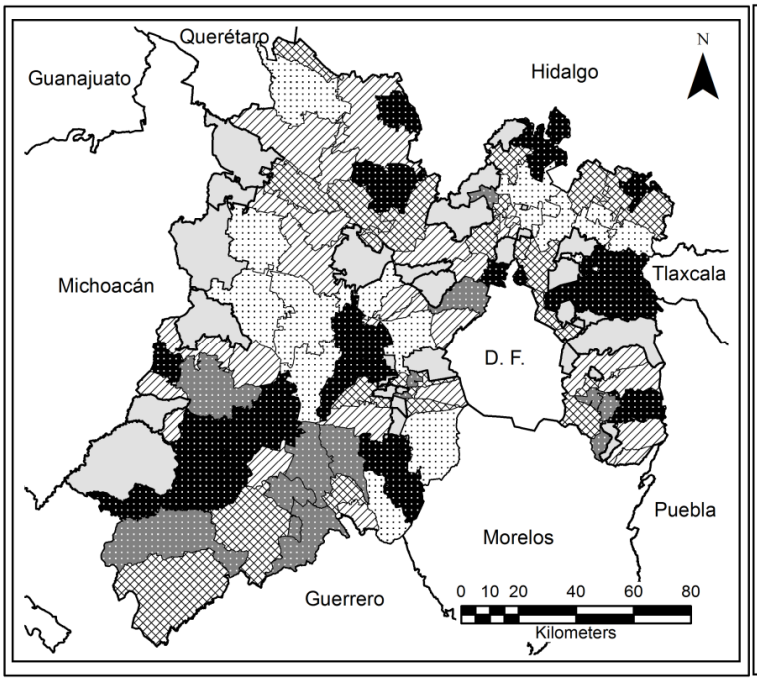

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Figure 7. State of México, 2010: Distribution of distribution malignancies mortality.

Simbology
Mortality rate
(100 000 people)

- Very Low
- Low
- Low Medium
- High Medium
- High
- Too High

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Source: On the basis of the Institute of Health of Mexico, 2010 National Institute of Geography and Statistics, INEGI, 2010.

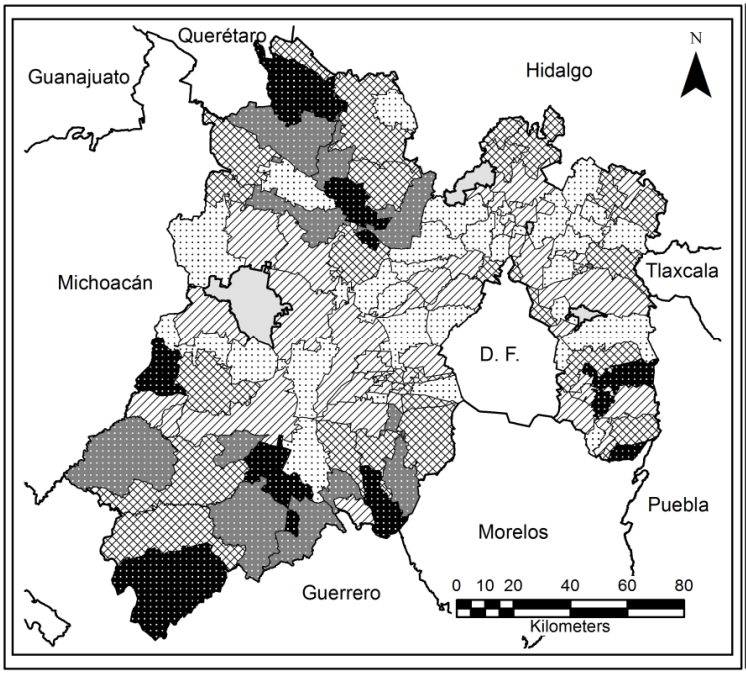

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Figure 8. State of México, 2010: Cerebrovascular disease.

Simbology
Mortality rate
(100 000 people)

- Very Low
- Low
- Low Medium
- High Medium
- High
- Too High

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Source: On the basis of the Institute of Health of Mexico, 2010 National Institute of Geography and Statistics, INEGI, 2010.

