Supplemental material for the paper Homicides increased inequality of lifespans and slowed down life expectancy gains in Mexico, 2005-2015

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Abstract

Background Mexico experienced an unprecedented rise of violence after 2005 related to the war on drugs. The net effect of rising homicides on health inequalities in the last decade is unknown. We quantify the effect of homicides on lifespan inequality and average lifespan in Mexico from 2005 to 2015.

Methods A cross-sectional retrospective demographic analysis with mortality data by cause of death was performed. Life expectancy and lifespan inequality conditional on surviving to age 15, as measured by years of life lost, with age- and cause-specific contributions of medically amenable conditions, diabetes, ischemic heart diseases, traffic accidents and homicides to the changes between 1995 and 2015 were calculated. National and subnational (32 states) populations by sex were analysed.

Findings Mexican male life expectancy at age 15 increased more than twice in 1995-2005 (1·17 years) than in 2005-2015 (0·55 years). Lifespan inequality decreased by more than half a year for males in 1995-2005 (from 14·31 to 13·77), while in 2005-2015, the reduction was about four times smaller. Homicides between ages 15-49 had the largest effect on slowing down male life expectancy and lifespan inequality in 2005-2015. At the state level, some states experienced reductions in life expectancy in 2005-2015 particularly in the North. In the same period five states showed a large increase in lifespan inequality. Although the increase in homicide mortality affected lifespan inequality in all states after 2005, one state in the South was affected the most (about 1 year increase for males and two months for females in Guerrero).

Interpretation After ten years of the unexpected increase of violence in Mexico, the country has not been able to reduce the levels homicides to those prior to 2005. Life expectancy improvements slowed down and inequality of lifespans increased among young Mexican males whereby young males are expected to die, on average, younger than in the recent past.

Classification of causes of death

Category	ICD 10	ICD 9
I. Amenable to medical service		
I.A. AM-Infectious & respiratory diseases : intestinal infections, tuberculosis, zoonotic bacterial diseases, other bacterial diseases, septicemia, poliomyelitis, measles, rubella, infectious hepatitis, ornithosis, rickettsioses/ arthropod-borne, syphilis (all forms), yaws, respiratory diseases, influenza & pneumonia, chronic lower respiratory diseases	A00-A09, A16-A19, B90, A20-A26, A28, A32, A33, A35, A36, A37, A40-A41, A80, B05-B06, B15-B19, A70, A68, A75, A77, A50-A64, A66, J00-J08, J20-C50, C53, C61, C62, J39, J60-J99, J09-J18, J40-J47	001-009, 010-018, 32, 33, 37, 137, 020-027, 38, 45, 55-56, 70, 73, 080-082, 087, 090-099, 102, 460-479, 500-519, 480-488, 490-496
I.B. AM-Cancers: malignant neoplasm of colon, skin, breast, cervix, prostate, testis, bladder, kidney-Wilm's tumor only, eye, thyroid carcinoma, Hodgkins disease, leukemia	C16,C18-C21, C43-C44, C67, C64, C69, C73, C81, C91-C95	153-154, 172-173, 174, 180, 185, 186, 188-189, 190, 193, 201, 204-208
I.C. AM-Circulatory: active/acute rheumatic fever, chronic rheumatic heart disease, hypertensive disease, cerebrovascular disease	I00-I02, I05-I09, I10-I13, I15, I60-I69, O00-O99, Q20-Q28, P00-P96	390-392, 393-398, 401-405, 430-438, 630-676, 745-747, 760-779, 240-246, 345, 531-533,540-543, 550-553, 574-575.1, 580-589, 600, E870-E876, E878-E879
I.D. AM-Birth: maternal deaths (all), congenital cardiovascular anomalies, perinatal deaths (excluding stillbirths)	E00-E07, 40-G41, K25-K27, K35-K38, K40-K46, K80-K81, N00-N07, N17-N19, N25-N27, N40, Y60-Y69, Y83-Y84, B69	
I.E. AM-Other: disease of thyroid, epilepsy, peptic ulcer, appendicitis, abdominal hernia, cholelithiasis & cholecystitis, nephritis, benign prostatic hyperplasia, misadventures to patients during surgical or medical care, cisticerchosis.		
II. Diabetes	E10-E14	250
III. Ischemic Heart Diseases (IHD)	I20-I25	410-414, 429.2
IV. Lung cancer	C33-C34	162
V. Cirrhosis	K70	571.1-571.3
VI. Homicides	X85-Y09	E960-E969
VII. Road traffic accidents	V01-V99	E810-E819
VIII. Residual Causes : HIV/AIDS; suicide and self-inflicted injuries; other cancers and other heart diseases	B20-B24, U03; X60-X84, Y87.0; C00-D48; I00-I99 if not listed above; R00-R99	042-044; E950-E959; 140-239; 390-459 if not listed above; 780-799

