Demographic Research a free, expedited, online journal
of peer-reviewed research and commentary
in the population sciences published by the
Max Planck Institute for Demographic Research
Konrad-Zuse Str. 1, D-18057 Rostock · GERMANY
www.demographic-research.org

DEMOGRAPHIC RESEARCH

VOLUME 23, ARTICLE 27, PAGES 749-770
PUBLISHED 22 OCTOBER 2010
http://www.demographic-research.org/Volumes/Vol23/27/
DOI: 10.4054/DemRes.2010.23.27

Descriptive Findings

Age-adjusted disability rates and regional effects in Russia

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Demographic Research: Volume 23, Article 27
Descriptive Findings

Age-adjusted disability rates and regional effects in Russia

Aleksandr A. Andreev[1]
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Abstract

We provide three measures of age-standardized disability rates for each Russian region and show that most, though not all, of the regional patterns in disability prevalence disappear with standardization. Disability prevalence remains unusually high for women in St Petersburg and Belgorod but the "remote but healthy" pattern is nearly gone. We conclude that differences in age structure largely account for the differences in disability prevalence across regions of Russia.

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1. Introduction

The prevalence of disability in transition nations is high, reflecting a combination of high prevalence of chronic disease, poor work-place safety practices, and relatively generous social safety net provisions (Andreev, 2008; Seitenova and Becker, 2008; Becker and Urzhumova, 1998). This high prevalence has attracted considerable discussion, and the presence of detailed data has made it possible to explore the characteristics of those receiving disability payments in far more detail than is practical for most other middle-income countries. One of the superficially surprising characteristics concerns regional patterns of disability. Previous research has found that disability prevalence is lowest in Russia's Far East and far north while highest in St Petersburg, Moscow, and the Central federal district. This is a counterintuitive finding, since the high prevalence regions are more prosperous and have better health care and social services. Based on anecdotal evidence, the discrepancies in disability prevalence across regions have been attributed to differences in the generosity of benefits, ease of access to the disability screening process or the prevalence of corruption or fraud. However, by incorporating the age structure of Russian regions, we conclude that almost all of the differences in disability prevalence can be attributed to differences in age structure, and that non-medical explanations are likely to be fairly unimportant.

Due to recent migration out of the Russian north and Far East, the population distribution in these regions is undoubtedly a product of self-selection on the basis of health and employment opportunity, which heavily correlate with age. Crude comparisons of disability prevalence rates across the regions of Russia may therefore be biased. A more appropriate method of comparison of disability rates would adjust for age. Such age-adjusted rates are already used in a number of applications, including mortality rates, incidence of cancer, and the like. This paper estimates age-adjusted disability rates on the basis of survey data of Russian households. In addition, the paper explores two other methods of capturing regional effects on disability prevalence using regression analysis.

With standardization, the "remote but healthy" advantage that appears to characterize Siberia, the Far East, and the northernmost regions almost disappears. A few significant gender differences in disability prevalence in some regions do remain. Even after standardization, for example, disability rates for women in St Petersburg and Belgorod Oblast remain unusually high.

The remainder of this paper proceeds as follows: the next section summarizes the structure of the Russian disability system as well as some of the recent literature on this subject. Section 3 provides the methodology for estimating age-adjusted disability rates from survey data and for capturing regional effects using regression models. Section 4 presents the results of the age-adjustment computations and regional effect regression analysis. A final section offers conclusions and ideas for further study.

2. The Russian disability system

Disability in Russia is governed by the 24 November 1995 Federal law "On the Social Protection of Disabled Individuals in the Russian Federation." The law defines as disabled an individual "who has a health impairment with a continued disruption of bodily functions caused by illness, the results of trauma, or [anatomical] defects, leading to limited capacity for life and requiring social protection" (Russian Federation, 1995).

Russia has a complex federal system in which disability policy is set at the national level and administered by the regions.[3] To obtain disabled status, an individual must undergo a medical evaluation at the local office of the Bureau of Medical and Social Evaluation (BMSE). The evaluating committee votes on the applicant's disabled status and assigns one of three disability groups, with Group I being most severe.[4]

Individuals with an assigned disability group who have an employment history are eligible for "labor disability pensions" administered by the Russian Pension Fund, the same entity that provides pensions for the retired. Rules governing the type and amount of labor disability pension are governed by the 17 December 2001 Federal law "Concerning Labor Pensions." In practice, all Group I, most Group II, and some of the Group III individuals with employment history are eligible. Those individuals who do not qualify for a labor disability pension may receive the smaller means-tested "social pension", which is not dependent on employment history.

Very little is known about the likelihood of recovery from disability or the characteristics of the Russian disabled population or, for that matter, the disabled populations of middle-income countries in general. Notable exceptions include Mont (2007), Braithwaite and Mont (2008), Mete, Braithwaite, and Schneider (2008), Scott and Mete (2008), and Hoopengardner (2001). There is also detailed presentation of disability patterns in Russia in Baskakov et al. (2001), Becker and Merkuryeva (2009), Schultz (2008), Mosgorzdrav (2005), FBEA (1999), and FBEA (1998).

