



Luule Sakkeus, Estonian Institute for Population Studies, Tallinn University
Gleb Denissov, Estonian Causes of Death Registry, National Institute for Health Development
Liili Abuladze, Estonian Institute for Population Studies, Tallinn University

**Alcohol-Induced Conditions as Underlying and
Contributory Cause of Death:
an Application of Multiple-Cause Analysis to
Alcohol-Related Mortality in Estonia**
*Presentation at EDK Summer Seminar, Toila , August 20-21,
2019*

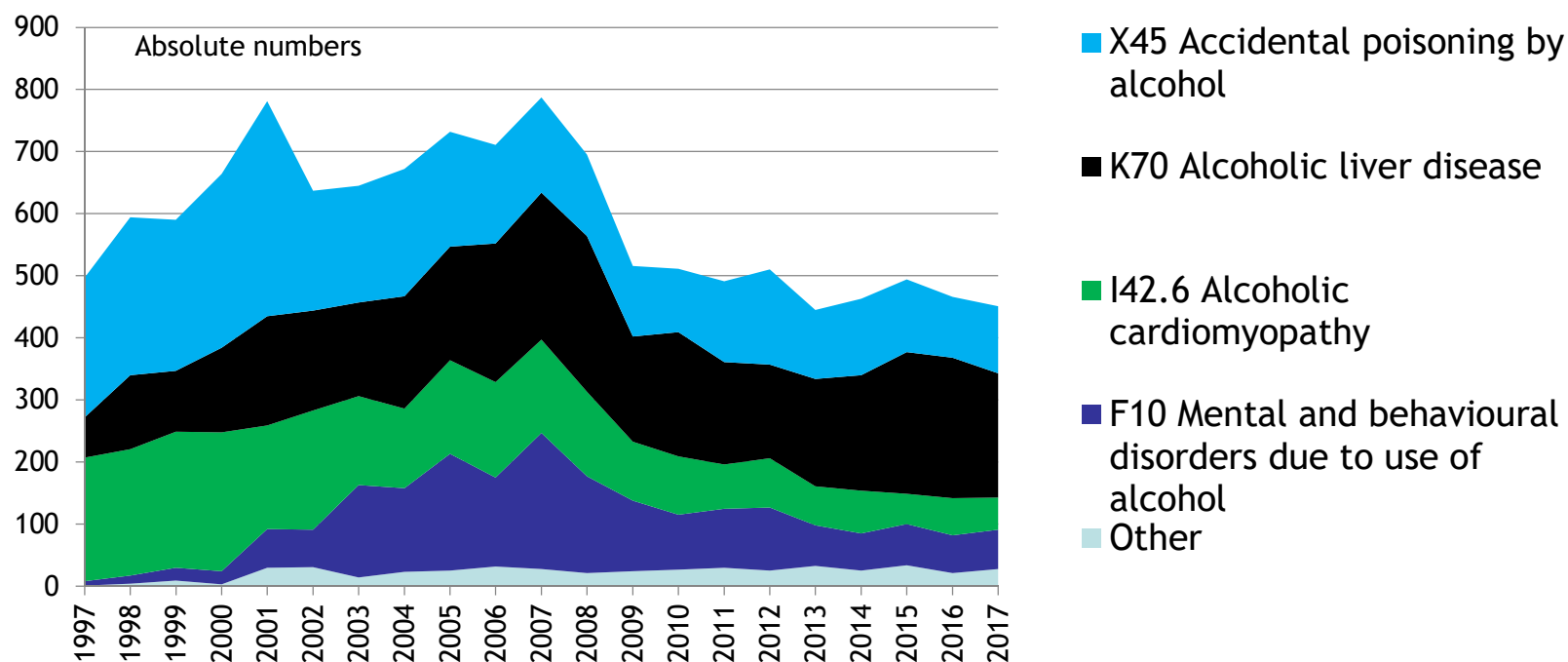


Aims

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- Study period is 1997-2017 - ICD-10 in use.
 - Produce absolute numbers and ASMR of alcohol-related deaths as underlying and multiple (any mention) cause.
 - Examine changes in registration practices over time.
 - Analyze cases with alcohol-induced conditions reported as contributory causes of death only (not underlying).
 - Link variation in mortality levels to policies pursued during the period by time series analysis (1st stage: male population underlying causes)

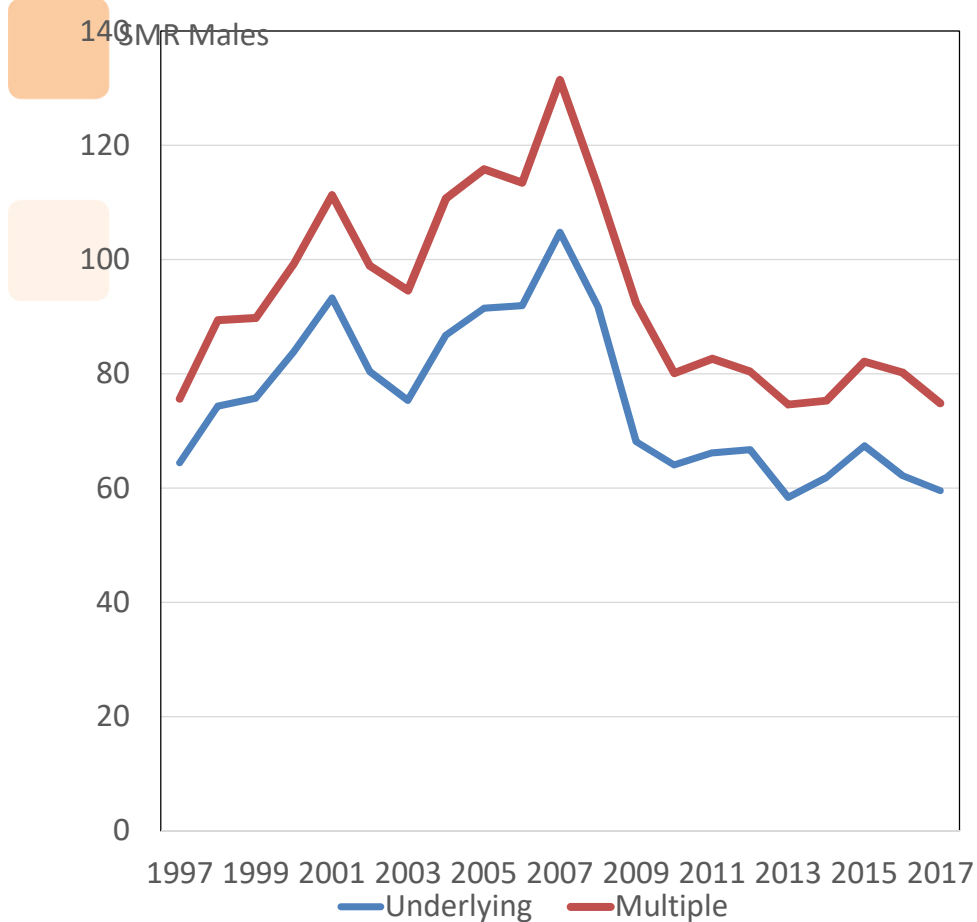
Working Party on Mental Health Definition