Source: Aburto, Beltrán-Sánchez, García-Guerrero, and Canudas-Romo (2016)

Lifespan inequality indicator

In lifetable notation, $e^{\dagger}_{15}$ is defined as:

$$e^{\dagger}_{15} = \frac{\int_{15}^{\omega} \ell(x)\mu(x)e(x)dx}{\ell(15)} = \frac{\int_{15}^{\omega} d(x)e(x)dx}{\ell(15)}$$

where $\ell(x)$, $\mu(x)$, $e(x)$, $d(x)$ and ω are the survival function, the force of mortality, life expectancy, the age at death distribution at age x, and the open-aged interval, respectively.

Code and data to reproduce results

Available at https://goo.gl/tQV6fL.

Shinny app for sensitivity and state specific analysis

Results with starting age 0, available at https://goo.gl/n9XuDy

Results with starting age 15, available at https://goo.gl/wy1miT

Supplemental figures. All figures are own calculations based on CONAPO (2017) and INEGI (2017) data.

Figure S1. Age-cause specific contributions to the changes in national life expectancy at age 15 for females. Panel A refers to 1995-2005 and panel B to 2005-2015. Note: Numbers in boxes are age-specific contributions.

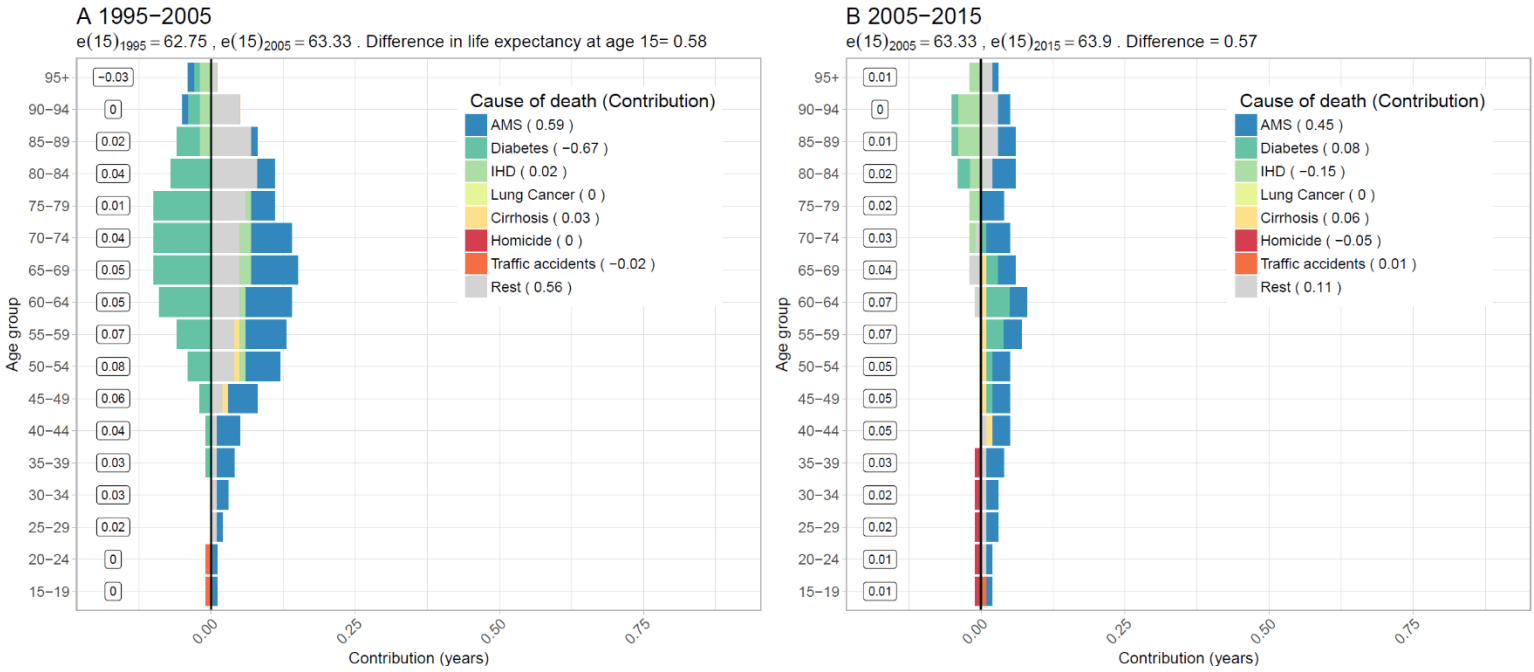


Figure S2. Age-cause specific contributions to the changes in national lifespan variation at age 15 ($e^{\dagger}$) for females. Panel A refers to 1995-2005 and panel B to 2005-2015. Note: Numbers in boxes are age-specific contributions

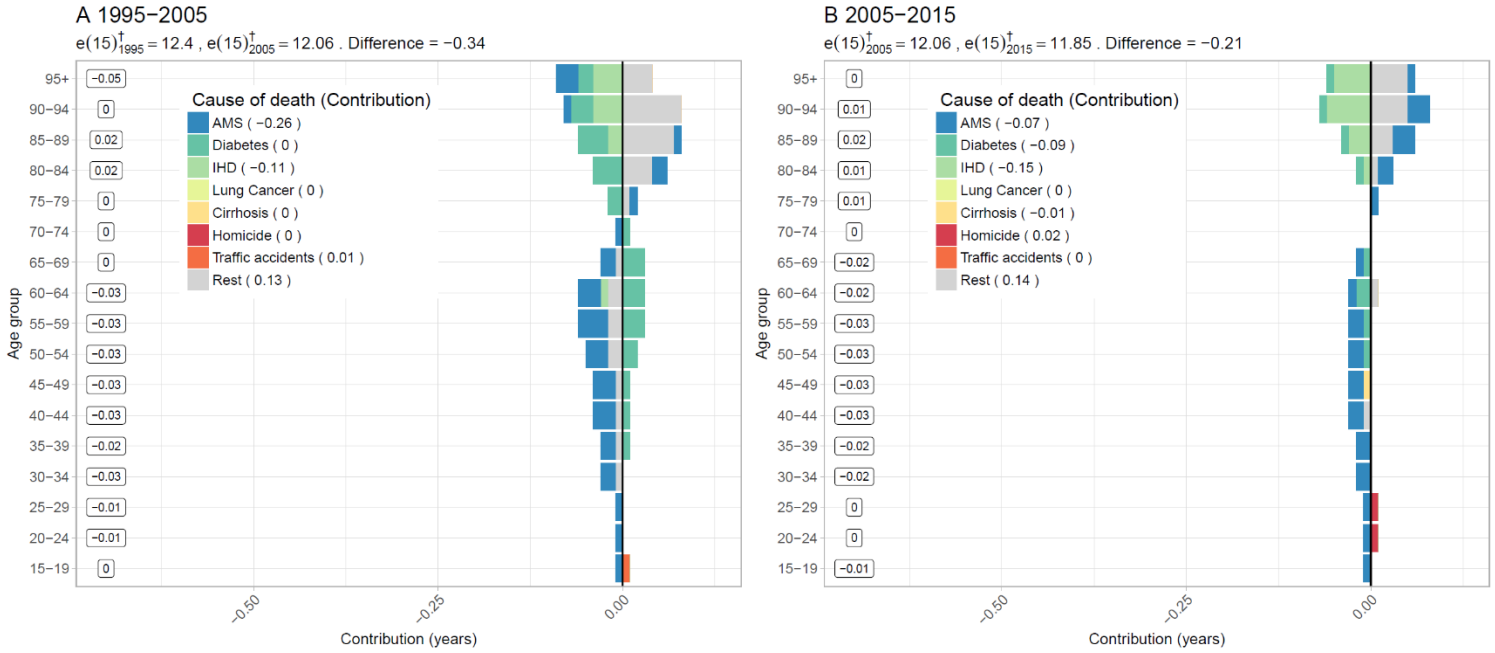


Figure S3. Changes in female life expectancy (e_{15}) (panel A) and female lifespan variation at age 15 ($e^{\dagger}$) (panel B) by state for the periods 1995-2005 and 2005-2015