There has also been little study of the accuracy of the screening system or attempting to enumerate cases of benefits abuse, corruption or fraud. Using data from the RLMS, Merkuryeva (2007) examines the targeting accuracy of the Russian disability system and concludes that discrepancies in the system amount to roughly 13%. However, we should note that the health questions in the RLMS dataset do not completely capture the criteria used by the BMSE in evaluation, so this figure should be treated with some caution. That

[3] We use the term "regions" to refer to the administrative subdivisions ("Federal subjects") of the Russian Federation. These consist of 21 republics, 46 oblasti, 9 kraii, 1 autonomous oblast, 4 autonomous okrugi and 2 federal cities.

[4] In a recent reform, Groups I, II, and III were renamed as Categories 3, 2, and 1, respectively. We use the old terminology for the sake of consistency with prior literature.

said, Merkuryeva (2007) also finds that discrepancies between health and disabled status increase with age; this provides one more reason to standardize disability rates by age.

Our study uses data from the Russian National Survey of Household Welfare and Participation in Social Programs, known by its Russian acronym as NOBUS. The NOBUS was conducted in 2003 by the Russian Federal Statistical Survey and the World Bank and is “a cross section survey of the Russian households, which was specially designed to measure the efficiency of the national social assistance programs by means of estimating the impact of social benefits and privileges on household welfare” (World Bank, 2003).

The NOBUS has a multi-stage stratified survey design, using sequential random selection. The population is divided into homogeneous strata based on the type of settlement. Within each stratum, primary sampling units (PSUs) were randomly selected. The PSUs are either settlements or, within large settlements, polling districts. Finally, within each PSU, households were selected at random. Within each household, a questionnaire was administered to each individual (the individual questionnaire) and to the head of household (the household questionnaire). Given such a survey design, observations in the NOBUS are not independent; thus, we use the appropriate econometric techniques for working with survey data, and reweigh observations to account for nonresponse, using the weights provided in the data.

Our NOBUS sample contains almost 120,000 observations of individuals, of whom 6.3% are disabled. Prevalence of disability by disability group, age cohort, and sex is provided in Table 1. We observe that the overall prevalence of disability increases unambiguously with age for both sexes – in the oldest cohort, almost one quarter of all individuals are disabled. For all cohorts, the most prevalent disability group is Group II (severely but not permanently disabled) and prevalence of Group II disability increases dramatically around age 60, a phenomenon that may well be linked to retirement since many retirees apply for disabled status to obtain additional social benefits. Oddly, prevalence of Group III (partially disabled) status peaks at age 50-59 and then declines (this may also be linked with retirement patterns). Finally, age-specific disability prevalence is higher for men than for women; the overall disability rate is higher for women, however, undoubtedly due to higher female life expectancy.

Table 1: Disability prevalence by age and sex cohort (in percent of cohort population)

	Men				Women			
Age cohort	**Group I**	**Group II**	**Group III**	**Total**	**Group I**	**Group II**	**Group III**	**Total**
Ages 0-19	0.20	0.29	0.19	0.68	0.06	0.23	0.09	0.38
Ages 20-34	0.35	1.23	0.87	2.45	0.26	0.77	0.64	1.67
Ages 35-49	0.75	2.33	1.37	4.45	0.51	2.12	1.19	3.82
Ages 50-59	1.63	4.99	2.64	9.26	1.16	5.02	1.71	7.89
Ages 60-69	2.00	10.43	1.95	14.38	1.51	9.53	1.29	12.33
Ages 70 and up	2.46	18.87	2.28	23.61	1.98	16.35	1.44	19.76
Total	0.88	3.94	1.25	6.08	0.77	4.72	0.98	6.47

3. Methodology

In standard population counts, an age-adjusted rate may be computed as follows: Let δ_i be an indicator variable equal to one if the i^{th} individual is disabled, and zero otherwise. Divide the population into C age and sex cohorts. Then the age-specific disability rate for a given cohort is given by

$$ASDR_c = \frac{1}{n_c} \sum_{i=1}^{n_c} \delta_i \tag{1}$$

where n_c is the number of individuals in the c^{th} cohort.

The age-adjusted disability rate is simply a weighted average of the ASDRs for all cohorts using a standard population to determine weights. Let p_c be the number of individuals in the c^{th} age cohort in the standard population. The total standard population is then

$$p = \sum_c p_c \tag{2}$$

and the weight of the c^{th} cohort is

$$w_c = \frac{p_c}{p}. \tag{3}$$

We next compute the age-adjusted disability rate ADR as

$$ADR = \sum_c w_c * ASDR_c \tag{4}$$

$$= \frac{1}{N}\sum_{i=1}^{N} \delta_i w_i \tag{5}$$

where N is the total number of individuals in the population.

The above equations allow us to generalize this computation for survey data. Since the NOBUS dataset has a multi-stage survey design, we must rewrite Equation 4 taking into account survey sampling characteristics. Let our survey design sample primary sampling units (PSUs) from specified strata. It is easy to see that Equation 4 is simply the weighted mean of the disability indicator variable δ_i. Taking into account the survey design and the individual's probability weights, the formula becomes

$$ADR = \frac{\sum_{h=1}^{H}\sum_{j=1}^{J_h}\sum_{i=1}^{n_{hj}}\sum_{c} \delta_{hji} w_{hji} w_c}{\sum_{h=1}^{H}\sum_{j=1}^{J_h}\sum_{i=1}^{n_{hj}} w_{hji}} \tag{6}$$

where we have H strata, J_h PSUs in the h^{th} stratum, and n_{hj} observations in the j^{th} PSU of the h^{th} stratum. Again, δ_{hji} is the disabled status dummy of the i^{th} individual in the j^{th} PSU of the h^{th} stratum; w_c is the standardization weight of the c^{th} age cohort; and w_{hji} is the sample weight, which reflects the probability that the individual was included in the sample.

