THE EFFECTS OF TOBACCO TAXES ON HEALTH: AN ANALYSIS OF THE EFFECTS BY INCOME QUINTILE AND GENDER IN KAZAKHSTAN, THE RUSSIAN FEDERATION, AND UKRAINE

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Health, Nutrition, and Population (HNP) Discussion Paper

The Effects of Tobacco Taxes on Health:

An Analysis of the Effects by Income Quintile and Gender in Kazakhstan, the Russian Federation, and Ukraine

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Abstract: The main objectives of this paper are to estimate the burden of tobacco-caused mortality as a whole and by main tobacco-related diseases in Kazakhstan, the Russian Federation, and Ukraine, and to assess the distributional health impact of an increase in tobacco taxation in these three countries. According to the results obtained, in 2012 smoking caused around 310,000 deaths in Russia, about 70,000 in Ukraine and 14,300 in Kazakhstan, representing a key factor of mortality among the working-age population. Using data from various sources, the paper estimates the distributional consequences of a hypothetical tax rise in the three countries that leads to an approximately 30 percent increase of the average retail price of cigarettes. The analysis includes an estimation of changes in smoking prevalence, mortality, life expectancy, and public health expenditures by income quintile and gender. Considered excise growth could lead to about 3.5 to 4.0 percent fall in smoking prevalence, which in turn could avert about 600,000 tobacco-related deaths in Russia, 140,000 in Ukraine, and 30,000 in Kazakhstan over a 50 years period. Reduced tobacco-related morbidity would also result in substantial decrease in health expenditures for the treatment of tobacco-related diseases. Positive health effects are expected to be pro-poor, as almost 60 percent of the reduction in mortality is concentrated in the two lower-income quintiles of the population of the three countries.

Keywords: smoking, mortality, tobacco taxation, distributional health impact.

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1. INTRODUCTION

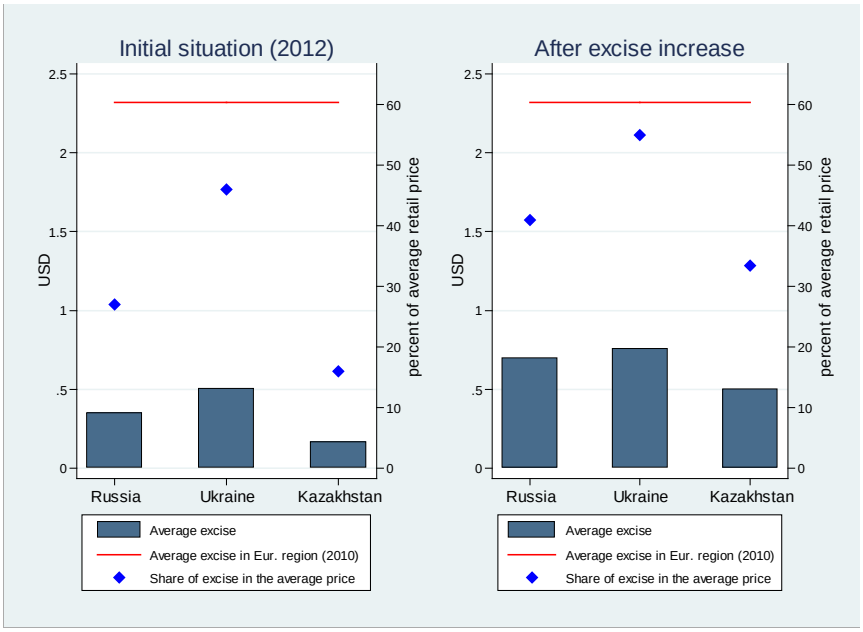
Smoking causes significant economic and health losses in the post-Soviet countries where smoking prevalence, traditionally high, increased significantly during the last twenty years. In the Russian Federation, where the prevalence of tobacco smoking among males rose from less than 50 percent in the mid-1980s to 60 to 65 percent in the 2000s (GATS 2009), the annual tobacco-related mortality was estimated in 2009 as 280,000 (Maslennikova and Oganov 2011), or 14 percent of total mortality.

Smoking is rapidly becoming popular among females, especially in Russia — according to WHO statistics, in 2010 the prevalence of current smoking of any tobacco product among females in Russia was 22 percent (WHO GHO 2014) compared to less than 10 percent in the 1980s (Cooper 1982). In Kazakhstan and in Ukraine 10 and 11 percent, respectively, of females smoked in 2010 according to data reported by WHO (WHO GHO 2014).

Another widely discussed characteristic is the low price elasticity of tobacco consumption in Russia and Ukraine that has been estimated to not exceed -0.3 (Ross et al. 2012; Arzhenovsky 2006; and Lukinykh and Zasimova 2009). Among possible explanations the researchers mention a wide range of prices, supported by the tobacco industry, and high social acceptability of smoking (Peng and Ross 2009). On the other hand, there are no estimates in the literature for the price elasticity of tobacco consumption in Kazakhstan.

Cigarette excises and retail prices are traditionally low in post-Soviet countries. Even in Ukraine where tobacco taxes were raised substantially in 2008–10, excise on filtered cigarettes in 2012 was almost five times less than the average excise for the European region of WHO in 2010. Kazakhstan is characterized by the lowest level of tobacco excise, as taxes reached only about 15 percent of the average retail price of cigarettes in 2012.

Figure 1.1 Average Excises Before and After a Considered Excise Increase



Source: Authors' estimates based on national official statistics (Kazstat 2014, Rosstat 2014, and Ukrstat 2014) and WHO data (WHO GHO 2014).

Tobacco taxation is widely acknowledged as an effective policy measure to curb tobacco consumption (Chaloupka et al. 2010), but it has been traditionally considered regressive because of the relatively higher incidence that the tax would have on the income of the poorer segments of the population (Warner 2000). However, recent studies based on Chinese and Indian data (see Verguet et al. 2013; and Murphy et al. 2012) using extended cost-effectiveness analysis (ECEA) (Verguet et al. 2014) have shown that due to stronger health effects on poorer income groups, excise taxes should be considered as a pro-poor (i.e., progressive) policy measure.

The main objectives of this paper are to estimate the burden of tobacco-caused mortality as a whole and by main tobacco-related diseases in Kazakhstan, Russia, and Ukraine, and to assess the distributional health impact of an increase in tobacco taxation in these three countries.

We estimate the distributional consequences of a hypothetical tax rise in the considered countries that leads to an approximately 30 percent increase of the average retail price. In this study we use micro-data of specialized surveys (Global Adult Tobacco Survey-GATS for Russia and Ukraine, and Household Health Survey for Kazakhstan), which helps create a model with mortality rate per age group and cause of death with and without smoking.