Mental and behavioural disorders due to use of alcohol F10, Degeneration of nervous system due to use of alcohol G31.2, Alcoholic polyneuropathy G62.1, Alcoholic myopathy G72.1, Alcoholic cardiomyopathy I42.6, Alcoholic gastritis K29.2, Alcoholic liver disease K70, Alcohol-induced chronic pancreatitis K86.0, Maternal care for (suspected) damage to foetus from alcohol O35.4, Fetus and newborn affected by maternal use of alcohol P04.3, Accidental poisoning by and exposure to alcohol X45

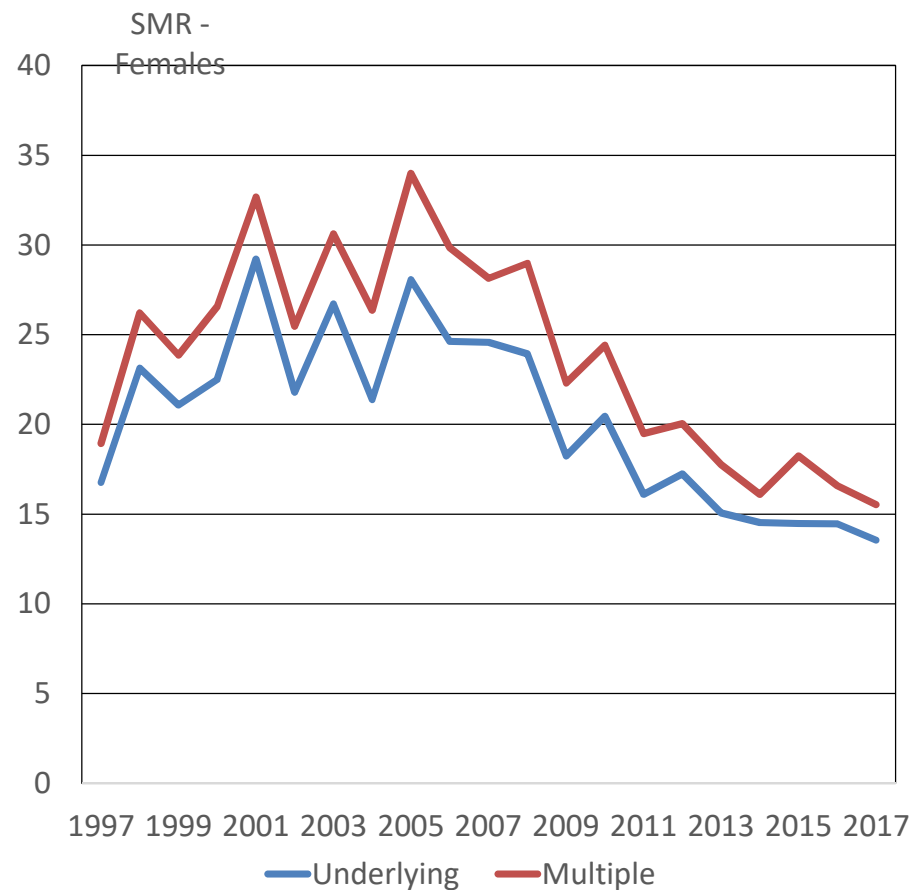


Alcohol-related mortality- underlying and contributory causes

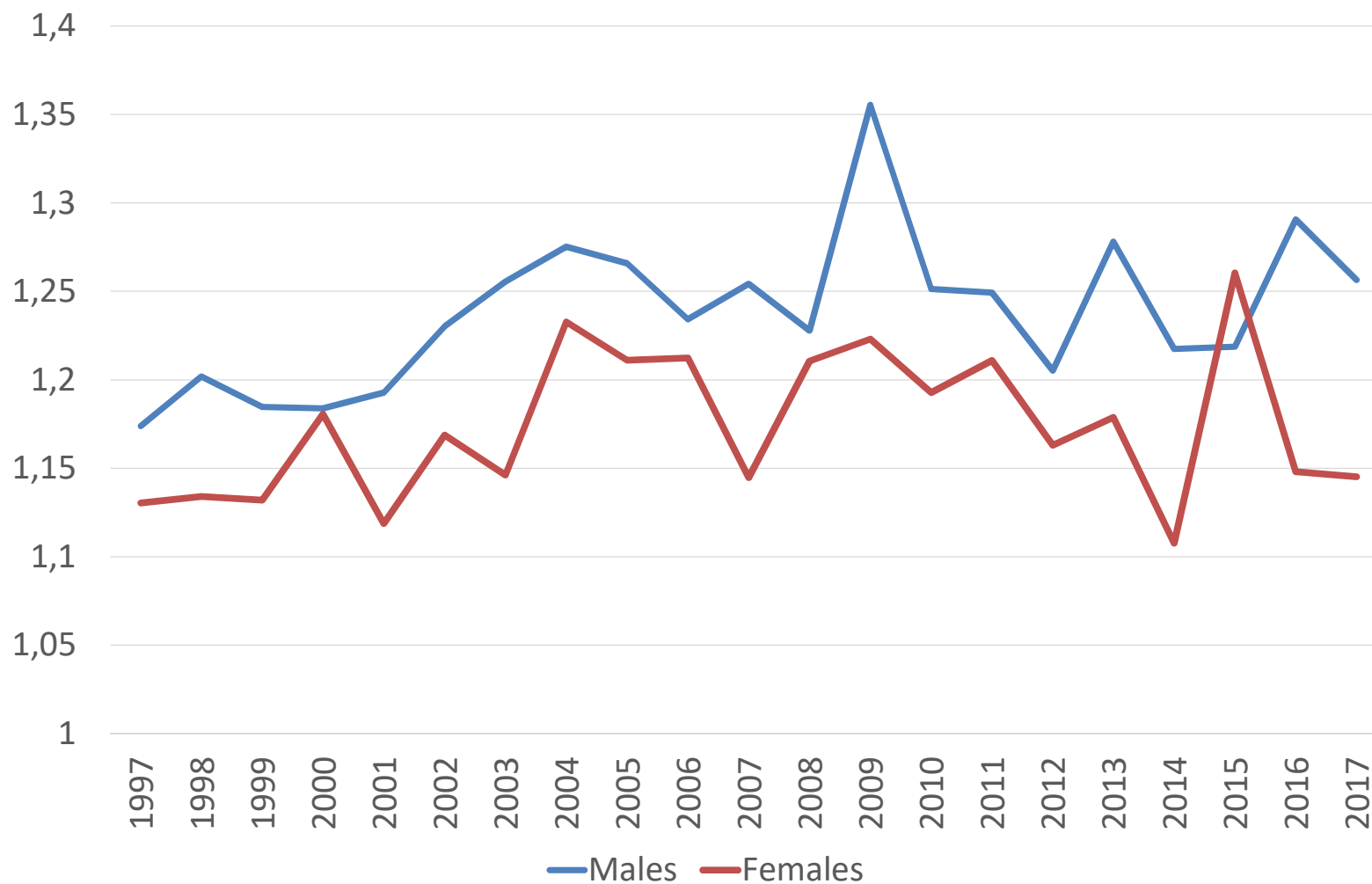
SMR Males



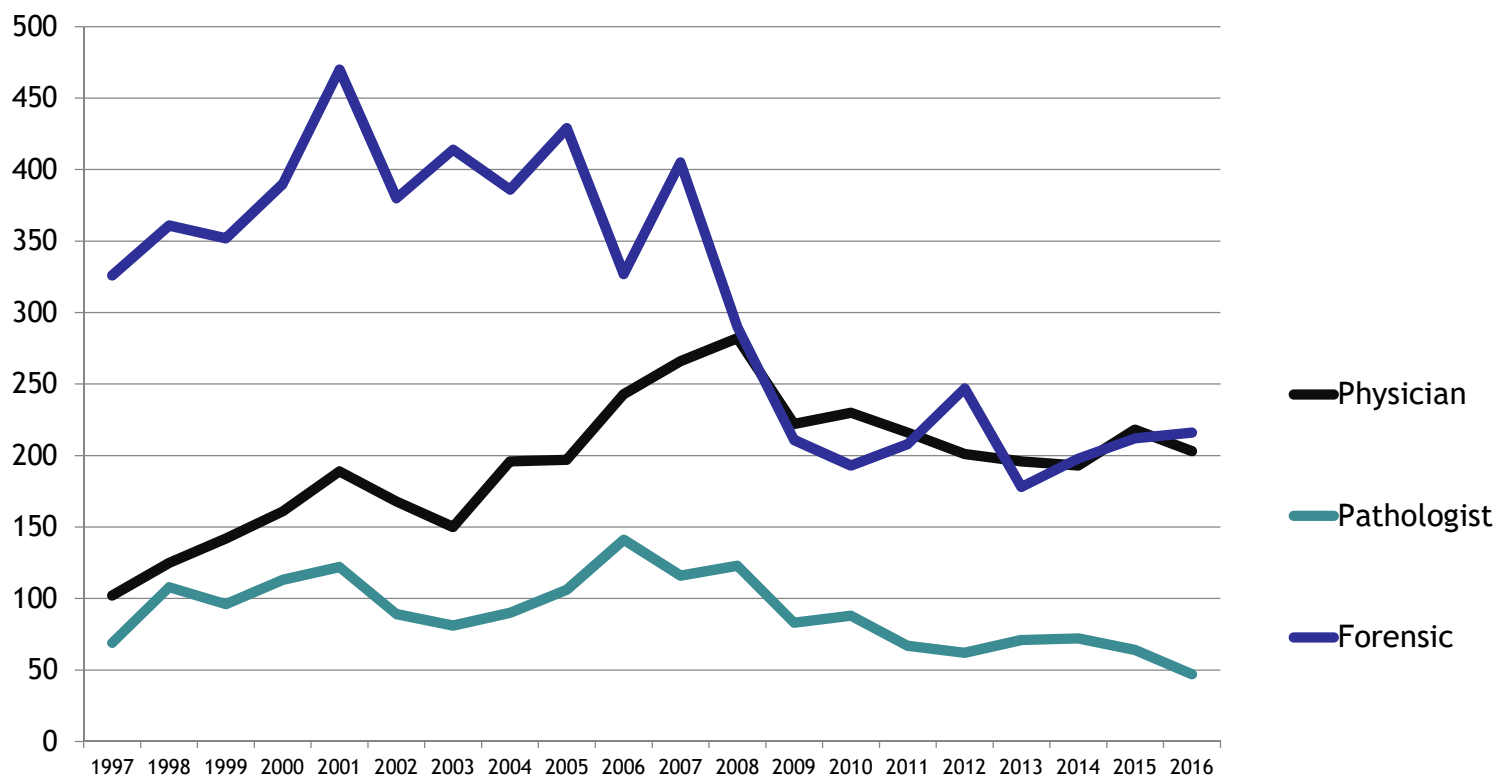
SMR females



Alcohol-related mortality, UC/MC ratio

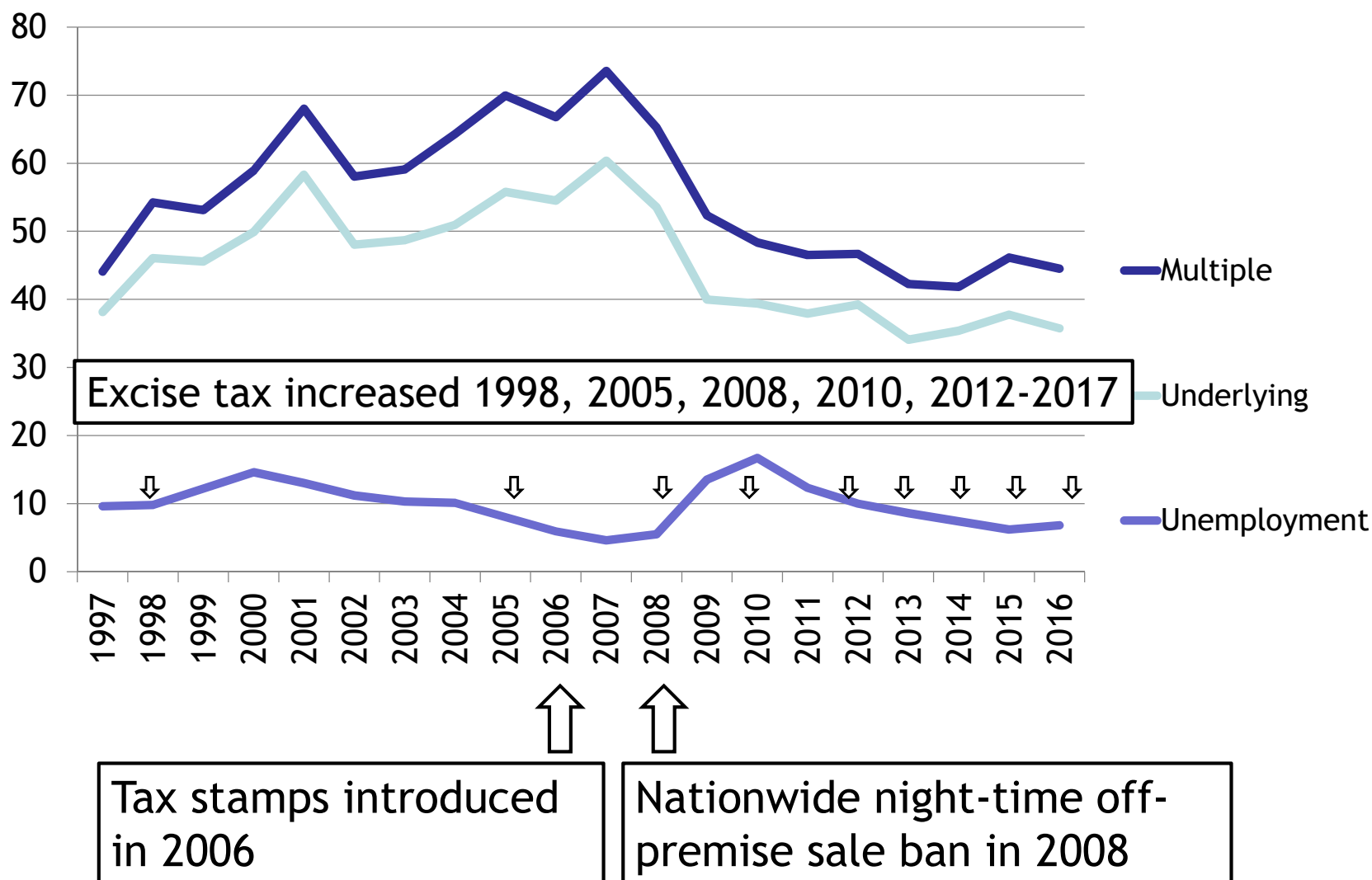


Alcohol-induced underlying cause of death by profession of certifier, absolute numbers