The variance of the age-adjusted disability rate can be computed using formulae for variances of means in a complex survey (Graubard and Korn, 1996). Let the total weight of the j^{th} PSU in the h^{th} stratum be $W_{hj} = \sum_{i=1}^{n_{hj}} w_{hji}$ and let ADR_{hj} be the age-adjusted disability rate in the j^{th} PSU of the h^{th} stratum. Then the variance is

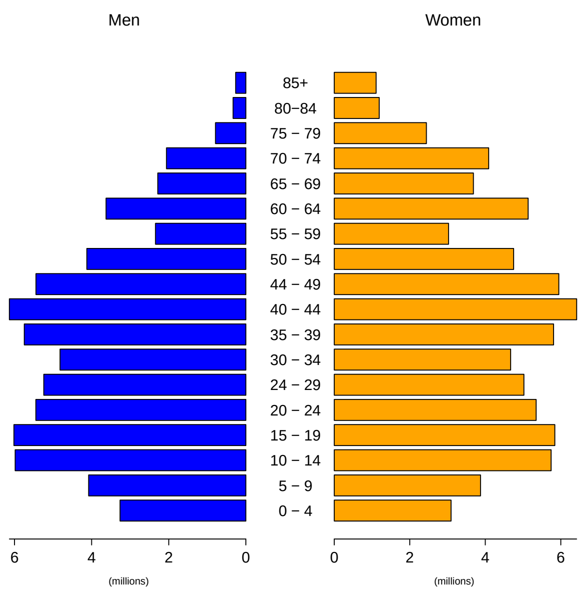
$$\hat{\sigma}^2_{ADR} = \frac{1}{\left(\sum_{h=1}^{H}\sum_{j=1}^{J_h} W_{hj}\right)^2} \sum_{h=1}^{H} \frac{J_h}{J_h - 1} \sum_{j=1}^{J_h} \Bigg[W_{hj}(ADR_{hj} - ADR) - \frac{1}{J_h}\sum_{k=1}^{J_h}(ADR_{hk} - ADR)\Bigg]^2 . \tag{7}$$

Finally, we must choose a standard population for the computation of weights in Equation 3. In principle, the magnitude of age-adjusted rates has no meaningful interpretation by itself. That is, the purpose of standardized rates is to provide an ordinal ranking rather than a cardinal interpretation. Thus, any affine transformation of a standardized rate is equally appropriate, and hence the precise choice of standard population is not important, provided that the distribution chosen does not lead to ordinal rankings different from other plausible distribution choices.

In practice, a convenient standard population is usually chosen in order to facilitate comparison with other studies. For the purposes of this study, we chose the 2000 mid-year Russian population as the standard. The standard population structure is presented in Table 2 and the accompanying age pyramid. The population structure reflects significant events in Russian history. The decline for those aged 55-59 is evidence of low birth rates during World War Two, which subsequently impacted birth rates in the late 60's. Hence we see a second decline for the 30-34 cohort. Arguably, it still accounts for some of the recent decline in birth rates, further magnified by the current demographic situation.

Table 2: Mid-year Russian population in 2000

Age cohort	Population
0-4 years	6,356,661
5-9 years	7,951,563
10-14 years	11,726,731
15-19 years	11,857,292
20-24 years	10,793,627
25-29 years	10,264,022
30-34 years	9,491,001
35-39 years	11,554,944
40-44 years	12,553,216
45-49 years	11,391,053
50-54 years	8,875,119
55-59 years	5,370,948
60-64 years	8,761,106
65-69 years	5,969,644
70-74 years	6,148,461
75-79 years	3,228,269
80-84 years	1,522,619
85 years and up	1,372,880
Total	145,189,156



Source: Goskomstat.

A few words are warranted about the choice of the number of cohorts. On the one hand, the larger the number of age cohorts, the better the analysis captures all the details of age-specific variation in disability rates. On the other hand, as the number of cohorts increases, the number of observations in each cohort decreases and the standard error of the age-adjusted disability rate estimate grows dramatically. Table 3 presents one possible grouping of age cohorts, which we will use for this study. Since the prevalence of disability increases unambiguously with age, this distribution imposes narrower age delineations in the older population.

Table 3: Age distribution based on the standard population

	Men			Women		
Age cohort	**Population**	**Total Weight**	**Group Weight**	**Population**	**Total Weight**	**Group Weight**
Ages 0-19	19,339,595	0.1332	0.2844	18,552,652	0.1278	0.2403
Ages 20-34	15,506,899	0.1068	0.2281	15,041,751	0.1036	0.1948
Ages 35-49	17,323,234	0.1193	0.2548	18,175,979	0.1252	0.2354
Ages 50-59	6,468,365	0.0446	0.0951	7,777,702	0.0536	0.1008
Ages 60-69	5,910,016	0.0407	0.0869	8,820,734	0.0608	0.1143
Ages 70 and up	3,443,145	0.0237	0.0506	8,829,084	0.0608	0.1144
Total	67,991,254	0.4682	1.0000	77,197,902	0.5317	1.0000

We now present two alternative methods to capture regional effects on disability prevalence. In the first method, compute the crude disability rate for the r^{th} region as

$$cdr_r = \frac{1}{n_r} \sum_{i=1}^{n_r} \delta_i. \tag{8}$$

The next step is to regress across regions the crude disability rates obtained in Equation 8 on the number of individuals in each age cohort

$$cdr_r = w_r \sum_c \beta_c n_{r,c} + \epsilon_r \tag{9}$$

where $w_r = n_r / \sum_r n_r$ is the weight of the r^{th} region. The estimated coefficients $\hat{\beta}_c$ are the estimates of national age-specific disability rates and the residual $\hat{\epsilon}_r$ captures the fixed effect of the r^{th} region not due to age structure. In theory, regions with high age-adjusted disability rates (computed as specified above) should have positive residuals and regions with low age-adjusted disability rates should have negative residuals.

