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Credibility of disability estimates from the 2011 population census in Poland

Elżbieta Gołata¹, Grażyna Dehnel²

ABSTRACT

The problem of disability is perceived as one of the most serious social issues faced by the contemporary society. The number of people with disability is consistently rising for a variety of reasons, including the aging of the population. Data on disability are collected through numerous statistical surveys, among which censuses are the most wide-scale ones. In the period between the 2002 and 2011 censuses (the last two censuses conducted in Poland), a 14% decrease in the number of people with disabilities was observed. However, it should be emphasised that significant modifications were introduced to the methodology of the last census. Population census 2011 was the first census in Poland combining administrative data sources and the survey sampling method. The main objective of the study is to assess the quality of estimates relating to the number of disabled persons, obtained on the basis of the 2011 census data. It is a comparative study aimed at identifying the similarities and discrepancies between the estimates, and determining the size and source of these discrepancies. The analysis takes into account such aspects as the measurement methods, the definitions and criteria of disability, the voluntary nature of the question, and the quality of the information on disability obtained from various sources.

Key words: disability, health condition, demographic processes, quality of a statistical survey.

JEL: I15, I18, J11, J14.

1. Introduction and motivation

The measurement of disability is a particular challenge for statisticians. Results of ad hoc surveys tend to indicate higher proportions of disabled people than census-based estimates (Loeb, 2016b; Mont, 2007; US Census Bureau, 2017; WHO & The World Bank, 2011). Data from censuses are usually an important source of information about disability, especially in countries which do not conduct regular surveys on this

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topic. The interest in this problem was motivated by the discrepancy between expectations and the actual estimates of the number of disabled persons in the 2011 census in Poland (NSP 2011). Given the continuing aging of Poland's population, it was reasonable to expect a higher number and percentage of disabled persons. However, according to the actual census results, the number of disabled persons was put at 4,697,000, which means a decline of over 750,000 compared to the 2002 census, a decrease in the share of disabled persons from 14.3% to 12.2%. This gave rise to criticism levelled against the approach used in 2011 census, in particular the fact that replies to the question about disability were voluntary (Dz.U. Nr 47 poz. 277, 2010). This solution was adopted in view of the sensitive nature and the topic. It raised reservations and triggered controversy within the scientific community, especially given the large number of refusals in the survey (Slany, 2014).

Any such assessment is further complicated by the multiplicity of definitions of disability, regulations used for purposes of administrative registers or social assistance in Poland (Antczak, Grabowska, & Polańska, 2018; Dehnel & Klimanek, 2016). There are also differences between approaches adopted in surveys conducted by international organisations (Altman, 2016; Molden & Tøssebro, 2010; Mont, 2007; UN, 2008b; Van Oyen, Bogaert, Yokota, & Berger, 2018). Depending on the survey type, the definition and criteria used in identifying people with disabilities, the population of disabled persons in Poland could range from 4.9 to 7.7 million.

The main aim of the study described in this article is to assess the quality of estimates of the number of disabled persons obtained on the basis of data from the 2011 census in Poland. It is a comparative study aimed at identifying similarities and discrepancies between estimates, and determining the size and source of these discrepancies.

The first part contains an overview of definitions of disability used in various surveys including references to the literature and results obtained. The overview comprises definitions and classifications used in population census, ad hoc survey modules and administrative registers. Another aspect addressed in this respect is the question of the quality of disability information obtained from various sources. In particular, a number of reasons for this multiplicity of definitions are identified, which prevents direct comparability between different surveys, although they do have their social justifications.

The next part is devoted to the presentation of international initiatives aimed at ensuring the validity of estimates, as well as their reliability and comparability. Particular reference is made to recommendations concerning the measurement of disability in censuses based on the results of the Washington Group on Disability Statistics (UN, 2008b). The presentation includes methods of measurement as well as similarities and differences between various approaches.

The reliability of the data collected during the 2011 census is assessed in two ways. Firstly, metadata and characteristics of the 2011 census are compared with other surveys described previously. Secondly, methods of demographic analysis are applied to assess the census results by comparing them with those obtained in the 2002 census. Unfortunately, the comparability of results produced in both surveys is limited by the fact that different definitions were used in both cases. However, an attempt was made to provide detailed explanations for specific discrepancies.

The article ends with a discussion of the results.

2. Measurement of disability in statistical surveys

According to the first World Report on Disability published by the World Bank and the World Health Organisation, “more than billion in the world live with some form of disability” (WHO & The World Bank, 2011). The problem of disability is becoming increasingly widespread and is now estimated to affect about 15% of the world population. A better knowledge of the needs and problems faced by disabled persons is the key to providing them with effective help. We are also becoming increasingly aware of the fact that most of us, at some point in our lives, will experience some form of disability. Given the ubiquity and scale of this phenomenon, it is more and more frequently addressed in discussions and activities undertaken not only at the local and national level, but is also tackled globally.

Disability can be approached from different perspectives. There are two approaches in the literature: the medical and social view (Dehnel & Klimanek, 2016; US Census Bureau, 2017; WHO, 2002). Some studies also distinguish a functional approach or use other concepts such as the biological model (Antczak et al., 2018). When analysing disability research, it is useful to refer to the recommendations of WHO (2002). However, even they do not dispel all the existing doubts. According to the medical model proposed by WHO, disability is defined as “a feature of the person, directly caused by disease, trauma or other health condition, which requires medical care provided in the form of individual treatment by professional” (WHO, 2002). Under the social model, disability is viewed not as an attribute of an individual but as a social problem created by an unaccommodating physical environment, which demands a political response. WHO (2002) experts believe that “disability is a complex phenomenon that is both a problem at the level of a person's body, and a complex and primarily social phenomenon”. For this reason they stress that disability involves an interaction between features of the person and characteristics of the environment in which the person lives (Figure 1). Because “some aspects of disability are almost entirely internal, while others are almost entirely external”, the appropriate approach to disability at the individual level should combine both social and medical responses.

The approach proposed by WHO as the International Classification of Functioning, Disability and Health (ICF) (UN, 2008b; US Census Bureau, 2017; WHO, 2002), is universal and can be used to describe and measure disability for purposes of many sectors (medicine, economy, social policy). This approach ensures comparability of results obtained in different surveys not only between sectors but also at the international level. The basic idea behind this classification is that “every human being can experience a decrement in health and thereby experience some disability”. This means that disability is defined by assessing the person’s health in the context of their relationship with the environment, taking into account three levels of limitations: (i) Body Functions and Structures, (ii) Activity (iii) Participation. For example, Antczak et al. (2018) distinguish limitations of body functions and abilities (e.g. a blind person cannot see); limitations of activity (the same person may experience difficulties with moving, preparing meals, self-care, etc.); limited participation in social life.

