Mortality by cause in Moldova since 1965: assessing long-term trends and recent changes

Olga Penina*

France Meslé**

Jacques Vallin**

*ASM, Chisinau; **INED, Paris

«Демографические вызовы XXI века»
Семинар, ИДЕМ
Moscow, 22 April, 2010

Overview

The analysis of long-term trends is complicated by periodic revisions of classifications of causes of death. A method for reconstructing time series developed by *F.Meslé, J.Vallin* (INED) is a way to overcome this problem.

Previous experience: France, Poland, West Germany, Czech Republic, the USSR, Russia, Ukraine, the Baltic and Caucasian countries, Byelorussia

The work for Moldova is carried out in the framework of the international Project "European Convergence and Divergence in Causes of Deaths" (INED, MPIDR)

Major stages of the reconstruction work

	SC 1965	SC 1970	SC 1981	SC 1988	ICD-9	ICD-10
Stage 0	1965-1969	1970-1980	1981-1987	1988-1990	1991-1995	1996-2008
Stage 2	1965-1970					
Stage 3	1965-1981					
Stage 4	1965-1990					
Stage 5	1965-1995					
Stage 6	1965-2008					

A method of reconstruction including three basic steps:

1. Correspondence Tables
2. Fundamental Associations of Items
3. Transition Coefficients

The quality of death registration

- Infant mortality under-registration in the 1960s and 1970s
- Problem of "live-birth" definition
- Old-age mortality
- Ill-defined causes of death, including "Senility"

Outline

- Infant mortality reassessment
- Old-age mortality correction
- Recent "Senility" peak
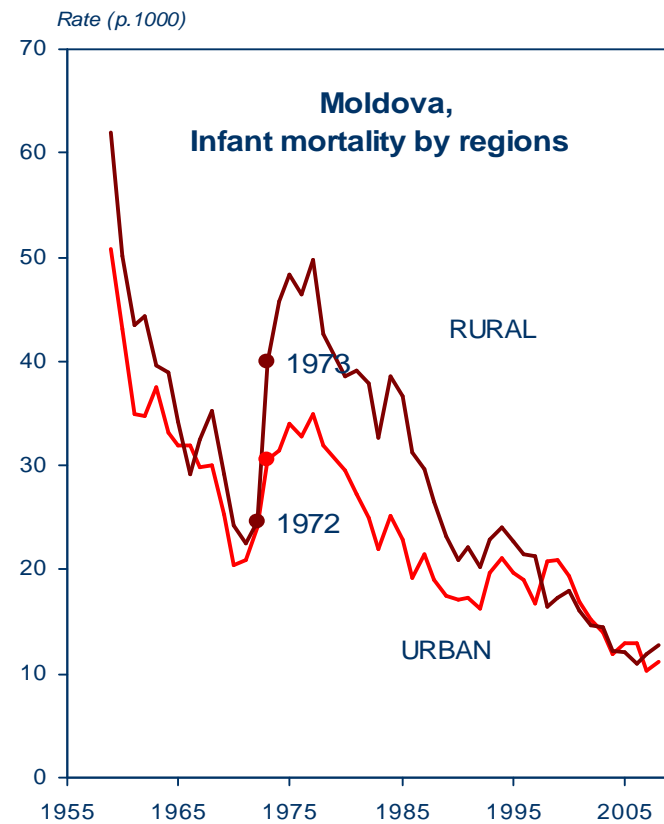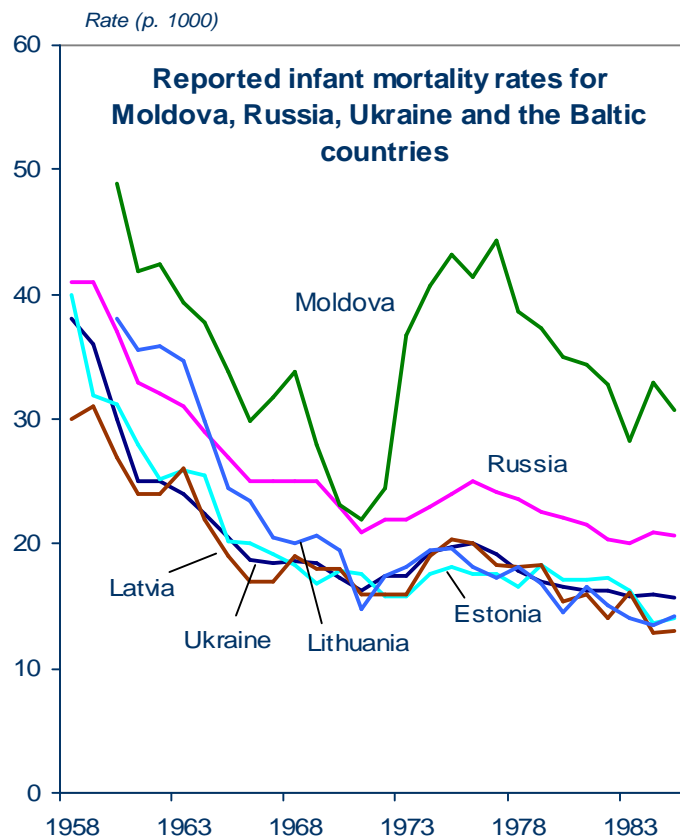- Evolution of mortality by causes of death since 1965 (preliminary results)

Reassessment of Infant Mortality in Moldova

Evolution of neonatal and post-neonatal mortality in Moldova, 1945-2008
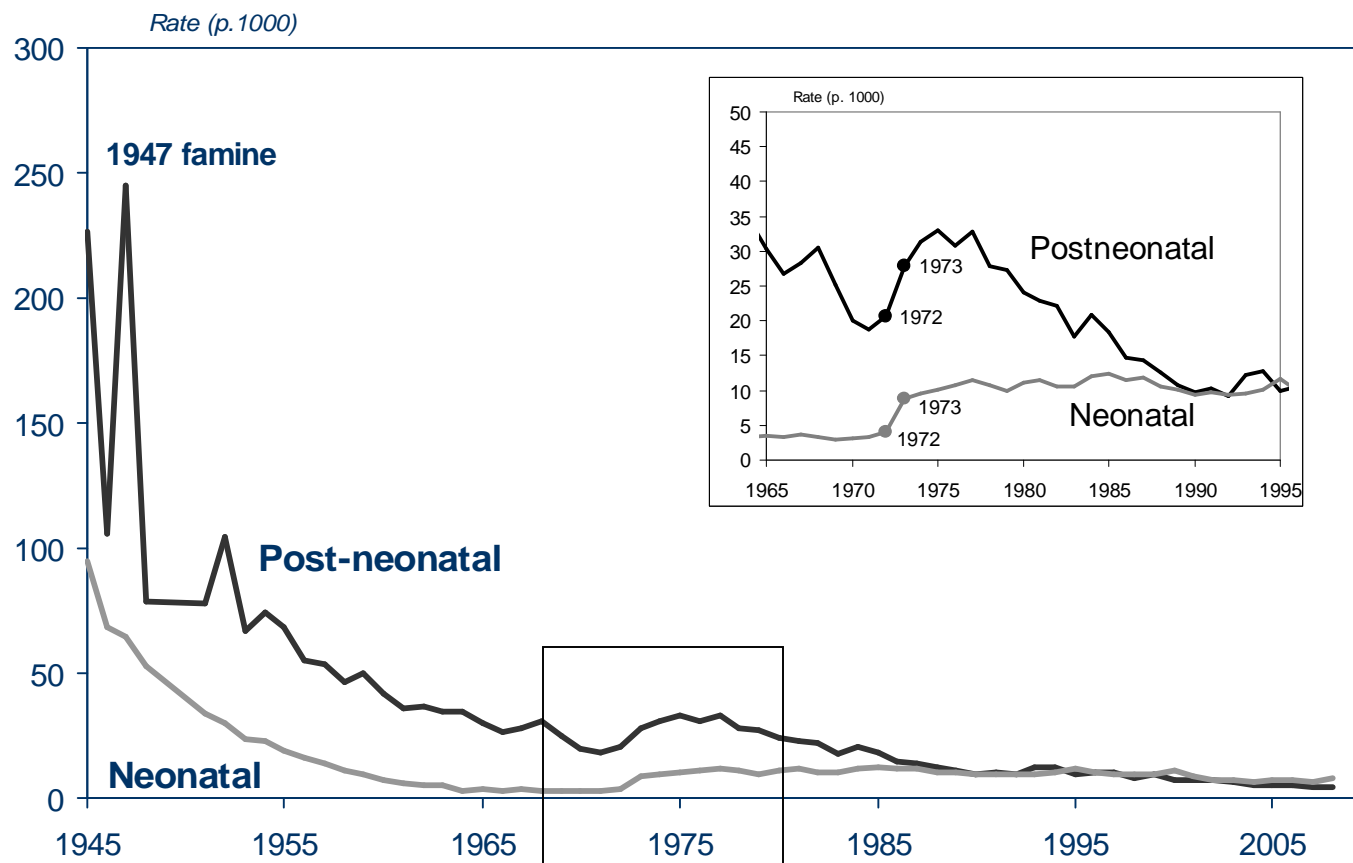
Under-registration of infant deaths before 1973

Rate (p. 1000)

Reported infant mortality rates for Moldova, Russia, Ukraine and the Baltic countries

Moldova

Russia

Latvia

Ukraine   Lithuania

Estonia

1958   1963   1968   1973   1978   1983

Rate (p.1000)

Moldova, Infant mortality by regions

RURAL

1973

1972

URBAN

1955   1965   1975   1985   1995   2005

Reported early, late-neonatal and post-neonatal mortality rates, Moldova, 1959-2008
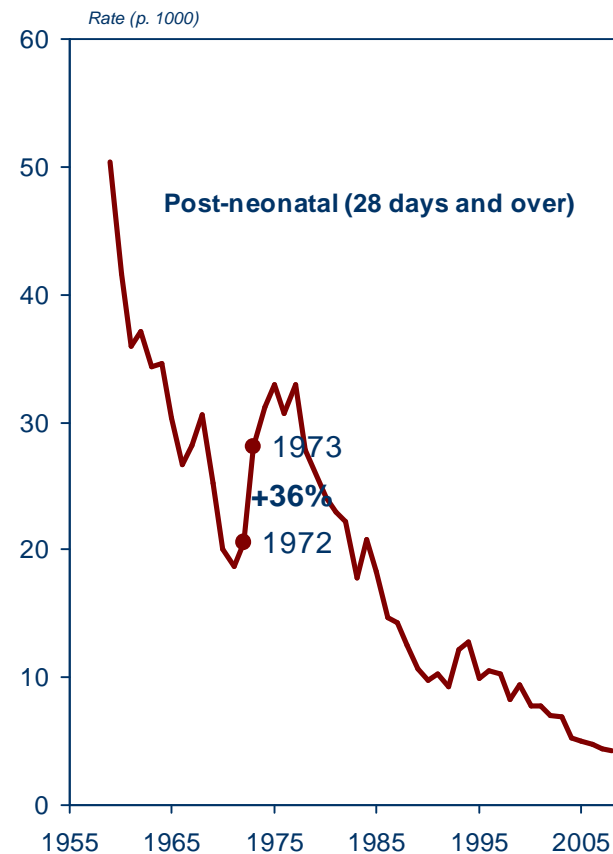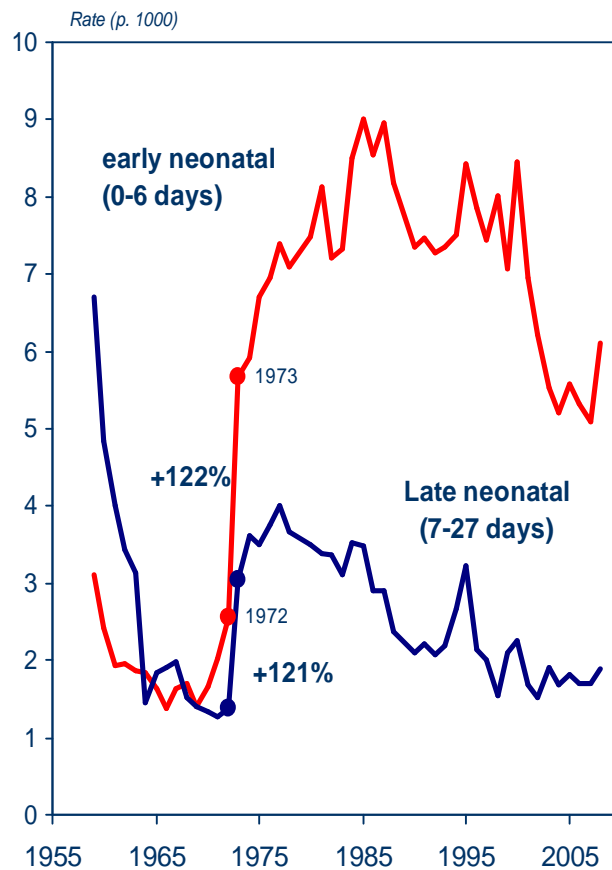
Reported neonatal and post-neonatal mortality rates by place of death, Moldova, 1959-2008
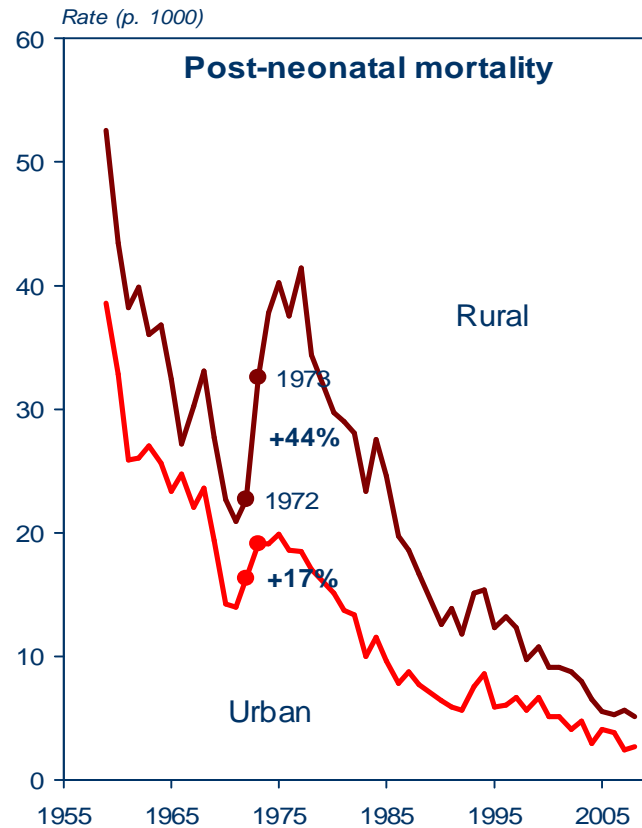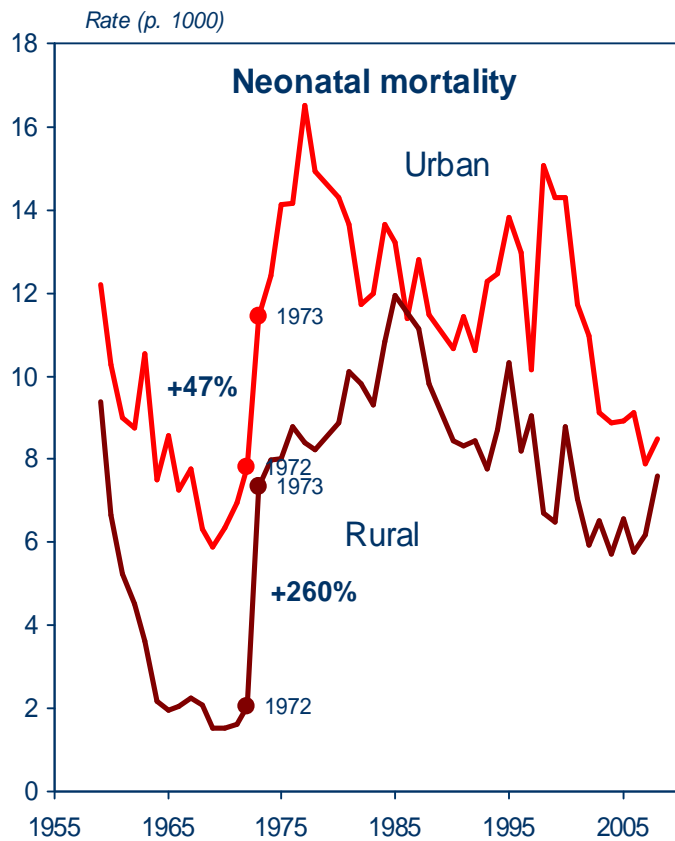
Two methods of infant mortality correction due to the under-registration before 1973

Absolute method

$$R'_i = R_i + (R_{1973} - R_{1972})$$

Relative method

$$R'_i = R_i \times \frac{R_{1973}}{R_{1972}}$$

R_i $(R_{1945}, R_{1946}....R_{1972})$ Registered infant mortality rates before 1973

R'_i $(R'_{1945}, R'_{1946}....R'_{1972})$ Corrected infant mortality rates before 1973