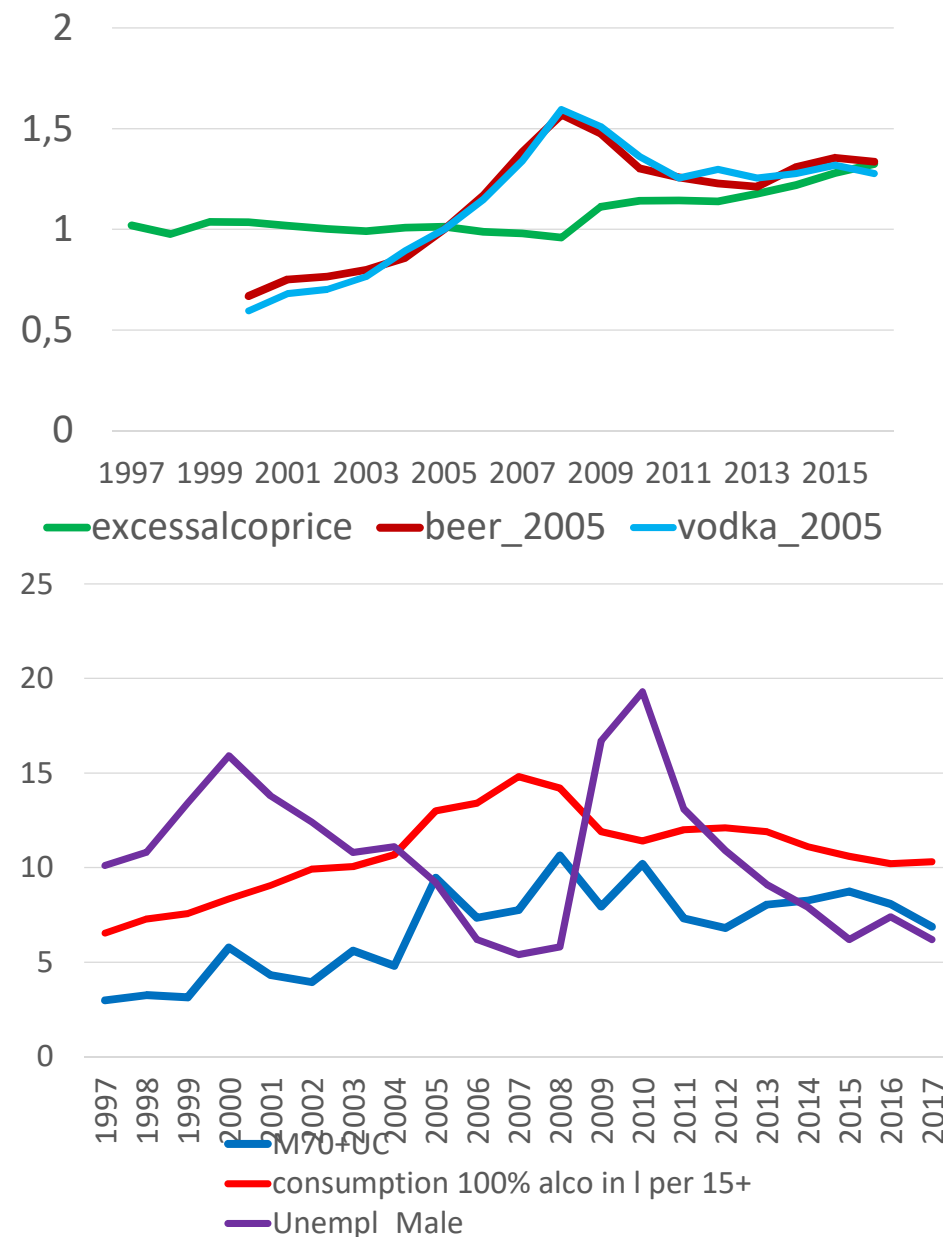
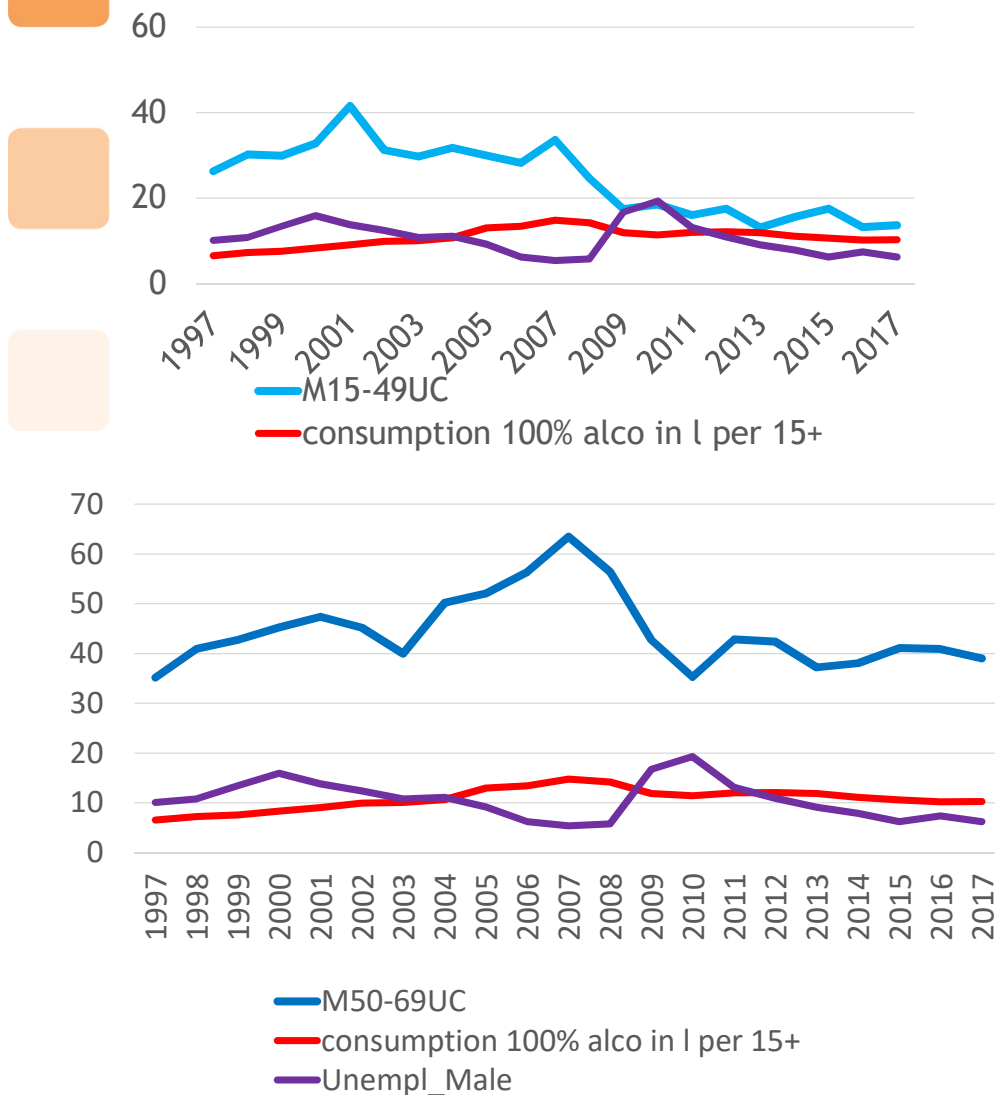