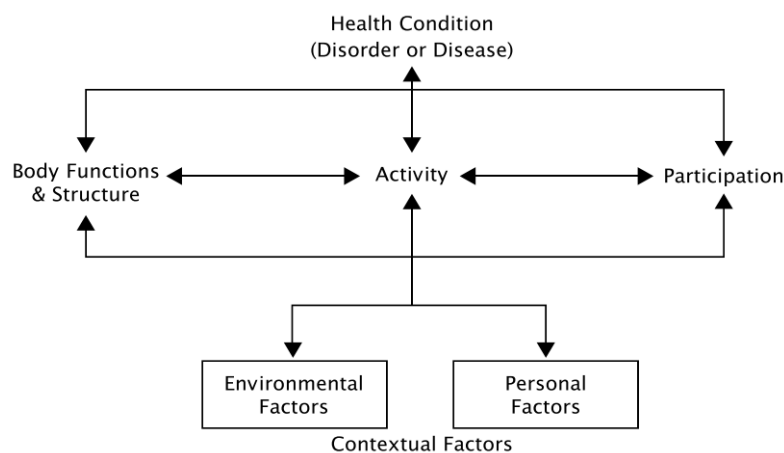


Figure 1. The International Classification of Functioning, Disability and Health Conceptual Model of Disability

Source: WHO 2002.

Definitions and classifications of disability according to the functional model are matched by specific methods of measurement proposed by the Washington Group on Disability Statistics (UN WG). The UN WG was created in 2001 as a result of the International Seminar on the Measurement of Disability, which sought to propose universal measurement tools that could ensure international comparability. This led to the development of a Short Set of Questions (UN WG, 2006). During the Global Disability Summit 2018, the World Bank Group, together with other participants, announced the Summit’s Charter for Change, containing a list of 10 pledges (WBG,

2018a, 2018b) aimed at accelerating global measures for the equalization of opportunities for disabled persons and counteracting their social exclusion. The list of commitments was created to support the goals of the 2030 Agenda for Sustainable Development adopted during the UN Summit (UN, 2015b). The charter included a commitment to gather comparable data according to best practices and world standards, with special emphasis on the short set of questions developed by UN WG. Adopted in 2006, the set was recommended by the UN for the census rounds in 2010 and 2020 (UN, 2008b; UN WG, 2006; US Census Bureau, 2017). The proposed set contains the following six questions:

- 1) Do you have difficulty seeing, even if wearing glasses?
- 2) Do you have difficulty hearing, even if using a hearing aid?
- 3) Do you have difficulty walking or climbing steps?
- 4) Do you have difficulty remembering or concentrating?
- 5) Do you have difficulty (with self-care such as) washing all over or dressing?
- 6) Using your usual (customary) language, do you have difficulty communicating, for example understanding or being understood?

Each question can be answered with four replies: (i) No – no difficulty, (ii) Yes – some difficulty, (iii) Yes – a lot of difficulty, (iv) Cannot do it all. These replies can be used to establish the degree of ability limitations from mild to severe. According to the recommendations of UN WG, the population of disabled persons includes all those who indicated the presence of difficulties in at least one of the core functional domains (questions 1–6) by choosing options (iii) or (iv) (UN, 2008b, 2008a, 2015a; US Census Bureau, 2017).

The recommendations of UN WG were taken into account in the recommendations prepared before the census rounds in 2010 and 2020. It was agreed that set of questions was an appropriate tool for measuring disability of persons aged 5 and older. However, given the limited scope of a census, as a survey designed to collect information about multiple domains, only the first four questions were included in the census questionnaire; the full set was to be used in ad hoc surveys devoted specifically to disability. It is also emphasized that because the concept of disability can be differently understood by respondents, it is crucial that the survey questionnaire should be formulated carefully in order to ensure correct identification of the population. The WG also recommended that questions about disability should be put individually to each respondent and control questions about the presence of disabled persons in the household should be avoided, such as “Is there a disabled person in the household?” (US Census Bureau, 2017).

The WG method of measurement has been evaluated and compared to other approaches like the Model Disability Survey (Sabariego et al., 2015). The discussion conducted (Madans, Mont, & Loeb, 2015) exemplifies the crucial role played by the

definition and the choice of the measurement method. The gap in the measurement methodology was filled by Loeb (2016a) and Meltzer (2016), who published a list of challenges that need to be addressed with respect to the measurement of disability among children and the proposal of a census module devoted to disability, which was developed by Cialesi, De Palma and Battisti (2016). Another crucial problem involved in the measurement of disability is the correct identification of environmental and contextual factors, which is discussed by Altman and Meltzer (2016). Problems of measuring disability among people living in group quarters and their impact on the comparability of international estimates were addressed by Cambois, Jagger, Nusselder, Van Oyen and Robine (2016).

Loeb (2016b) notes that about 30 countries reported using the short set of 6 WG questions in the 2010 census round. In order to determine the impact of the tool used to measure disability on the final estimates, WG researchers conducted a voluntary survey involving about 120 countries, asking the respondents to indicate the type of disability model used and the exact wording of the questions (Table 1). A clear distinction was made between the medical model focusing on impairments and types of disability and the social model emphasizing activity limitations, including the WG short set of questions. The survey involved countries where disability data were collected in the census (26 countries) as well as those where a sample survey was used (25 countries). The response rate was 54%. It turned out that out of the countries where disability data came from the census only Aruba (6 questions) and Israel (4 questions) used the tool according to the WG recommendations. Turkey also used 6 similar questions in the 2011 census, but they were not identical to those proposed by the WG. The estimated shares of disabled people varied considerably, ranging from under 1% (the Dominican Republic) to 12.9% (Peru).

Estimated percentages based on sample surveys were generally higher but also showed a great degree of variation, with values ranging from 1.4% in Togo, 2.0% in Yemen or 2.6% in Lesotho, to 12.5% in the Netherlands, 13.8% in Poland, 14.3% in Canada, 14.8% in Israel and 16.6% in New Zealand (Loeb, 2016b). In the European Health Interview Survey (EHIS) conducted in Poland 9 questions about activity limitations were used. The approach adopted in Thailand, Poland, Hungary and the Netherlands was similar to the one proposed by the WG, however, the question wording was not identical. Estimates obtained in these countries, except for Thailand, are also believed to be similar to those expected under the WG approach. Based on this analysis, (Loeb, 2016b) notes that the use of the definition of disability based on information about impairments resulted in obtaining the lowest estimate of the share. Estimates of the share of disabled people based on the WG approach are regarded as moderate, except for the value for Israel (1.4%).