The analysis includes an estimation of changes in smoking prevalence, mortality, life expectancy, and public health expenditures by income quintile and gender. Tobacco-related losses are also estimated (for example, tobacco-related mortality by age and causes, losses in life expectancy caused by smoking).

According to the results obtained, in 2012 smoking caused more than 300,000 deaths in Russia and about 70,000 in Ukraine and 14,300 in Kazakhstan, representing a key factor of mortality among the working-age population. However, the Kazakhstan health survey used in the analysis shows a smoking prevalence that is significantly lower than other estimate (e.g., WHO GHO 2014). Therefore, the data used for Kazakhstan may lead to both lower model estimates of health losses due to smoking and expected health effects of hypothetical tobacco excise growth.

According to our estimations, considered excise growth could lead to about 3.5 to 4.0 percent fall in smoking prevalence, which in turn could reduce tobacco-related mortality by about 30,000 in Kazakhstan, 600,000 in Russia, and 140,000 in Ukraine.

Reduced tobacco-related mortality and morbidity would result in substantial decrease in health expenditures for the treatment of tobacco-related diseases: the expected reduction can be estimated as more than US$50 million in Kazakhstan, more than US$2 billion in Russia, and US$180 million in Ukraine.

Positive health effects are expected to be pro-poor — almost 60 percent of reduced mortality is observed within two lower-income quintiles, which means that the poor would benefit more from health improvements due to the tobacco tax increase.

2. METHODOLOGY

DATA

Our estimates are based mainly on official information published by national agencies of statistics,[1] WHO, and on micro-data:

- Kazakhstan: Household Health Survey held by the Ministry of Health of Kazakhstan and the World Bank, 2012
- Russia: GATS, 2009
- Ukraine: GATS, 2010[2]

It is worth mentioning that survey data used in the analysis for Kazakhstan give a considerably lower estimate of smoking prevalence (34 percent for men and 2 percent for women) than reported by WHO[3] (52 percent for men and 9 percent for women). GATS survey is not held in Kazakhstan, so the Kazakhstan health survey is the only available source of micro-data on smoking in the country. However, it is possible that these data underestimate smoking prevalence in the country, which in turn leads to lower model estimates of health losses as well as lower expected health effects of hypothetical tobacco excise increase.

METHODS

In our analysis we use a modeling approach similar to the ones used in Verguet et al. (2013) and Jha et al. (2012). We estimate health effects across income quintiles, gender,[4] and five-year age cohort, over a fifty years period with five-year intervals.

Health effects of increased taxation derive from the reduction of premature mortality from tobacco-related diseases. The greatest effect of one-time tobacco-control intervention such as excise increase would be observed after 25 to 30 years when a substantial fraction of tobacco-caused deaths occur.[5]

To estimate health losses due to smoking and expected health benefits of tobacco tax increase, the following steps are taken.

---

1. Federal State Statistics Service of Russian Federation (official site http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/en/main/); Agency of Statistics of the Republic of Kazakhstan (official site http://www.stat.gov.kz/faces/home); and State Statistics Service of Ukraine (official site http://www.ukrstat.gov.ua/).

2. GATS data for Russia and Ukraine are available online at http://nccd.cdc.gov/GTSSData/default/default.aspx.

3. See WHO GHO 2014.

4. The effect for female population in Kazakhstan was not calculated because of the low smoking prevalence estimated in the country.

5. See time distribution of preliminary mortality avoided by tobacco-control intervention in (Jha et al. 2006).

Step 1. Estimating changes in smoking prevalence and tobacco-related mortality

First, we estimate the change in smoking prevalence after the considered tax increase. An excise tax hike leads to an increase of the average retail price, which in turn, through a price elasticity mechanism (see the assumptions on price elasticities of demand and participation in Table 1.4) causes a fall in smoking prevalence.

Given changes in smoking prevalence, we obtain the reduction in tobacco-related disease–specific mortality. In our calculations we use the assumptions from earlier research on age probabilities of avoiding tobacco-related death after smoking cessation (Ranson et al. 2002)[6] and the risks of premature mortality for long-term smokers (Jha et al. 2006).[7]

Step 2. Estimating the number of years gained by reduced tobacco-related mortality

To estimate the number of life years gained by reduction in premature mortality, we need to compare life expectancy for smokers and nonsmokers. This can be done on the basis of mortality and smoking prevalence data as well as through estimates for relative risks of dying prematurely from tobacco-related diseases.

To calculate life expectancy at different ages for smokers and nonsmokers, we use the relative risk data from earlier research (see WHO 2012 and Danaei et al. 2009). The relative risk for a specified disease is the risk of dying from it among smokers relative to nonsmokers. Seven main causes of tobacco-related mortality are considered: ischemic disease, stroke, other cardiovascular diseases, chronic obstructive pulmonary disease (COPD), other respiratory diseases, lung cancer, and other neoplasms. The values of relative risks for main tobacco-related diseases used in the research are presented in the Table 1.1.

Table 1.1 Relative Risks for Various Causes of Death, Males/Females

Age	Ischemic disease	Stroke	Other cardiovascular diseases	COPD	Other respiratory diseases	Lung cancer	Other neoplasms
30–44	5.5/2.3	3.1/4.6	2.2/2.0	10.8/12.3	1.9/2.2	21.2/12.5	2.2/1.4[8]
45–60	3.0/3.8	3.1/4.6	2.2/2.0	10.8/12.3	1.9/2.2	21.2/12.5	2.2/1.4
60–69	1.9/2.5	1.9/2.8	2.2/2.0	10.8/12.3	1.9/2.2	21.2/12.5	2.2/1.4
70–79	1.4/1.7	1.4/2.0	2.2/2.0	10.8/12.3	1.9/2.2	21.2/12.5	2.2/1.4
80 and over	1.1/1.4	1.1/1.0	2.2/2.0	10.8/12.3	1.9/2.2	21.2/12.5	2.2/1.4

Source: Danaei et al. 2009.
Note: The relative risk presents the ratio between the probability of death for a smoker and the probability of death for a nonsmoker. Therefore, the relative risk of diseases that are not caused by tobacco is equal to 1.0.

6. 95 percent of quitters age 15 to 29 will avoid tobacco-related deaths, while it is only 75 percent of quitters age 30 to 39, 70 percent of quitters age 40 to 49, 50 percent of quitters age 50 to 59, and 10 percent of quitters age 60 or older who will avoid tobacco-related deaths.

7. Between one-half and two-thirds of long-term smokers would eventually die from tobacco-related illnesses. In the model we use a more conservative variant (the risk of premature mortality for a long-term smoker is 50 percent).