Alcohol-related mortality, unemployment rate and policy measures

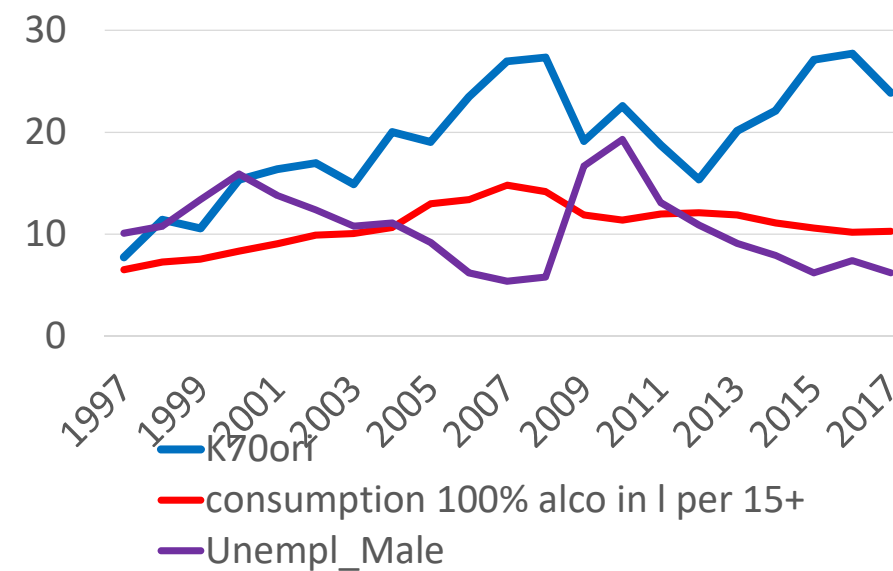
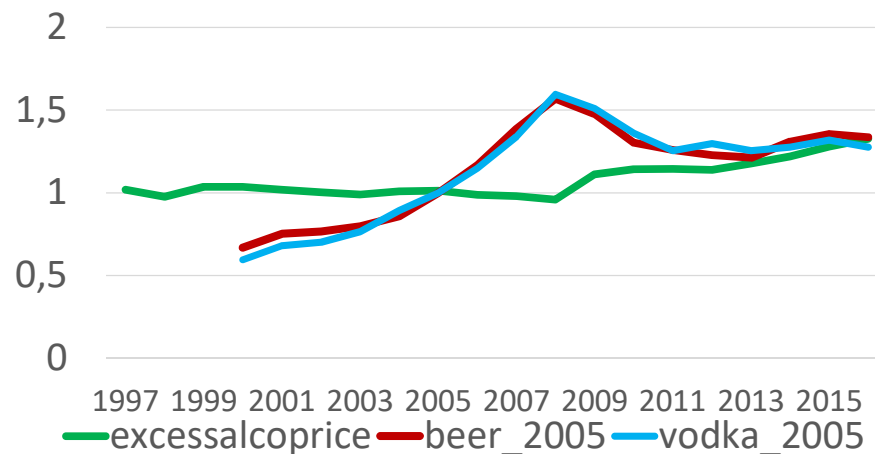
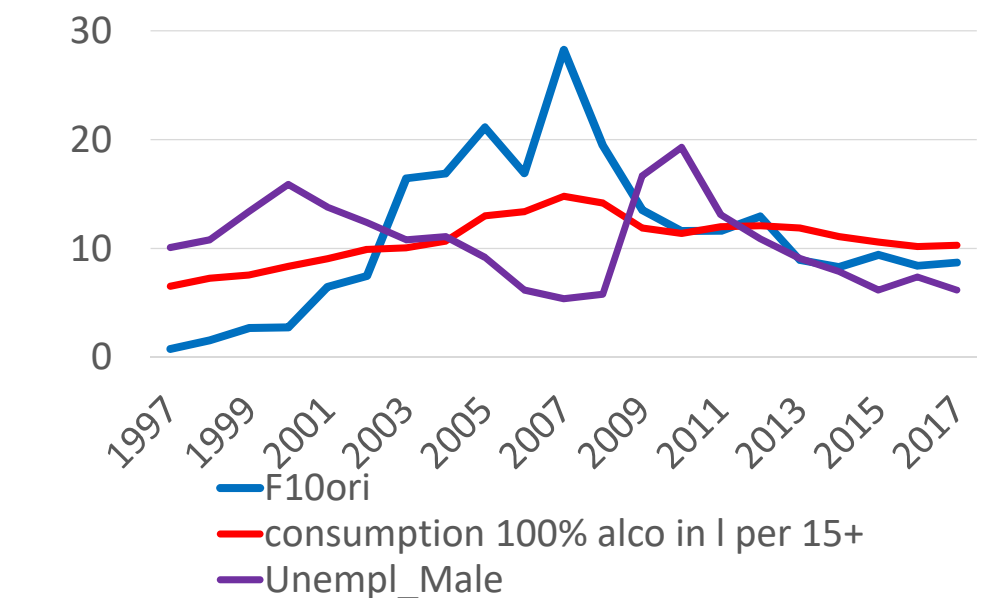
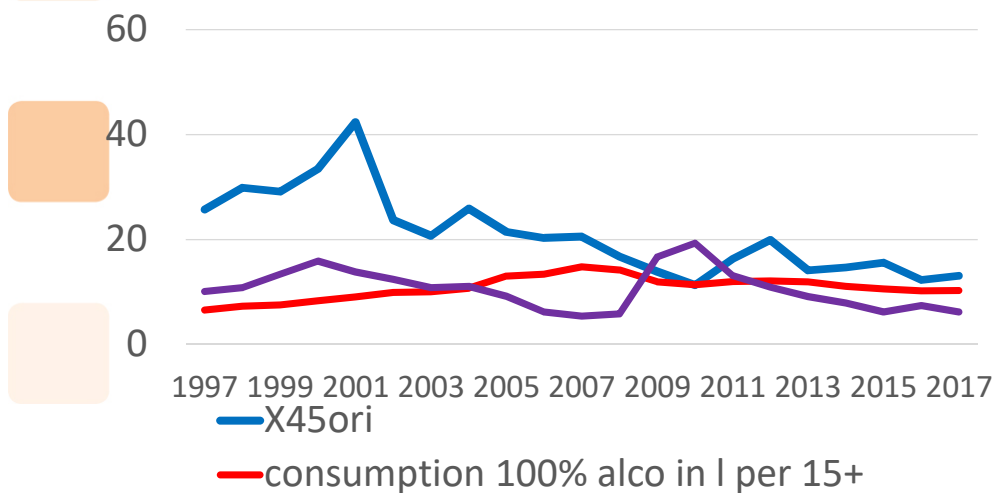
ASMR per 100,000 population, unemployment rate 15-74 per cent, both sexes