A second alternative method adopts a decision-based approach. Assume that an individual faces a binary choice of being disabled or not disabled. Then there arises a probit in which the probability that the i^{th} individual is disabled is

$$P[disab_i = 1|\vec{I_i}] = \Phi\left(\beta_0 + \sum_r \beta_r I_{i,r} + \sum_c \beta_c I_{i,c} + \epsilon_i\right) \tag{10}$$

where $I_{i,r}$ is an indicator variable equal to one if the i^{th} individual lives in the r^{th} region and zero otherwise and $I_{i,c}$ is an indicator variable equal to one if the i^{th} individual is in the c^{th} age cohort and zero otherwise. Then the estimated $\hat{\beta}_c$ captures the national age-specific disability rate for cohort c and the estimated $\hat{\beta}_r$ captures the regional fixed effect.

In principle, other terms can be added to the regression in Equation 10. We add individual-specific variables that affect disability risk, including those variables found in standard prevalence analyses (see in particular Merkuryeva (2007); also Scott and Mete (2008), Hoopengardner (2001), and Schultz (2008)). The remaining regional effects are those that exist controlling for demographic structure as well as differences in composition of individuals (who vary in terms of education, marital status and health-related measures), settlement properties (urban or rural), and regional prosperity (reflected in per capita household income).

By adding these terms, it is possible to compare unadjusted regional disability rates with age-standardized rates that do not correct for the environment, and then with standardized rates that correct for individual and regional characteristics. We see that while most differences in prevalence across regions disappear with standardization, the remaining differences, with a few exceptions, disappear once we control for these individual characteristics.

4. Results

Table 4 presents the adjusted disability rates for 79 regions of the Russian Federation based on the first standardization approach (data for Chechnya are not available). The first column reports the sex- and age-adjusted rate and the next two columns report age-adjusted rates for men and women separately.[5] Observe that the highest sex- and age-adjusted disability rates are in Belgorod Oblast and the lowest are in Chukotka AO. Splitting the sample along gender lines reveals a more complex trend: for women, the highest disability rates are in St Petersburg, Belgorod Oblast, Karelia Republic, and the Jewish AO; the lowest are in in Chukotka and Kaliningrad Oblast. For men, the highest adjusted rates are in the Karachay-Cherkess Republic while the lowest are in Chukotka and Khakassia Republic.

[5] We also computed overall age-adjusted rates without adjusting for sex. These are almost identical to the sex- and age-adjusted rates reported in Table 4.

Table 4: Estimated age-adjusted disability rates in the regions of Russia

	All	Men	Women
Central Federal District			
Moscow City[a]	6.38	4.41	8.10
Belgorod Oblast	10.00	7.81	11.93
Bryansk Oblast	6.41	6.98	5.91
Ivanovo Oblast	4.80	5.89	3.83
Kaluga Oblast	4.70	7.64	2.10
Kostroma Oblast	5.93	5.35	6.45
Kursk Oblast	5.01	5.01	5.01
Lipetsk Oblast	6.70	7.23	6.22
Moscow Oblast	4.51	4.36	4.64
Orel Oblast	5.03	4.84	5.21
Ryazan Oblast	5.98	7.00	5.08
Smolensk Oblast	5.03	4.22	5.74
Tambov Oblast	7.41	7.75	7.11
Tver Oblast	3.54	4.55	2.65
Tula Oblast	3.80	3.25	4.28
Vladimir Oblast	6.74	7.40	6.16
Voronezh Oblast	5.50	5.51	5.49
Yaroslavl Oblast	6.76	6.77	6.75
Southern Federal District			
Krasnodar Krai	3.93	3.86	3.99
Stavropol Krai	6.35	5.33	7.24
Adyg Republic	7.30	7.61	7.04
Chechen Republic	N/A	N/A	N/A
Dagestan Republic	6.19	5.75	6.57
Ingush Republic	4.16	5.05	3.37
Kabardino-Balkar Rep.	4.58	4.63	4.52
Kalmyk Republic	5.04	5.35	4.76
Karachay-Cherkess Rep.	6.45	9.03	4.17
North Ossetin Rep.	5.22	6.49	4.10
Astrakhan Oblast	2.70	3.44	2.06
Rostov Oblast	6.45	5.49	7.30
Volgograd Oblast	4.08	4.58	3.63

Table 4: (Continued)