8. Due to incomplete data of mortality by causes, we had to aggregate relative risks for different types of cancers.

Knowing the values of relative risks (RR) and the number of deaths from specified diseases for five-year age cohorts, one can split the total number of deaths for those representing smokers and nonsmokers:

$$D_{smokers} = D_{total} * \frac{prevalence*RR}{1-prevalence+prevalence*RR};$$
$$D_{nonsmokers} = D_{total} * \frac{1-prevalence}{1-prevalence+prevalence*RR}.$$

Then we use the standard life table technique[9] to estimate life expectancy of smokers and nonsmokers at age x given the observed five-year age-specific death rates for them (${}_5M_x={}_5D_x/{}_5N_x$, where ${}_5D_x$ is the number of deaths between ages x and x+5, and ${}_5N_x$ is the mid-year population in age interval x and x+5). Within these calculations, the following characteristics are computed:

- ${}_5q_x$ — probability of dying between ages x and x+5
- l_x — number of people left alive at age x (in the cohort of 100,000 births)
- ${}_5d_x$ — number of people dying between ages x and x+5 (in the cohort of 100,000 births)
- ${}_5L_x$ — number of person-years lived between ages x and x+5 (in the cohort of 100,000 births)
- T_x — person-years lived above age x, and finally expectation of life at age x (in the cohort of 100,000 births)
- e_x — life expectancy at age x

Step 3. Estimating the reduction in public health expenditures for treatment of tobacco-related diseases

To estimate the reduction in expenditures for treatment of tobacco-related diseases, we first estimate input of each of seven main causes (ischemic disease, stroke, other cardiovascular diseases, COPD, other respiratory diseases, lung cancer, and other neoplasms) in total tobacco-caused mortality.

Subsequently, taking into account probability of health care utilization for different diseases taken from the earlier research (Verguet at al. 2013)[10] and estimated tobacco-related diseases treatment costs, we obtain the expected changes of public health expenditures. Tobacco-related diseases treatment costs were estimated on the basis of the medical-economic standards of one Russian region and subsequently indexed to Kazakhstan and Ukraine using WHO data on per capita public health expenditures (see Table 1.5 for details).

We also try to take into account the fact that a younger smoker who is expected to die from tobacco-caused disease needs more public health expenditures during his life time than an older person whose treatment was probably paid off by the health care system earlier. So we suppose

9. See, for example, the description of period life table construction in Preston 2001, p. 49.

10. 80 percent for ischemic disease, stroke, and other cardiovascular diseases; 50 percent for cancer; and 33 percent for respiratory diseases.

that the expected number of utilizations of health care during a lifespan depends on the age of the person suffering from the tobacco-caused disease (assumed to be 2.0 for smokers age 15 to 30, 1.8 for smokers age 30 to 45, 1.5 for smokers age 45 to 60, and 1.0 for others).

To estimate total health expenditures avoided due to fall in smoking prevalence, we applied country data on general government expenditures on health as a percentage of total expenditure on health reported by WHO[11] to estimate previously avoided public health expenditures.

To check the sensitivity of obtained results, we consider several values of price elasticity of demand — two values for Ukraine: -0.3 (basic) and -0.4 (higher); and three values for Russia and Kazakhstan: -0.3 (basic), -.0.2 (lower), and -0.3 (higher).

BASIC ASSUMPTIONS

INITIAL EXCISE CHANGE

Due to significant differences in VAT and share of excise in average retail prices between the countries,[12] the same increase of excise will lead to different changes in average retail price (see the table below).

Table 1.2 Sensitivity of Average Retail Price on Filter Cigarettes with Respect to Changes in Excise

	Share of excise in average retail price (%)	VAT	Percent change of average retail price after 50% increase of excise	Percent change of average retail price after 100% increase of excise	Percent change of average retail price after 200% increase of excise
Kazakhstan	16	12	9	18	36
Russia	27	18	16	32	64
Ukraine	46	20	28	55	110

Source: Authors' estimates based on national official statistics and Euromonitor 2013.

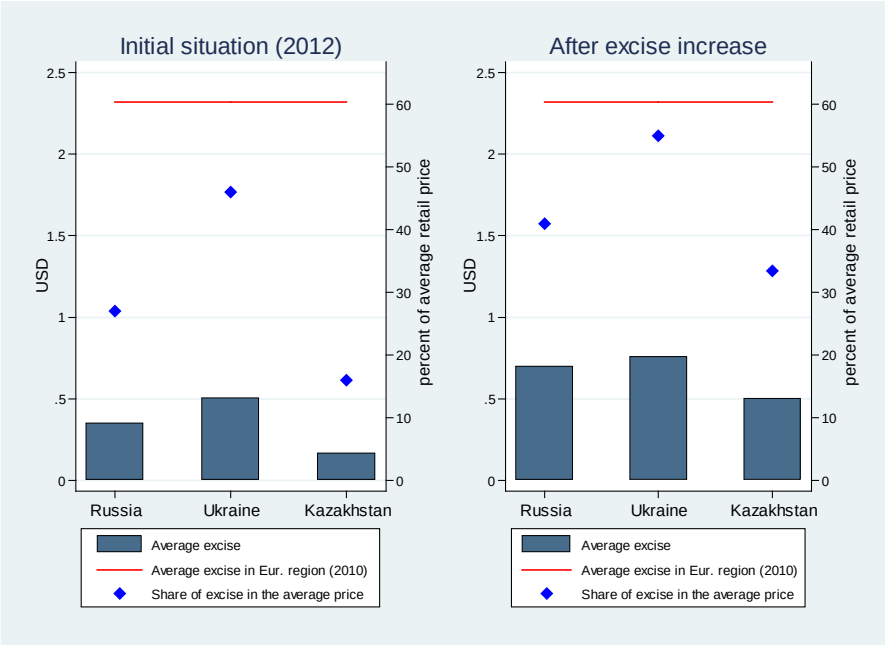
To obtain the close changes in the average retail price, we are going to consider the following:

- 200 percent excise change in Kazakhstan (36 percent change of average retail price)
- 100 percent excise change in Russia (32 percent change of average retail price)
- 50 percent excise change in Ukraine (28 percent change of average retail price)

11. 59.7 percent in Russia, 51.7 percent in Ukraine, and 57.9 percent in Kazakhstan in 2011; see http://apps.who.int/gho/data/node.main.75?lang=en.

12. In 2012 the share of excise in the average retail price was about 16 percent in Kazakhstan, 27 percent in Russia, and 46 percent in Ukraine (see Table 1.2).

Figure 1.2 Average Excises Before and After the Increase



Source: Authors' estimates.