Table 1. Models of disability used in the 2010 round of censuses and in sample surveys

Disability model	Census	Sample survey
Medical model – loss of ability (impairments)	8	5
Social model – activity limitations	11	13
WG short set of 6 questions	7	6

Source: Based on (Loeb, 2016b).

Unlike censuses, sample surveys can cover a subpopulation of a certain age. Surveys with the highest estimates of disability covered subpopulations of a specified age: in Poland – aged 15 and older, in the Netherlands – aged 12 and older or aged 55 and older, in Hungary – aged 15 and older, in Israel – aged 20 and older (Loeb, 2016a). As the share of disabled people in the population increases with age, so the way the target population is defined may affect the final estimates. Results of the analysis lead Loeb (2016b) to conclude that there are considerable differences between approaches, definitions and measurement methods, which render international problematic, but there are also good reasons to question the usefulness of estimates obtained in each country for national purposes.

In both rounds of the EHIS that took place in Poland (2009 and 2014), the same standard question was used³, as recommended by Eurostat. Data obtained in this way are supposed to enable the estimation of the level of disability that is comparable between European countries and to estimate the Healthy Life Years indicator (HLY) (Bogaert, Van Oyen, Beluche, Cambois, & Robine, 2018; EHLIS, 2015; Van Oyen et al., 2018). However, the Eurostat guidelines do not refer to the WG recommendations. The WG short set of questions is not used in the disability module of the Polish Labour Force Survey (LFS), which is conducted according to the recommendations of Eurostat (GUS, 2012). However, according to the UN recommendations for census rounds in 2010 and 2020 (UN, 2008a, 2015a), disability should be viewed in the light of the ICF model and measured using the WG short set of questions. The UN definition of disabled people includes persons who are more likely than the general population to experience limitations in the performance of certain tasks or when trying to participate in activities associated with their social roles.

³ The question was formulated as follows (GUS, 2016): Do you experience a health-related limitation in your ability to perform typical activities of daily life that has lasted for at least 6 past months?

- Yes, a serious limitation.
- Yes, but not very serious.
- No, I have not experienced any limitations.

3. The definition of disability used in official statistical surveys in Poland

A detailed description of disability surveys in Poland, including information about their frequency and the scope of published results, and, above all, methods of measurement, can be found in the paper by Antczak, Grabowska & Polańska (2018). A detailed presentation of the method of measuring disability in Polish censuses can be found in the paper by Dehnel and Klimanek (2016). With regard to the 2002 census, the authors point out that the medical definition of disability, focusing on the degree of impairment, was replaced by the definition involving limitations in the performance of basic activities regarded as typical for a given age (Dehnel & Klimanek, 2016). The definition of a disabled person in the 2011 census included an additional note that the duration of the experienced limitation should be at least 6 months (GUS, 2011a). In the revised definition the number of degrees of activity limitations was extended from “complete” and “serious” in the 2002 census, to “complete”, “serious” and “moderate” in the 2011 census.

According to the definition used in the censuses a person was regarded as disabled if they could present an appropriate decision issued by an authorised body or, in the absence of such a document, if they experienced activity limitations (Antczak et al., 2018; Dehnel & Klimanek, 2016; GUS, 2013a). This means that the definition used in the censuses reflects two views of disability: the formal indication confirmed by a legal decision (disability in the legal sense), and the subjective indication of a person who experiences activity limitations (disability in the biological sense). Therefore, when describing disability in Poland, one has to take into account the existing regulations in this respect, which can have a significant influence on the final estimates. The act on social and occupational rehabilitation and the employment of disabled persons, which has been in effect since 1997, despite numerous amendments, retains the same definition. In the act disabled persons are defined as those whose physical, psychological or mental condition creates a permanent or temporary limitation in the performance of social roles, and, in particular, limits their ability to work⁴. The unchanged definition of a disabled person seems to guarantee the comparability of the population of people classified as disabled in the legal sense in the 2002 and 2011 census. However, the presence of disability in Poland is assessed by different institutions and for different purposes and not all statements of disability can be used to claim disability discounts or allowances (GUS, 2011b, 2016). Although the legal definition of disability is the same, the two systems of disability assessment existing

⁴ „Niepełnosprawnymi są osoby, których stan fizyczny, psychiczny lub umysłowy trwale lub okresowo utrudnia, ogranicza bądź uniemożliwia wypełnianie ról społecznych, a w szczególności ogranicza zdolności do wykonywania pracy zawodowej”.

in Poland⁵ make it difficult to obtain reliable information about the number of people that actually have official decisions confirming disability, which is reflected by census data. It should be noted that in the surveys conducted by Statistics Poland, including the LFS⁶, the EU Statistics on Income and Living Conditions (EU-SILC) and in statistical reporting, disabled persons are identified only on the basis of official decisions, while in the European Health Interview Survey, like in the census, both kinds of disability are taken into account (the legal and biological sense). Moreover, the two categories of disability are not exclusive (Table 2).

Table 2. Categories of disability according to the definition used in 2011 Census

BIOLOGICAL	LEGAL
disabled persons EXCLUSIVELY in the BIOLOGICAL SENSE, i.e. those who did not have an official decision/statement of disability but who felt that their ability to perform basic activities typical for their age was completely, seriously or moderately limited.	disabled person EXCLUSIVELY in the LEGAL SENSE, i.e. those who had a valid statement of disability but did not report any limitations in the ability to perform basic activities typical for their age
	disabled persons in the LEGAL SENSE, i.e. those who had a valid statement of disability issued by an authorised body: - by ZUS for purposes of disability allowances, - by district and provincial disability evaluation boards for other purposes
LEGAL AND BIOLOGICAL	
disabled persons in the LEGAL AND BIOLOGICAL SENSE i.e. those who had a valid statement of disability and reported a completely, seriously or moderately limited ability to perform basic activities typical for their age	

Source: (GUS, 2013b).

Each survey is based on different definitions and classifications. This limits the possibility of making comparisons. For 2011, there are virtually no comparable data about the number of disabled persons. Only in the case of disability in the legal sense is it possible to compare census data with those collected in the LFS. According to the 2011 Census, the number of disabled persons in the legal sense was equal to almost 3,131 thousand, while according to the LFS, it was 3,505.5 thousand (Table 3). This

⁵ For purposes of disability allowances, disability assessment is conducted by the Social Insurance Institution and for other purposes – by district and provincial disability evaluation boards.

⁶ With the exception of the ad hoc module conducted as part of the LFS in the 2nd quarter of 2011, which took into account disability in the legal and biological sense (GUS, 2012) according to the Commission Regulation (EU) No 317/2010 of 16 April 2010.

means that the census count was lower by 374 thousand. In addition, the subpopulation of disabled persons in the LFS, identified within the total population aged 15 and older, included people aged 16 and older, who had received statements about the degree of disability or work disability. Consequently, the estimated count in the census should be decreased by subtracting disabled persons under the age of 16, i.e. 129,950 persons.