	All	Men	Women
Northwestern Federal District			
St Petersburg	9.45	6.19	12.34
Karelia Republic	8.11	4.64	11.18
Komi Republic	4.98	6.29	3.82
Arkhangelsk Oblast	5.79	6.34	5.31
Kaliningrad Oblast	2.77	4.54	1.21
Leningrad Oblast	6.26	4.99	7.38
Murmansk Oblast	4.33	3.47	5.09
Novgorod Oblast	7.20	8.48	6.06
Pskov Oblast	5.95	5.83	6.06
Vologda Oblast	4.54	4.31	4.75
Far Eastern Federal District			
Khabarovsk Krai	4.40	3.26	5.40
Primorskiy Krai	5.47	5.88	5.10
Saha (Yakutia) Rep.	4.87	5.38	4.43
Amur Oblast	6.53	6.01	7.00
Kamchatka Oblast	3.18	2.05	4.17
Magadan Oblast	2.43	2.80	2.10
Sakhalin Oblast	4.29	4.29	4.29
Chukotka AO	0.49	1.07	0.00
Jewish AO	6.99	2.46	10.98
Uralic Federal District			
Chelyabinsk Oblast	3.82	3.98	4.05
Kurgan Oblast	3.84	4.56	3.22
Sverdlovsk Oblast	5.37	4.97	5.72
Tyumen Oblast	4.50	4.22	4.75

Table 4: (Continued)

	All	Men	Women
Volga Basin Federal District			
Bashkir Republic	3.43	3.80	3.11
Chuvash Republic	6.52	6.15	6.85
Mari El Republic	6.91	7.24	6.62
Mordva Republic	7.10	8.19	6.15
Tatar Republic	4.81	5.39	4.29
Udmurt Republic	4.92	5.94	4.02
Kirov Oblast	6.11	6.31	5.94
Nizhniy Novgorod Obl.	6.94	6.15	7.64
Orenburg Oblast	5.92	4.35	7.31
Penza Oblast	3.96	4.51	3.48
Perm Oblast	6.00	5.39	6.53
Samara Oblast	6.45	6.69	6.23
Saratov Oblast	2.95	2.01	3.78
Ulianovsk Oblast	6.52	8.22	5.03
Siberian Federal District			
Altai Krai	5.53	5.79	5.31
Krasnoyarsk Krai	5.29	5.59	5.03
Altai Republic	5.73	4.33	6.96
Buryat Republic	4.84	4.25	5.37
Khakassia Rep.	2.41	1.21	3.47
Tuva Republic	2.87	2.09	3.55
Chita Oblast	6.65	6.34	6.92
Irkutsk Oblast	5.50	5.12	5.83
Kemerovo Oblast	3.82	4.34	3.36
Nobosibirsk Obl.	4.18	4.67	3.75
Omsk Oblast	5.77	5.99	5.57
Tomsk Oblast	4.01	3.96	4.05

[a] The regions are identified according to their 2003 names and boundaries. Since then, some regions have merged with neighboring regions and / or have been renamed. For statistical purposes, Autonomous Okrugi are included within their parent Oblast or Krai.

Figure 1 plots the overall adjusted disability rate against the overall crude disability rate. For ease of comparison, we have scaled both variables to zero mean and unity variance (recall that this transformation preserves the ordinal rankings). We observe that remote regions – those in the north, Siberia and Far East – tend to be above the 45-degree line (we have identified Karelia in the north, Altai on the Mongolian border and the Jewish AO in the Far East) – while more populous central regions tend to be below the 45-degree line (for example, St Petersburg, Moscow and its suburbs). This confirms that differences in age structure are at play. To help further visualize the effect of standardization, we plot crude and age-adjusted disability rates on a map of the Russian Federation in Figure 2. The maps reveal that with standardization some, though not all, of the counter-intuitive "remote but healthy" pattern is gone.