The results of considered interventions are presented in the diagram above. It is easy to see that suggested excise growth allows converging excises in three countries.

The key characteristics of tobacco consumption in the three countries are summarized in the table below.

Table 1.3 Parameters on Tobacco Consumption (Initial Situation, 2012)

	Smoking prevalence, males/females (%)	Average consumer price, national currency units	Share of excise in the average retail price (%)	Increase of excise assumed (%)
Kazakhstan	34/2	157.0	16	200
Russia	61/20	40.0	27	100
Ukraine	53/11	8.8	46	50

Source: WHO GHO 2014, Euromonitor 2013, official statistics and authors' estimates.

PRICE ELASTICITIES OF DEMAND AND PREVALENCE

As stated in numerous research (see Arzhenovsky 2006; Lukinykh and Zasimova 2009 for Russia; Ross et al. 2012 for Ukraine), the price elasticity of demand on tobacco is low in Ukraine

and Russia. There exist no empirical estimates of price elasticity for Kazakhstan, except for expert assumptions about its size.[13]

Ross et al. (2012) estimate price elasticity of demand in Ukraine during the period of sharp rise of excises as 0.3. Relatively low price responsiveness of demand in the country can be explained by a set of factors, such as a wide range of prices (when a smoker can switch to less expensive brands instead of decreasing consumption), high social acceptability of smoking, as well as limited efforts to introduce additional measures to control tobacco use (see also Peng and Ross 2009). Empirical data from Ukraine (Krasovsky 2013) show that the price growth in 2009–10 had a long-term effect mainly on younger and poorer people.

To analyze changes in smoking prevalence and consumption, we have to use estimates for elasticities[14] of smoking prevalence ($\varepsilon_{prevalence}$) and intensity ($\varepsilon_{intensity}$). Taking into account that price elasticity of demand ε_{total} follows the rule $\varepsilon_{total}=\varepsilon_{prevalence}+\varepsilon_{intensity}$, we assume the following:

- Absolute value of demand of cigarettes depends negatively on incomes: the demand of the higher income group is more inelastic.
- Total price elasticity of demand is low (about -0.3 for Ukraine and -0.2 for Kazakhstan and Russia).
- The demand for cigarettes among the richest income group is twice less elastic than among the middle-income groups (that is, third quintiles)[15] and three times less elastic than among lowest-income groups (quintiles one and two).
- Smokers from the highest-income quintile are almost insensitive to price changes, as shown in Ukraine data (Krasovsky 2013).
- Elasticity of participation is assumed to be half of the price elasticity of demand.

These assumptions allow us to estimate elasticities of demand and participation presented in the table below. We undertake sensitivity analysis by comparing the results for three price elasticity estimates: lower (-0.2), basic (-0.3), and higher (-0.4) (see annex 2 with main results comparison).

Table 1.4 Authors' Assumptions for Price Elasticity of Demand,[16] and Elasticity of Participation

	1 (the poorest)	2	3	4	5	Total
Price elasticity of demand	-.4	-.4	-.250	-.2	-.130	-.30
Elasticity of participation	-.2	-.2	-.125	-.1	-.065	-.15

Source: Authors' estimates.

13. http://cdrwww.who.int/tobacco/economics/meetings/astana_tob_tax_may2010.pdf.

14. Only long-run elasticities were considered.

15. According to Krasovsky et al. (2002), price elasticity within the high-income group was 0.15, while it was 0.28 and 0.33 within low-income and middle-income groups, respectively (for smokers age 29 and older).

16. Readers can compare suggested values of price elasticity of demand with similar estimates for other countries: {-0.64, -0.51, -0.38, -0.25, -0.12} in China and {-1.4, 1.4, -1.1, -0.7, -0.5} in India for income groups I, II, III, IV, and V (see Verguet et al. [2013] and Murphy et al. [2013]).

To estimate tobacco-related diseases treatment costs for Russia, we used data of regional medical economic standards for one Russian region (Sverdlovsk region).[17] Such standards are developed at the regional level to estimate the cost of the benefit package provided under the Federal Mandatory Health Insurance system also known as Program of State Guarantees for Medical Care Provision Free of Charge. The estimated costs of tobacco-related diseases treatment for Russia both in national currency and in US dollars are presented in Table 1.5.

Since there was insufficient data to estimate similar treatment costs for Kazakhstan and Ukraine, we indexed the treatment costs for Russia to the ratio of per capita public health expenditures of Kazakhstan and Ukraine. In support of this method, it can be argued that 25 years ago these countries were part of the same health systems and that the relative costs of treating the same disease across the three countries are still comparable.

Table 1.5. Authors' Assumptions about Public Health Expenditures for Selected Tobacco-Related Diseases

	Russia, Rub	Kazakhstan, US$	Russia, US$	Ukraine, US$
Ischemic heart disease	60,000	1,071	1,948	584
Stroke	70,000	1,250	2,273	682
Other cardiovascular diseases (arteriosclerosis)	45,000	804	1,461	438
Respiratory diseases (COPD)	25,000	446	812	244
Cancer (lung cancer)	65,000	1,161	2,110	633

Source: WHO GHO 2014 and authors' estimates.
Note: In our estimations we used IMF exchange rates for 2012: 14 T/US$ for Kazakhstan, 30.8 Rub/US$ for Russia, and 8.0 Hrv/US$ for Ukraine; and WHO data on public health expenditures per capita: US$264 for Kazakhstan, US$482 for Russia, and US$136 for Ukraine.

3. RESULTS

HEALTH LOSSES DUE TO TOBACCO USE

Smoking substantially decreases life expectancy due to higher relative risks of tobacco-caused diseases, such as cardiovascular diseases (ischemic disease and stroke), COPD, various types of cancer, and other diseases. Life expectancy in Kazakhstan, Russia, and Ukraine is low; these countries experienced a significant mortality crisis in the post-Soviet period. However, smoking is not the sole contributory factor for higher mortality and lower life expectancy — influence of factors such as alcohol consumption, unhealthy lifestyle, and low health system performance are also important (Shkolnikov et al. 2013). That is why Kazakh, Russian, or Ukrainian smokers would gain less from avoiding tobacco-caused death than smokers in countries with higher life expectancy. Therefore, estimates derived from countries where contributory factors are less

17. The list of standards (in Russian) is available online at http://www.google.ru/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CCsQFjAA&url=http%3A%2F%2Fwww.okb1.ru%2Ffiles%2FTarif_soglaschenie_pril3.xls&ei=a6yEUtaCGqXj4wTo3YG4Cw&usg=AFQjCNHzw-IxOchrldAV4izMFUlGFwR4Ew&sig2=ScPRVhTDZ7MBes7PWTkYvQ&bvm=bv.56343320,d.bGE&cad=rjt.

important, for example Britain (see Doll et al. 2004) would overestimate the health effect if applied to the countries examined in the paper.