Alcohol-related mortality, male UC age group visual matching with policies



Alcohol-related mortality, male UC main causes visual matching with policies



Variables used and method for analysis

FD - % of family doctors determining COD

Excess - excess of consumer price index on alcohol on total CPI

UNEMP - unemployment rate (total or male)

Beer_2005 - how many bottles of beer one can have for an average salary to 2005 level

Vodka_2005 - how many bottles of vodka one can purchase per month for an average salary to 2005 level

Consumption - consumption of alcohol (equivalent to 100%) in litres per 15+ population

Method

From literature (Norström, Skog 2011)

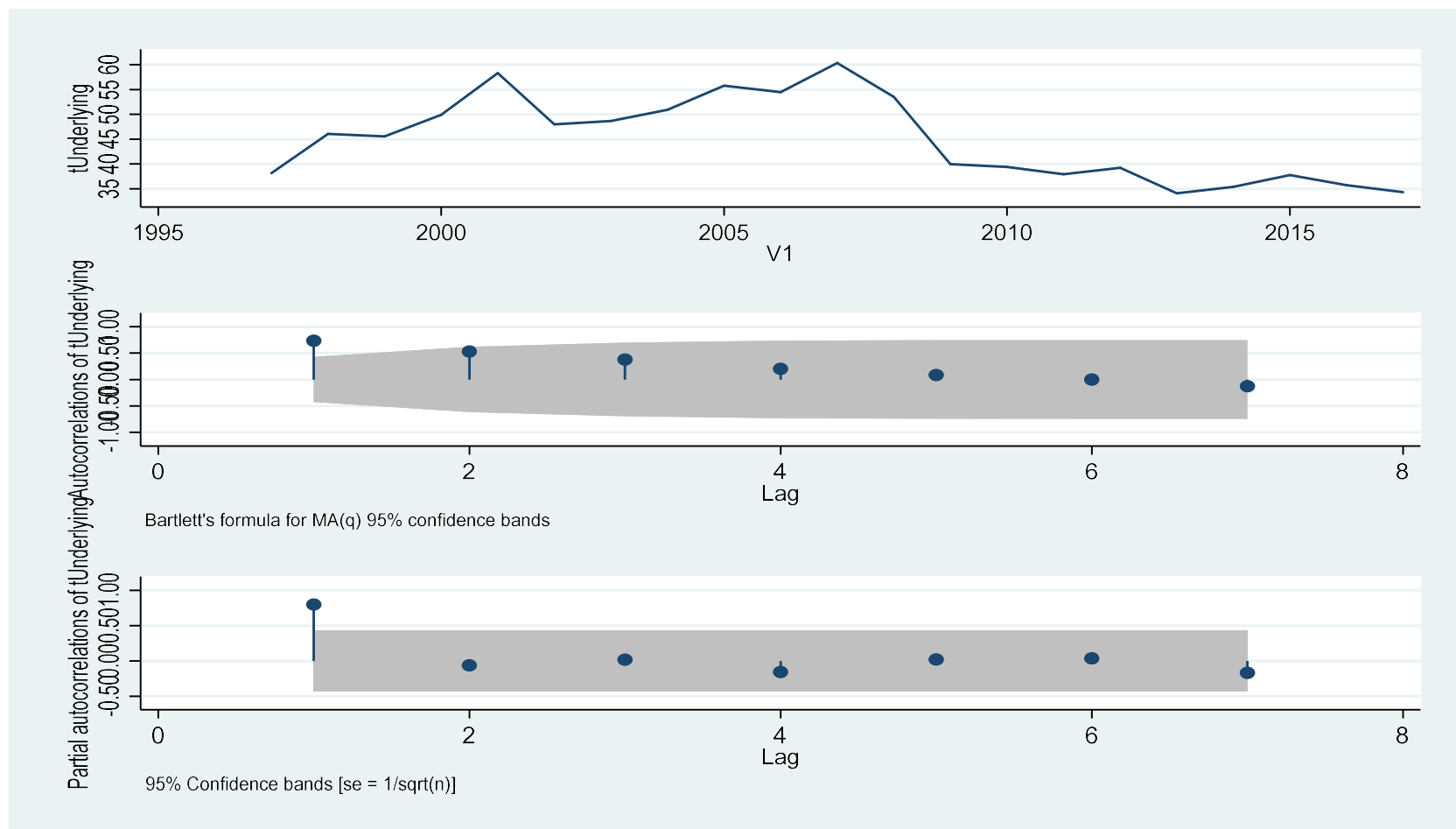
Time series analysis - ARIMA autoregressive order (1,0,0)

Applied for male and female underlying causes

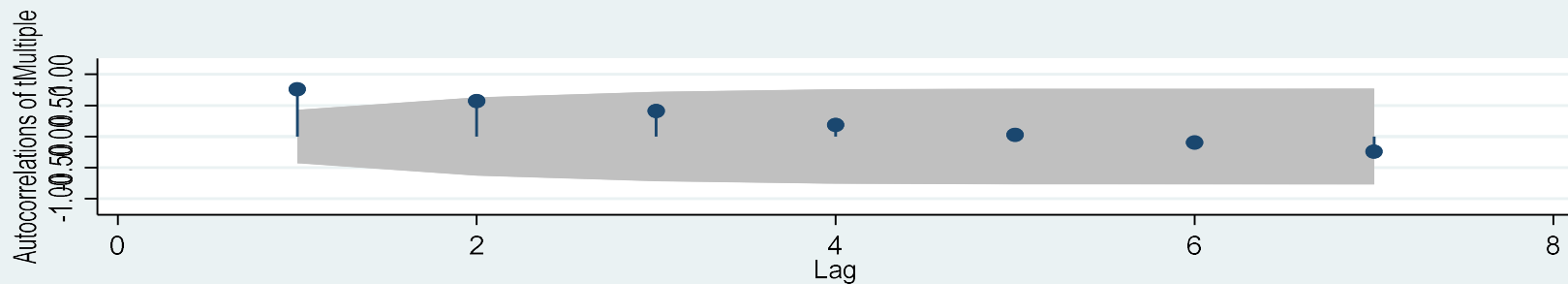
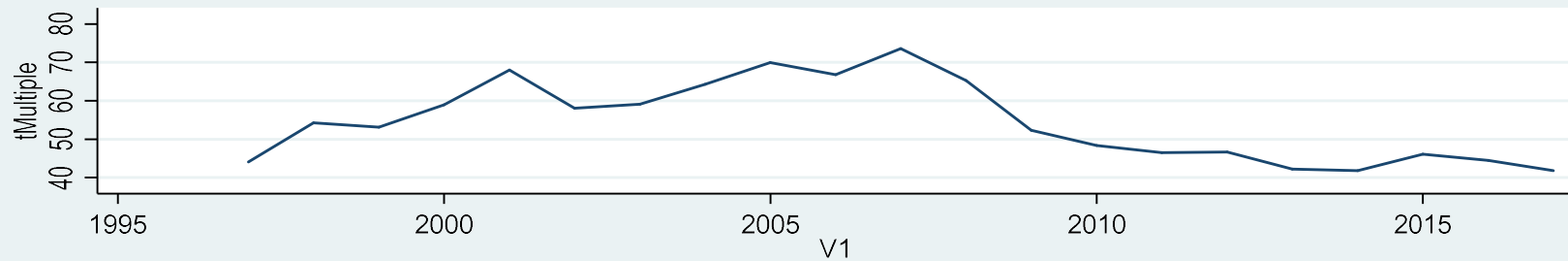
Explored 3 age groups 15-49, 50-69, 70+