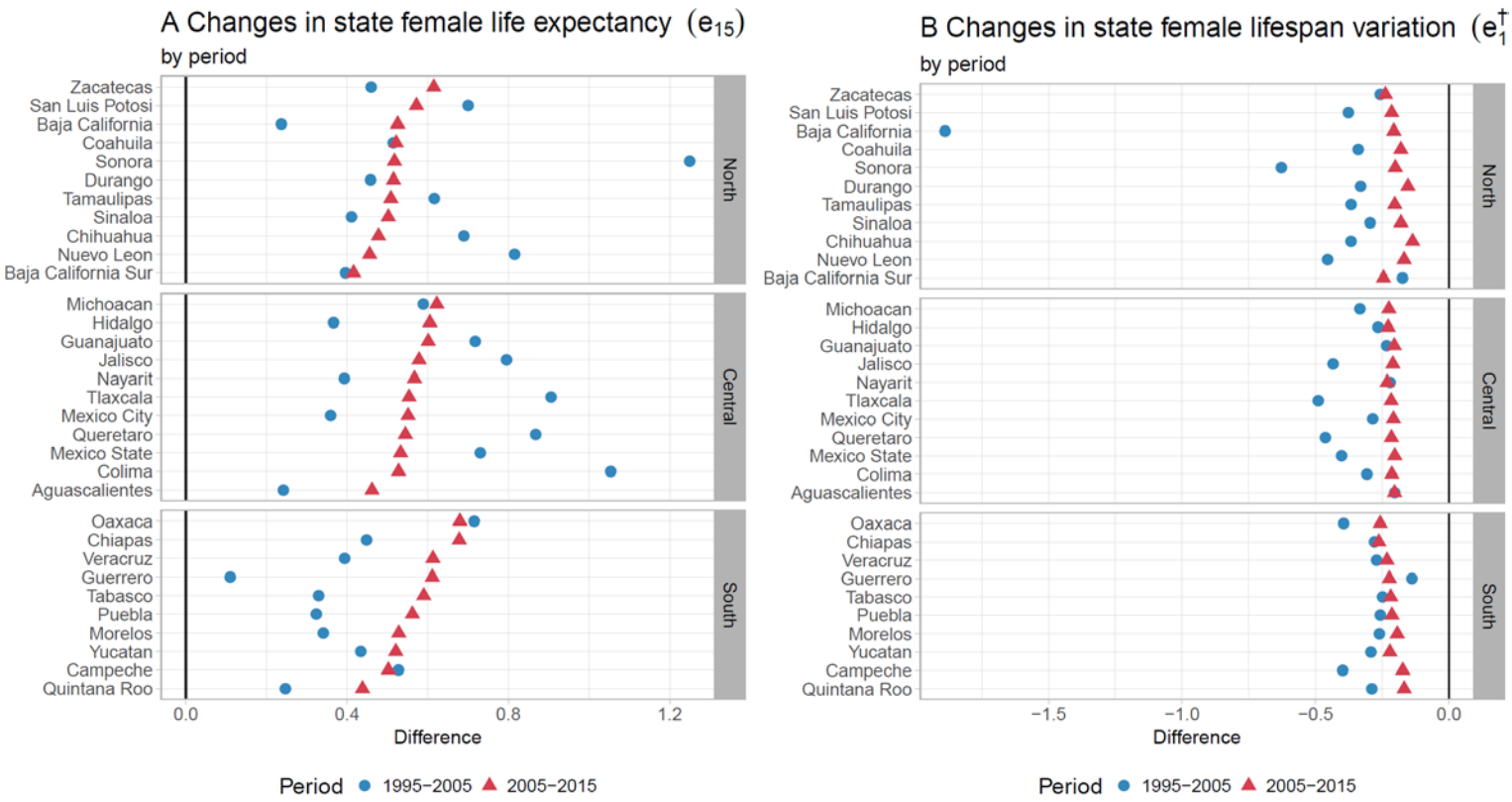


Figure S4. Cause-specific contributions to changes in female lifespan variation at age 15 ($e^{\dagger}$) by state for the periods 1995-2005 and 2005-2015.