The second point that needs to be emphasized is the result of comparing the LFS data with data from the EHIS for 2009 and 2014. Estimates of the number of disabled persons for both years are higher than the LFS estimate: by about 18% (630 thousand) in 2009, and by about 10% (333 thousand) in 2014 (Table 3). As already pointed out, in official publications (GUS, 2011b, 2016), estimates from both surveys were based on respondents' declarations. The results are therefore not fully comparable. However, this is more the case with the scale of the phenomenon, and less so with respect to the structure of the distribution. According to GUS, the discrepancy between the results could be due to different objectives of each survey, which may have affected respondents' answers.

Table 3. Disabled persons in the legal sense in Poland on the basis of selected sources

Survey year	Source of data			
	EHIS (thousand)	EHIS (thousand) (aged 16+)	LFS* (thousand)	Census (thousand)
2009	4155.3	3971.3	3505.5	
2011			3341.3 (3359**)	3131.5
2014	3801.5	3607.0	3272.0	

Note: * midyear data, **2nd quarter of 2011.

Source: (GUS, 2011b, 2016), <http://www.niepelnosprawni.gov.pl/p,81,bael>, 2011 Census.

4. Disability in census 2002 and 2011

Comparing disability from the last two censuses, it can be noticed that the decline in the number and percentage of disabled persons is not the same across different categories (Table 4). This can be observed with regard to the total number of disabled persons, but is due to the decline in the number of disabled persons in the legal sense. This was mainly the result of the complicated rules that were the basis for disability decisions, which discouraged many people from applying for a disability allowance, and, consequently, led to a decrease in this category (Dehnel & Klimanek, 2016; GUS, 2011b).

In contrast, the number of persons classified as disabled persons exclusively in the biological sense rose to about 1.5 million in 2011, i.e. by about 56% compared to the 2002 census. Their share increased from 2.63% to 4.07%. Consequently, the share of disabled in the biological sense, in both categories (exclusively biological as well as

biological and legal) rose by about 10% from 3.8 million in 2002 to over 4.2 million in 2011 (10.95% of the total population). However, a decrease in the number of disabled persons exclusively in the legal sense by nearly 70% corresponds to a decline in their share from 4.25% to just 1.24% and has an effect on the overall estimate showing a decline in the scale of disability.

Given the obligatory nature of the questions about disability in 2002 census (in contrast to the 2011 census, where these questions were asked only in the survey part), those results are generally regarded as reliable, putting the number of disabled persons at about 5.5 million, i.e. 14% of the total population. There is a lot of variation in the distribution of disabled persons by age. In the age group 0-3, the share of disabled persons is 1-2%, which increases to 3% for people aged 20. There is a marked growth in the share of disabled persons around the age of 40, when it rises from 8% to 30% over the following 15-year interval. In the group of people aged 75 and older the share of disabled persons is close to 50%.

Table 4. Disability according to censuses in 2002 and 2011

Disability category	NSP 2002		NSP 2011	
	number of persons	share of the population	number of persons	share of the population
Total	5 455 914	14.27	4 697 048	12.20
Legal	4 449 685	11.64	3 131 459	8.13
Exclusively legal	1 624 568	4.25	479 453	1.24
Biological	3 831 346	10.02	4 217 598	10.95
Exclusively biological	1 006 229	2.63	1 565 592	4.07
Biological and legal	2 825 117	7.39	2 652 006	6.89

Source: NSP 2002, NSP 2011.

The percentage of disabled persons increases with age almost exponentially (Figure 1). This is particularly true for men up to the age of 60. Attempts at modelling the share of disabled by age show a very good fit for the exponential function and, obviously, the second or possibly the third degree polynomial⁷. Nonetheless, one can observe evident changes in the scale of disability between the age of 50 and 70. There is a clear difference between the trends for men and women, which is not apparent up to the age of about 53. From the age of 50 to 60, the share of disabled persons in the male population is considerably higher and increases by over 50% (from 0.288 at 53 to 0.432 at 59). In the group of women of this age the share of disabled persons increases by only 13%. This dramatic increase in the share of disabled men over a relatively short period of time, followed by a period of relative stability and a decline to the level observed for women can be attributed to various causes. Certainly, it should be linked to the higher

⁷ Coefficient of determination is equal to 0.92 for exponential functions and 0.98 for polynomials.

incidence of cardiovascular diseases, malignant tumours, as well as accidents and injuries in men. Another pattern observed in demographic research is the higher death rate for men compared to women of this age, the so-called excess male mortality⁸ (Fihel, 2011; Szukalski, 2018). Another cause of this higher level of male disability may be associated with men's interest in pension-related benefits and their desire to obtain official confirmation of their health condition. A reverse trend can be observed for the population after the age of 80: the share of disabled women grows faster, with an increase of over 60%.

When analysing the share of disabled people by age based on data from the 2011 census (Figure 2, Table 5), one thing worth noting is that it is lower than the level observed in 2002. The difference becomes evident from the age of about 35 and is maintained up to the oldest age groups. The growth in the share of disabled persons after the age of 40 is clearly less abrupt than that observed in 2002. A similarly weaker increase can be seen in the pre-retirement age.

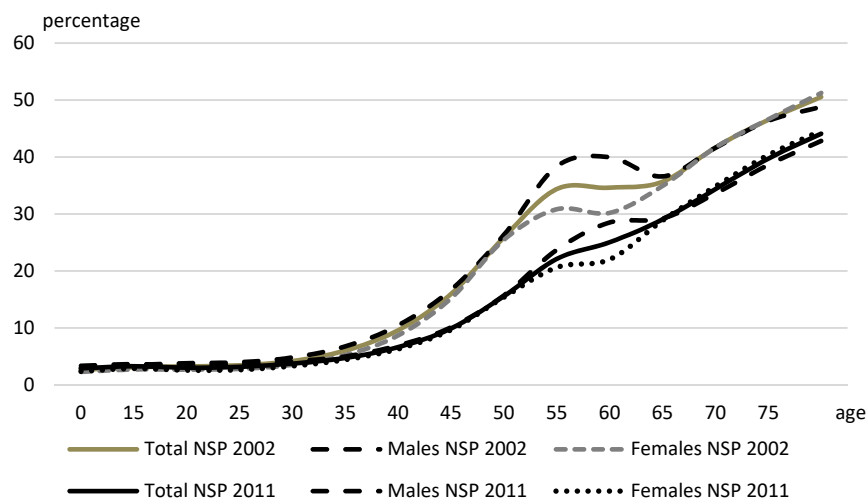


Figure 2. Disabled persons per 100 population by sex and age, Poland, NSP 2002 and NSP 2011

Source: NSP 2002, NSP 2011

Table 5. Share of disabled persons by sex and age in the censuses of 2002 and 2011

Age	NSP 2002			NSP 2011		
	Total	Men	Women	Total	Men	Women
Total	14.3	13.9	14.7	12.2	11.6	12.7
0-14	2.7	3.0	2.3	2.9	3.4	2.4
15-19	3.1	3.5	2.7	3.3	3.7	2.9
20-24	3.3	3.8	2.7	3.0	3.4	2.6

⁸ Excess mortality is measured by the male/female ratio of death rates, the probability of dying or other life table parameters, such as life expectancy by age.