Relative and absolute methods of neonatal mortality correction for 1945-1972, Moldova, for urban and rural regions
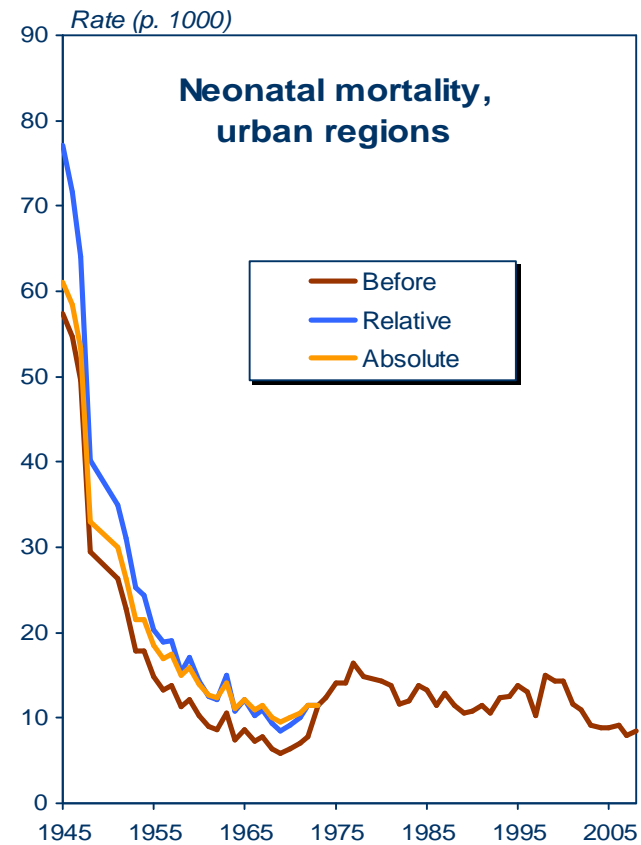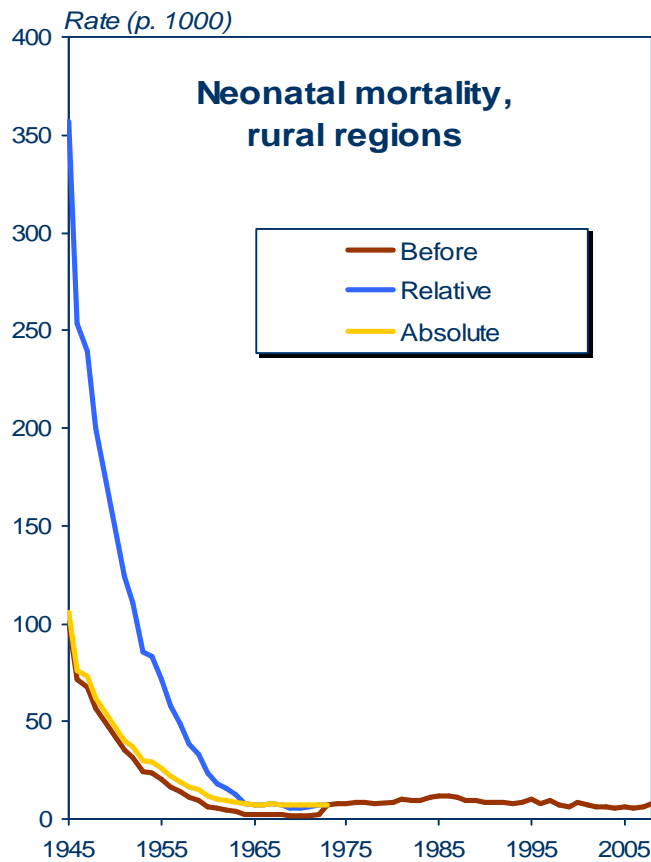
Relative and absolute methods of post-neonatal mortality correction for 1945-1972, Moldova, for urban and rural regions
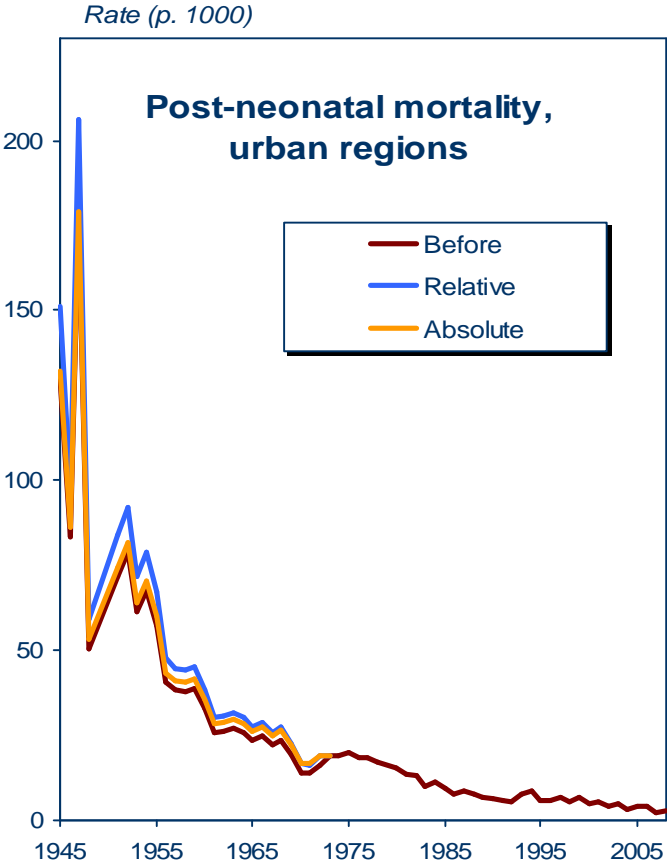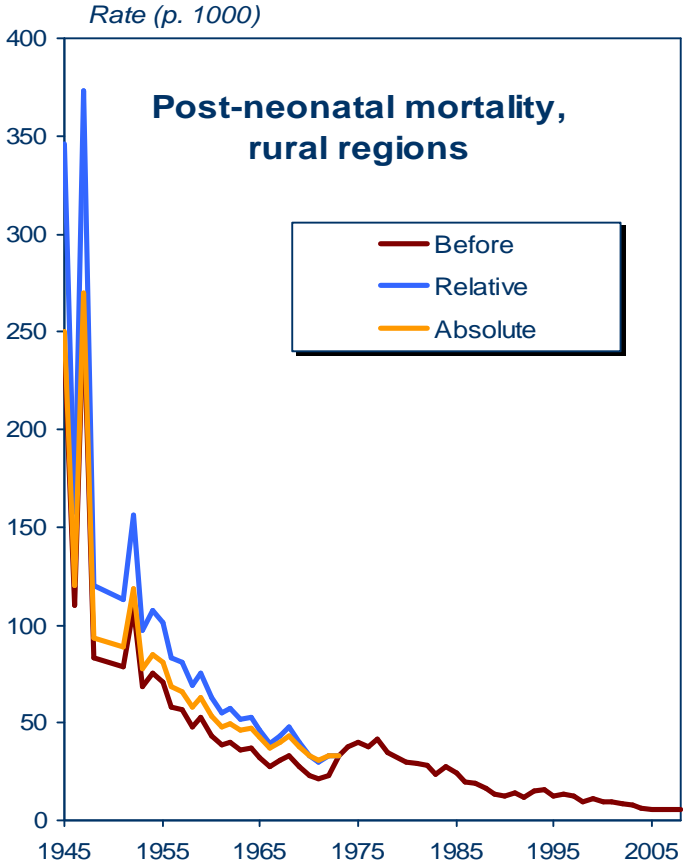
Relative, absolute and combined methods of infant mortality correction for 1945-1972, Moldova
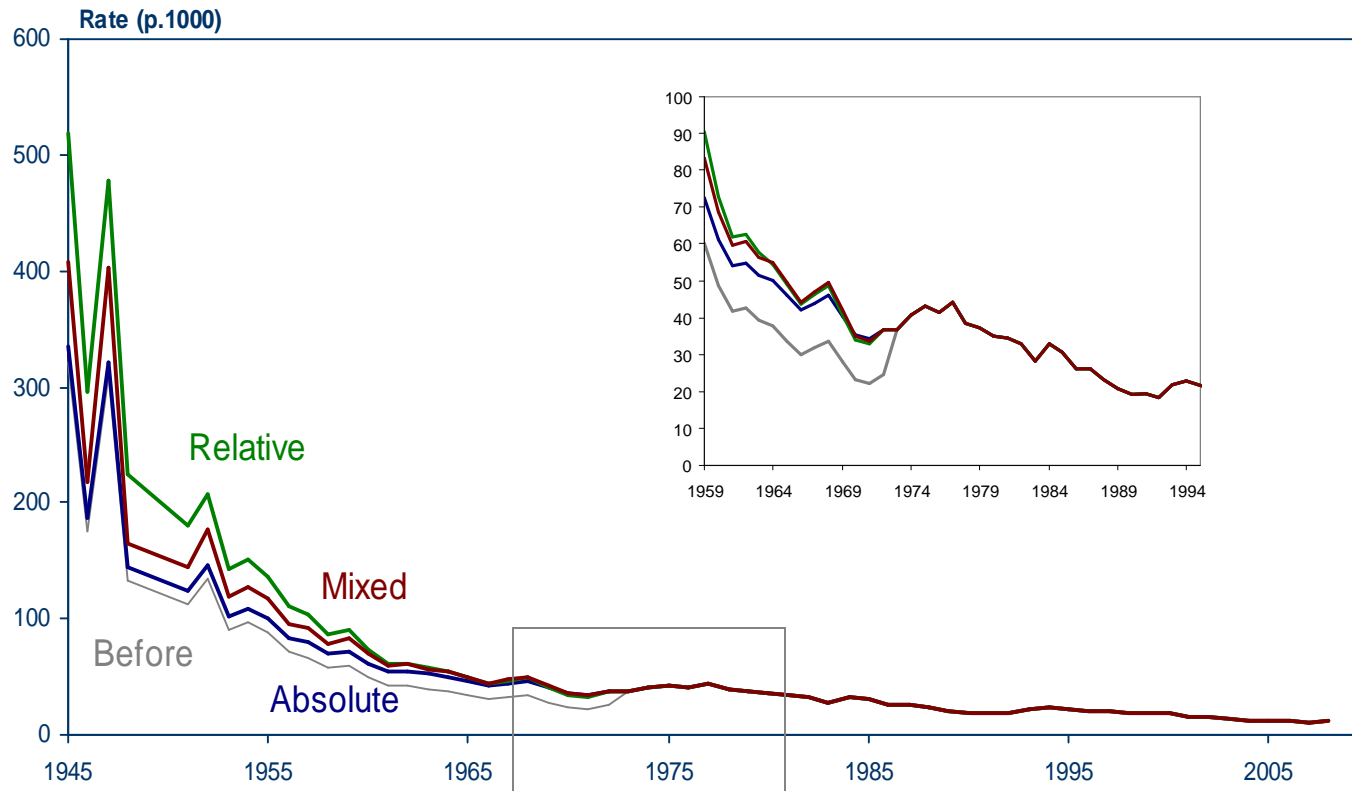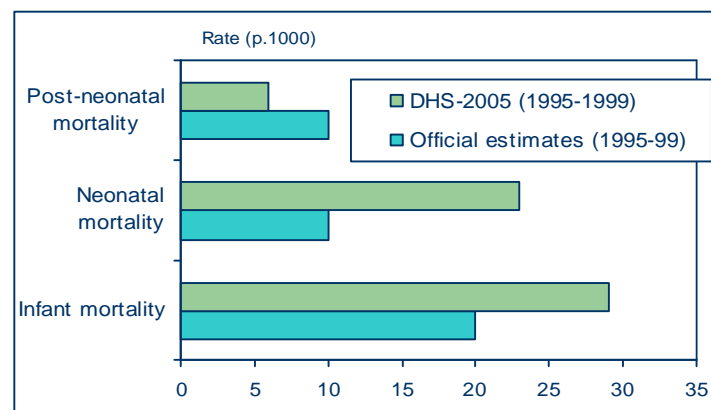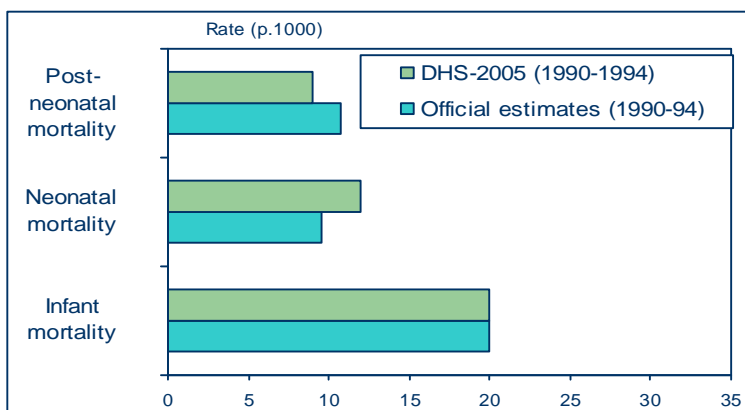
# Trends in infant mortality rates by cause before and after correction, Moldova
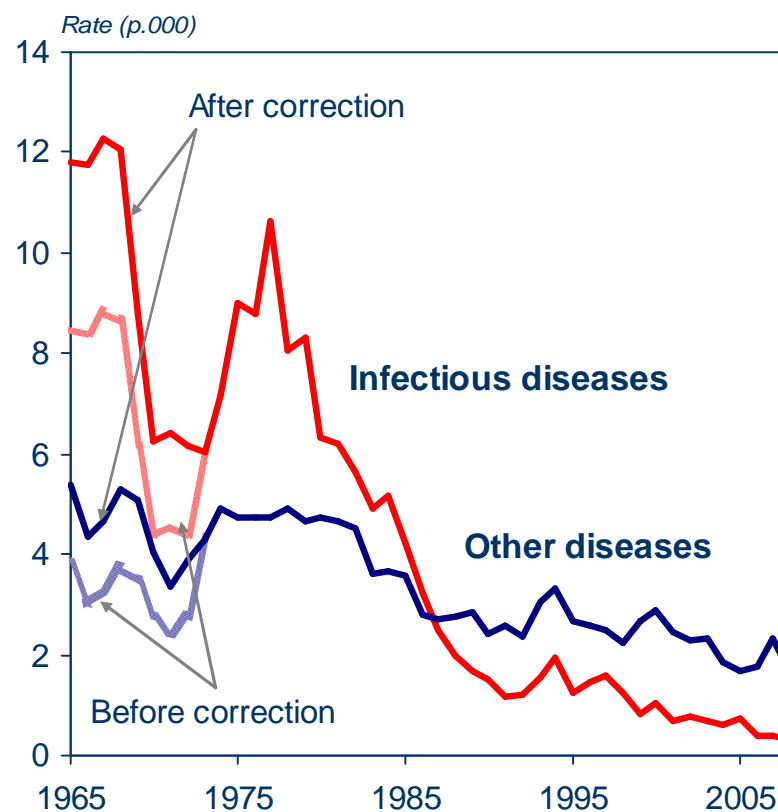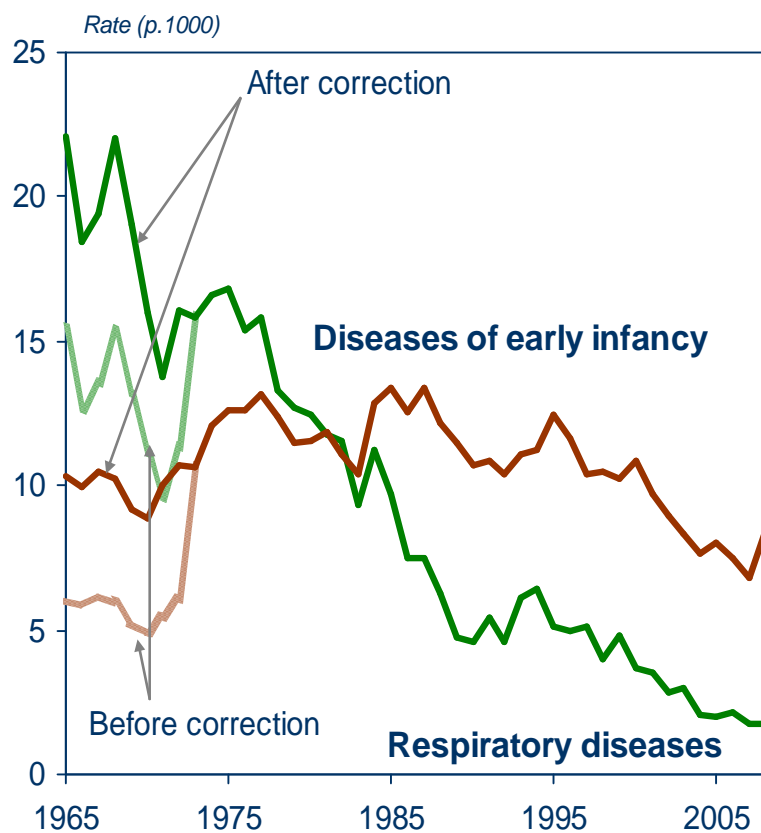
Trends in early neonatal mortality in Moldova, 1985-2008

Rate (p.1000)

50% adjustment

medical documentation (500gr.)

Official estimates
(1000 gr.+)
since 2008 (500gr.+)
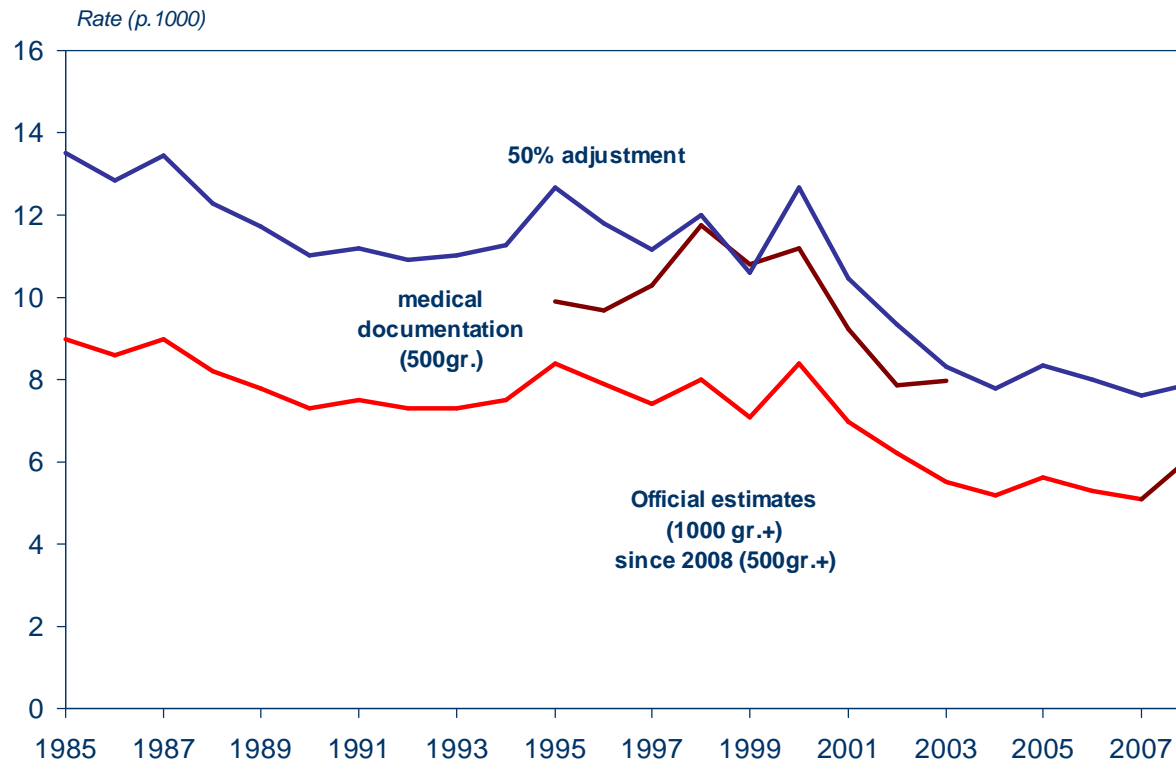
# Infant, neonatal and post-neonatal mortality rates according to official estimates and DHS-2005 in Moldova, 1990-2004
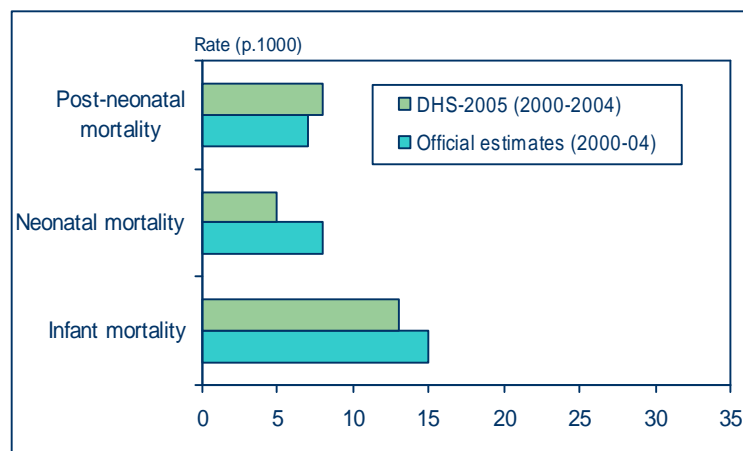
# Corrected trends of life expectancy at birth after two infant mortality corrections
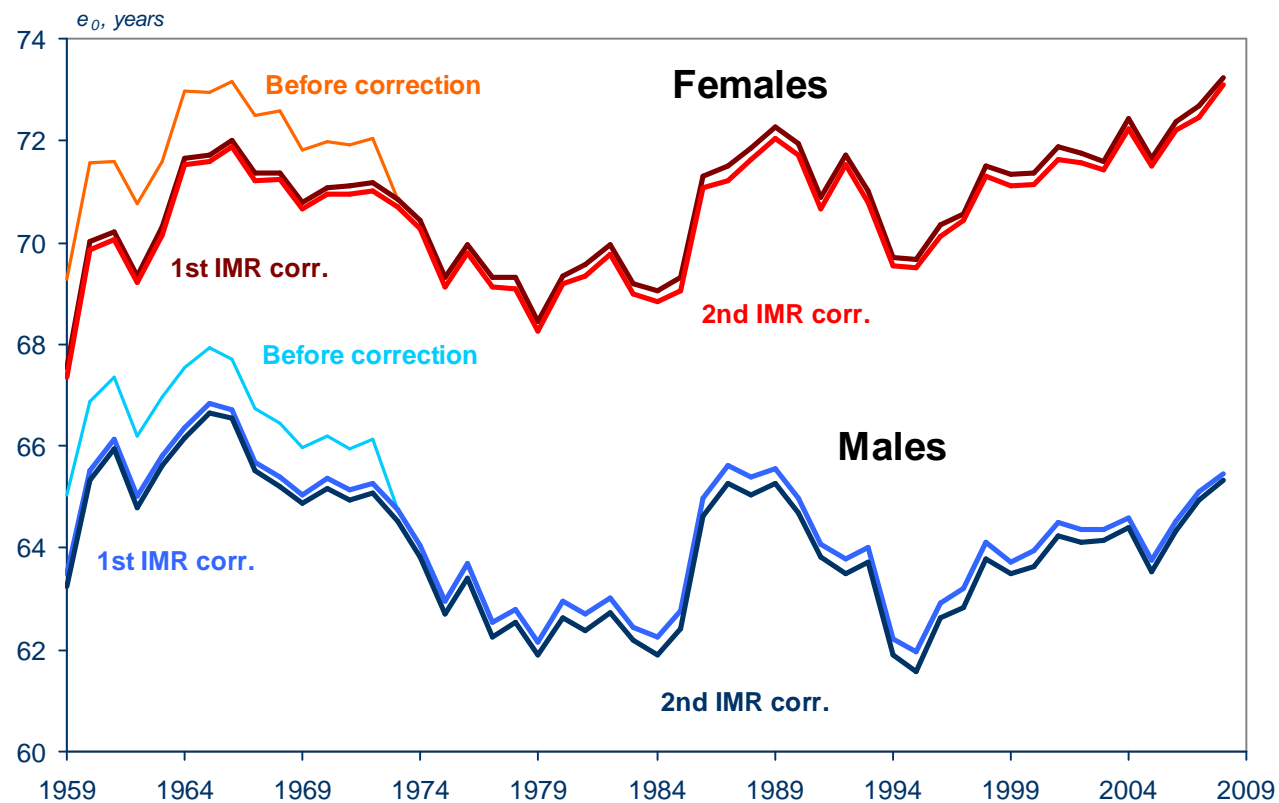
Old-age mortality correction