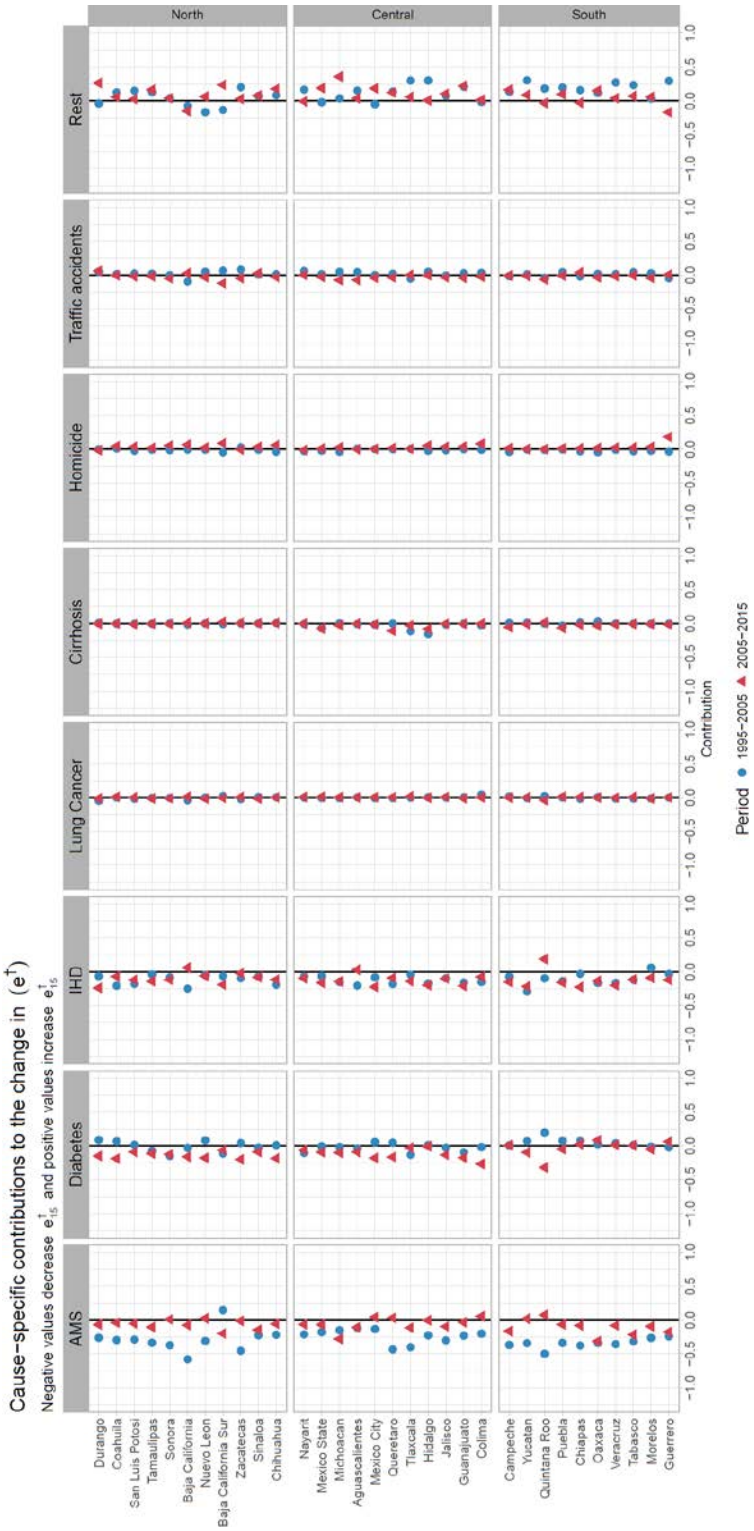


Figure S5. Cause-specific contributions to changes in female life expectancy at age 15 (e_{15}) by state for the periods 1995-2005 and 2005-2015.

