

THE TEACHER'S PODIUM

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EXAMPLES OF POPULATION PROCESS SELECTIVITY IN THE DEMOGRAPHICS COURSE

Abstract. The article discusses the necessity to refer to the notion of demographic process selectivity in the Demography course at the bachelor's degree program, examples of selectivity manifestation of various demographic processes are given.

Key words: demographic process selectivity, healthy migrant effect, healthy worker effect

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The phenomenon known as “*survivor bias*” is widely known in economic research and is discussed in a number of economic courses at the baccalaureate and magistracy level. For example, when examining companies' activities, those which, for various reasons, have ceased to work do not fall into the sample, resulting in biased, overrated performance ratings for companies, as the performance of the loser companies has not been accounted for. Selectivity is applied in insurance, including personal insurance, when the premium is related to the age and health of the insured.

J. Heckman, who won the 2000 Nobel Prize in Economics “for his development of theory and methods for analyzing selective samples”, noted the importance of taking this phenomenon into account in demographic studies, pointing out that “in demographic studies, and in experiments to establish effective learning, only those units of observation that are available throughout the monitoring period are usually considered. These features of the analysis lead to results similar to the problem of self-selection: when estimating structural equations the main

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factors of major interest and factors determining the probability of making it into the sample “mix together” [Heckman, 2013, p.130].

Historically, A. Deparcieux was one of the first to mention the possibility of selectivity in demographic processes back in the XVIII century, in particular, the mortality process. He calculated mortality tables for rentier, comparing them to the mortality tables of the entire population, as well as mortality tables of the monks of various monastic orders, and concluded that the mortality of rentier was lower than that of the entire population because rentier can be attributed to elite, whose behavior is different from that of other people [Dupaquier, 1996].

In the baccalaureate demography courses, demographic processes selectivity issues are very rarely dealt with, the topic is generally not available in the course programs and in Russian university textbooks, leading to erroneous interpretations of known phenomena by students. For example, when explaining the lowering of age-related mortality rates from cancerous diseases in older years (*Figure 1*), students who are not familiar with the notion of selectivity of demographic processes tend to explain the dynamics of age mortality rates in older age simply by reducing mortality, without regard to the composition of the population relative to mortality from the class of diseases studied.

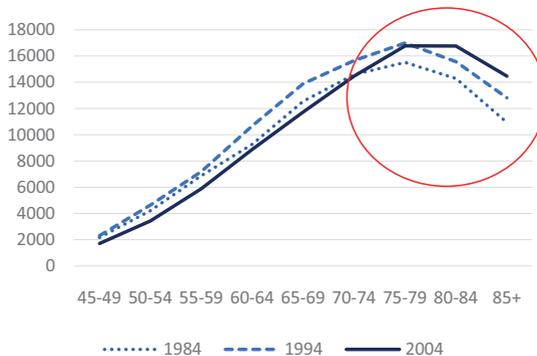


Figure 1. Age-specific mortality rates from neoplasms (ICD-10 code: C002-D48), per 1 million people, Russia, men.

Source: Human Cause-of-Death Database. French Institute for Demographic Studies (France) and Max Planck Institute for Demographic Research (Germany). www.causeofdeath.org (reference date: 15.11.2017)

Another example of selection neglect is the evaluation of total fertility or marriage of generations according to the census of population, based, for instance, on the survey of women beyond the boundary of reproductive age (50+). At the same time, women who have not been interviewed during the census, either because they have changed their place of residence or because

they did not live to the census, remain outside the research. Since we do not know a priori whether those women who were not interviewed in the census were a special (selective) group with respect to fertility or marriage, whether there were different characteristics of their fertility (e.g. average number of children born) or marriage (mean age of marriage) from the same characteristics among the population interviewed, we cannot safely say that the census-based fertility and nuptiality figures can be considered as unbiased estimates of these processes in women's cohorts.

If the composition of the cohort (population) is heterogeneous in relation to the risk of the occurrence of the studied event, the part of the individuals who have a higher probability of occurrence of the event will encounter it sooner than the others. Or it will not happen to other individuals at all (in the case of competing risks). In our example (Figure 1), in older years, the reduction in age-related mortality rates from tumors is not due to a reduction in mortality in general, but to the gradual disappearance in the population being studied of people who die from this cause at earlier age or die for other reasons. Thus, selectivity is based on the heterogeneity of the population in relation to the studied phenomenon.

The demographic literature describes the various manifestations of selection. Here are some examples.