Relative difference between observed <u>male</u> age-specific probabilities of dying of each year (1965-1972) and those of Coale and Demeny life table, interpolated levels
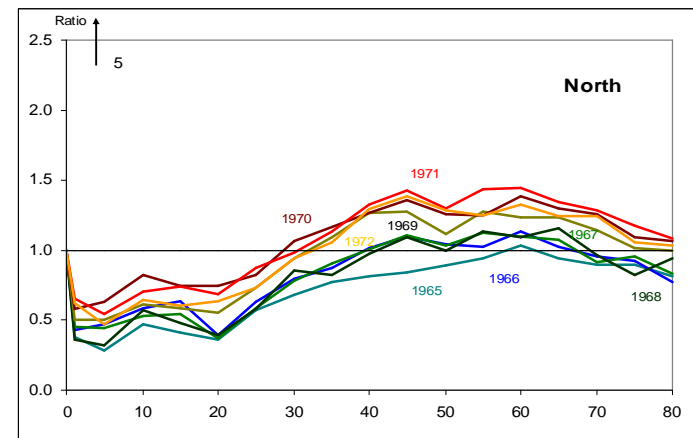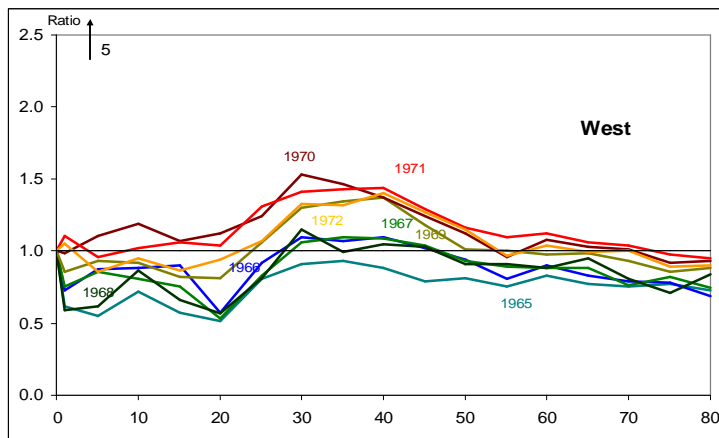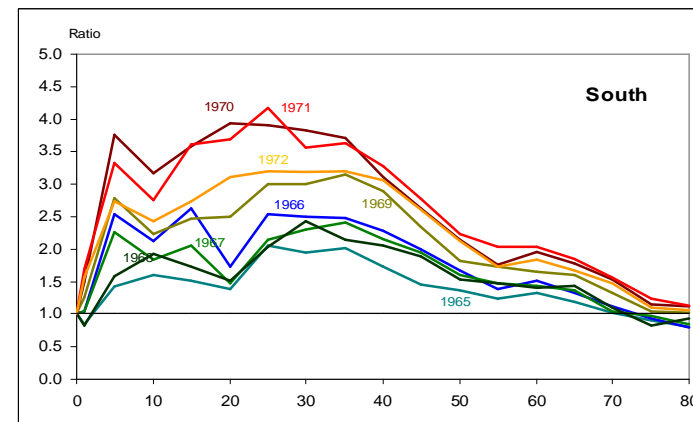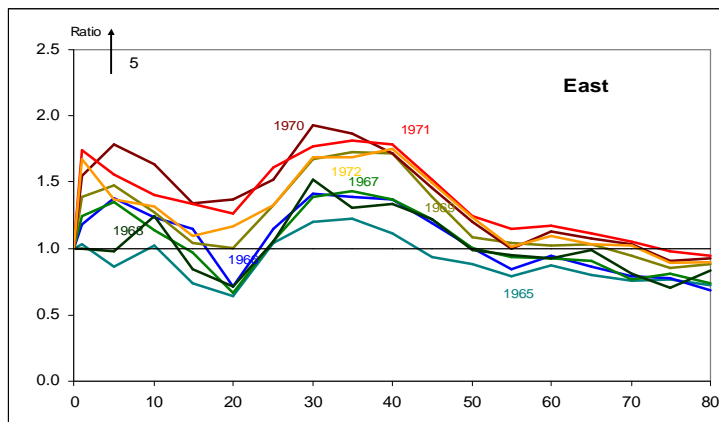
Relative difference between observed <u>female</u> age-specific probabilities of dying of each year (1965-1972) and those of Coale and Demeny life table, interpolated levels
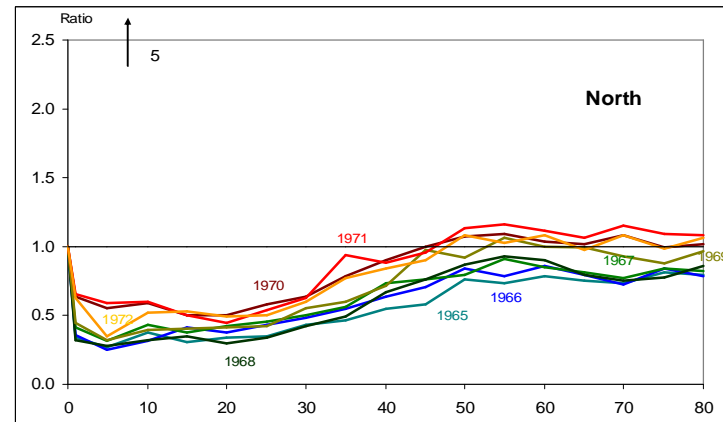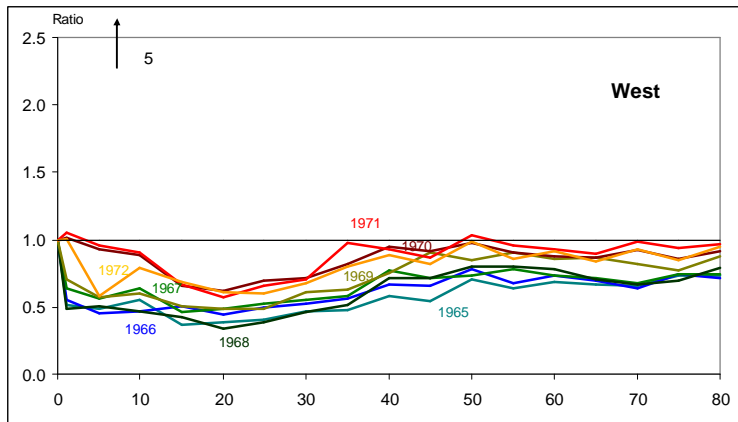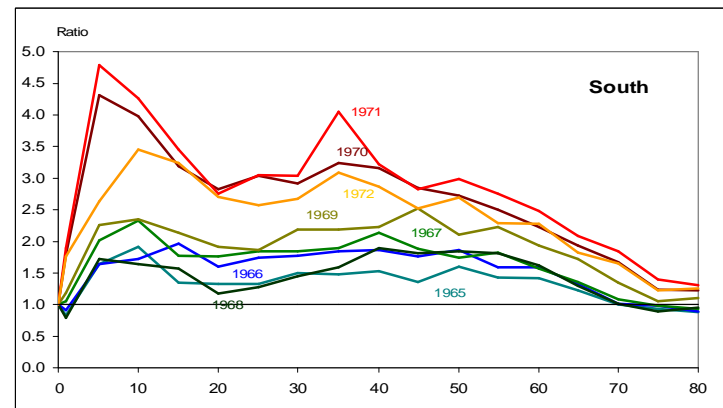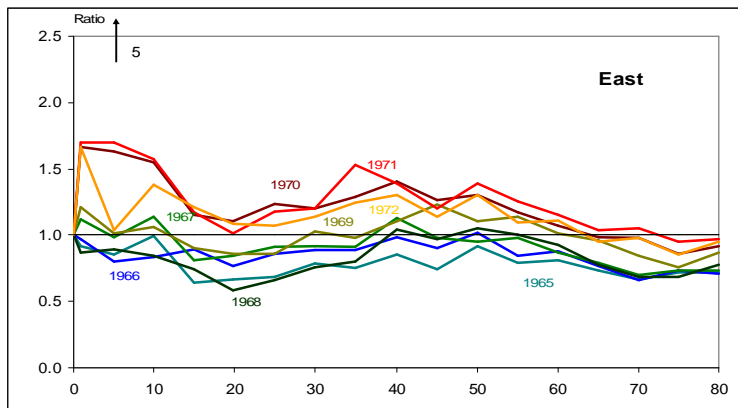
Life expectancy at age 60: observed values and values in Coale and Demeny model life tables corresponding to the same level of infant mortality rate

| Year	Infant Mortality Rate estimated	e60 observed	EAST	WEST	SOUTH	NORTH	Average	Average difference
		e60 values in the models, interpolated levels, 1959-1972						
				Males				
1965	55.0	17.7	15.8	15.7	18.2	17.3	16.7	-1.0
1966	48.4	17.7	16.0	15.9	18.8	17.6	17.1	-0.6
1967	53.1	17.4	15.9	15.7	18.4	17.4	16.8	-0.6
1968	55.8	17.2	15.8	15.7	18.2	17.2	16.7	-0.5
1969	47.1	16.6	16.1	16.0	18.9	17.7	17.2	0.6
1970	40.6	16.2	16.4	16.2	19.5	18.1	17.5	1.3
1971	40.0	15.9	16.4	16.2	19.5	18.1	17.6	1.6
1972	43.6	16.4	16.3	16.1	19.2	17.9	17.4	1.0
				Females				
1965	48.6	20.3	17.6	17.3	20.6	18.3	18.5	-1.8
1966	44.7	20.5	17.8	17.5	21.0	18.6	18.7	-1.7
1967	45.0	20.2	17.8	17.4	21.0	18.5	18.7	-1.5
1968	48.0	20.3	17.7	17.3	20.7	18.3	18.5	-1.8
1969	41.1	19.2	18.0	17.6	21.4	18.8	19.0	-0.2
1970	34.1	19.1	18.5	18.0	22.3	19.3	19.5	0.4
1971	31.9	18.6	18.7	18.1	22.6	19.4	19.7	1.1
1972	35.2	19.0	18.4	17.9	22.1	19.2	19.4	0.4

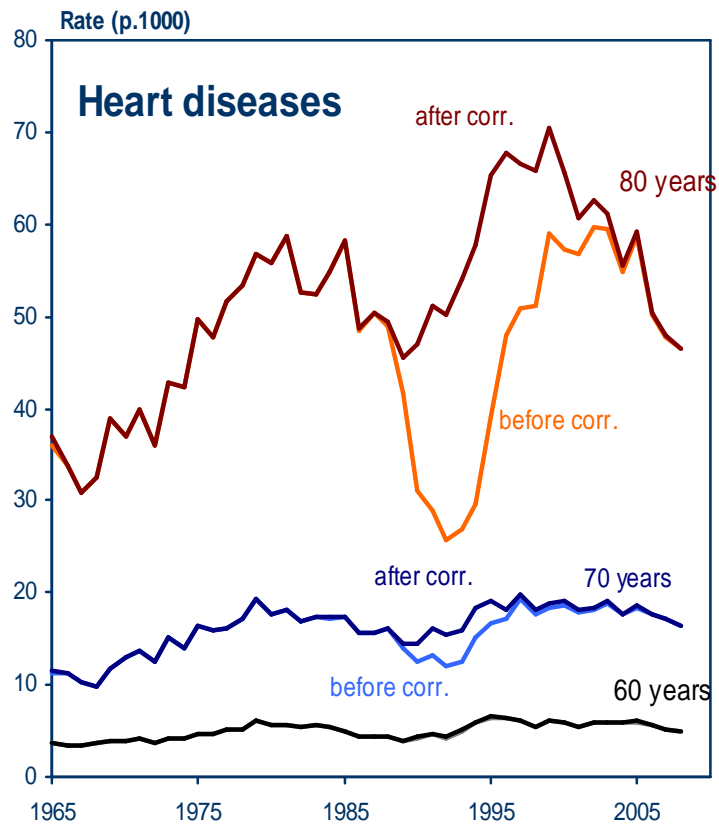# Corrected trends in comparison with neighbouring countries
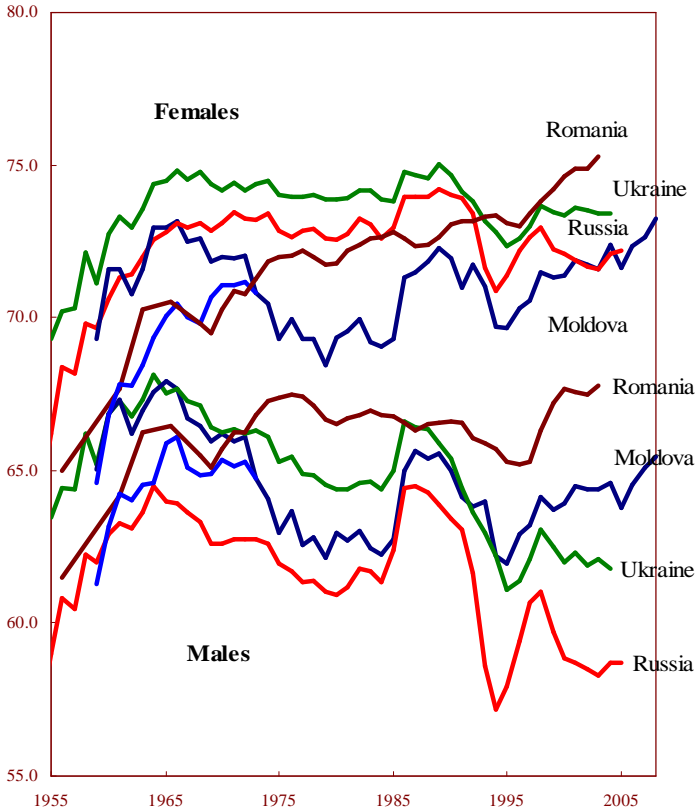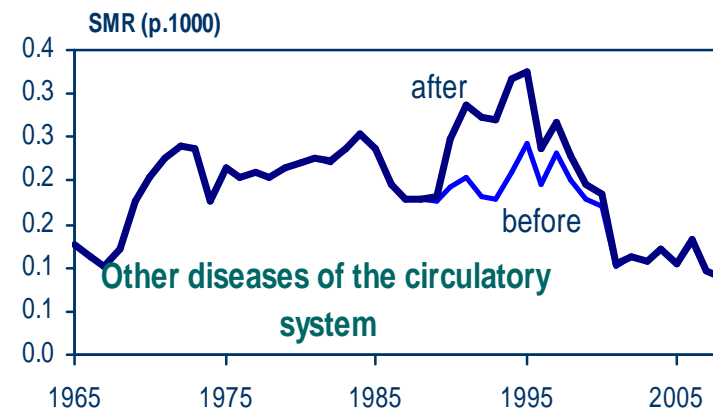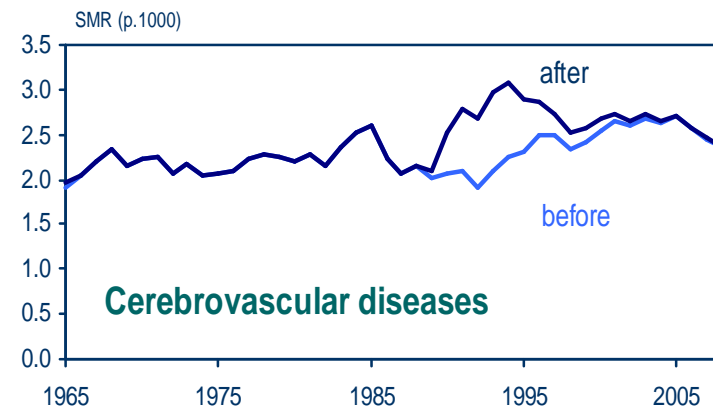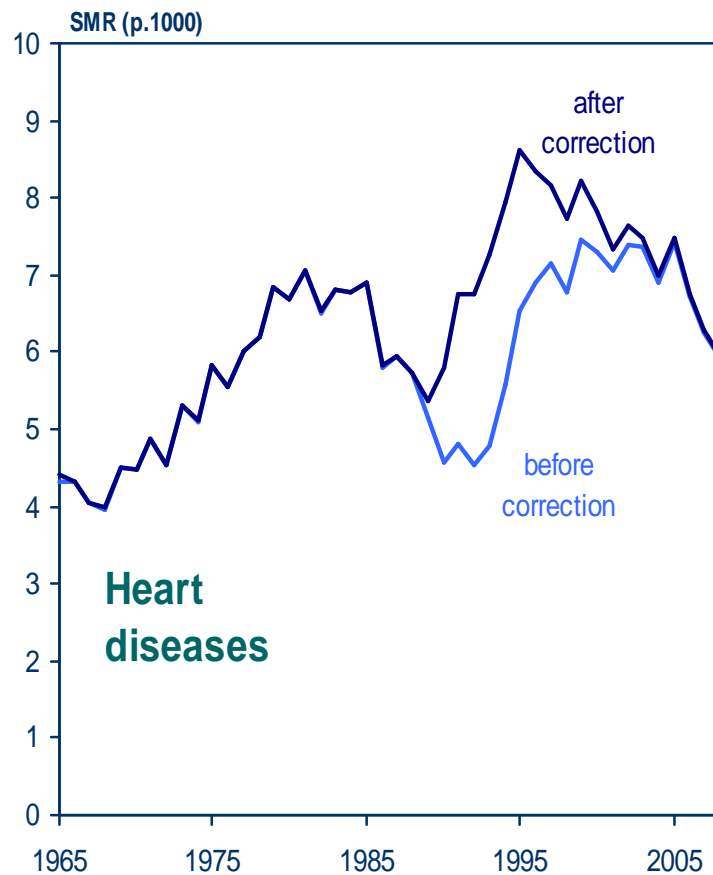
The recent senility peak