Figure 1: Overall age-adjusted vs. crude disability rates in regions of Russia

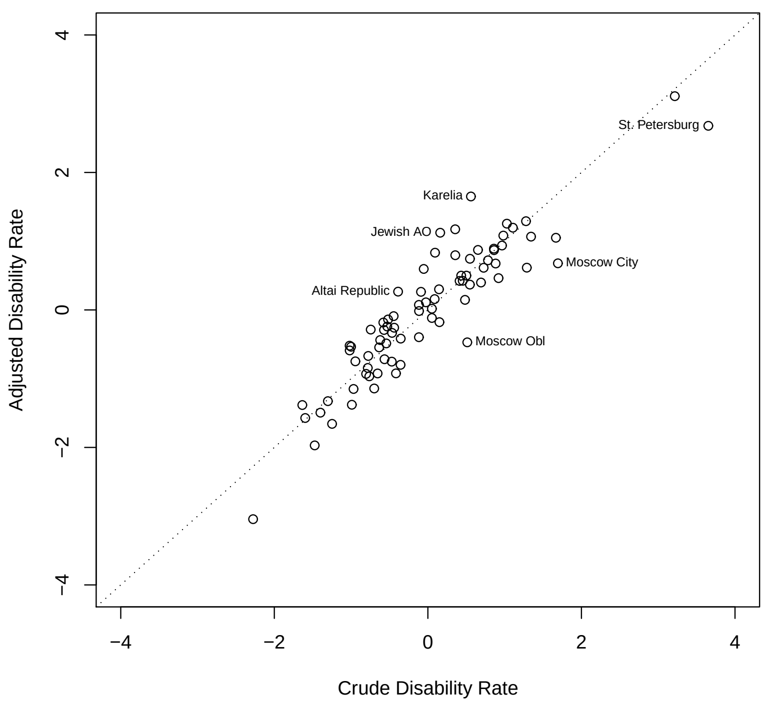


Figure 2: Crude and age-adjusted disability rates

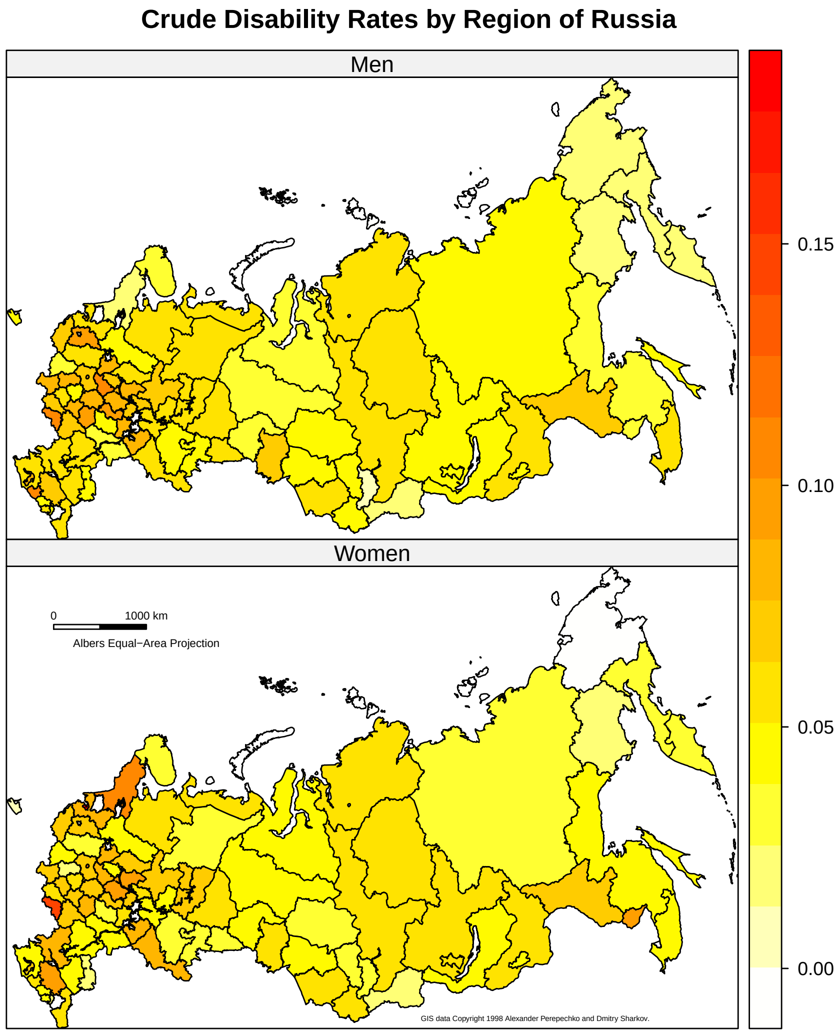
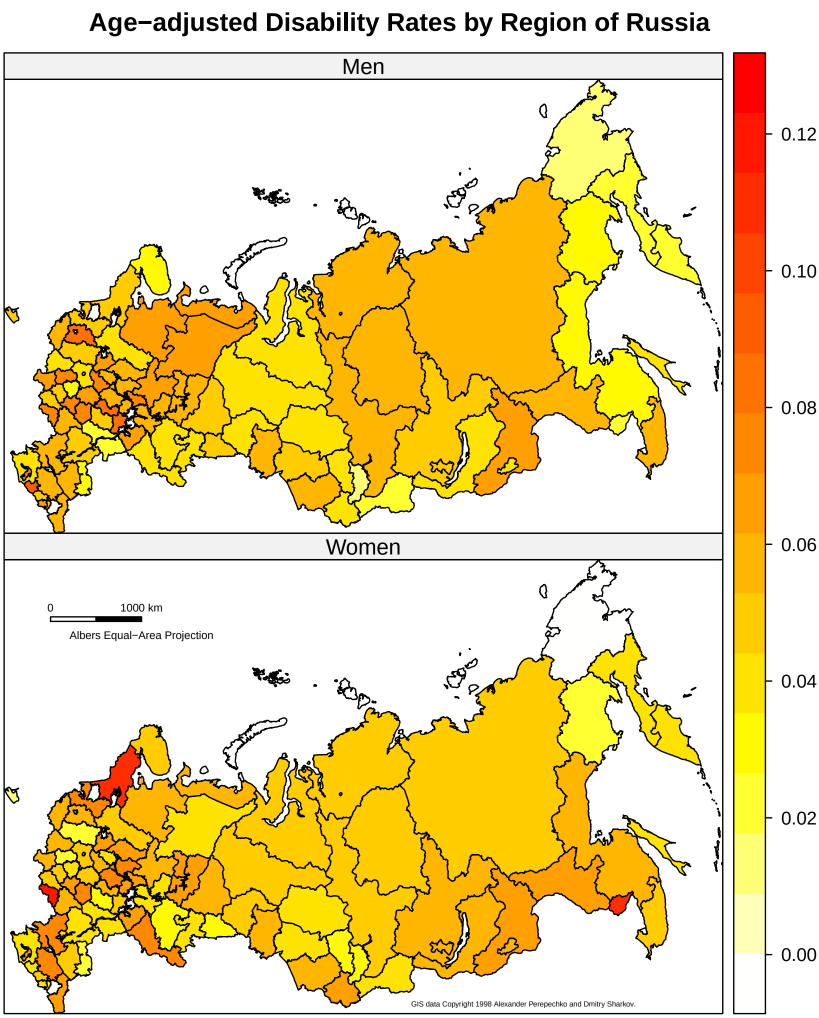