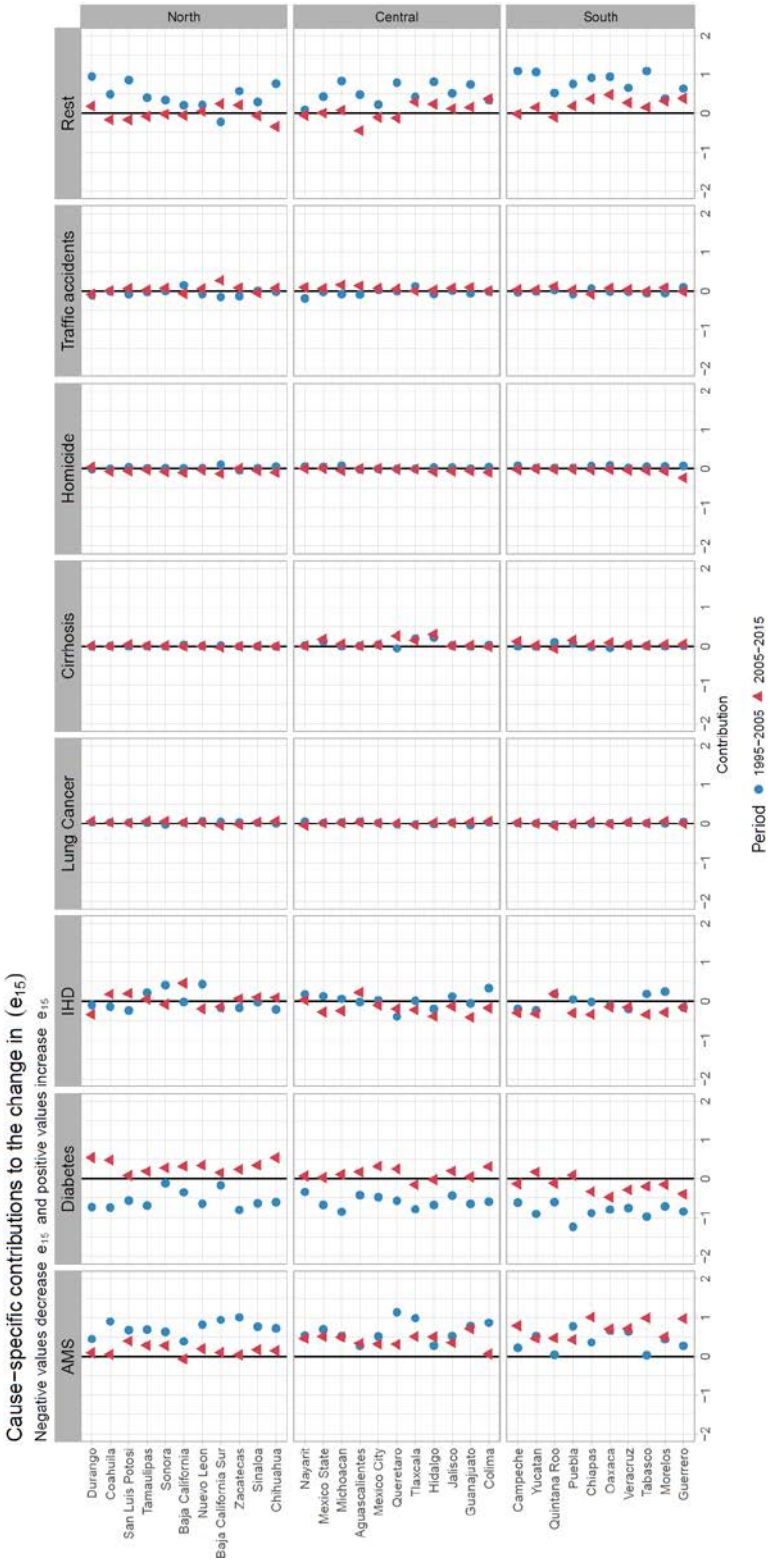


Figure S6. Cause-specific contributions to changes in male lifespan variation at age 15 ($e^{\dagger}$) by state for the periods 1995-2005 and 2005-2015.