Evolution of SMR by "ill-defined causes of death", including "Senility", in Moldova, Ukraine and Romania since 1965
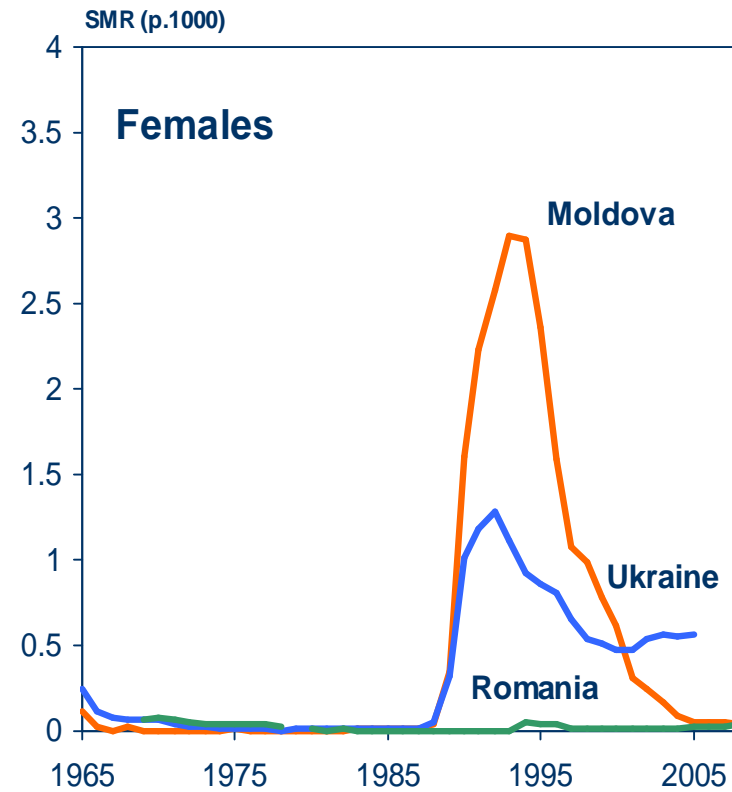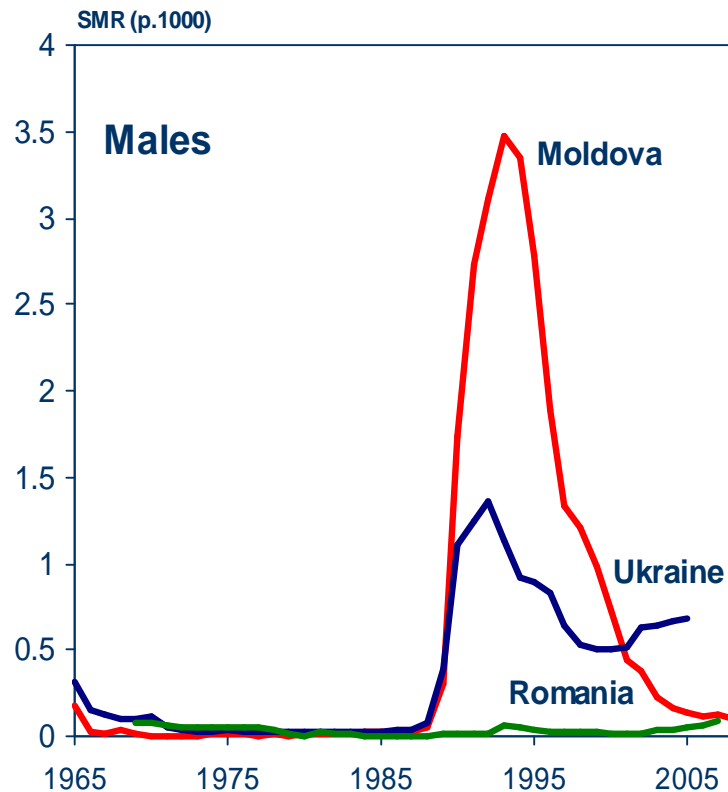
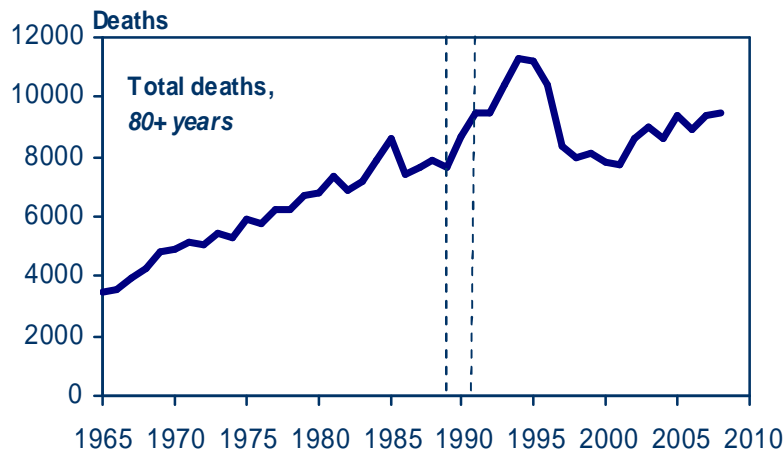# Integral proportional redistribution of "Senility" item, Moldova, 1965-2008
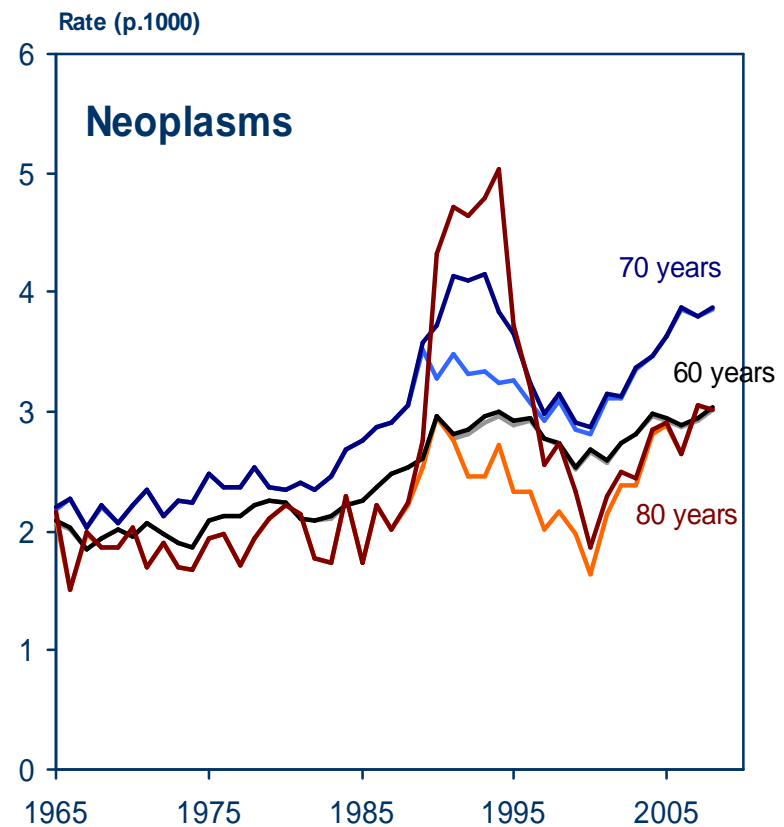
Proportional method of "Senility" redistribution restricted to cardio-vascular items, Moldova

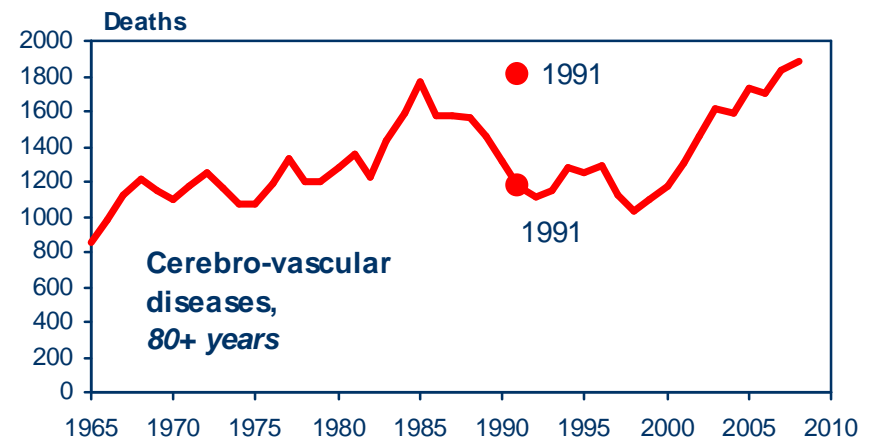# Specific method of "Senility" redistribution restricted to cardio-vascular items

1. Correction coefficients for items "CeVD" and "Other dis. of CiS"

$$ K = \frac{D_{total}^{1991}}{D_{total}^{1989}} $$

2. Estimated deaths in 1991 for items "CeVD" and "Other dis. of CiS"

$$ D_{CeVD}^{'1991} = D_{CeVD}^{1989} \times K $$

CeVD = cerebrovascular diseases; CiS = circulatory system

Specific method of "Senility" redistribution restricted to cardio-vascular items

3. Redistribution coefficients for items "CeVD" and "Other dis. of CiS"

$$M_{CeVD} = \frac{D_{CeVD}^{'1991} - D_{CeVD}^{1991}}{D_s^{1991}}$$

D_{CeVD}^{1991} observed deaths in 1991 by CeVD

$D_{CeVD}^{'1991}$ estimated deaths in 1991 by CeVD

D_S^{1991} deaths by item "Senility" in 1991

4. Redistribution coefficients for item "Heart diseases"

$$M_{HD} = 1 - \frac{\Delta_{CeVD}^{1991}}{D_s^{1991}} - \frac{\Delta_{ODCiS}^{1991}}{D_s^{1991}}$$

Δ_{CeVD}^{1991} difference b/w estimated and observed deaths by CeVD

Δ_{ODCiS}^{1991} difference b/w estimated and observed deaths by other dis. of CiS

D_S^{1991} deaths by item "Senility" in 1991

CeVD = cerebrovascular diseases; HD = Heart diseases; ODCiS = orther diseases of the circulatory system

Evolution of SMR before and after proportional and specific methods of "Senility" redistribution restricted to cardio-vascular items, Moldova, males
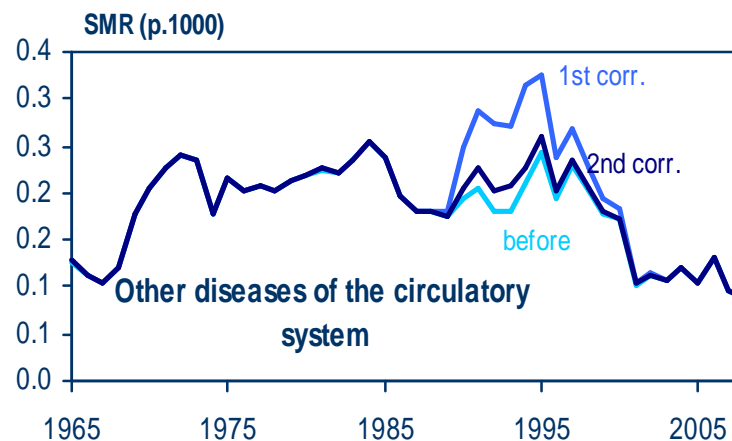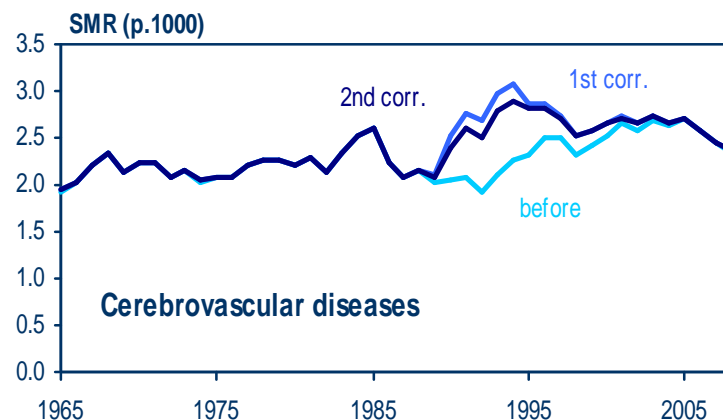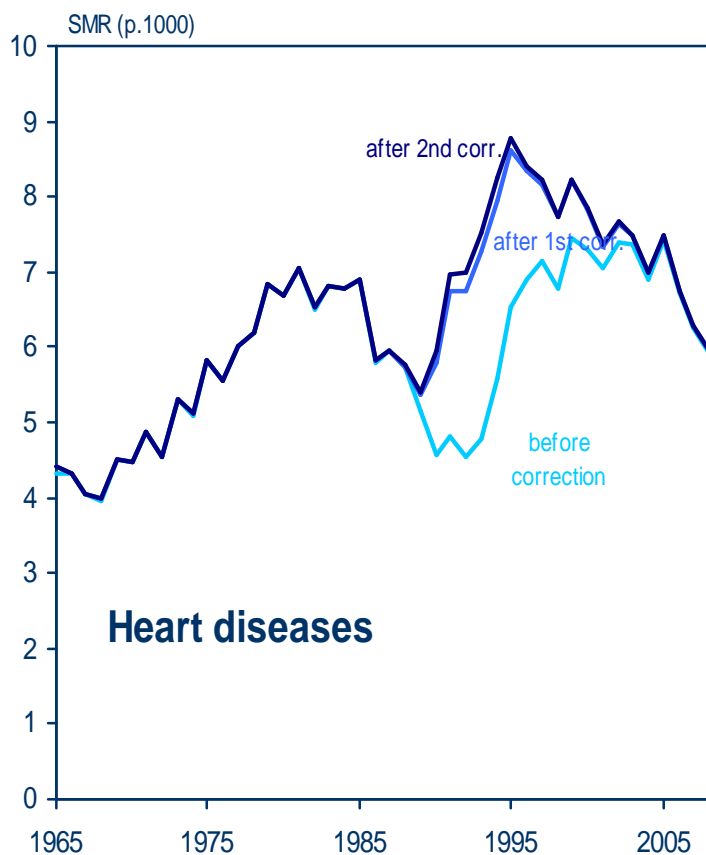
Evolution of SMR by cardio-vascular diseases (after correction) and all causes of death, Moldova
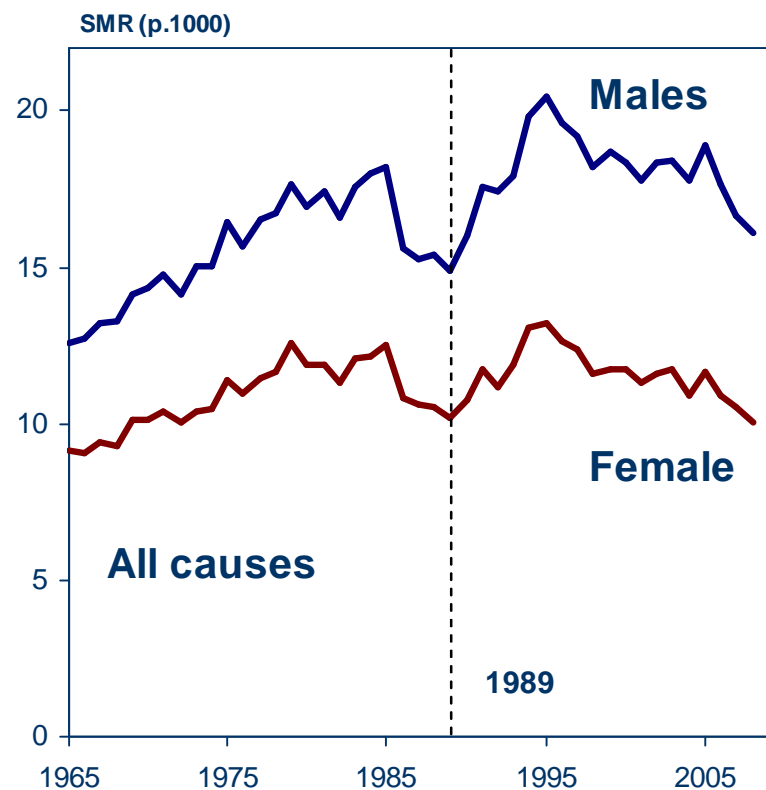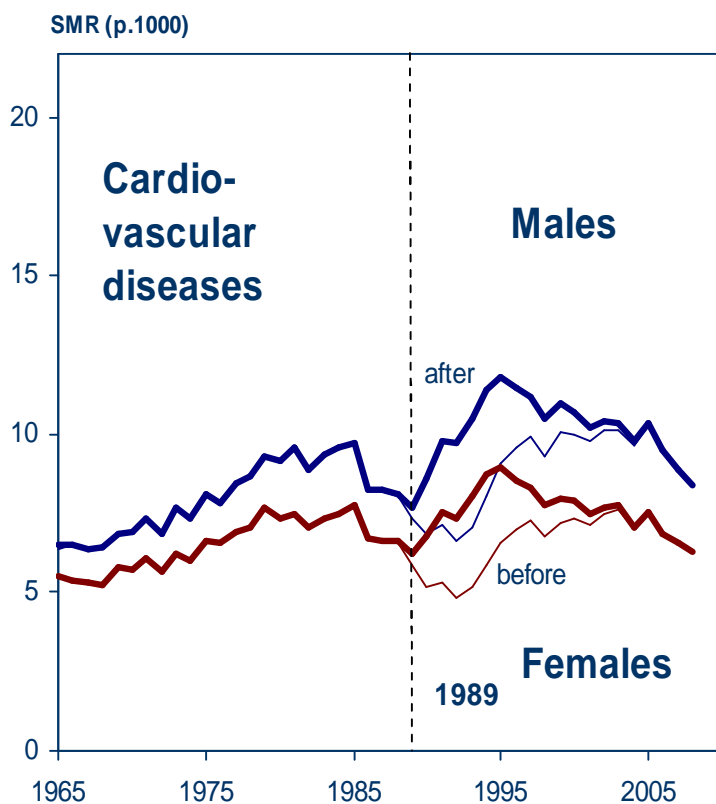
Evolution of mortality by causes of death in Moldova in 1965-2008 (preliminary results)

- Moldova: reconstructed data (1965-2008)

- Ukraine: reconstructed data (1965-2004)

  F. Meslé, J. Vallin et al., 2004, "Mortalité et causes de désès en Ukraine au XXe siècle"

  2005-2006: unreconstructed data

- Romania: unreconstructed data

  WHO mortality database

  1963-2008 according to 7 broad groups of causes of deaths

  1999-2008 according to detailed groups (ICD-10)