Table 5. Share of disabled persons by sex and age in the censuses of 2002 and 2011 (cont.)

Age	NSP 2002			NSP 2011		
	Total	Men	Women	Total	Men	Women
25-29	3.4	4.0	2.8	3.2	3.6	2.7
30-34	4.2	4.8	3.6	3.8	4.2	3.3
5-39	6.0	6.8	5.3	4.7	5.0	4.4
40-44	9.6	10.5	8.7	6.6	6.9	6.3
45-49	16.0	16.7	15.2	9.9	10.1	9.7
50-54	25.9	26.4	25.5	15.6	15.7	15.4
55-59	34.4	38.4	30.9	22.1	23.7	20.6
60-64	34.6	40.0	30.2	25.0	28.5	22.0
65-69	35.7	36.6	34.9	29.0	29.2	28.9
70-74	41.7	41.6	41.7	34.4	33.6	34.9
75-79	46.5	46.4	46.6	39.7	38.6	40.4
80 +	50.5	48.8	51.3	44.1	42.8	44.6

Source: NSP 2002, NSP 2011.

When data from both censuses are compared, one is struck by the higher share of disabled people in the youngest age groups, up to the age of 20. In contrast, the percentage of disabled persons in the population aged 40 and older is lower by 10 pp and drops by as much as 40% in the 50-54 age group.

It is the above differences in the estimates of disability based on two consecutive censuses that motivated our attempt to look for an explanation and evaluate the quality of estimates based on the 2011 census.

5. Assessment of the quality of disability estimates obtained in NSP 2011 – the use of the aging algorithm from demographic projections

When one compares the results of the 2002 and 2011 censuses it is important to keep in mind two significant differences between them. The first one is the change from the traditional method of conducting a census in 2002 to the mixed-mode approach adopted in 2011. The so-called short census form contained data obtained from administrative registers, while information provided in the ad hoc modules attached to the long questionnaire was collected in a 20% sample survey. The second difference is the voluntary nature of responses to the question about disability. This was the consequence of the provision of the Polish constitution (Article 51), which prohibits the imposition of an obligation to reveal information about one's health. The decision was motivated by the sensitive nature of such information. The question was only put to adult respondents who agreed to answer it, while information about children could only be provided by their parents or caretakers. Over 1.3 million respondents exercised their right to refuse to answer the question about disability. Dehnel and Klimanek

(2016) argued that there are good reasons to believe that this group included disabled people. The quality of estimates may also have been affected by the high rate of nonresponse in the survey.

The assessment of disability estimates obtained in the 2011 census poses a challenge not only because of a certain degree of ambiguity and changes of definitions but also for many other reasons. The main one is the lack of other sources of information about disability that could be used as a reference point in comparative analyses concerning the year of the census. Other problems stem from the use of different methods of census organisation, different sampling schemes, sample sizes and estimation methods.

The group of methods used to assess the quality of censuses exploiting existing data sources includes, among others, demographic analyses based on data from previous censuses, comparisons with administrative registers and with existing surveys, e.g. such as those focusing on household budgets or the labour force. Obviously, such methods do not eliminate the crucial problem due to the difference between the traditional (NSP 2002) and mixed-mode census (NSP 2011), but similarity of estimates obtained from independent surveys is the best evidence of their reliability and quality.

Accordingly, our assessment of the disability estimates from the 2011 census is made in reference to the data collected in 2002. The analysis was conducted by applying the cohort component method, which is used for constructing population projections. The method is based on the idea of a longitudinal study in which particular generations are tracked over intercensal periods. Life table parameters for successive single year of age, especially survival probabilities, were used to age the population into the future. As a result, a population projection was obtained, broken down by sex and age for the year of the next census. It was supplemented by a projection and aging of the number of births, accounting for disability. This study was based on unit-level data from both censuses shared by Statistics Poland for research purposes under a special agreement⁹.

The applicability of the above method for the purpose of assessing the quality of census-based estimates of disability by category is seriously limited by the lack of information about survival rates for subpopulations of disabled persons¹⁰. As regards life table parameters for males and females, it was assumed that the survival probability for healthy and disabled persons is the same. Assuming a closed population, one could therefore expect that estimation results for 2011 should be higher than those actually

⁹ Under the agreement, access to the sample survey data on disability from the 2011 census was granted to researchers via a computer located in the Statistical Office in Poznań. The data could be processed using the SAS software.

¹⁰ Life tables published by the European Health & Life Expectancy Information System, EH&LEIS (<http://www.eurohex.eu/IS/web/app.php/Ehleis/LifeGeographic?Typ=Life&SubTyp=None>) also provide information about the population in total. By decomposing life expectancy one obtains an estimate of Healthy Life Years (HLY) by sex and age (Sullivan, 1971). However, data which would enable the construction of complete life tables are not publicly available.

observed. Obviously, the disabled population is not closed, not only because of foreign migrations, which, in the case of disabled people, tend to be negligible. However, with advancing age, the population of disabled people increases due to a higher incidence of diseases, accidents and injuries. We do not have information that could be used to determine whether the overestimation of the population of disabled persons due to the adoption of higher survival rates is compensated for by an underestimation resulting from the growing number of persons who become disabled with age. This is definitely a strong and controversial assumption. Despite these reservations, this method was used for comparative purposes in order to explain as best as possible the existing discrepancy in estimates.

The results of the prediction of the disabled population identified in 2002 into the future for all categories are about 10% lower than those obtained in the 2011 census (Table 6, Figure 3). For example, in the age group 35–39, the share of disabled persons obtained after being aged into the future is higher by 26%, and in the next three age groups, by as much as 35%. The differences are somewhat bigger for women than for men. It is worth noting that estimates for ages 60–70, recalculated with a 10-year shift, are in fact higher.