Figure 2: (Continued)



What is the quantitative impact of age structure on the regional crude disability rate? We can answer this question by looking at the regional effect regressions using group data, presented in Table 5. The coefficients confirm that disability prevalence increases with age. However, the coefficients for the cohort aged 60-69 are insignificant. Members of the group aged 60-69 at the time of data collection were born in 1934-1943. It is possible that the statistical insignificance of these coefficients captures effects of Soviet collectivization policies in the 1930's and the Second World War era. This is a small birth cohort, and it is possible that premature mortality for many would have led to a survival bias.[6]

Table 5: Regression of crude disability rate on age cohorts over the regions

	Entire Sample	Men	Women
Constant	-0.172 †	-0.0621	-0.300
Ages 20-34	0.132	-0.0022	0.352
Ages 35-49	0.404 †	0.263 *	0.543 †
Ages 50-59	0.456 *	0.245 **	0.608 *
Ages 60-69	0.112	0.115	0.147
Ages 70 and above	0.413 **	0.255 **	0.593 **
Number of Obs.		79	
R^2	0.54	0.45	0.47
F on 5 and 73 df	10.56 **	14.96 **	8.17 **

Significance levels: †: 10%, ∗: 5%, ∗∗: 1%

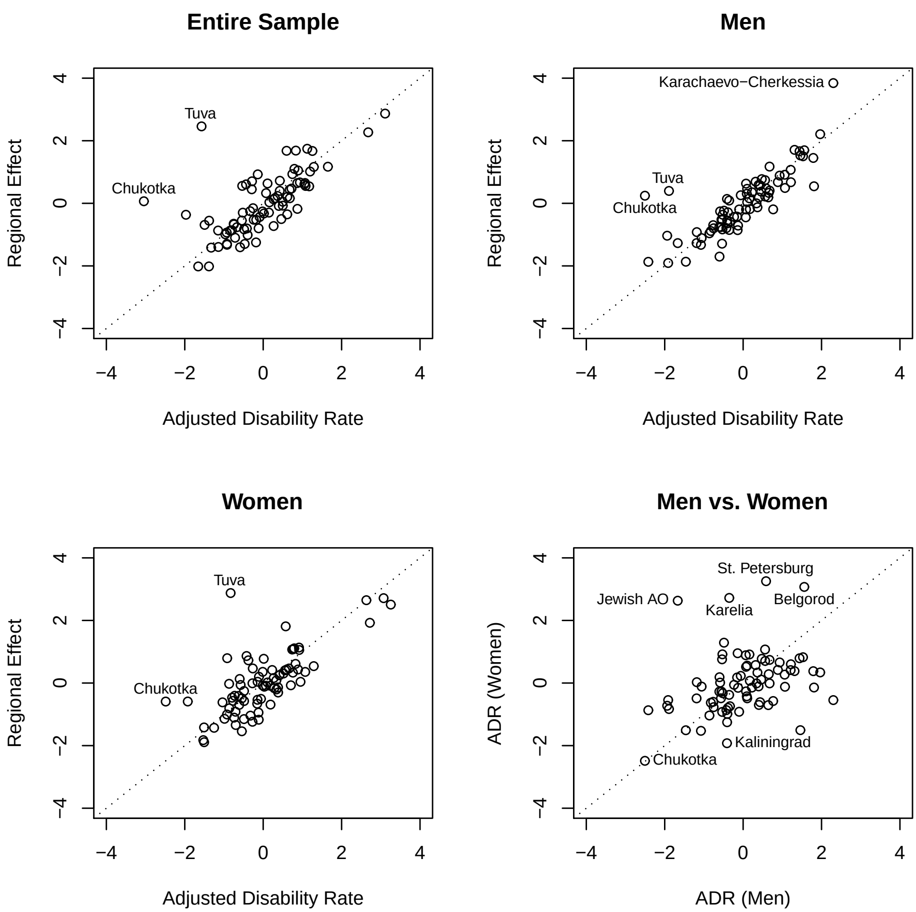
Second, the age coefficients for women are almost double those of their male counterparts. Especially striking is the large coefficient on women aged 50-59; a one-tenth unit increase in the share of this cohort would account for an increase in the crude disability rate of six percentage points. We believe this is a consequence of the retirement age for women set at 55; upon retiring many individuals apply for disabled status in order to qualify for additional social benefits.

The regional effect residuals are plotted against the age-adjusted disability rates in Figure 3. Again, both values have been standardized to have zero mean and unity variance. The high degree of collinearity between these measures confirms that the standardization

[6] This is not inconsistent with an effect, suggested below, of being a survivor of the Siege of Leningrad, since those survivors have legal entitlement to disability payments because of their status.

procedure is robust. The only two exceptions are Chukotka AO and Tuva; the standardized rates and residuals differ considerably, probably because of the small number of observations in these two (most remote) regions.

Figure 3: Age-adjusted disability rates and regional effect residuals



Finally, Table 6 presents the probit regression results. Initially, we regress disabled status on region of residency and age cohort for both women and men. As expected from the age-adjustment computations, we observe statistically significant and positive coefficients for women in Belgorod Oblast and St Petersburg. We observe a negative and statistically significant coefficient for women in Astrakhan Oblast, which agrees with the low age-adjusted rate for that region. For men, we observe negative and statistically significant coefficients in Kamchatka and Khakassia. Both of these regions also have low age-adjusted rates. The coefficients on other regions are not significant once we control for age structure.