Dynamics of standardized mortality rates by causes of death

Trends in standardized mortality rates according to 7 broad causes-of-death groups, Moldova, 1965-2008
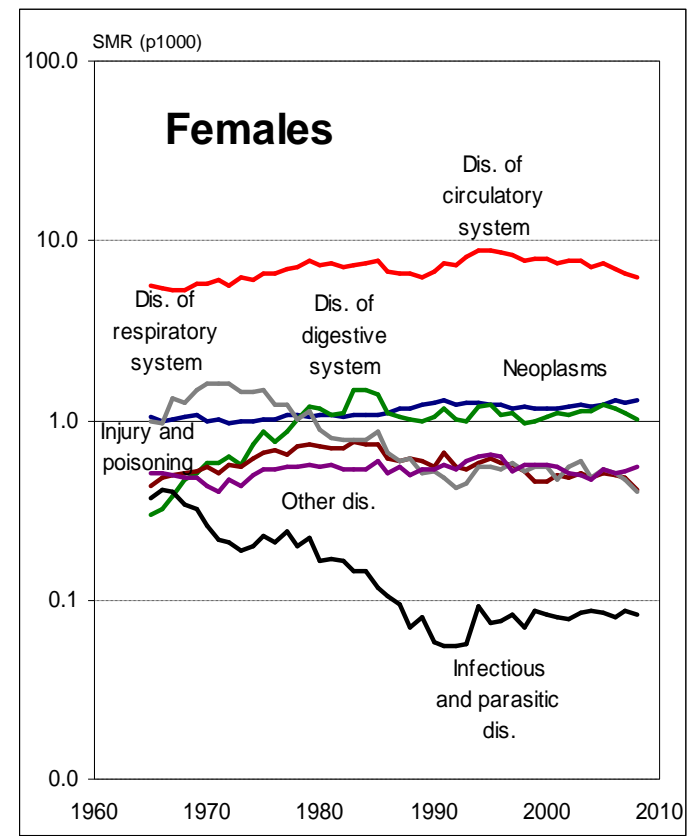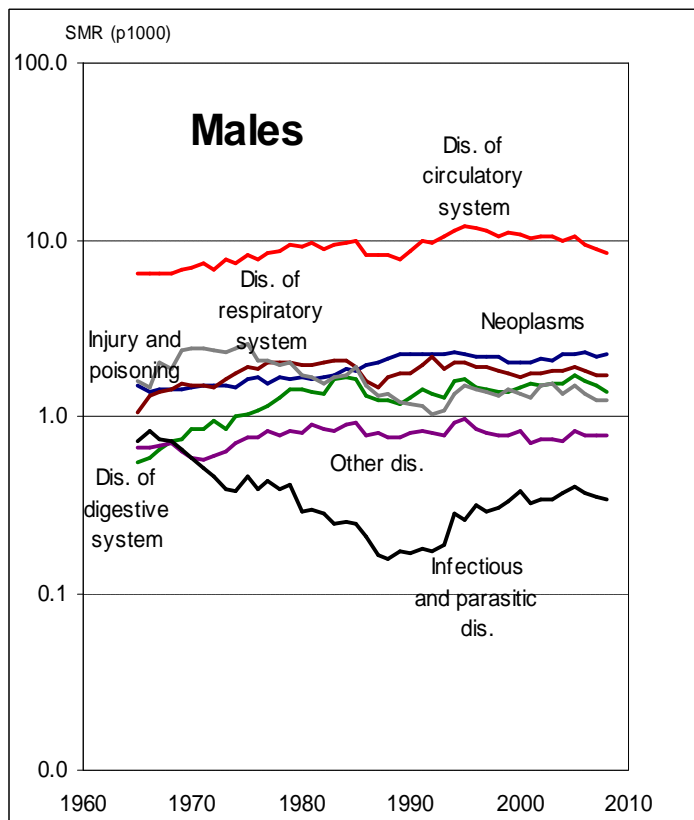
Cardio-vascular diseases (1)
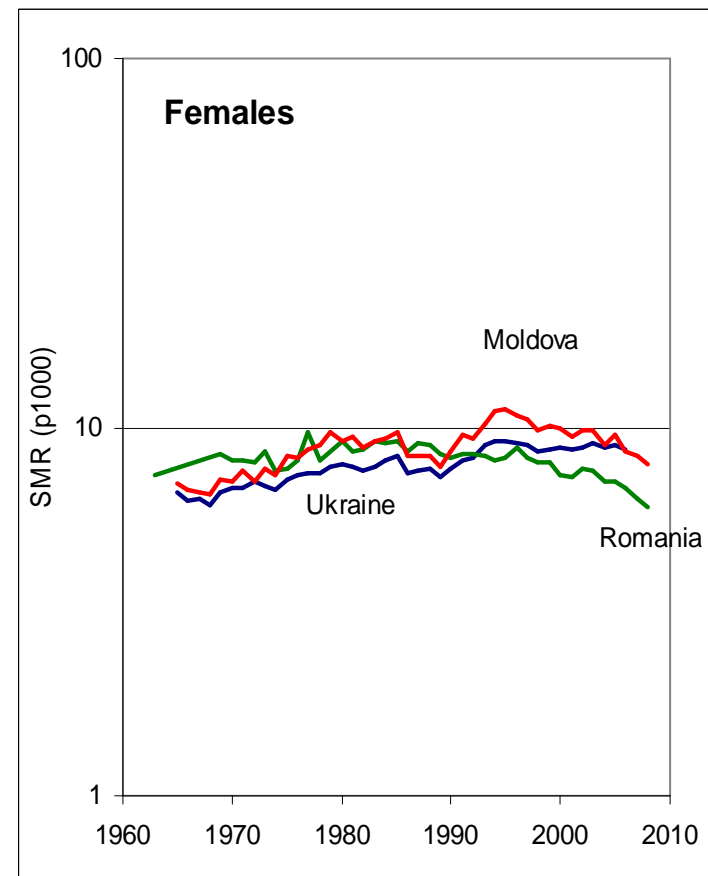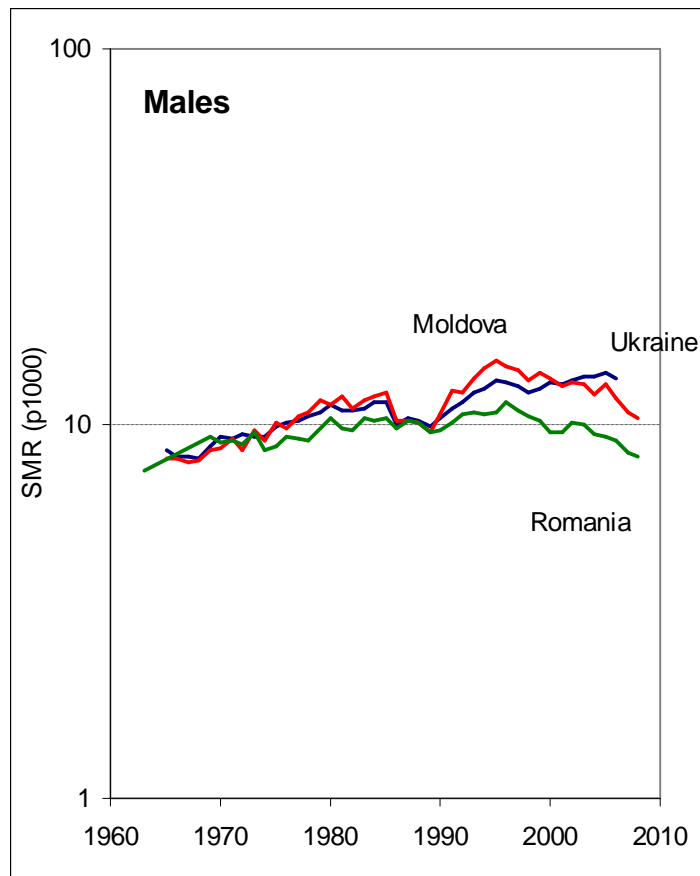
Cardio-vascular diseases (2)
(heart diseases, cerebro-vascular diseases, other diseases of the circulatory system)
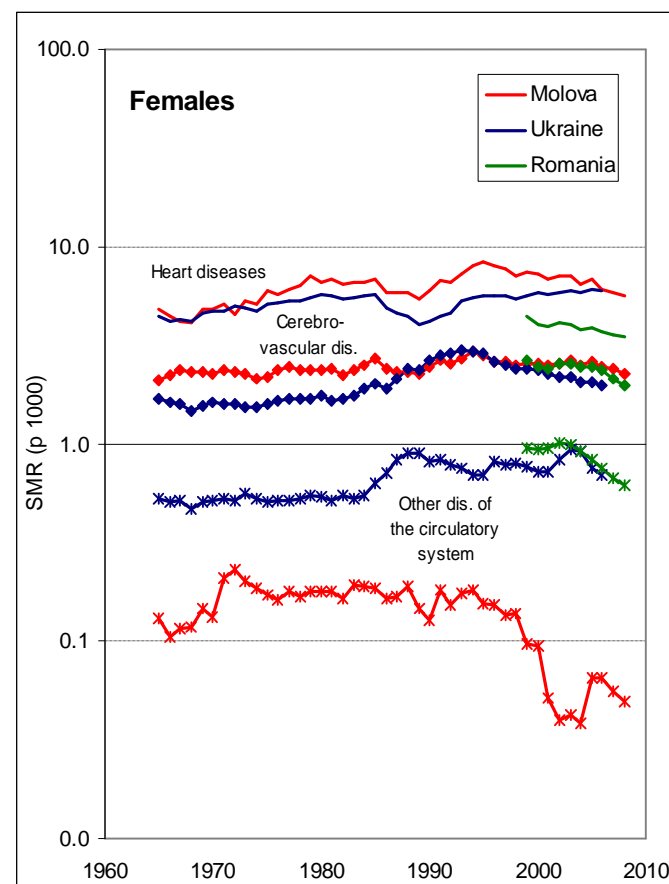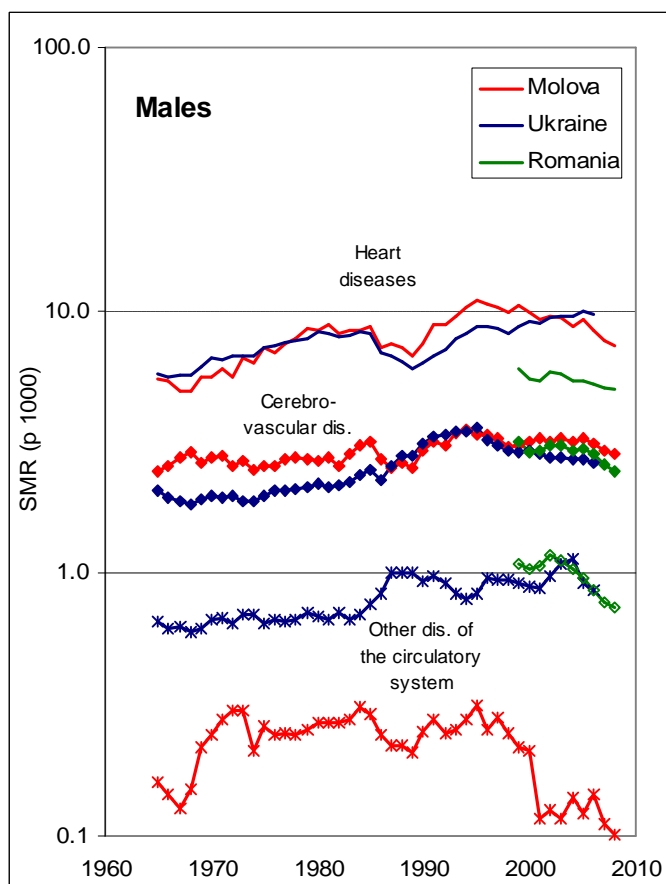
Cardio-vascular diseases (3)
(atherosclerotic cardiosclerosis, other ischaemic heart diseases, other heart diseases)
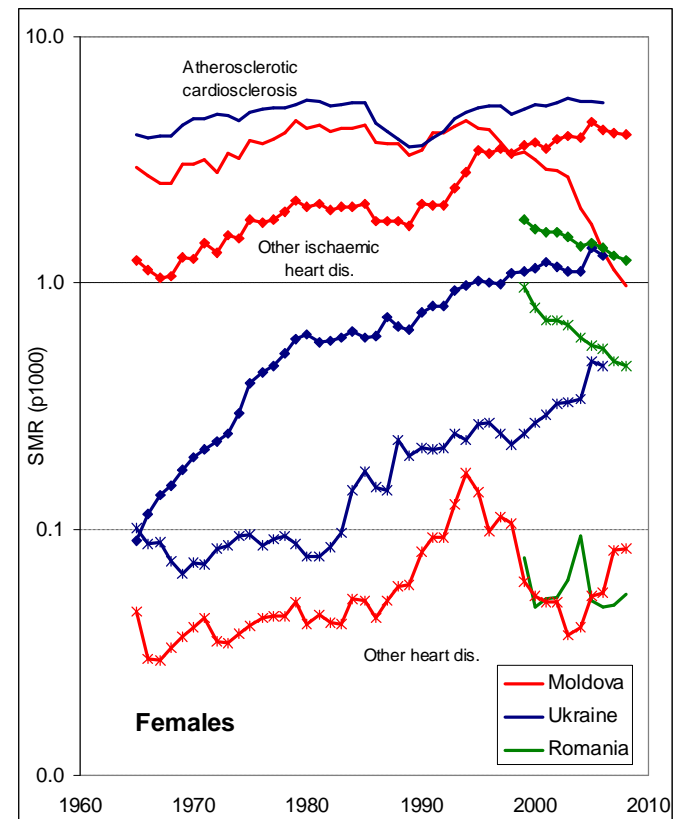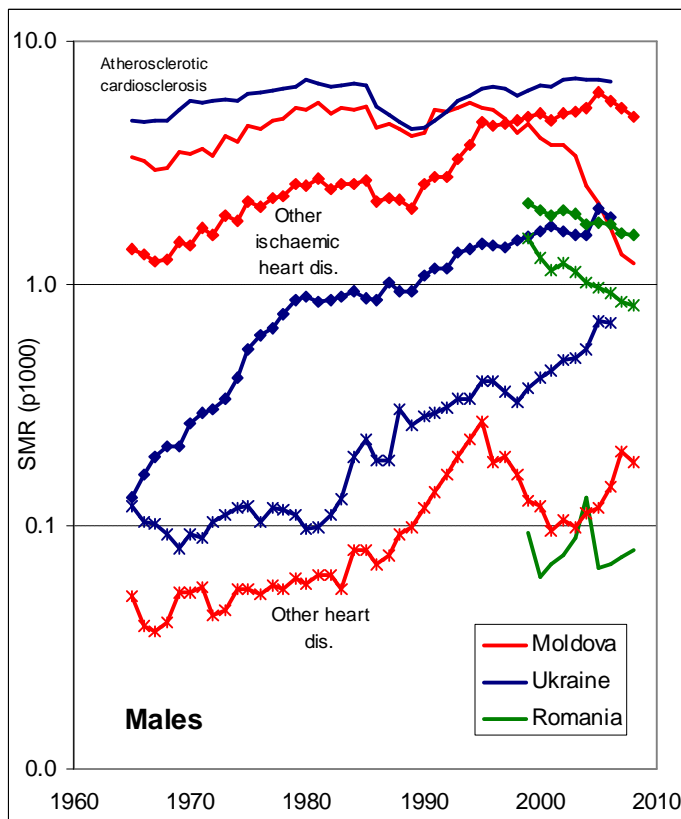