According to our estimates, in Kazakhstan the highest difference in life expectancy of nonsmokers and smokers is observed at the age of 35 and exceeds 7 years for men and 8 years for women. In Russia the number of years of life gained for avoiding tobacco-caused mortality was about 7.0 years at age 30, about 6.5 years at age 40, about 6 years at age 50, and about 5 years at age 60. In Ukraine the highest difference in life expectancy of nonsmokers and smokers is observed at the age of 35 and amounts to about 7 years for both men and women (see table 1.6).

Table 1.6 Estimated Difference in Life Expectancy between Smokers and Nonsmokers in years

Age	Males	Females
Kazakhstan		
30–44	7.24	8.13
45–59	6.59	7.25
60–74	4.66	4.49
75 and older	2.81	2.03
Russia		
30–44[18]	6.45	6.42
45–59	5.74	5.94
60–74	3.84	3.92
75 and older	1.93	1.73
Ukraine		
30–44	6.77	7.17
45–59	6.11	6.64
60–75	3.99	4.13
75 and older	2.01	1.93

Source: Authors' estimates.

The numbers of deaths caused by tobacco-related diseases estimated by the model are presented in table 1.7. In 2012 in Kazakhstan smoking caused about 14,300 deaths among men and 600 deaths among women, or about 15,000 deaths within the whole population. However, as mentioned before, smoking prevalence in Kazakhstan estimated using the 2012 Household Health Survey is significantly lower that other estimates, which may lead to lower estimates for both health losses due to smoking and expected health effects of hypothetical tobacco excise

18. In this table only life expectancies for age 30 and older are presented (from this age mortality rates for smokers and nonsmokers begin to differ significantly). For population age 15 to 30, following the results by Doll et al. (2004), we assume that difference in life expectancy is only one year more than for age 30 to 35.

growth. For example, according to national Ministry of Health data, annually, about 25,000 adults die prematurely from tobacco-caused diseases.[19]

Diseases caused by smoking are responsible for 18 percent of all male mortality in Kazakhstan and 1 percent of all female mortality. In middle age (from 30 to 59 years), the input of smoking in overall mortality is 25 percent for men and 2 percent for women. Obtained results seem to underestimate losses caused by smoking due to lower reported smoking prevalence.

According to our estimates, in 2012 in Russia smoking caused about 265,000 deaths among men and 45,000 deaths among women, or 310,000 in total. In earlier research (Maslennikova and Oganov 2011), similar losses in 2009 were estimated as about 280,000 in total. Diseases caused by smoking are responsible for 24 percent of all male mortality and 5 percent of all female mortality. In middle age (from 30 to 59 years), the input of smoking in overall mortality is quite impressive: 31 percent for men and 16 percent for women.

In Ukraine, in 2012 smoking was the cause of about 65,000 deaths among men and 6,000 deaths among women, or 71,000 within the whole population. Diseases caused by smoking are responsible for 19 percent of all male mortality and 2 percent of all female mortality. In middle age (from 30 to 59 years), the input of smoking in overall mortality is 29 percent for men and 9 percent for women.

Table 1.7 Tobacco-Caused Health Losses

	Tobacco-caused mortality, thousand per year	**Input of smoking in total mortality (15 years and older, %)**	**Input of smoking in total mortality (years 30–59, %)**
Kazakhstan			
Men	14.3	18	25
Women	0.6	1	2
Total	14.9	10	18
Russia			
Men	265.0	24	31
Women	45.0	5	16
Total	310.0	15	27
Ukraine			
Men	65.0	19	29
Women	6.0	2	9
Total	71.0	10	23

Source: Authors' estimates.

Finally, table 1.8 presents the relative importance of the different types of tobacco-caused diseases, such as cardiovascular diseases (ischemic disease and stroke), COPD, various types of cancer, and other diseases. In Kazakhstan more than 55 percent of male and more than 60 percent of female tobacco-related mortality is caused by cardiovascular diseases.

19. See, for example, http://tengrinews.kz/kazakhstan_news/ot-kureniya-v-kazahstane-ejegodno-umirayut-25-tyisyach-chelovek-189357/.

In Russia cardiovascular diseases were the cause of more than 58 percent of all tobacco-related mortality. In the earlier research on Russian data (Maslennikova and Oganov 2011), this indicator was estimated in 2009 as 63 percent.

In Ukraine cardiovascular diseases accounted for 58 percent of male and more than 70 percent of female tobacco-related mortality. It is worth mentioning the crucial role of cardiovascular diseases in total mortality in Russia and Ukraine. The phenomenon of high input of cardiovascular diseases in total mortality in Russia and Ukraine is well known and extensively discussed in the literature (see, for example, Meslé and Vallin 2012).[20]

Table 1.8 The Structure of Tobacco-Related Mortality in Kazakhstan, Russia, and Ukraine (*percent*)

	Ischemic heart disease	Stroke	Other cardiovascular diseases	COPD	Other respiratory diseases	Lung cancer	Other cancers
Kazakhstan							
Males	24	14	18	16	12	13	3
Females	18	26	17	9	6	21	2
Russia							
Males	31	14	13	16	16	8	4
Females	35	25	13	7	9	8	3
Ukraine							
Males	38	11	9	15	16	9	2
Females	42	23	8	8	9	9	2

Source: Authors' estimates.

EXPECTED HEALTH EFFECTS OF TOBACCO EXCISE INCREASE

The expected results of 200 percent excise growth in Kazakhstan, 100 percent excise growth in Russia, and 50 percent in Ukraine (leading to 36 percent, 32 percent, and 28 percent average retail price growth, respectively) are presented in Table 1.9 (males) and table 1.10 (females). The results for Kazakhstan are reported for males only, since smoking prevalence among females is almost negligible according to the Kazakhstan Household Health Survey.

Smoking prevalence among males in Kazakhstan is expected to fall by 4 percent on average, and 6 percent in the poorest quintile. Tobacco-related mortality among males would fall by 28,000, and due to higher price sensitivity about 55 percent of this decrease in mortality would be observed within the two poorest income quintiles. Reduced premature mortality of males in

20. Among the main causes, the researchers mention high mortality from cardiovascular diseases in younger ages (due to alcohol abuse, smoking, and inappropriate health care); high mortality from external causes; and overestimation of this type of mortality in mortality statistics. Authors are grateful to Evgeny Andreev for useful comments.

Kazakhstan would decrease long-term public health expenditures on treatment of tobacco-related diseases by US$31 million[21] and total health expenditures by US$53 million.