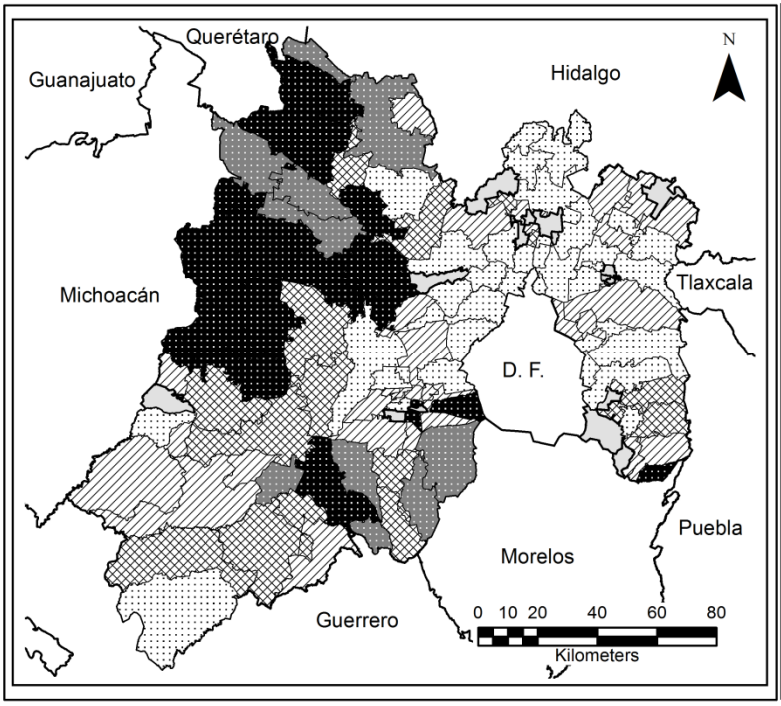

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Figure 9. State of México, 2010: Cirrhosis and other chronic liver diseases.

Simbology
Mortality rate
(100 000 people)

- Very Low
- Low
- Low Medium
- High Medium
- High
- Too High

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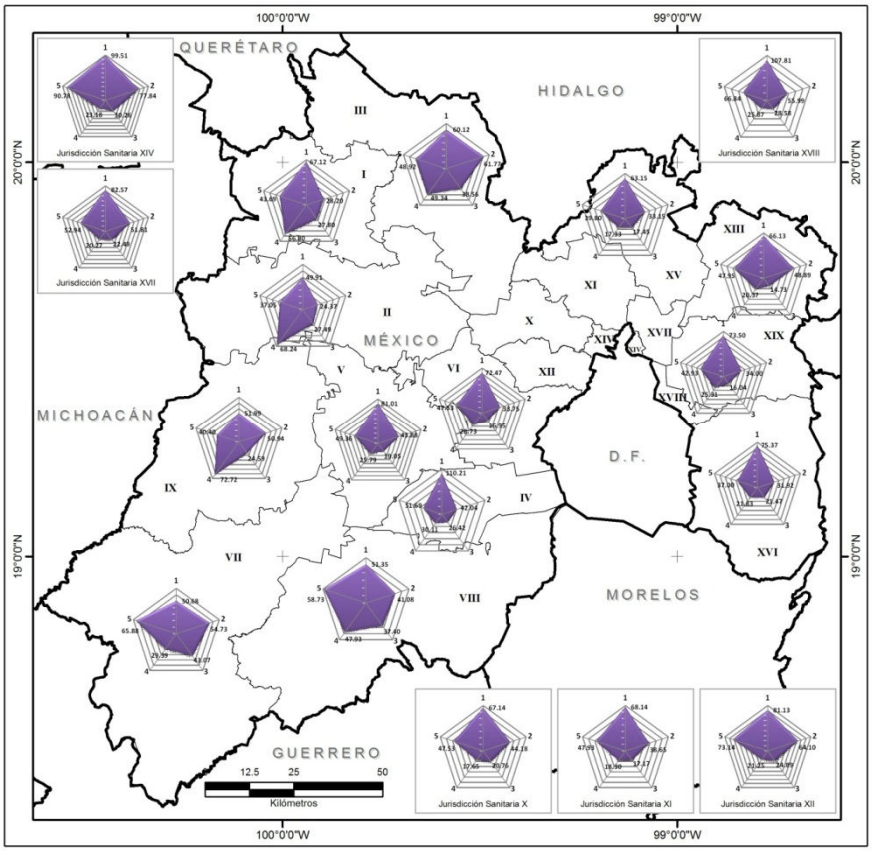

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Figure 10. State of Mexico. Mortality rates of the five most common causes, 2010. For health jurisdiction (per 100, 000 population)

Simbology

Most common causes of mortality

1. Diabetes Mellitus
2. Diseases Ischemic Heart
3. Cirrhosis and other liver diseases
4. Malignancies
5. Cerebrovascular diseases

Basic symbology

- Municipal Boundary
- State Boundary

NP	JURISDICTION
I	ATLACOMULCO
II	IXTLAHUACA
III	JILOTEPEC
IV	TENANGO DEL VALLE
V	TOLUCA
VI	XONACATLAN
VII	TEJUPILCO
VIII	TENANCINGO
IX	VALLE DE BRAVO
X	ATIZAPAN DE ZARAGOZA
XI	CUAUTITLAN
XII	NAUCALPAN
XIII	TEOTIHUACAN
XIV	TLALNEPANTLA
XV	ZUMPANGO
XVI	AMECAMECA
XVII	ECATEPEC
XVIII	NEZAHUALCOYOTL
XIX	TEXCOCO

Source: On the basis of the Institute of Health of Mexico, 2010; National Institute of Geography and Statistic, INEGI, 2010.

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