Table 6. The share of disabled persons by sex and age in NSP 2011 and the predicted share based on NSP 2002

Age	NSP 2011			prediction based on NSP 2002		
	Total	Men	Women	Total	Men	Women
Total	12.2	11.6	12.7	11.0	10.6	11.4
0-14	2.9	3.4	2.4	2.16	2.5	1.8
15-19	3.3	3.7	2.9	2.91	3.3	2.5
20-24	3.0	3.4	2.6	3.05	3.4	2.6
25-29	3.2	3.6	2.7	3.21	3.6	2.8
30-34	3.8	4.2	3.3	3.25	3.8	2.7
35-39	4.7	5.0	4.4	3.48	4.0	2.9
40-44	6.6	6.9	6.3	4.47	5.1	3.8
45-49	9.9	10.1	9.7	6.46	7.2	5.7
50-54	15.6	15.7	15.4	10.47	11.3	9.7
55-59	22.1	23.7	20.6	17.56	18.1	17.0
60-64	25.0	28.5	22.0	27.81	28.4	27.3
65-69	29.0	29.2	28.9	35.38	40.3	31.5
70-74	34.4	33.6	34.9	27.72	31.3	25.3
75-79	39.7	38.6	40.4	36.97	37.6	36.6
80 +	44.1	42.8	44.6	46.78	46.5	46.9

Source: Estimates based on NSP 2002 and NSP 2011.

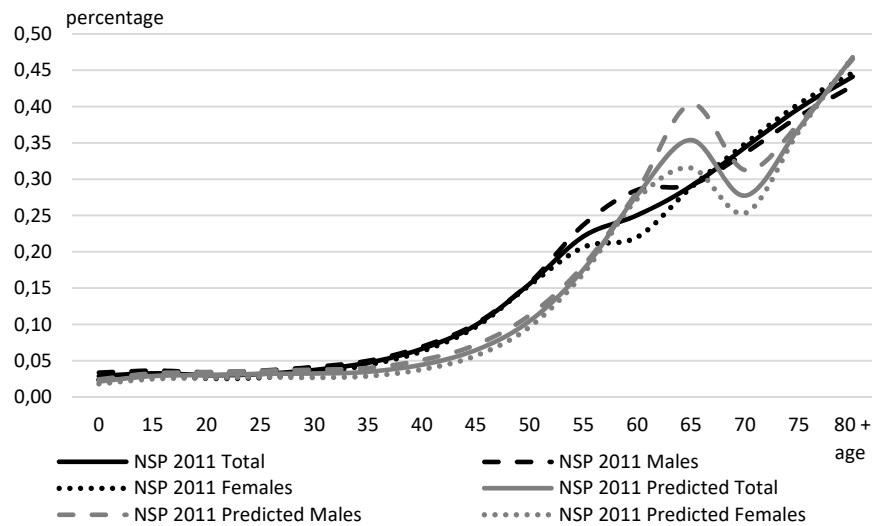


Figure 3. Disabled persons per 100 population by sex and age according to NSP 2011 and after aging the population of disabled people from NSP 2002

Source: Estimates based on NSP 2002 and NSP 2011.

The discrepancies described above inspired a further investigation seeking to determine how the estimates would change if one accounted for the distinction between disability in the legal and biological sense (Figures 4–6). The estimated shares of disabled persons in the 2011 census and those obtained after aging the disabled population from NSP 2002 into the future are roughly consistent with the pattern described above only in the case of the total population, without accounting for different categories of disability. The relationship is less evident in the case of disabled people in the biological and legal sense. One can clearly see the discrepancy resulting from the higher share of disabled persons in the retirement age in 2002, described above. This contrasts considerably with the relationship between estimates from NSP 2011 and the predicted values for the categories of exclusively legal and exclusively biological. It is this very difference that explains the lower estimates obtained in NSP 2011 compared to NSP 2002. This difference should be analysed separately for each of the two categories.

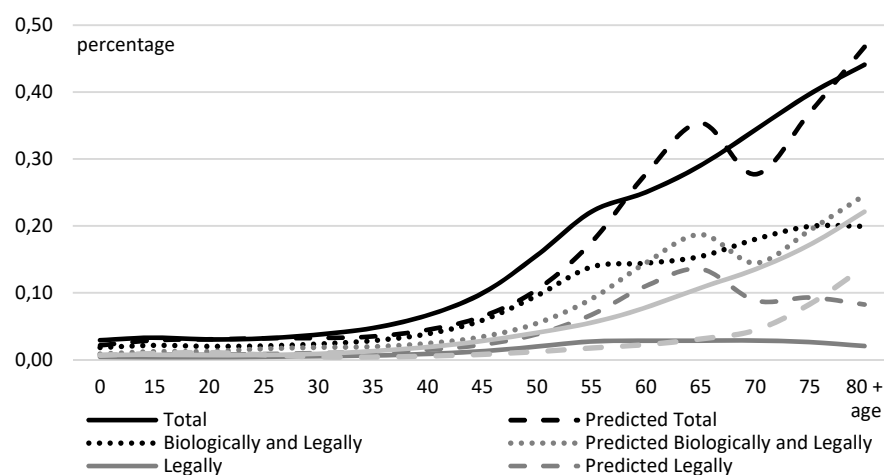


Figure 4. Disabled persons per 100 population by disability category and age according to NSP 2011 and after aging the population of disabled people from NSP 2002

Source: Estimates based on NSP 2002 and NSP 2011.

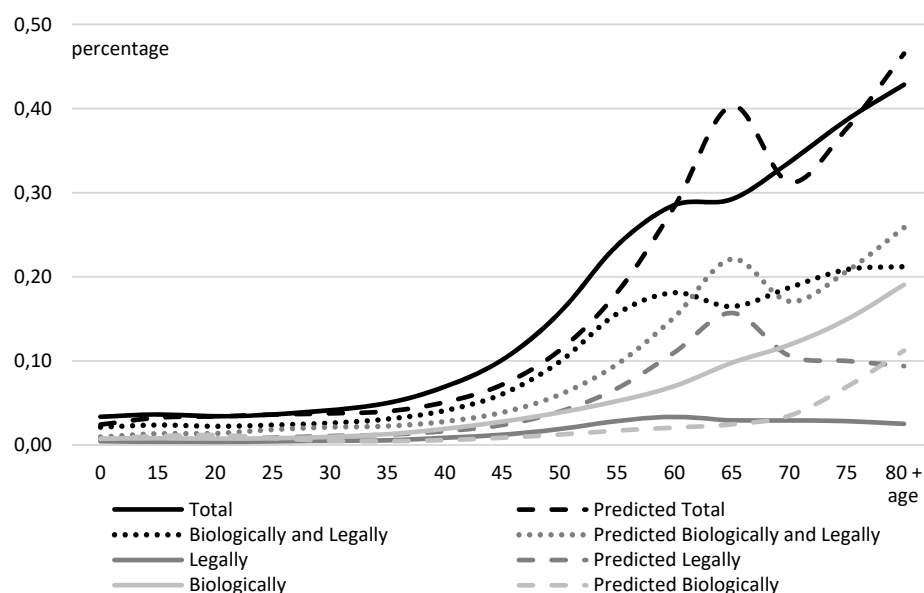


Figure 5. Disabled men per 100 population by disability category and age according to NSP 2011 and after aging the population of disabled people from NSP 2002

Source: Estimates based on NSP 2002 and NSP 2011.