Explored 3 different causes F10, X45, K70

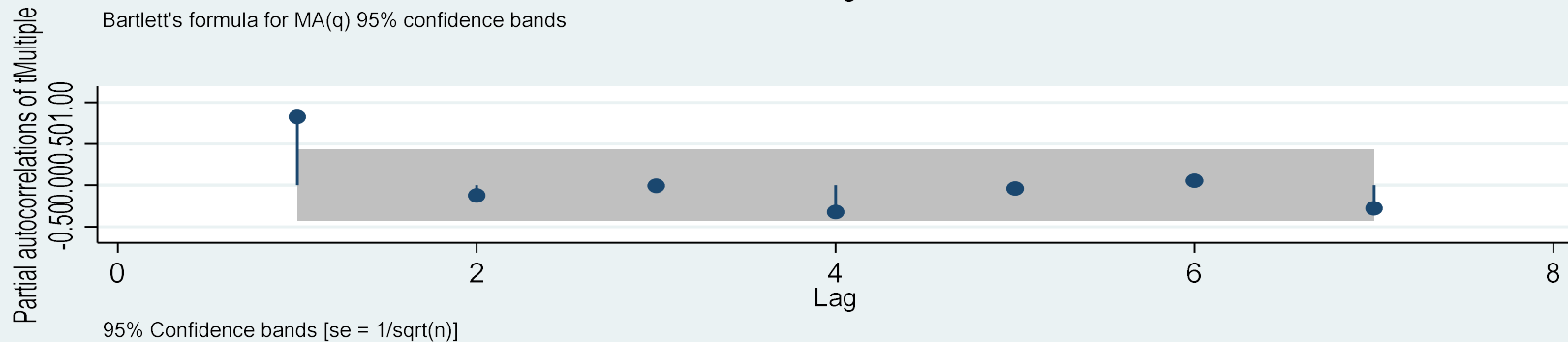
Decision-making for time series model- Underlying causes - ARIMA AR (1,0,0)



Decision-making for Contributory causes - ARIMA AR (1,0,0)

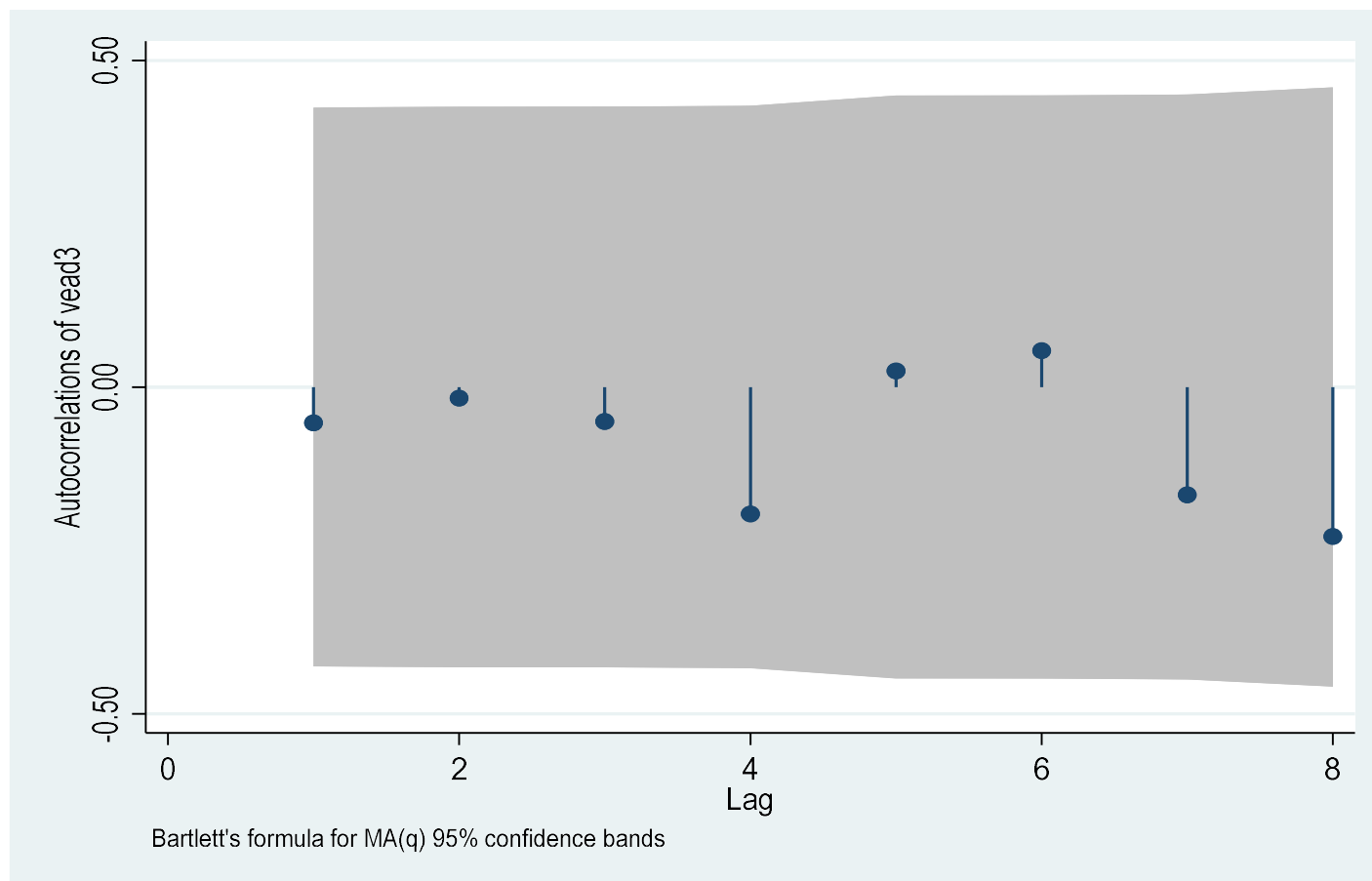


Bartlett's formula for MA(q) 95% confidence bands



95% Confidence bands [se = 1/sqrt(n)]

Control for errors after ARIMA(1,0,0)- contributory



Results for total population UC and MC

- UC most powerful contributor to reduction is if CPI on alcohol compared to total CPI increases by 1 unit, it reduces UC mortality by 14,4-82,3 (49,3) deaths per 100000
- However, the increase in consumption of pure alcohol by 1 l per 15+ population increases deaths from alcohol-related underlying causes from 0,36 to 5,75 (3.06) deaths per 100000 of underlying causes
- Additionally increase in physicians coding UC by 1% increases deaths from 0,04 to 0,41 (0.22) deaths
- For total Contributory causes the policy measures have not had significant effect, although the directions of the effect are in the same line (excess -53,1, consumption 3,6).
- MC main contributor has been the increase of coding MC by physicians- increase by 1% increases the MC from 0- 0,40 deaths (0,20).