Cardio-vascular diseases (4)
(myocardial infarction, hypertension, rheumatismal cardiopathies)
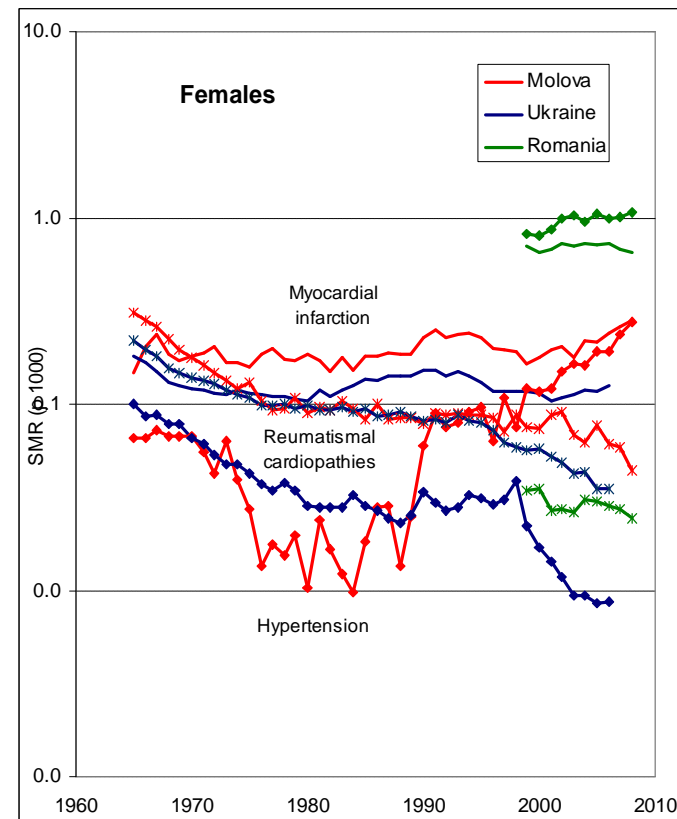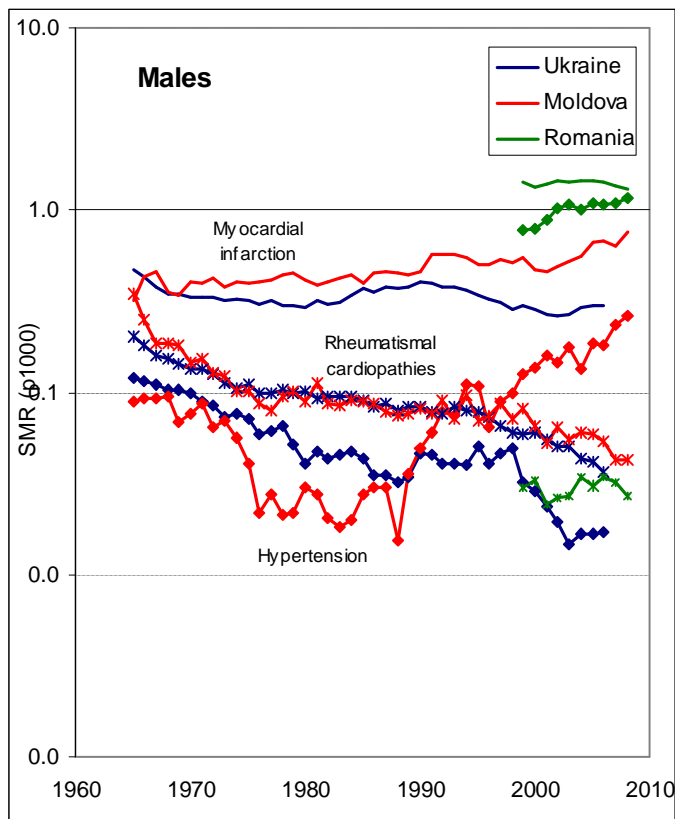
Neoplasms (1)
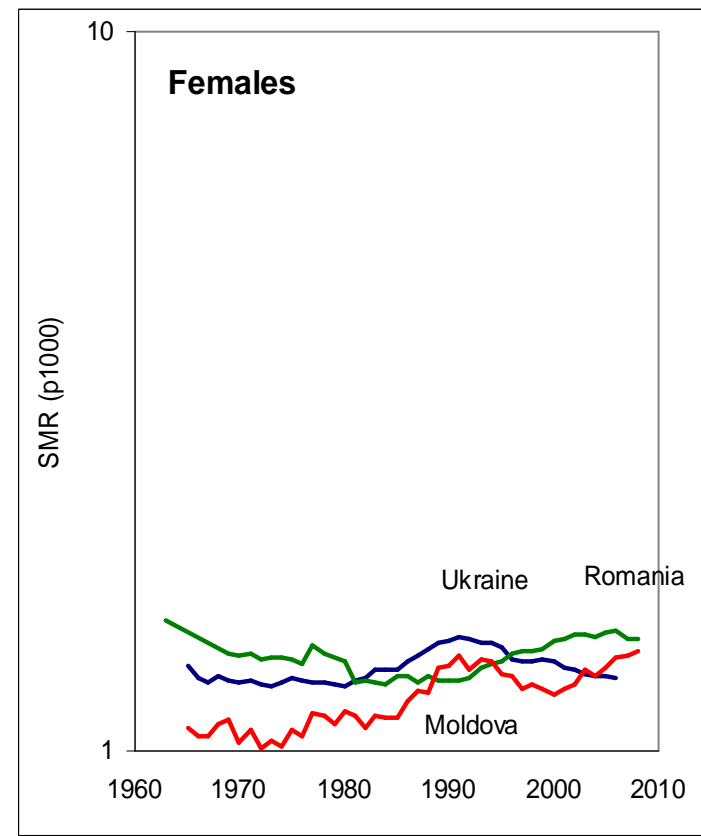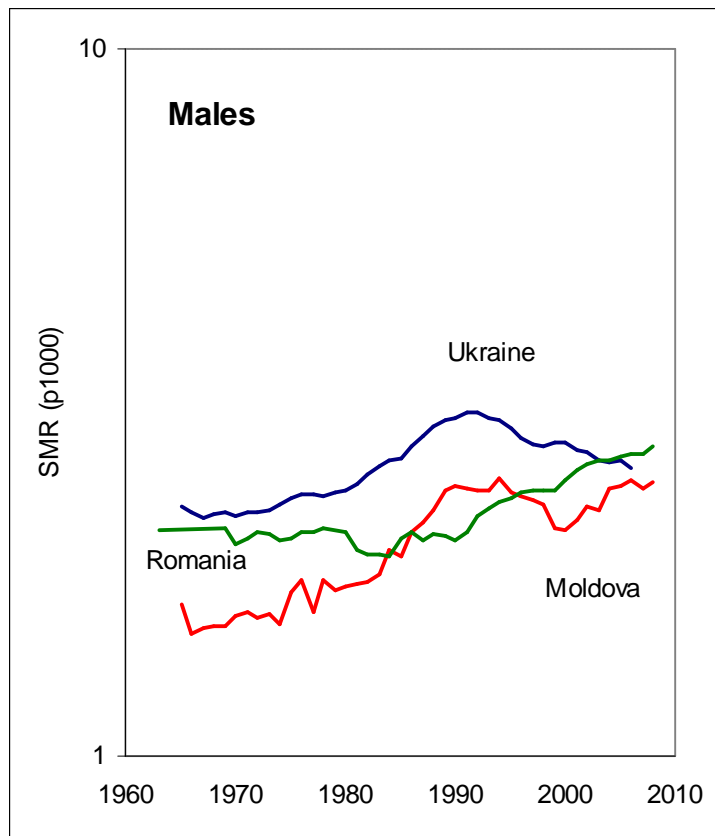
Neoplasms (2)
(cancer of the respiratory organs, lips, mouth, pharynx and oesophagus)
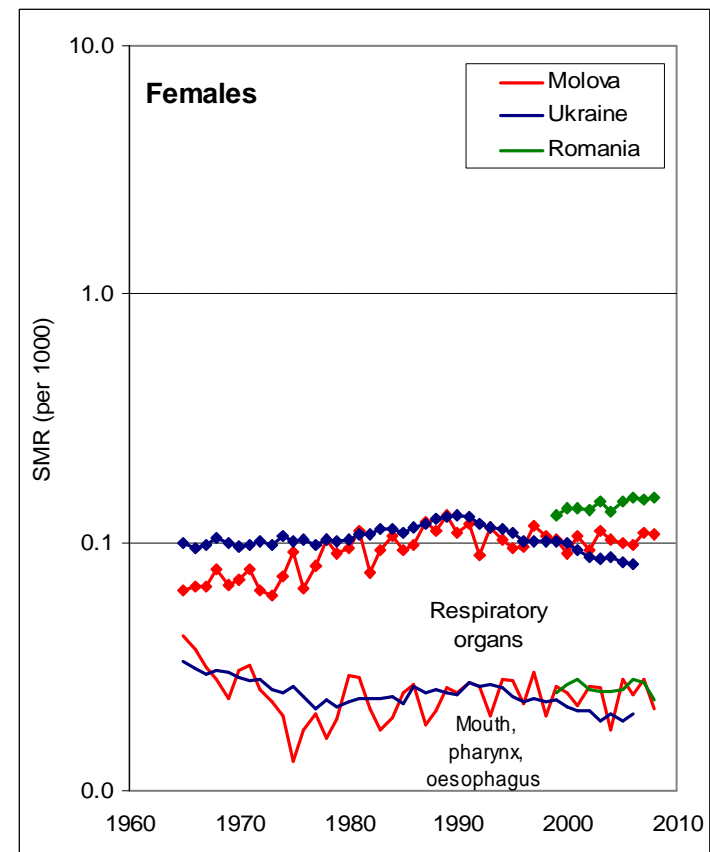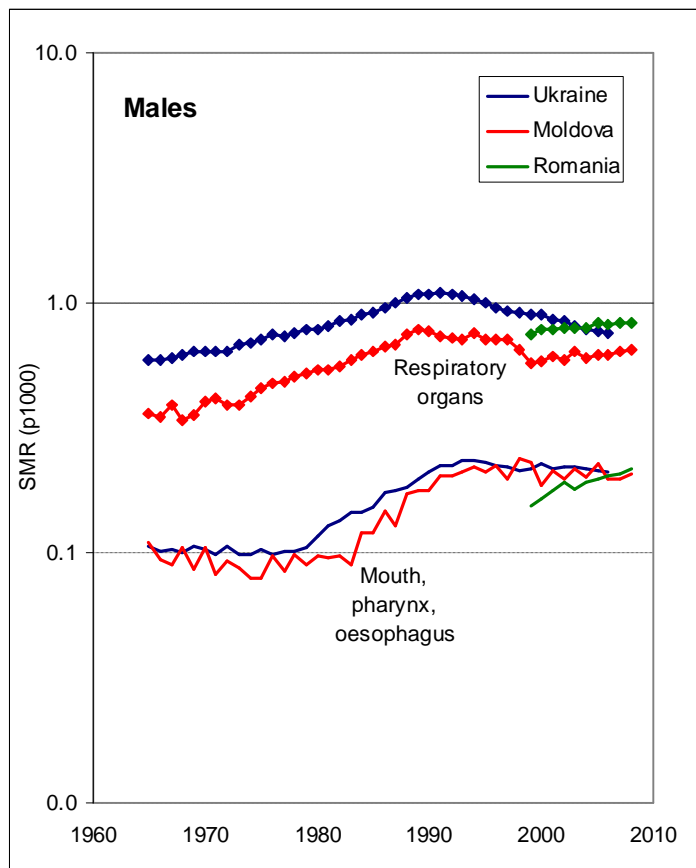
Neoplasms (3)
(Cancer of stomach, intestine and rectum)
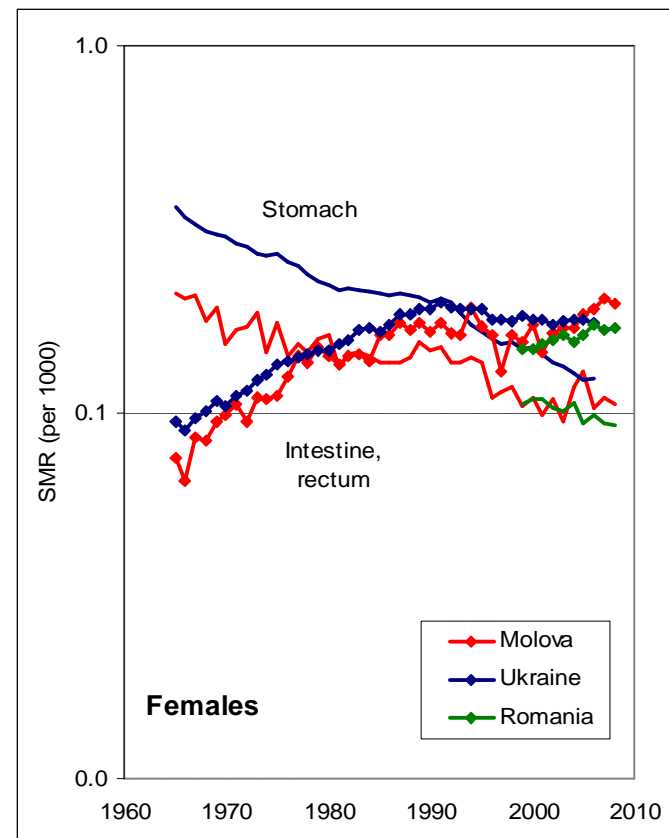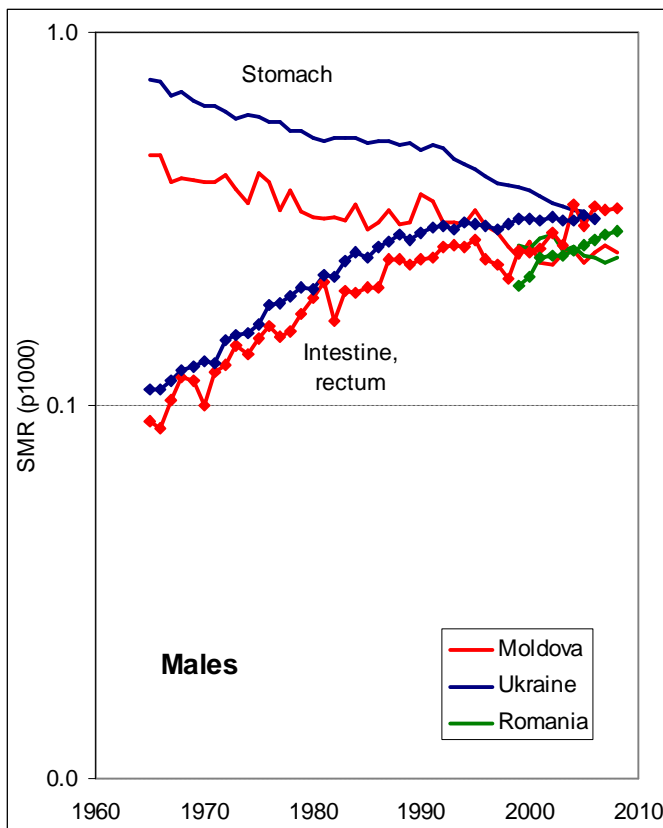
Neoplasms (4)
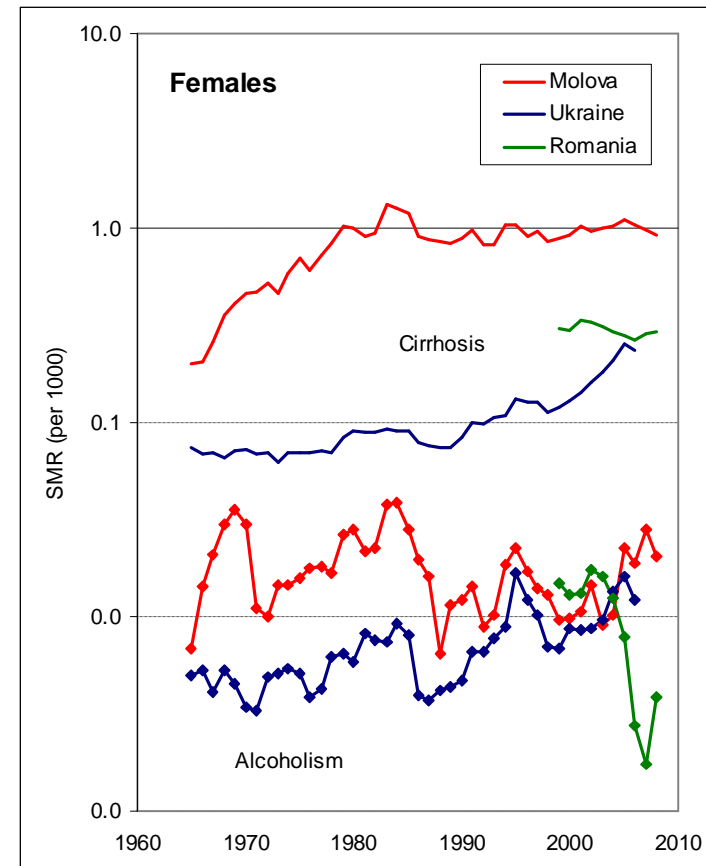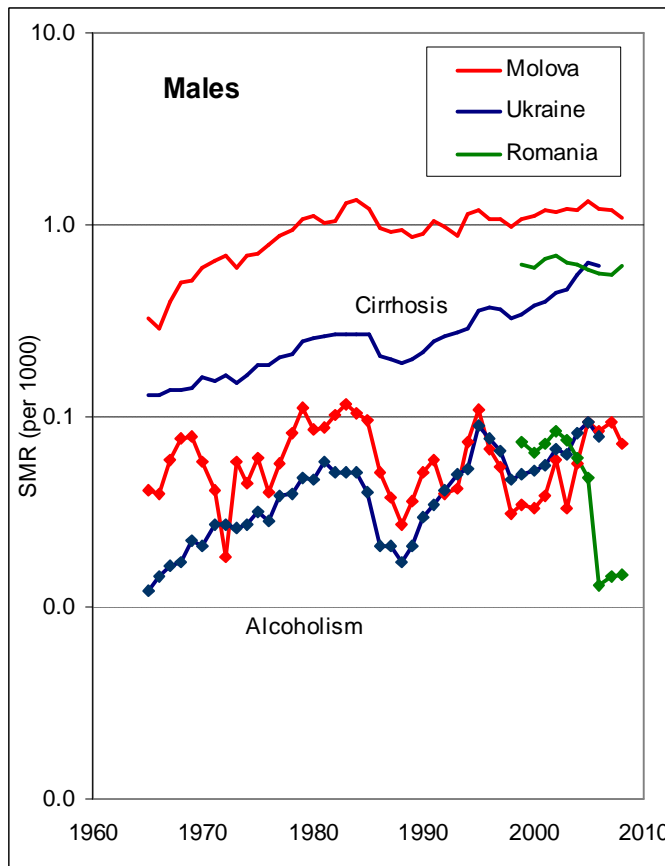## (Cancer of the urinary tract, prostate, uterus and breast)