The “**healthy worker effect**” has been discussed in an article on the analysis of mortality in the chemical industry in the United States) [Burns, Bodner, Jammer, Collins, & Swaen, 2011]. The effect is that the health of workers employed at hazardous workplaces may be better than that of the general population as a whole. The results of the study demonstrated that those employed in the chemical industry (from laborers to company management) had lower age-standardized mortality rates from nonmalignant diseases, due to several factors, including selection, which is the basis for hiring healthier workers and the dismissal of workers with poor health. The “healthy hire effect” works on two sides: the worker and the employer. For example, a candidate with poor health or obesity will not be accepted for a job that requires physical effort or high mobility; an applicant with asthma will not apply to an enterprise with poor air quality; smokers may refuse to work if the employer prohibits smoking, etc. The health of employees may also be better due to additional health insurance schemes existing in a hazardous working environment.

The “**healthy migrant effect**” [Bershte & Jusot, 2010] is the paradox that migrants are healthier, with low morbidity and mortality rates compared to the country's permanent population. This paradox is usually attributed to the selectivity of migration, which “selects” individuals with better health. Another manifestation of the selectivity of migration was called the “**salmon bias**”. It also explains the better health of migrants, but not the selection “on arrival”, but, on the contrary, the fact that older migrants return

to the country of exit, as a result their deaths are registered at home, reducing the mortality and morbidity index. The third manifestation of the selectivity of migration referred to in the article is the difference in sociocultural attitudes towards smoking, alcohol consumption, dietary habits between migrants and the population of the receiving country.

As shown in the study [Preston & Elo, 2014] the “healthy migrant effect” is at the core of the difference between the life expectancy at birth of the population of New York and the United States as a whole. If the selectivity of migration is not taken into account, it is very difficult to explain the increase in the life expectancy of new workers and the US population as a whole: during the 20-year period from 1990 to 2010 male life expectancy grew by 10.49 years in New York and only 4.49 in the US as a whole. For women in New York, life expectancy increased by 6.25 years, and in the country as a whole - by 2.39 years. The increase in life expectancy in the city was accompanied by increased poverty, declining household incomes and a deterioration in the educational structure of the population. The authors of the article conclude that the difference in life expectancy is based on the population structure by place of birth: with close levels of life expectancy for people born in the United States and abroad, the share of foreign-born in New York is significantly higher than in the United States. In 2008-2010 the life expectancy of men born in the United States was 75.38 years in the country as a whole, in New York - 75.28 years, and for men born abroad - 81.18 and 81.06 years respectively. The share of foreign-born in the US population was 13.6%, in the population of New York - 37.8%. And since the life expectancy of this segment of the population is higher, the total life expectancy in the city is higher despite the deteriorating socio-economic conditions. The lower mortality of migrants as compared to the entire population is attributable by the authors to the “healthy migrant effect”: the worse access of migrants to health insurance and medical screening procedures is counterbalanced by behavioural factors - migrants are less likely to smoke, consume alcohol and suffer from obesity less frequently, the prevalence of HIV infection among them is also lower. Thus, taking into account the selectivity of migration, the authors conclude that the leading role in the growth of life expectancy in New York has not been improved by the health system, but by a change in the structure of the population at the place of birth.

In the calculation of net demographic processes intensity, i.e. when only one process is considered, the possibility of selection is not considered. As a rule, the so-called *condition of independency*, introduced into scientific circulation by French demographer *L. Henry* [Henry, 1966], is accepted. If the combined impact of two or more processes is considered, selection can often not be ignored. If selection is present, it must be adjusted by dividing the population into homogeneous subgroups in relation to the process under study (see, for example: [Wunsch & Termote, 1978]).

References

1. Heckman J. (2013). Selective sample bias as a specification error. *Applied econometrics*, 31(3), 128-137. Available at http://pe.cemi.rssi.ru/pe_2013_3_129-137.pdf (19.11.2017)
2. Bershete C., & Jusot F. (2010). L'état de santé des migrants de première et de seconde génération en France. Une analyse selon le genre et l'origine. *Revue économique*, 61(6), 1075-1098. doi:10.3917/reco.616.1075
3. Burns C.J., Bodner K.M., Jammer B.L., Collins J.J., & Swaen G. (2011). 19 ноября 2017. *Occupational medicine*, 61(1). Available at <https://academic.oup.com/ocmed/article/61/1/40/1450389> (11.10.2017)
4. Dupaquier J. (1996). *L'invention de la table de mortalité*. Paris: PUF.
5. Henry L. (1966). Analyse et mesure des phénomènes démographiques par cohortes. *Population*, 21(3), 465-482.
6. Preston S.H., & Elo I.T. (2014). Anatomy of a Municipal Triumph: New-York City's Upsurge in Life Expectancy. *Population and Development Review*, 40(1), 1-29.
7. Wunsch G.J., & Termote M.G. (1978). *Introduction to Demographic Analysis*. New York, London: Plenum Press.