Results for male population - UC and MC

- UC most powerful contributor is the excess of CPI on alcohol compared to total CPI by 1 unit which reduces mortality by a rate from 17.4-131.1 (-74.3).
- However, increase in consumption of pure alcohol by 1 l per 15+ population increases UC mortality by a rate from 1.9- 9.0 (5.4)
- MC main contributor is the consumption of alcohol from 1.3-11.3 (2.6)



Different contributors for different age ranges of male UC

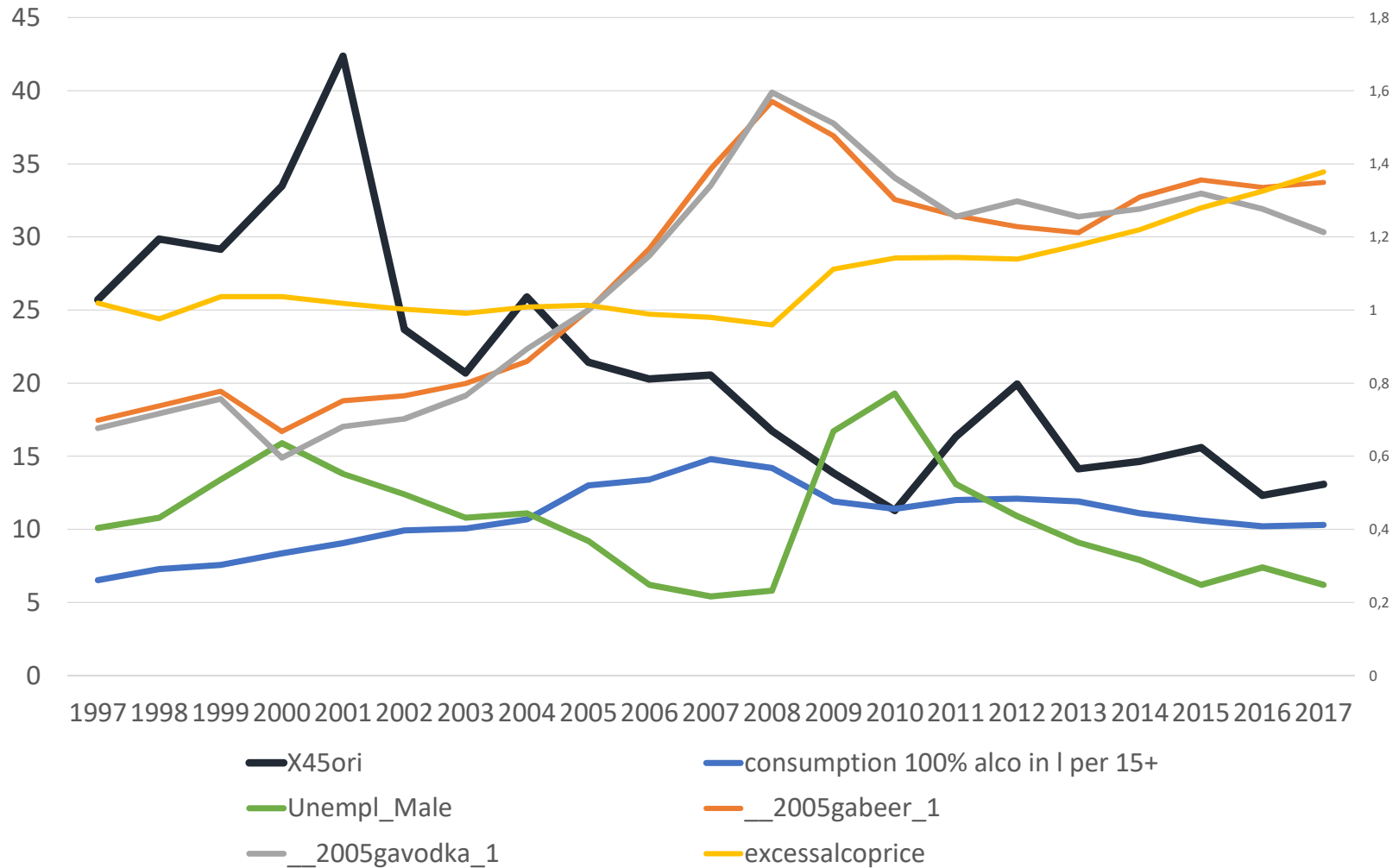
- For 15-49 most powerful contributor for decrease is if the CPI on alcohol increases by 1 unit compared to total CPI, then it reduces their mortality rate from 4.5 -85.5 (-45.1)
- For 50-69 increase by 1l in consumption increases their mortality rate from 1.3 -5.1 (3.2)
- For 70+ male population the main contributors are if one can purchase more beer or vodka per average salary compared to 2005 level by 1 unit - it increases UC rate from (beer) 4.8-8.4 (6.5); (vodka) from 4.7-7.9 (6.3), but also increase in consumption of pure alcohol by 1l increases deaths from UC: 0.4-1.2 (0.8)



Different contributors for different diseases

- X45 - main contributors are increase in purchasing power of beer and vodka which both reduce mortality for alcohol-related accidents- which is a very contradictory result.
 - Most probably different contributors are having effect at the same time (restrictions on availability, unemployment, excess of CPI on alcohol and consumption possibilities - see figure) - most probably it represents increase of purchasing power of other interests as well, but also wider increase in wealth in the society (more controls on driving behavior), also change in values.
- F10 - main contributor to the increase in this underlying cause is increase in consumption of pure alcohol(2.0-3.6 (2.8)), but even more increase in purchasing power of beer increases rates from 2.1-21.8 (11.9) and of vodka from 1.0- 21.8 (11.9)
- K70 - the same contributors as for F10 (consumption 0.6-3.1 (1.9), beer PP (8.3-22.9 (15.6)), vodka PP (8.7- 18.9 (13.8)). This is the only group where unemployment plays a role, increase by 1% decreases mortality from K70 slightly(-1.3—0.2 (-0.7))

Visual correlations of macro -indicators with male X45





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Tervise Arengu Instituut

National Institute for Health Development



Luule.sakkeus@tlu.ee

Gleb.denissov@tai.ee

lili@tlu.ee

THANK YOU!

Cases with alcohol-induced contributory causes by underlying cause of death

	Abs. number	% of total
Certain infectious diseases (A, B)	168	6,64
..of which tuberculosis (A15-19, B90)	113	4,47
Malignant neoplasms (C)	143	5,65
Circulatory system (I)	1153	45,57
..of which IHD (I20-25)	590	23,32
..non-alcoholic cardiomyopathy (I42 excl. I42.6)	38	1,50
Respiratory system (J)	331	13,08
..of which pneumonia (J12-18)	197	7,79
Digestive system (K)	163	6,44
..of which non-alcoholic pancreatitis (K85-86 excl. K86.0)	54	2,13
External causes (V-Y)	299	11,82
Other	160	6,32