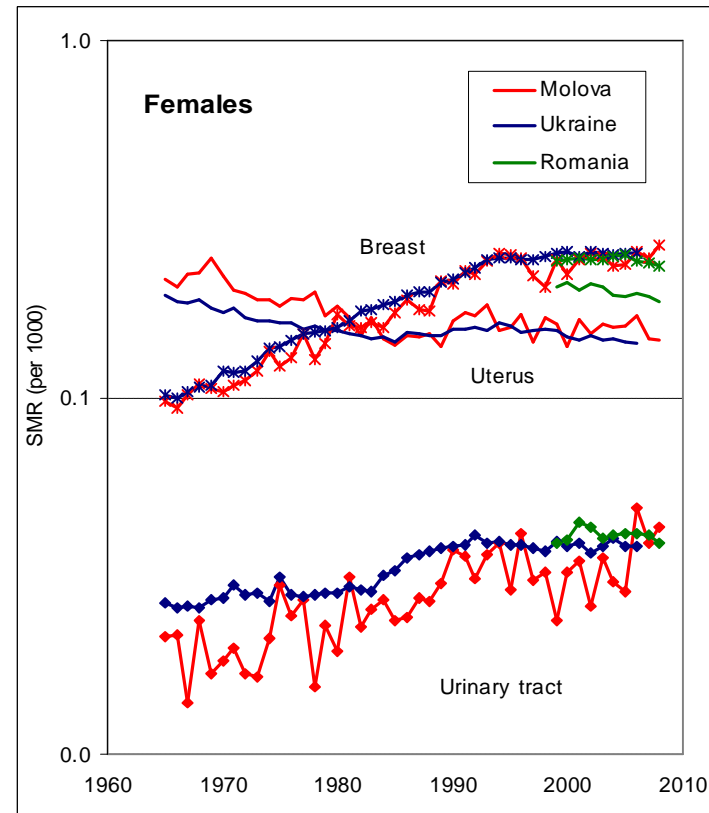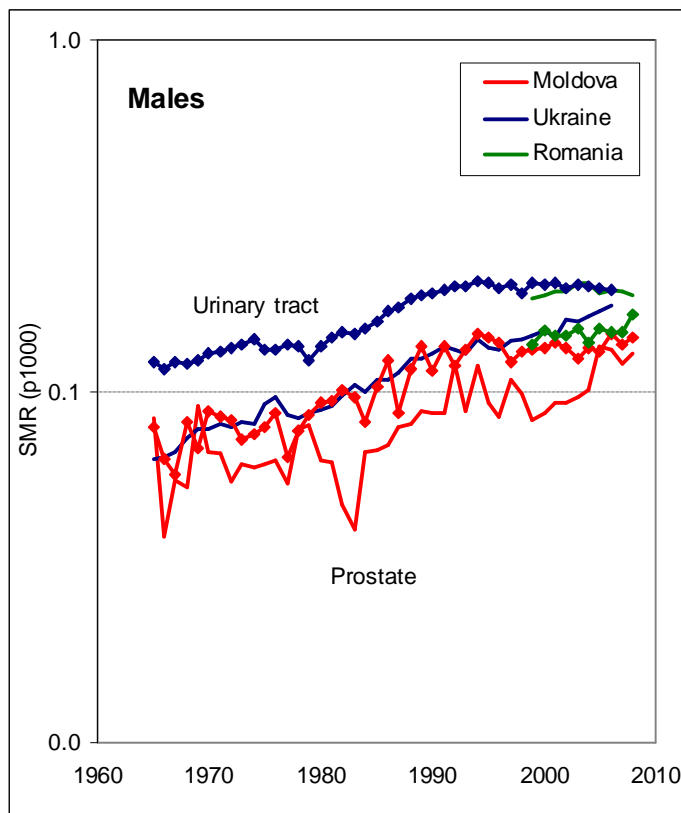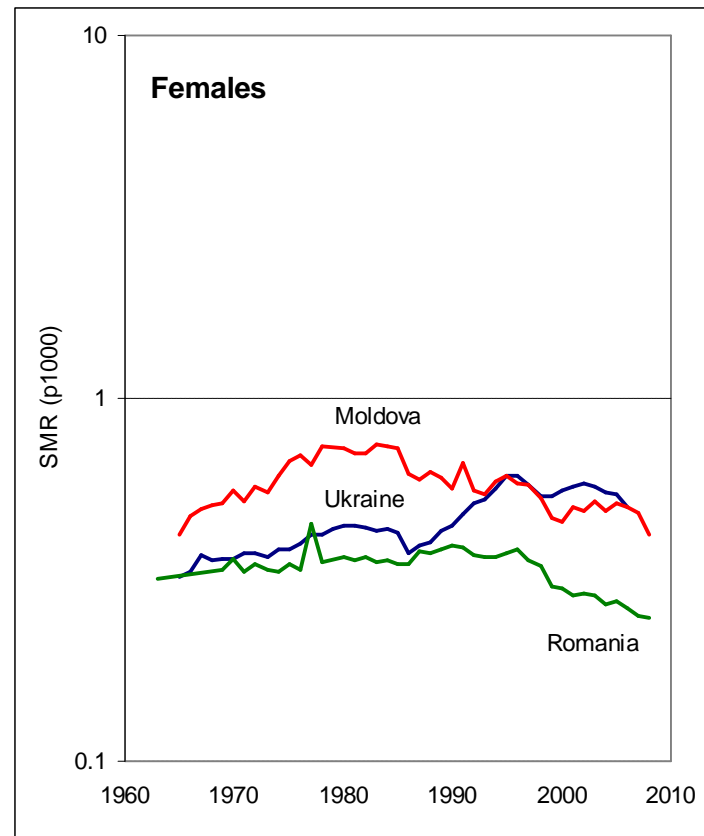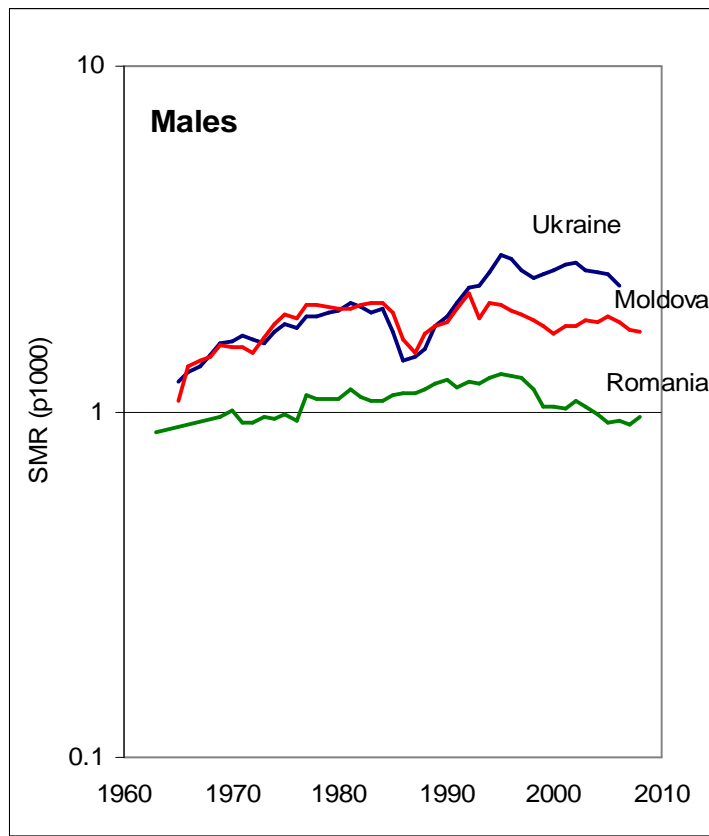
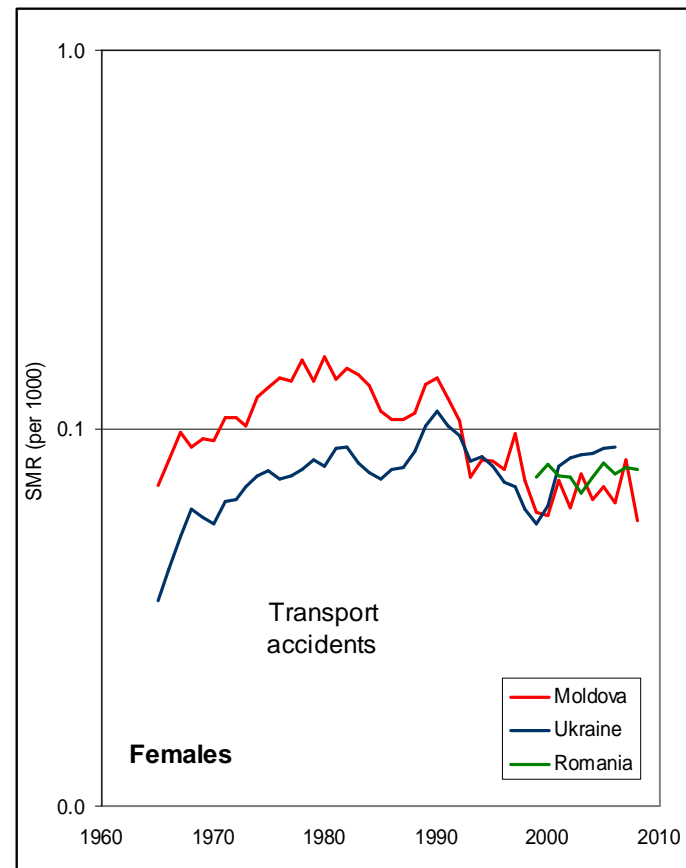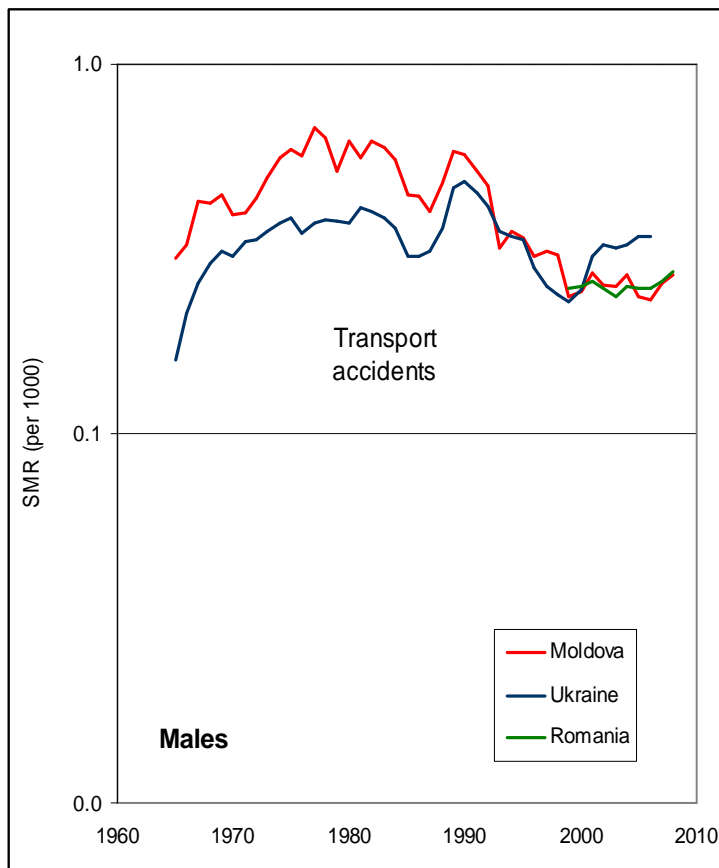# Diseases of the digestive system (1)
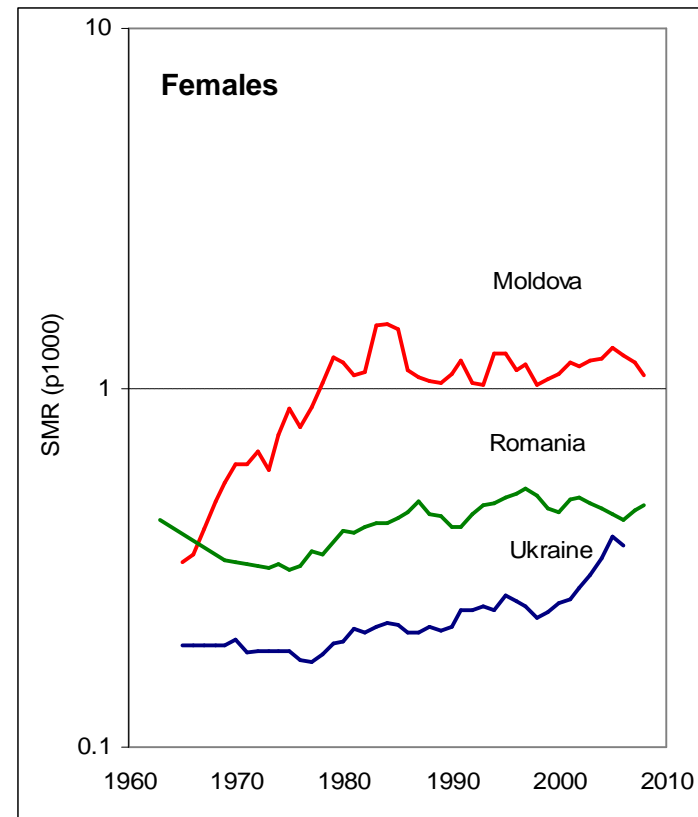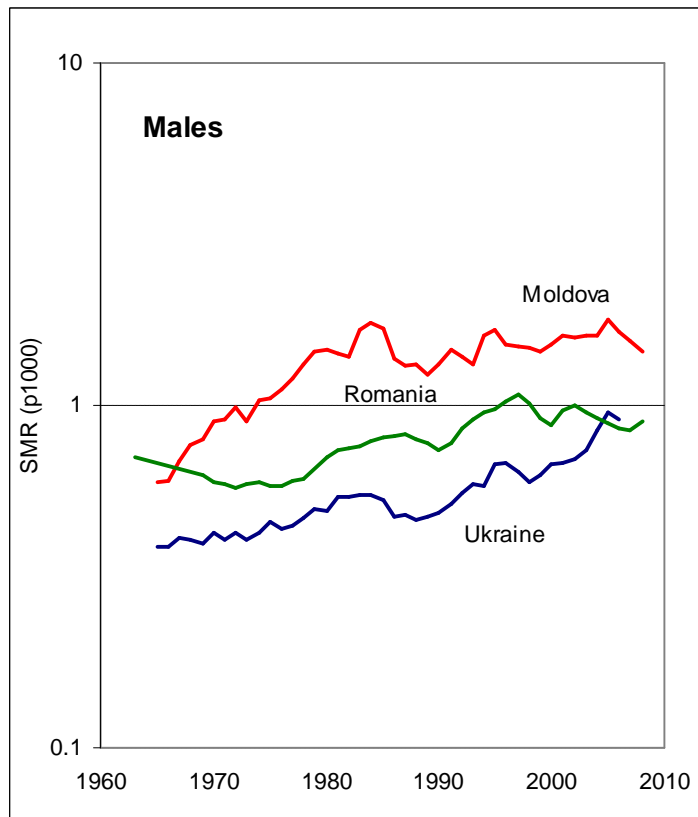
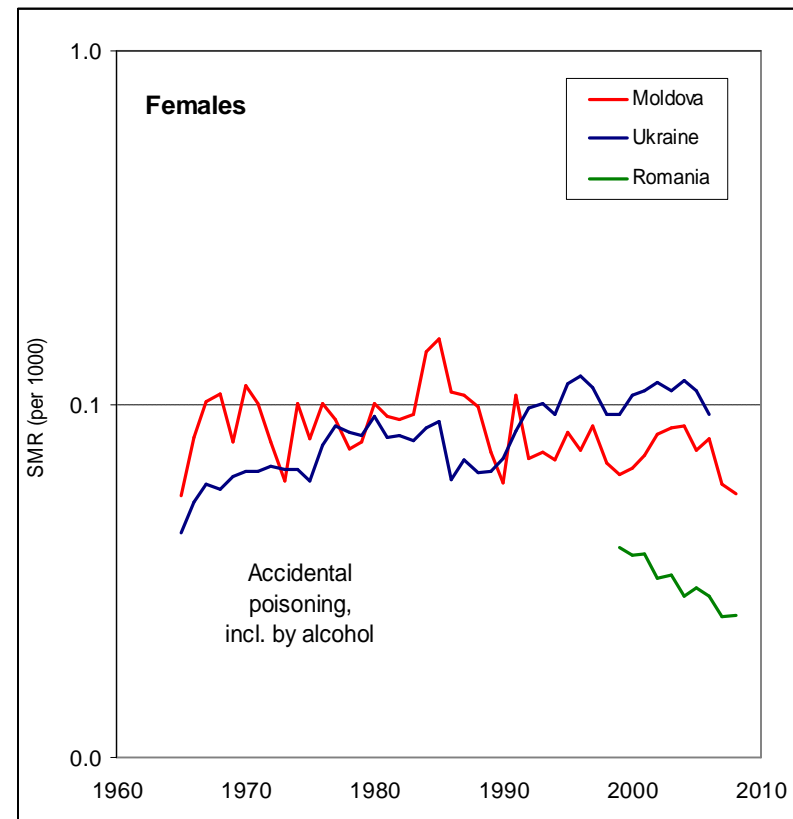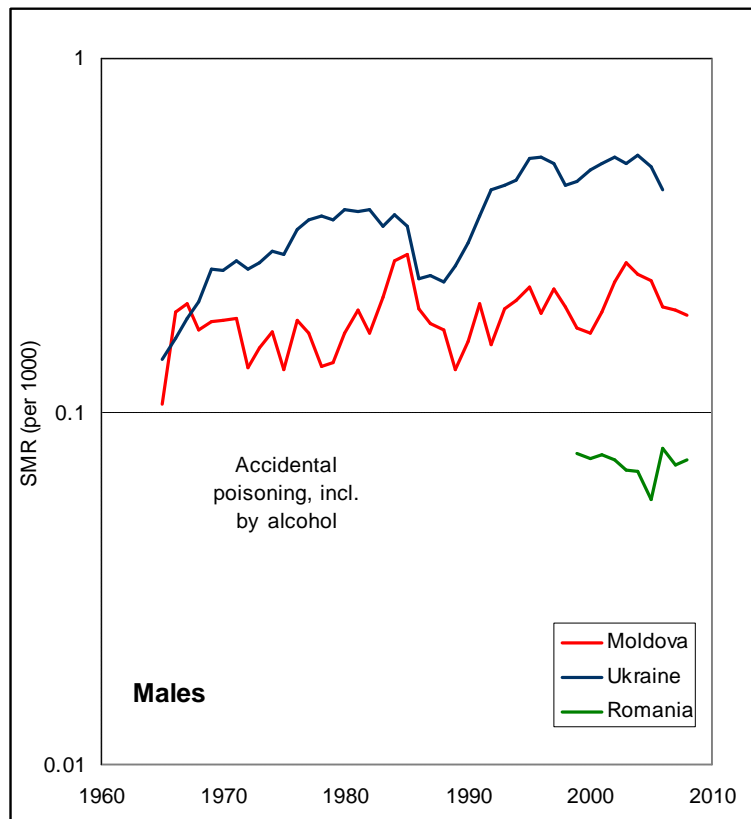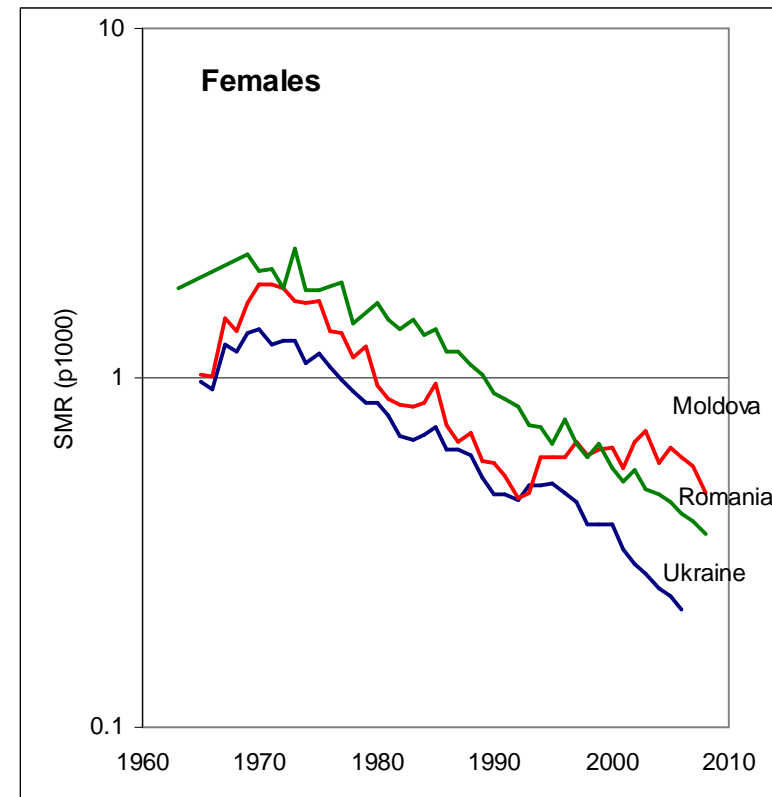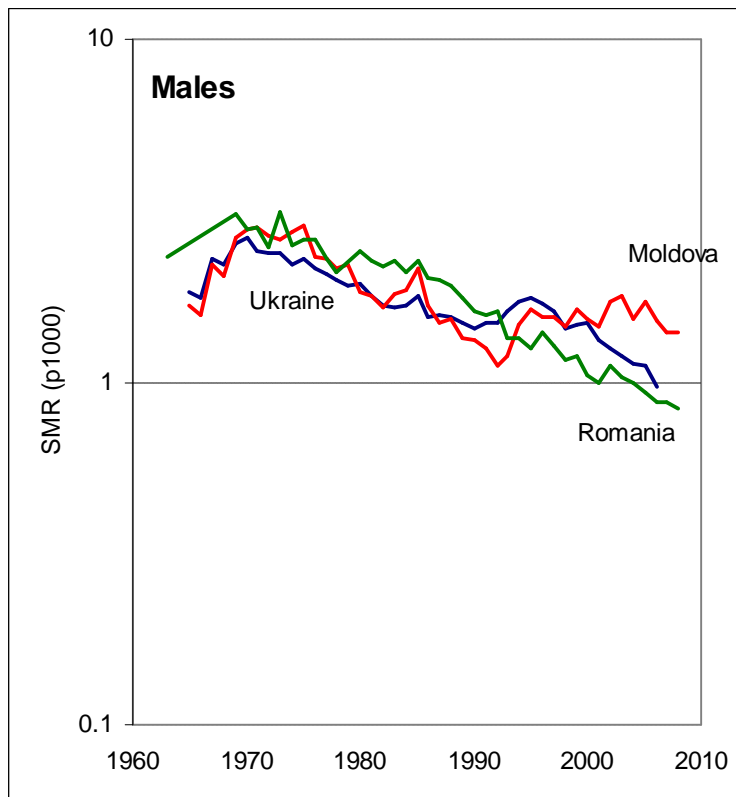# Diseases of the digestive system (2)
(cirrhosis and alcoholism)
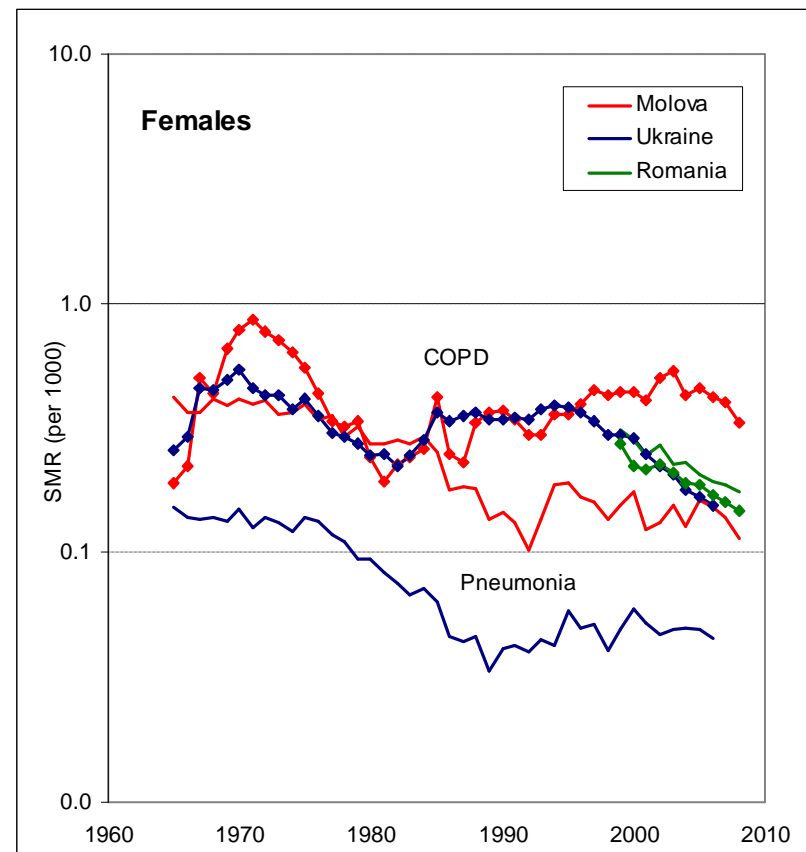
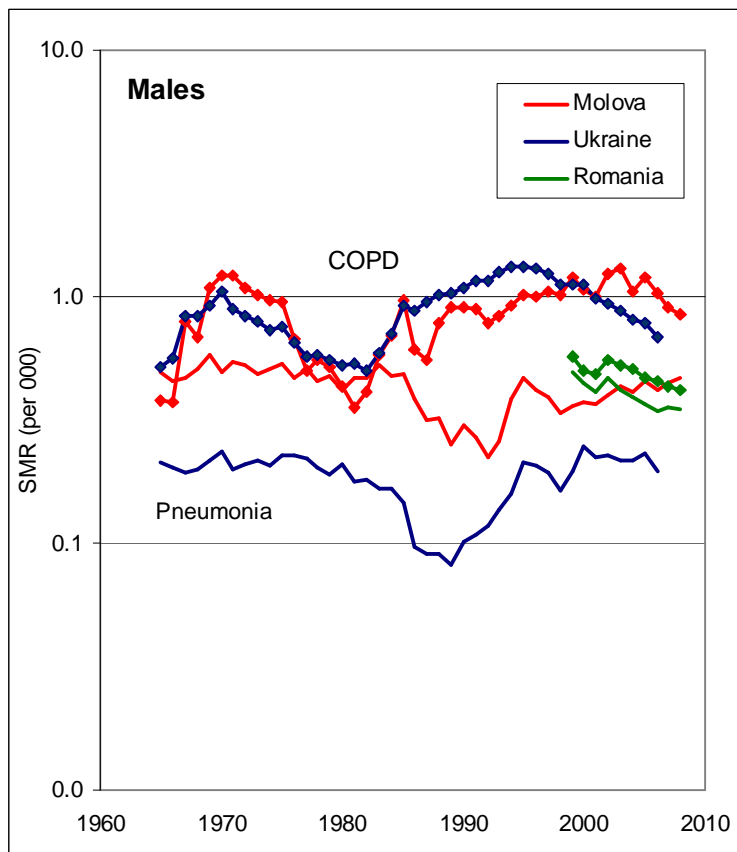# Violent deaths (1)