As a result of a 100 percent excise increase, the smoking prevalence in Russia is expected to decrease by 3.6 to 3.8 percent among the adult population and by 5.4 percent in the poorest quintile. A large number of those who would quit smoking would be able to avoid tobacco-related diseases: about 430,000 males and 180,000 females, or more than 600,000 in total. The effects of increased tobacco taxation would be concentrated in the lower-income groups — about 60 percent of males (54 percent for females) who are expected to avoid premature mortality belong to the two poorest income quintiles. The decrease of tobacco-related mortality in Russia would accrue about 4 million years of life (2.9 million for males and 1.2 billion for females). Public health expenditures averted can be estimated as more than US$1.3 billion,[22] while the reduction of total health expenditures, including private health expenditure would be more than US$2.2 billion.

The lower effect of excise tax increase on the health of the poorest females can be explained by the lower impact of income on female smoking. In Russia, the dependence of smoking prevalence on incomes is not as distinct as in some other counties, such as China (Verguet et al. 2013) or India (Murphy et al. 2012). For example, in India the prevalence of smoking in the poorest income quintile is twice as large as in the wealthiest quintile.[23] In Russia, on the contrary, no significant differences were observed in smoking rates among income quintiles, nor does smoking prevalence tend to rise or fall with income growth. Several possible explanations can be suggested for these trends. First, smoking is too widespread in Russia; it affects the whole population, not just selected groups. Also different tendencies are superimposed on one another: richer citizens tend to live healthier lifestyles and smoke less, while for women, especially young women, smoking still remains a symbol of independence and emancipation.

According to our estimations, the expected results of 50 percent excise growth and subsequent 28 percent average retail price growth in Ukraine could lead to a reduction in smoking prevalence of 3.4 percent on average and 4.7 percent within the two poorest quintiles. Tobacco-related mortality among males would fall by almost 140,000, due to higher price sensitivity; 62 percent of this decrease in mortality would be observed within the two poorest income quintiles.

Reduced premature mortality would allow lower public health expenditures on treatment of tobacco-related diseases by more than US$90 million[24] and on total health expenditures by US$180 million.

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21. As a comparison, total expenditures on health in 2012 were about US$8.5 billion (total expenditures on health estimated by WHO as 4.2 percent of GDP, estimated by IMF as US$204 billion).

22. As a comparison, total expenditures on health in 2012 were about US$127 billion (total expenditures on health estimated by WHO as 6.3 percent of GDP, estimated by IMF as US$2004 billion).

23. https://depts.washington.edu/cvdd/drupal/sites/default/files/Tobacco.pdf.

24. As a comparison, total expenditures on health in 2012 were about US$13.3 billion (total expenditures on health estimated by WHO as 7.6 percent of GDP, estimated by IMF as US$176 billion).

Table 1.9 Expected Health Effects of Tobacco-Control Interventions in Kazakhstan, Russia, and Ukraine (within 50 Years, with Greatest Effect Observed in 25 to 30 Years) by Income Quintiles, Males

	Quintile 1 (the poorest)	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Kazakhstan						
Reduction in smoking prevalence, %	5.88	5.88	3.71	2.98	1.95	3.97
Reduction in tobacco-related mortality, thousand person	7.60	7.92	4.87	4.34	3.16	27.89
Total reduction in mortality (for each income group), %	27	28	17	16	11	100
Years of life gained, million	0.06	0.06	0.04	0.03	0.02	0.21
Public health expenditures averted, 2012 US$ million	8.47	8.65	5.32	4.77	3.51	30.71
Total health expenditures averted, 2012 US$ million	14.62	14.94	9.19	8.24	6.05	53.04
Russia						
Reduction in smoking prevalence, %	5.34	5.34	3.37	2.71	1.77	3.78
Reduction in tobacco-related mortality, thousand person	134	125	74	57	38	428
Total reduction in mortality (for each income group), %	31	29	17	13	9	100
Years of life gained, million	0.89	0.83	0.50	0.38	0.6	2.87
Public health expenditures averted, 2012 US$ million	282	261	158	120	81	902
Total health expenditures averted, 2012 US$ million	473	437	264	201	136	1,511
Ukraine						
Reduction in smoking prevalence, %	4.73	4.73	2.98	2.39	1.56	3.44
Reduction in tobacco-related mortality, thousand person	37	31	19	14	8	110
Total reduction in mortality (for each income group), %	33	29	17	13	8	100
Years of life gained, million	0.26	0.22	0.13	0.10	0.06	0.77
Public health expenditures averted, 2012 US$ million	24	20	12	9	5	71
Total health expenditures averted, 2012 US$ million	46	39	24	18	11	137

Source: Authors' estimates.

Table 1.10. Expected Health Effects of Tobacco-Control Interventions in Russia and Ukraine (within 50 Years, with Greatest Effect Observed in 25 to 30 Years) by Income Quintiles, Females

	Quintile 1 (the poorest)	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Russia						
Reduction in smoking prevalence, %	5.34	5.34	3.37	2.71	1.77	3.57
Reduction in tobacco-related mortality, thousand person	50	46	38	22	22	178
Total reduction in mortality (per each income group), %	28	26	22	12	13	100
Years of life gained, million	0.34	0.31	0.26	0.15	0.15	1.21
Public health expenditures, 2012 US$ million	117	108	92	51	53	420
Total health expenditures avoided, 2012 US$ million	195	180	154	86	88	704
Ukraine						
Reduction in smoking prevalence, %	4.73	4.73	2.98	2.39	1.56	3.33
Reduction in tobacco-related mortality, thousand person	7	12	4	4	3	30
Total reduction in mortality (per each income group), %	24	38	14	14	9	100
Years of life gained, million	0.06	0.09	0.03	0.03	0.02	0.23
Public health expenditures avoided, 2012 US$ million	5	9	3	3	2	23
Total health expenditures avoided, 2012 US$ million	10	17	6	6	4	44

Source: Authors' estimates.

The results of sensitivity analysis for different price elasticity estimates are presented in annex 2.

4. CONCLUSION AND RECOMMENDATIONS

The paper presented the estimated distributional consequences of a hypothetical one-time increase in tobacco excise tax that leads to approximately 30 percent increase of average retail cigarettes price.