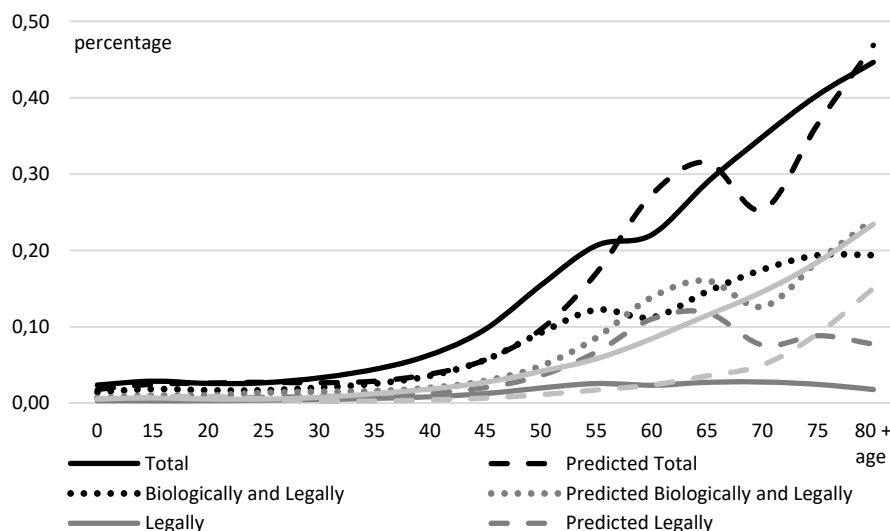


Figure 6. Disabled women per 100 population by disability category and age according to NSP 2011 and after aging the population of disabled people from NSP 2002

Source: Estimates based on NSP 2002 and NSP 2011.

The demographic aging was applied separately for different categories of disabled persons from NSP 2002 in order to track changes in these subpopulations after 9 years. The subpopulation of disabled persons exclusively in the legal sense was identified in the census based on subjective assessments of persons who had valid disability statements but did not experience any limitations in performing activities typical for their age. This category does raise certain doubts as to the grounds on which an authorized administrative body issued a disability statement about someone who did not have biological disabilities. The number of such persons, according to NSP 2011, is estimated to be around 480 thousand. In the previous census, this group amounted to over 1.6 million. In other words, the share of disabled persons exclusively in the legal sense declined from 4.25% in 2002 to 1.24% in 2011.

For men and women the estimates of disabled persons exclusively in the legal sense in NPS 2011 are lower than those obtained for the same year by prediction based on data from NSP 2002. There is a slight but noticeable increase in the share of the exclusively legal category of disability for people aged 50 and older, which rises to 2%. In the group of people aged 60, the share is equal to 3% and remains at a stable level for the following age groups. This situation can be explained by the desire to obtain a disability benefit associated with a disability statement as a supplement to the pension.

As regards the prediction for 2011 based on the subpopulation of disabled persons exclusively in the legal sense from NSP 2002, the estimated share is clearly higher and

equals 3.5% of the total population. It is twice as high as the share in NSP 2011. Starting from the age of 60, we can observe a threefold increase, which reaches its maximum (fivefold rise) for the age group 65–69. There is a similar pattern for women, although the differences are somewhat smaller. The biggest difference can be observed for the age group 60–64, where the share of disabled persons exclusively in the legal sense is over four times as high as that estimate.

The predicted values cannot be treated as precise estimates but they do show a trend reflecting inappropriate practices. The relationship between the share of this category of disability based on NSP 2011 and the predicted share for the same year based on data from NSP 2002 seems to be the result of efforts to counteract abuses concerning disability assessment decisions. This means that disability statements issued earlier may have become invalid, but also that in the following decade it was particularly difficult to obtain a positive decision and the number of disability statements actually issued was smaller. However, with respect to the exclusively biological category, the relationship between the share estimated in 2011 and the predicted share is exactly reverse. Given the clearly bigger scale of disability exclusively in the biological sense, a different conclusion can be drawn. From a social point of view, is it appropriate that such a high percentage of disabled people are classified as ‘exclusively biological’, which can, if fact, mean that these people are not able to successfully apply for a disability benefit.

Shares of disabled people exclusively in the biological sense in 2011 are clearly higher than the values obtained for 2011 by applying demographic prediction to data from 2002. There are two possible explanations for the discrepancy. The first one is the possibility that the degree of limitations in the performance of activities typical for a given age increases over the decade. The second possibility is that the difference is due to the declining share of disabled people classified as “exclusively legal” as a result of stricter disability assessment procedures.

The share of disabled people classified as “exclusively legal” in 2011 was 4.1% for the total population, 3.3% for men and 4.8% for women. The corresponding values obtained through prediction are 1.8%, 1.5% and 2.1%, respectively. Starting from the age of 50, there is a steady increase in the share of disabled people in this category from 4% to over 22% for people aged 80 and older. In contrast, with respect to the predicted shares (based on data from 2002), the onset of the intensive increase in the incidence of biological disability is delayed by 15–20 years. Consequently, at the age of 70 the share of people with biological disability is 3.5% for men and 5% for women. For people aged 80 the share of biological disability equals 14% (11% for men and 15% for women, Figures 3–5).

The above analysis contains a comparison of the relationship between the share of people with biological disabilities according to 2011 and 2002 censuses. The analysis took into account all people who reported the fact of experiencing activity limitations,

regardless of whether or not they had official statements of disability (Figure 6). It turns out that the share of biologically disabled estimated in 2011 was about 9% higher than in 2002. Thus, earlier suggestions about the possible underestimation of disability in 2011 compared to 2002 are not confirmed. Moreover, the variation across age groups shows an evident pattern: for people up to the age of 40, the share of disability estimated in 2011 is higher than that indicated in 2002. The difference amounts to as much as 30% for children up to the age of 15. For people aged 25–30, according to 2011, the share of disability for men is 16% higher than in the previous census, while for women it equals 22%. For people aged 40 the shares of disabled persons in both censuses are equal (ratio = 1, Figure 7). The biggest difference can be observed for people aged 50 – the share of biological disability among men in 2002 is 15% higher than in 2011 and 12% for women. For older age groups the discrepancy between the two censuses decreases and even disappears completely at one point.