Violent deaths (2)
(transport accidents)

Violent deaths (3)
(accidental poisoning, incl. by alcohol)

Violent deaths (4)
(suicide, homicide, undetermined intent)

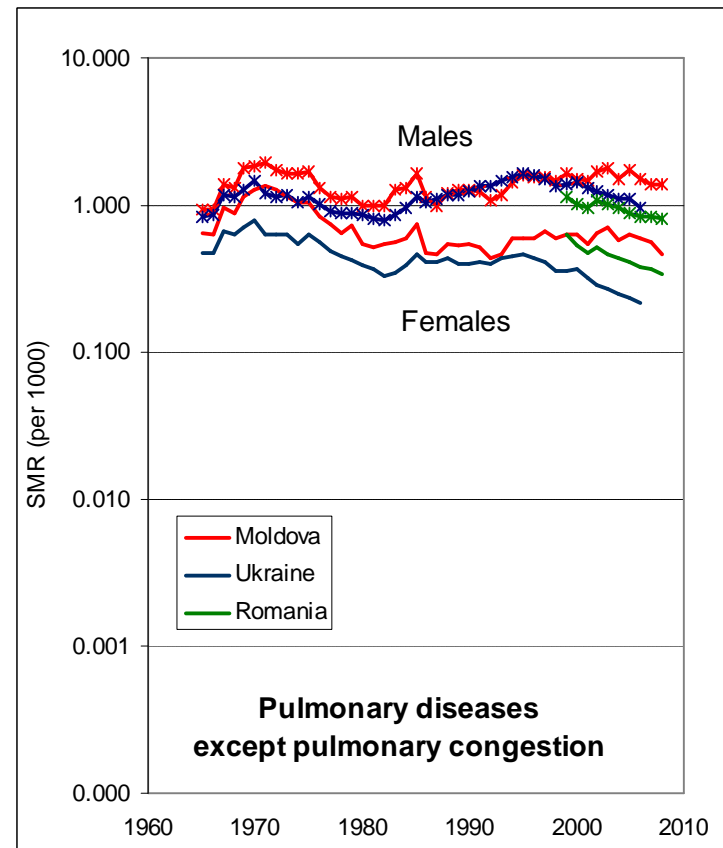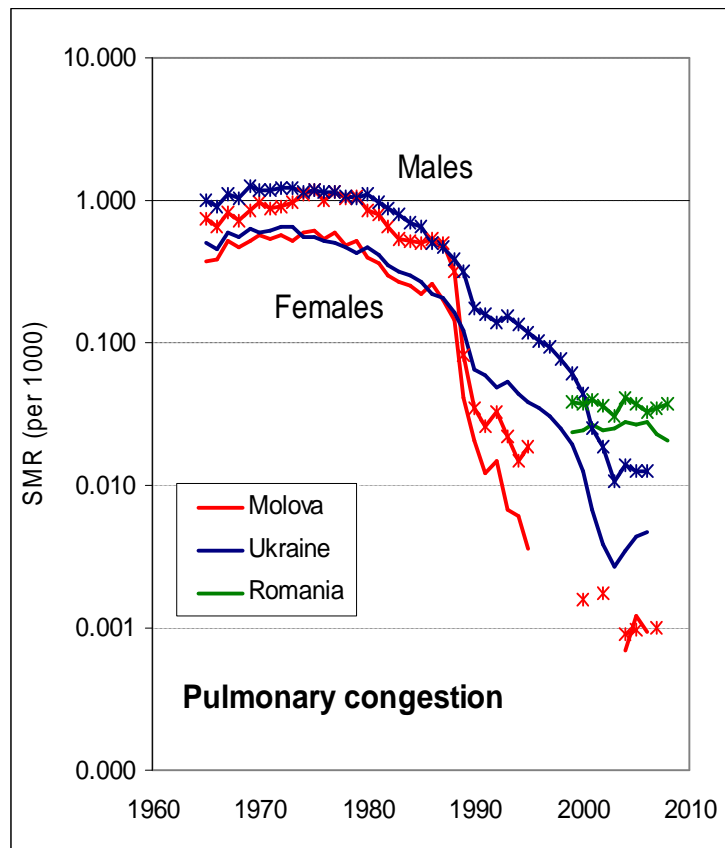# Diseases of the respiratory system (1)

Diseases of the respiratory system (2)
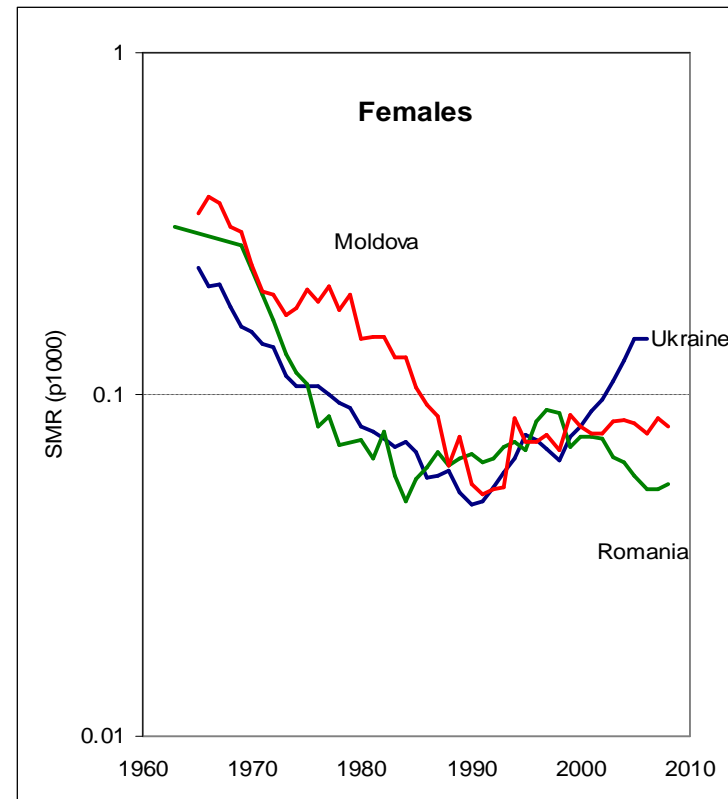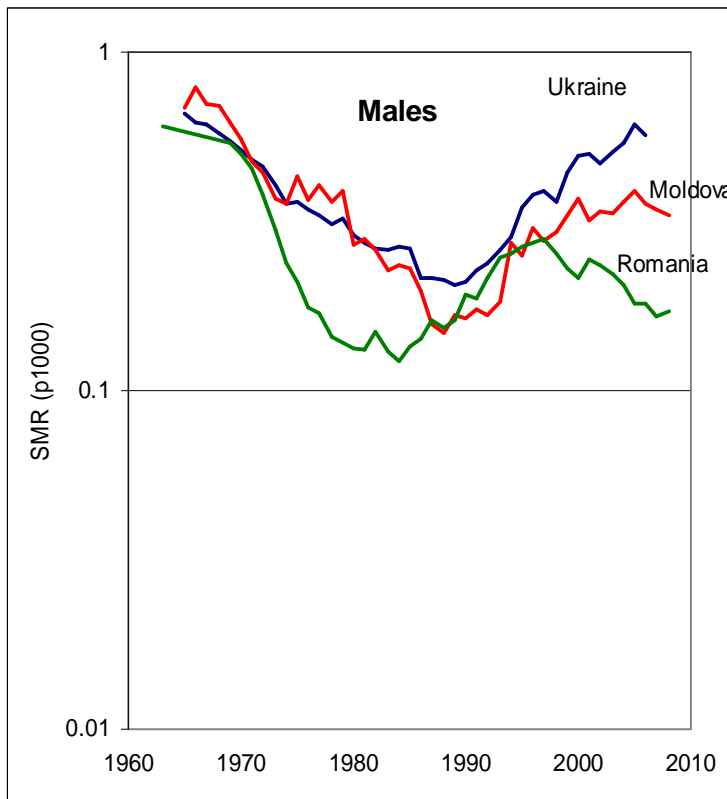## (chronic obstructive pulmonary disease, pneumonia)
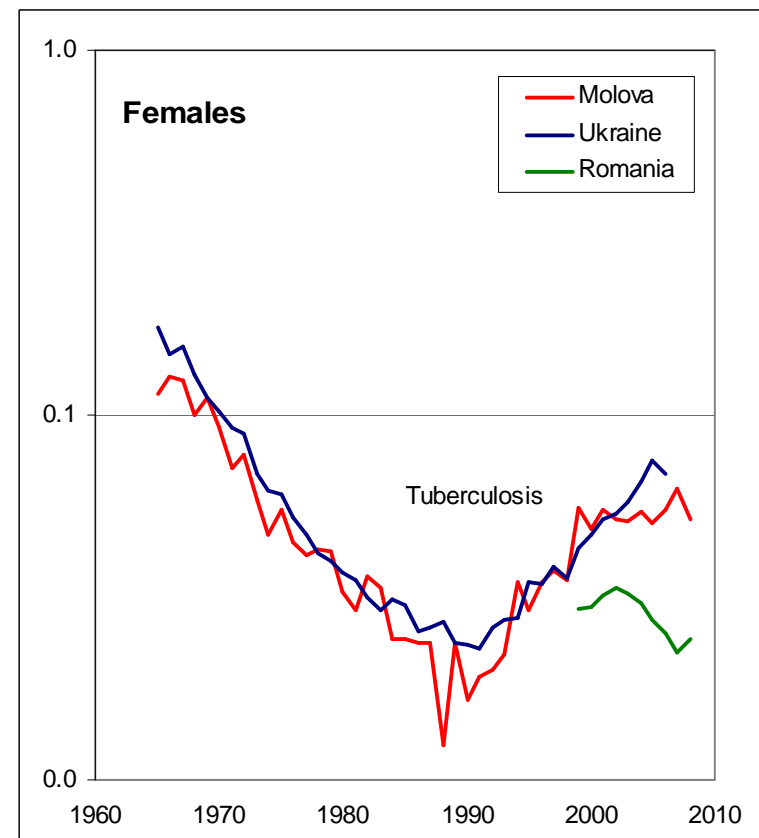
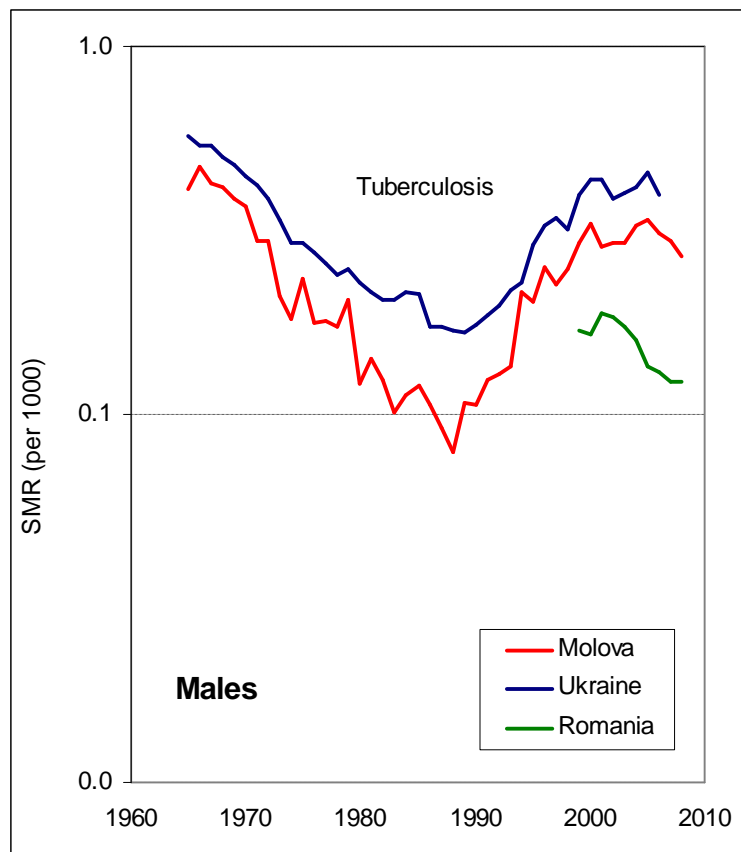# Diseases of the respiratory system (3)
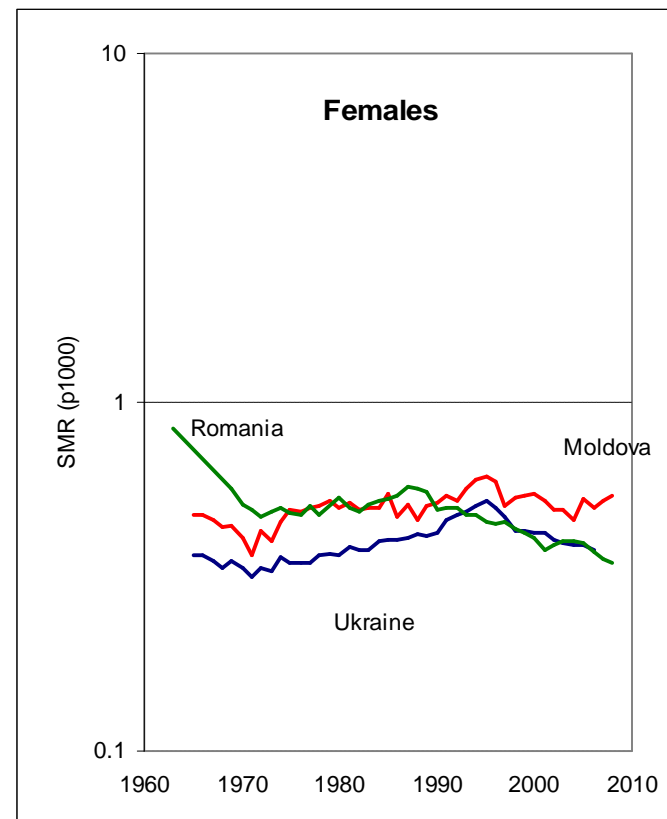## (pulmonary congestion, pulmonary diseases except pulmonary congestion)

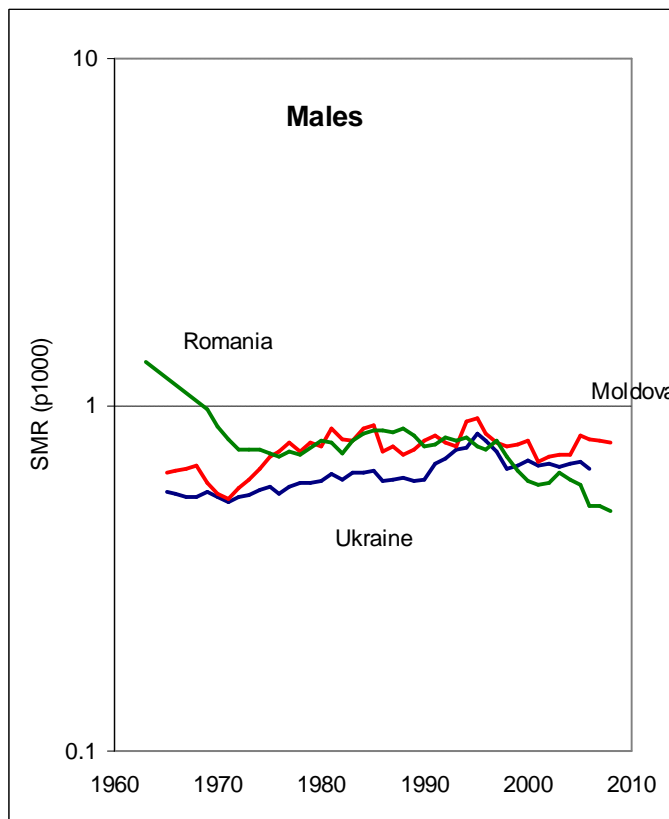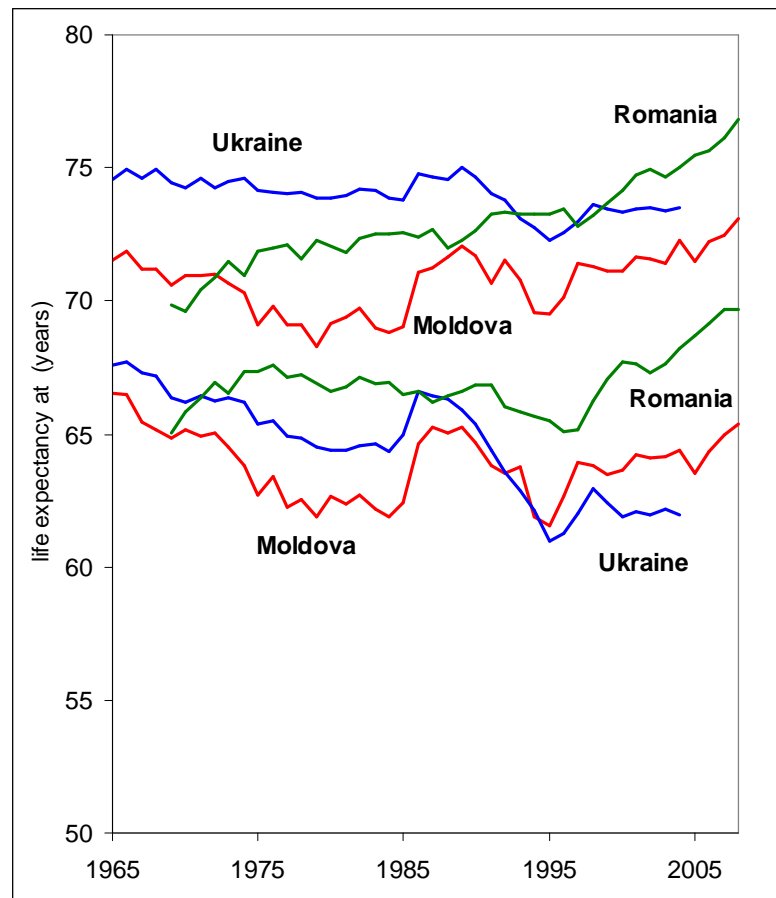# Infectious diseases (1)

Infectious diseases (2)
(tuberculosis)

Other diseases

Age and cause-of death contributions to the changes in life expectancy at birth

Life expectancy at birth in Moldova, Ukraine and Romania

Moldova, Ukraine and Romania (1)

Moldova 1965-2008 males
total loss/gain= -1.2 years

Moldova 1965-2008 females
total loss/gain= 1.6 years

Ukraine 1965-2004 males
total loss/gain= -5.6 years

Ukraine 1965-2004 females
total loss/gain= -1.1 years

Romania 1963-2008 males
total loss/gain= 3.8 years

Romania 1963-2008 females
total loss/gain= 7.3 years

Contribution (years)

- ■ Infectious and parasitic diseases
- ■ Neoplasms
- ■ Cardio-vascular diseases
- ■ Diseases of the respiratory system
- ■ Diseases of the digestive system
- ■ Other diseases
- ■ Injury and poisoning

Moldova, Ukraine and Romania (2)

Moldova 1965-1984 males
total loss/gain= -4.7 years

Moldova 1965-1984 females
total loss/gain= -2.7 years

Ukraine 1965-1984 males
total loss/gain= -3.2 years

Ukraine 1965-1984 females
total loss/gain= -0.7 years

Romania 1963-1996 males
total loss/gain= -0.8 years

Romania 1963-1996 females
total loss/gain= 2.9 years

- Infectious and parasitic diseases
- Neoplasms
- Cardio-vascular diseases
- Diseases of the respiratory system
- Diseases of the digestive system
- Other diseases
- Injury and poisoning

Moldova, Ukraine and Romania (3)

Moldova 1984-2008 males
total loss/gain= 3.4 years

Moldova 1984-2008 females
total loss/gain= 4.3 years

Ukraine 1984-2004 males
total loss/gain= -2.4 years

Ukraine 1984-2004 females
total loss/gain= -0.3 years

Romania 1996-2008 males
total loss/gain= 4.6 years

Romania 1996-2008 females
total loss/gain= 4.4 years

Legend:
- Infectious and parasitic diseases
- Neoplasms
- Cardio-vascular diseases
- Diseases of the respiratory system
- Diseases of the digestive system
- Other diseases
- Injury and poisoning

Moldova, Ukraine and Romania (4)

Moldova 1984-2005 males
total loss/gain= 1.6 years

Moldova 1984-2005 females
total loss/gain= 2.7 years

Moldova 2005-2008 males
total loss/gain= 1.8 years

Moldova 2005-2008 females
total loss/gain= 1.6 years

Contribution (years)

- Infectious and parasitic diseases
- Neoplasms
- Cardio-vascular diseases
- Diseases of the respiratory system
- Diseases of the digestive system
- Other diseases
- Injury and poisoning