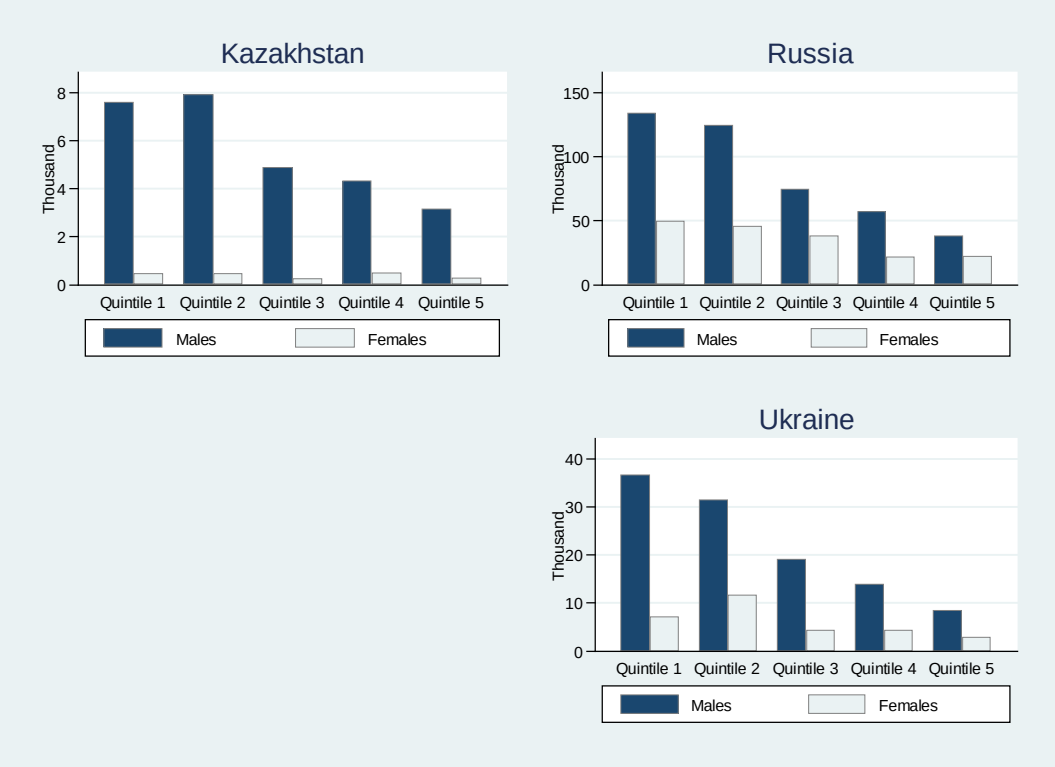
Tobacco smoking is widespread in Kazakhstan, Russia, and Ukraine, especially among males, although the numbers of female smokers is increasing significantly in all three countries. As a result smoking leads to vast health losses — it is one of the main causes of adult and working-age mortality — and economic costs.

In spite of high smoking prevalence and significant health losses, tobacco excise policy remains rather low in the countries included in the research. Absolute and relative tobacco excises are low, especially when compared to excises in European countries. Low level of tobacco excise policy combined with high social acceptability of smoking and a wide range of prices for different brands of cigarettes explain the low price elasticity of demand for tobacco that is typical for the countries included in the research.

According to our estimations, the excise increase considered in the study would lead to about 3.5 to 4.0 percent fall in smoking prevalence, which in the long term would allow reductions in tobacco-related mortality by about 30,000 in Kazakhstan, 600,000 in Russia, and 140,000 in Ukraine.

Positive health effects are expected to be pro-poor as showed in figure 1.3. Due to higher absolute values of price elasticity for tobacco products among low-income groups, the poor are more price-sensitive to tobacco control measures. According to modeling results, the expected health effects would be concentrated in the lower-income groups — almost 60 percent of reduced mortality is observed within the two poorest income quintiles.

Figure 1.3 Distribution of Reduction in Tobacco-Caused Mortality Due to a Hypothetical Excise Growth



Source: Authors' estimates.

Reduced tobacco-related morbidity would substantially decrease health expenditures for treatment of tobacco-related diseases: the expected reduction can be estimated as more than US$50 million in Kazakhstan, more than US$2 billion in Russia, and US$180 million in Ukraine. Thus, according to the obtained results (see table 1.11), considered tobacco excise increase would have a significant health effect in terms of mortality reduction and years of life gained. Since the poor are more price-responsive than the rich, they benefit more from the health improvements effected by the growth of excises. Another important outcome of toughening of state excise policy is a noticeable reduction of health expenditures on tobacco-caused diseases treatment.

Table 1.11 Expected Health Consequences of a Hypothetical Excise Growth in Russia, Ukraine, and Kazakhstan

	Russia		Ukraine		Kazakhstan
	Males	**Females**	**Males**	**Females**	**Males**
Reduction in tobacco-related mortality, thousand person	428	178	110	30	28
Total reduction in mortality attributable to two poorest income quintiles (%)	60	54	62	62	55
Years of life gained, million	2.87	1.21	0.77	0.23	0.21
Total health expenditures avoided, US$ million	1,511	704	137	44	53

Source: Authors' estimates.

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ANNEX 1. MORTALITY BY CAUSES

Table 1A.1 Mortality from Various Causes by Age Groups, Russia

Age group	Ischemic disease	Stroke	Other cardiovascular diseases	COPD	Other respiratory diseases	Lung cancer	Other cancers	Other causes
Males								
Total	278,933	143,803	90,796	42,706	114,168	23,686	31,777	322,445
0–1	0	16	127	2	62	0	509	7,466
1–4	0	1	48	1	164	4	174	1,479
5–14	0	16	85	2	293	6	83	2,189
15–24	264	243	824	16	789	44	480	20,075
25–34	2,230	947	5,121	93	1,586	137	2,727	50,814
35–54	44,302	14,847	27,736	7,128	19,443	1,729	12,448	124,707
55–74	139,817	69,222	36,445	28,218	66,411	12,418	11,893	83,353
75+	91,684	58,406	19,965	7,222	25,370	9,338	3,178	27,869
Females								
Total	306,244	228,731	88,154	8,727	128,001	10,353	13,646	178,373
0–1	0	12	118	0	58	0	434	5,467
1–4	0	4	46	1	162	3	132	1,022
5–14	2	14	51	1	228	5	113	1,315
15–24	102	153	356	8	575	33	341	5,960
25–34	459	432	1,531	50	1,934	39	1,163	12,650
35–54	9,671	7,207	9,927	1,152	21,482	539	3,641	37,161
55–74	86,683	61,560	24,953	4,393	62,577	3,470	3,847	46,154
75+	209,138	159,303	51,030	3,120	40,975	6,262	3,899	67,564

Source. Study calculations based on data from WHO mortality database, http://apps.who.int/healthinfo/statistics/mortality/whodpms/.