How much regional variation remains after controlling for age? To answer this question, we run a second set of regressions, adding the following variables: health improved, a categorical variable coded as 1 if the individual reported that his health improved in the last year, 0 if it stayed the same, or -1 if it got worse; indicator variables for the type of settlement in which the individual lives; indicator variables for the individual's education and family status; and the logarithm of total per capita household consumption, a proxy for poverty.

We note that disabled *women* are more likely to live in cities, to be single, and to have only elementary or secondary education. Improved health is negatively associated with disability, though the causality and timing here are unclear. In particular, we know that the individual reported that her health got worse (or better) in the last year, but we do not know how long she has been officially disabled. Per capita consumption is positively associated with disability, a counter-intuitive finding. Finally, observe that when we do add these additional variables, the coefficients on the regions tend to become smaller or less significant. This indicates that the remaining variation between regions can be explained by these behavioral variables. However, high female disability in Belgorod and St Petersburg remains unexplained. In the case of St Petersburg, the high prevalence of disability may be attributed to a large cohort of survivors of the 1941-1944 Siege of Leningrad, many of whom legally qualify for special social benefits, including disabled status.

Disabled *men* are also more likely to live in cities and to be single. However, education effects for men are different than for women; in particular, tertiary education is associated with a lower probability of becoming disabled. This indicates, perhaps, that much of male disability may be occupational. The poverty proxy is insignificant.

When we add the behavioral variables, the coefficients on the only two significant (at the 5% level) regions actually increase (become more negative). Put differently, disability prevalence among men in Kamchatka and Khakassia is still significantly lower than the average, even adjusting for age structure and controlling for behavioral characteristics. Given that Khakassia is a heavily industrialized region, this finding is unexpected.

Table 6: Probit estimation results (dependent variable: disabled)

	Women		Men	
Region [a]				
Astrakhan Oblast	-0.469 **	-0.489 *	-0.307 †	-0.314 †
Belgorod Oblast	0.525 **	0.517 *	0.226	0.269
Kaliningrad Oblast	-0.661 *	-0.610 †	-0.163	-0.083
Kamchatka Oblast	-0.115	-0.124	-0.495 **	-0.518 **
Tver Oblast	-0.362 *	-0.313 †	-0.123	0.086
Saint Petersburg	0.568 **	0.464 *	0.064	0.021
Khakassia	-0.197	-0.266	-0.925 *	-0.932 *
Age Cohorts [b]				
Ages 20-34	0.543 **	0.704 **	0.506 **	0.711 **
Ages 35-49	0.898 **	1.133 **	0.769 **	1.139 **
Ages 50-59	1.249 **	1.425 **	1.144 **	1.510 **
Ages 60-69	1.510 **	1.630 **	1.415 **	1.731 **
Ages 70+	1.806 **	1.873 **	1.756 **	1.995 **
Health Improved		-0.260 **		-0.442 **
Residency [c]				
Large City		0.275 **		0.177 *
City		0.208 **		0.068
Town		0.193 **		0.016
Education [d]				
Primary		0.105		-0.175 †
Incomplete Secondary		0.217 **		-0.130
Secondary		0.234 **		-0.083
PTU or FZU		0.136		-0.206 *
Vocational		0.106		-0.188 †
Tertiary		-0.119		-0.425 **
Family Status [e]				
Married		-0.369 **		-0.499 **
Cohabitating		-0.405 **		-0.438 **
Widowed		-0.253 **		-0.483 **
Divorced / separated		-0.282 **		-0.215 **
log(HH Consumption per capita)		0.101 *		-0.027
Constant	-2.723 **	-3.779 **	-2.415 **	-2.169 **
Number of Obs.	64,975		52,065	
Percent disabled	6.47%		6.08%	

Significance levels: † : 10%, ∗ : 5%, ∗∗: 1%.
[a] Total of 79 regions, reporting only statistically significant coefficients. Omitted dummy: Altai Krai.
Omitted dummies: [b] Ages 0-19. [c] Village. [d] No schooling. [e] Single.

5. Conclusion

We observe that with age-adjustment, much of the unusual pattern in disability prevalence rates in Russia disappears. Adjusted disability rates remain low for men in Kamchatka and Khakassia, the only remaining portion of the "remote but healthy" pattern. The disability rates for women remain unusually high in St Petersburg and Belgorod Oblast, despite standardization and control for additional individual characteristics. At least in the case of St Petersburg, it is possible that this can be attributed to residual effects of World War Two.

What we do not find is evidence that inhabitants of central regions are "softer" (in the sense of being more sensitive to chronic conditions) or more effective in petitioning for disability status. Of course, it is possible that those in central regions are actually healthier than those in remote areas, and that greater sensitivity and petitioning ability by the former group acts as equalizing force. All that we can say, with reasonable certainty, is that this force does not overcompensate.

Overall, most of the regional variation in disability prevalence across Russia is attributable to differences in age structure. As the population in remote regions is younger it also appears healthier; once we account for age, the disability structure is nearly uniform with a few exceptions. How much of the remaining variation is due to unobserved individual heterogeneity, and how much is due to fixed regional effects not due to age, is a topic for further investigation. Such research would need more detailed data on the structure of the disabled population in these regions. It would point to underlying causes of Russian disability beyond aging and suggest possible policy interventions.

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