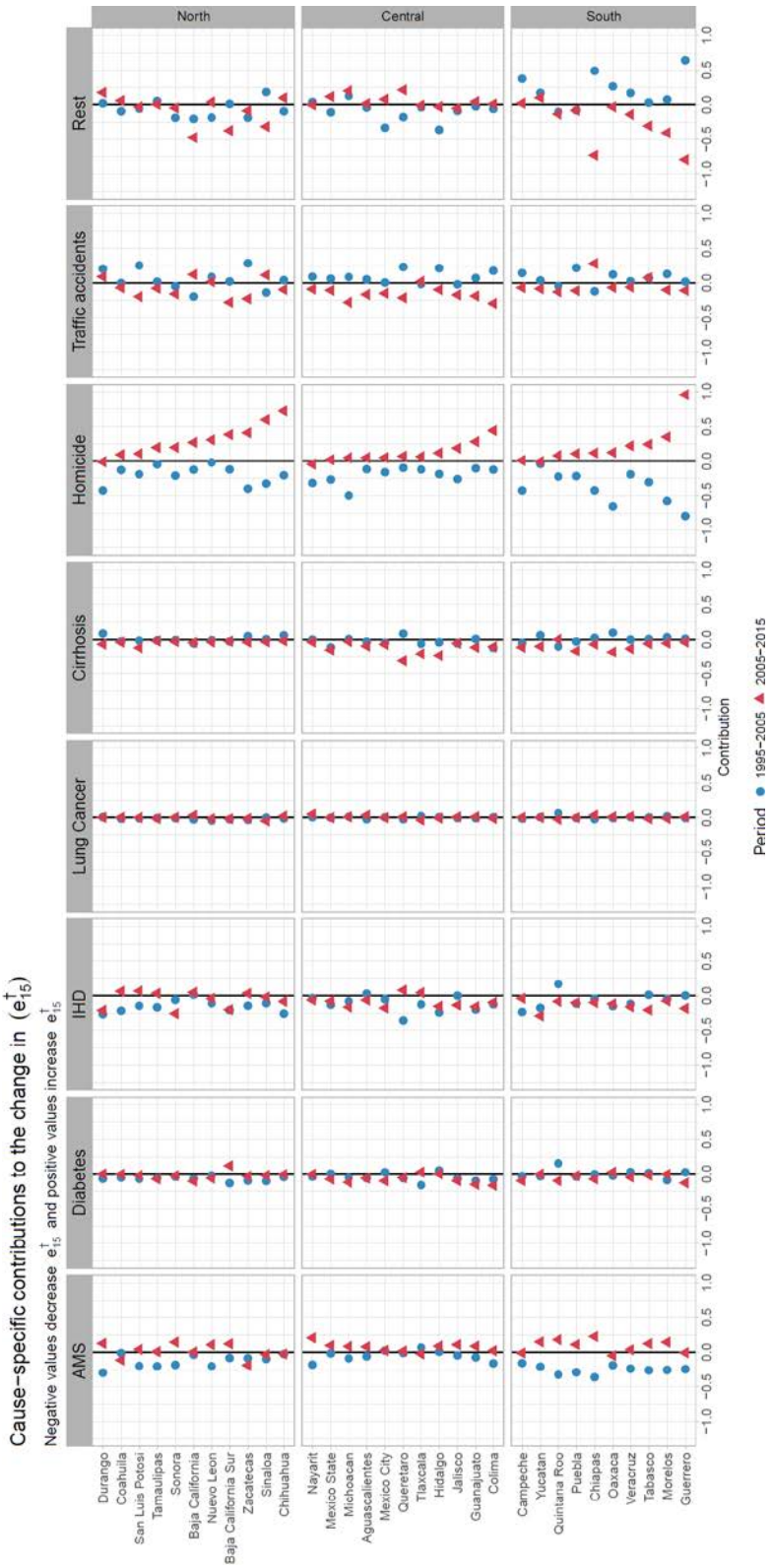
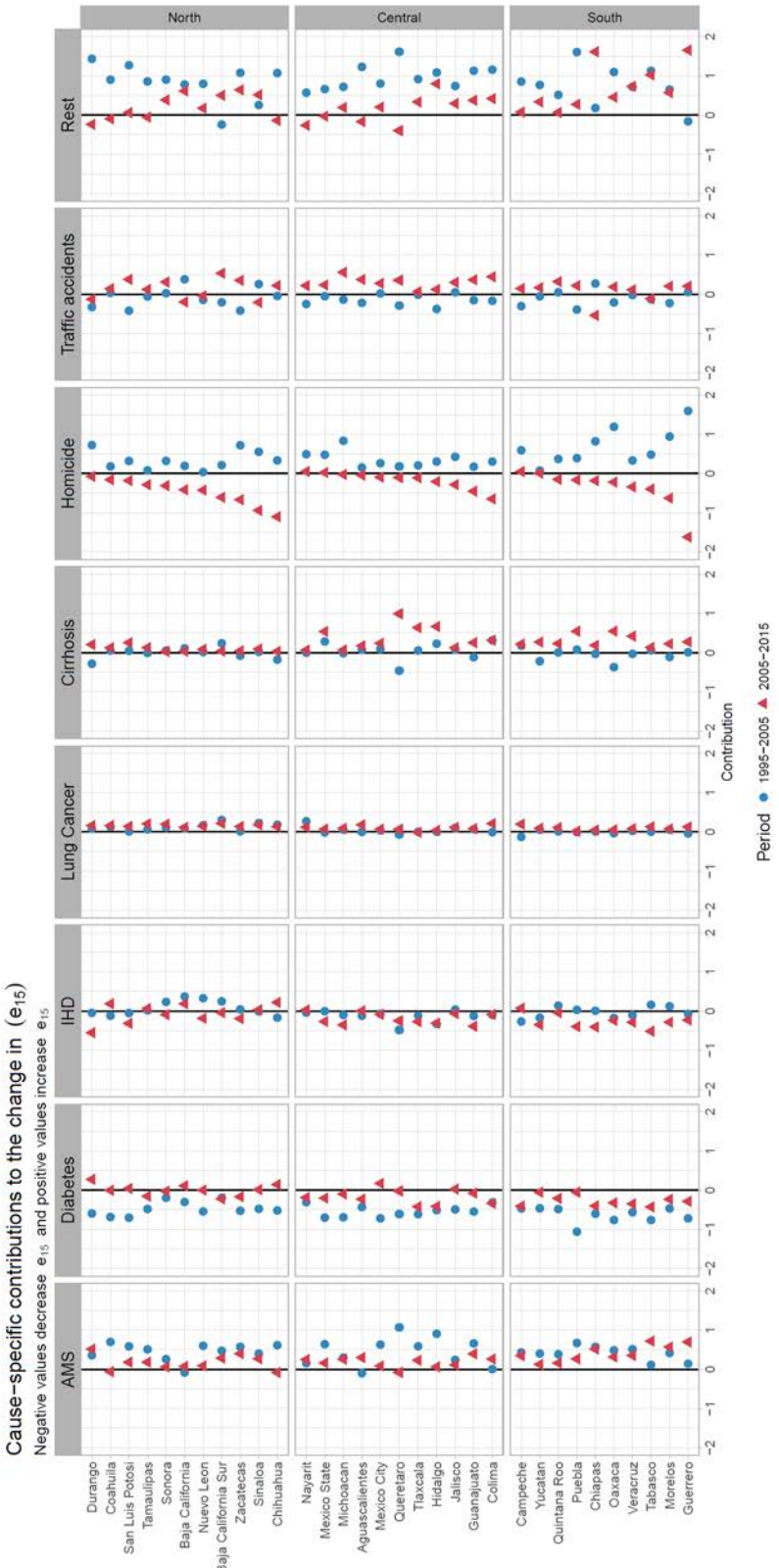


Figure S7. Cause-specific contributions to changes in male life expectancy at age 15 (e_{15}) by state for the periods 1995-2005 and 2005-2015.



References

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