Table 1A.2 Mortality from Various Causes by Age Groups, Ukraine

Age group	Ischemic disease	Stroke	Other cardiovascular diseases	COPD	Other respiratory diseases	Lung cancer	Other cancers	Other causes
Males								
Total	136,333	40,274	21,903	11,862	37,125	8,683	5,017	80,052
0–1	0	13	33	0	26	0	85	2,490
1–4	0	1	8	0	68	0	30	425
5–14	0	3	15	0	101	2	13	528
15–24	90	39	133	7	242	2	81	3,795
25–34	582	207	732	25	573	39	500	10,578
35–54	10,801	3,672	5,293	1897	6,755	535	2,154	32,588
55–74	66,644	19,521	7,878	8,263	22,565	4,387	1,684	22,488
75+	58,215	16,818	7,811	1,670	6,794	3,718	470	7,141
Females								
Total	178,339	61,075	27,169	2,314	37,466	4,069	1,711	44,843
0–1	0	10	17	0	23	0	58	1,809
1–4	0	0	5	0	44	0	32	314
5–14	0	5	5	0	70	2	12	323
15–24	38	27	49	7	196	7	57	1,135
25–34	136	81	232	18	678	15	204	2,950
35–54	2,671	1,913	1,763	347	7,234	156	603	9,476
55–74	51,720	18,133	4,916	1,323	20,709	1,166	448	11,320
75+	123,772	40,906	20,181	619	8,512	2,723	297	17,512

Source. Study calculations based on data from WHO mortality database, http://apps.who.int/healthinfo/statistics/mortality/whodpms/.

Table 1A.3 Mortality from Various Causes by Age Groups, Kazakhstan

Age group	Ischemic disease	Stroke	Other cardiovascular diseases	COPD	Other respiratory diseases	Lung cancer	Other cancers	Other causes
Males								
Total	13,434	8,809	11,234	2,630	7,062	2,769	2,226	30,483
0–1	1	10	28	1	10	0	343	3,321
1–4	1	6	16	0	42	3	108	443
5–14	1	6	9	0	58	2	17	426
15–24	31	31	123	1	104	9	55	2,322
25–34	210	99	503	20	146	46	180	4,434
35–54	2,879	1,589	2,989	464	1,433	385	701	9,961
55–74	7,034	4,801	4,878	1,845	4,181	1,576	638	5,896
75+	3,250	2,264	2,672	299	1,087	748	172	3,484
Females								
Total	11,575	10,236	11,023	566	7,702	1,515	1,214	20,300
0–1	0	16	32	0	14	1	271	2,467
1–4	0	0	18	0	27	1	84	342
5–14	1	10	8	0	42	1	25	268
15–24	11	26	59	2	78	6	57	941
25–34	45	52	170	6	195	22	92	1,190
35–54	636	908	1,144	109	1,869	122	243	3,197
55–74	4,453	4,348	3,756	316	3,985	672	277	3,952
75+	6,424	4,874	5,835	133	1,492	690	163	7,905

Source: Study calculations based on data from WHO mortality database, http://apps.who.int/healthinfo/statistics/mortality/whodpms/.

ANNEX 2. EXPECTED HEALTH EFFECTS OF TOBACCO EXCISE INCREASE FOR LOWER ESTIMATE OF PRICE ELASTICITY OF DEMAND FOR KAZAKHSTAN AND RUSSIA

Due to scarcity of data on price elasticity of demand on cigarettes in Kazakhstan and Russia, we used two variants of elasticity's value — basic (-0.3) and lower (-0.2). For sensitivity reasons we also estimated expected health effects for higher value of elasticity (-0.4), although -0.4 is quite a high value of elasticity, especially for Russia and Kazakhstan. The results for the basic value of elasticity are included in the main part of the report, while the results for lower and higher values are presented here.

Table 2A.1 Authors' Assumptions for Price Elasticity of Demand within Income Quintiles

Price elasticity of demand	Quintile 1 (the poorest)	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
-0.2 (lower)	-.28	-.28	-.18	-.14	-.09	-.20
-0.4 (higher)	-.56	-.56	-.36	-.28	-.18	-.40

Source: Study assumptions.

In the tables below, expected health effects for two countries are presented, based on lower variant of price elasticity.

Table 2A.2 Expected Health Effects of Tobacco-Control Interventions in Kazakhstan, Russia, and Ukraine (within 50 Years, with Greatest Effect Observed in 25 to 30 Years)

Price elasticity estimate	**-0.2**	**-0.3**	**-0.4**	**-0.2**	**-0.3**	**-0.4**
Kazakhstan						
Gender	*Males*			*Females**		
Reduction in smoking prevalence, %	2.81	3.97	5.53			
Reduction in tobacco-related mortality, thousand person	20	28	39			
Public health expenditures averted, 2012 US$ million	22	31	43			
Russia						
Gender	*Males*			*Females*		
Reduction in smoking prevalence, %	2.67	3.78	5.27	2.53	3.57	4.98
Reduction in tobacco-related mortality, thousand person	303	428	597	126	178	248
Public health expenditures averted, 2012 US$ million	638	902	1257	297	420	586
Ukraine						
Gender	*Males*			*Females*		
Reduction in smoking prevalence, %	2.43	3.44	4.80	2.35	3.33	4.64
Reduction in tobacco-related mortality, thousand person	77	110	153	22	30	42
Public health expenditures averted, 2012 US$ million	50	71	99	16	23	31

Source: Authors' estimates.
*For Kazakhstan, health effects were estimated for males only due to low reported smoking prevalence for females.

The main objectives of this paper are to estimate the burden of tobacco-caused mortality as a whole and by the main tobacco-related diseases in Kazakhstan, the Russian Federation, and Ukraine, and to assess the distributional health impact of an increase in tobacco taxation in these three countries. In 2012, smoking caused around 310,000 deaths in Russia, about 70,000 in Ukraine and 14,300 in Kazakhstan, representing a key factor of mortality among the working-age population. Using data from various sources, the paper estimates the distributional consequences of a hypothetical tax rise in the three countries that leads to an approximately 30 percent increase of the average retail price of cigarettes. The analysis includes an estimation of changes in smoking prevalence, mortality, life expectancy, and public health expenditures by income quintile and gender. Considered excise growth could lead to about 3.5 to 4.0 percent fall in smoking prevalence, which in turn could avert about 600,000 tobacco-related deaths in Russia, 140,000 in Ukraine, and 30,000 in Kazakhstan over a period of 50 years. Reduced tobacco-related morbidity would also result in a substantial decrease in health expenditures for the treatment of tobacco-related diseases. Positive health effects are expected to be pro-poor, as almost 60 percent of the reduction in mortality is concentrated in the two lower-income quintiles of the population of the three countries.

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