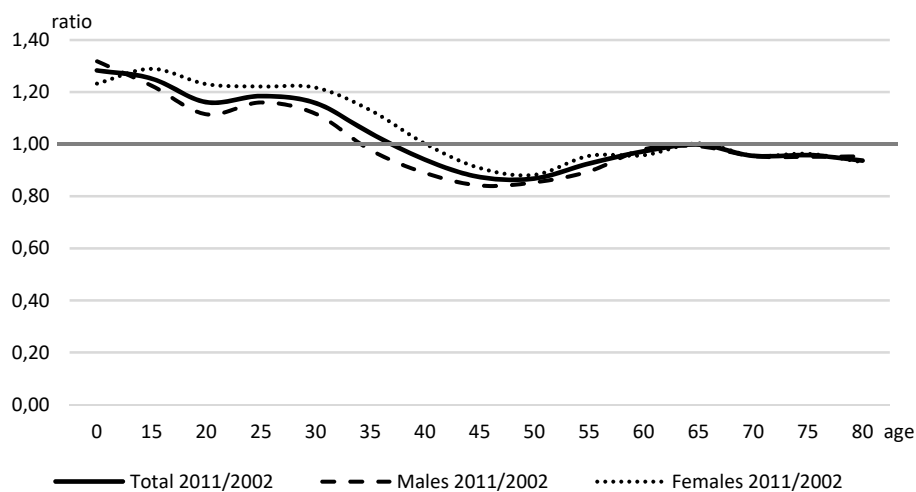


Figure 7. The relationship between the number of disabled persons in the biological sense by sex and age, NSP 2011/NSP 2002

Sources: Estimates based on NSP 2002 and NSP 2011.

The above considerations do not indicate that disability estimates in NSP 2011 are ‘true’. However, the results of the comparison with shares predicted on the basis of data from NSP 2002 indicate that estimates obtained in both censuses are compatible. The analysis confirmed a similar variation in the share of disability across age groups. A higher share of disability was observed in younger age groups, especially among children. The situation calls for additional reflection on the method of measuring disability in this age group, which is also a concern pointed out by statisticians from the Washington Group (Crialesi et al., 2016; Meltzer, 2016). The analysis also helped to

identify one of the causes for the lower estimates of disability in NSP 2011, namely the change of rules in disability assessment procedures. The obvious consequence of the lower number of disability statements is the lower estimated share of disabled people classified as “exclusively legal”.

6. Conclusions

The results of the analysis have highlighted a few aspects that should be taken into account when assessing the quality of estimates from the NSP 2011. For one thing, one should mention the consequences of the methodology adopted in the 2011 census. The voluntary nature of the question about such an essential topic as disability has two effects. First of all, it means that at the planning stage it was considered sufficient to estimate the number of disabled people in the legal sense on the basis of information from administrative registers. It is well known that regulations used for purposes of disability assessment vary across countries. For this reason, the comparability of results was supposed to be ensured by data from the survey. Following the example of other European countries, the recommendations of the Washington Group were not implemented in the census. However, leaving it up to respondents to decide whether or not to answer the disability question resulted in a high rate of non-response, which was the main cause of the bias in the results. Particularly, when one realises that the group of 1.3 million respondents who refused to answer the question most likely included disabled persons. To be fair, it was possible to link information from the sample survey in the 2011 census with data from the short questionnaire or from administrative registers, also for those who refused to answer the disability question. This additional information was then used to counteract the effect of non-response, *inter alia*, by means of calibration (Szymkowiak, 2012, 2014).

The lower estimates of disability in NSP 2011 were mainly due to decline in the subpopulation of disabled persons in the legal sense. The introduction of stricter criteria of disability assessment discouraged many potential applicants from applying for a disability benefit, which led to a fall in the actual size of this subpopulation and its estimates. This was accompanied by a rise in disability due to a higher incidence of diseases and injuries, which was confirmed by higher estimates of disability in the biological sense.

One can see an evident effect of new regulations used in the system of disability assessment and on decisions made by assessors. The natural consequence of this change is the decline in the number of disabled persons in the legal sense. Without passing judgement on how appropriate these administrative solutions actually were, there is no doubt that their effects were confirmed by statistical data. This fact should be viewed as evidence of the reliability of measuring the subpopulation of people with disability

statements. There is a separate question of using an appropriate definition of a disabled person, which focuses on people's limitations in the performance of basic activities for a given age and their participation in social life.

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References

- Altman, B. M., (2016). *International Measurement of Disability* (B. M. Altman, ed.). <https://doi.org/10.1007/978-3-319-28498-9>.
- Altman, B. M., Meltzer, H., (2016). Developing Tools to Identify Environmental Factors as Context for Disability: A Theoretical Perspective. In *International Measurement of Disability*, pp. 183–206, https://doi.org/10.1007/978-3-319-28498-9_12.
- Antczak, R., Grabowska, I., & Polańska, Z., (2018). Podstawy i źródła danych statystyki osób niepełnosprawnych. *Wiadomości Statystyczne*, (2), pp. 21–43, Retrieved from <http://stat.gov.pl/czasopisma/wiadomosci-statystyczne/archiwum/wiadomosci-statystyczne-nr-22018-681,7,38.html>.
- Bogaert, P., Van Oyen, H., Beluche, I., Cambois, E., & Robine, J. M., (2018). The use of the global activity limitation Indicator and healthy life years by member states and the European Commission. *Archives of Public Health*, 76(1), pp. 1–7, <https://doi.org/10.1186/s13690-018-0279-z>.
- Cambois, E., Jagger, C., Nusselder, W., Van Oyen, H., & Robine, J.-M., (2016). International Comparisons of Disability Prevalence Estimates: Impact of Accounting or Not Accounting for the Institutionalized Population. In *International Measurement of Disability*, pp. 207–229 https://doi.org/10.1007/978-3-319-28498-9_13.
- Crialesi, R., De Palma, E., & Battisti, A., (2016). Building a “Module on Child Functioning and Disability.” In *International Measurement of Disability*, pp. 151–165, https://doi.org/10.1007/978-3-319-28498-9_10.
- Dehnel, G., Klimanek, T., (2016). Disability in the national censuses of 2002 and 2011 – a comparison of information scope. *Acta Universitatis Lodzensis Folia Oeconomica*, 5(325), pp. 127–141, <https://doi.org/10.18778/0208-6018.325.10>.

- Dz.U. 2016 poz. 2046, (2016). Obwieszczenie Marszałka Sejmu RP z dnia 14 listopada 2016 r. w sprawie ogłoszenia jednolitego tekstu ustawy o rehabilitacji zawodowej i społecznej oraz zatrudnianiu osób niepełnosprawnych. *Dziennik Ustaw*, poz. 2046, Retrieved from <http://prawo.sejm.gov.pl/isap.nsf/download.xsp/WDU20160002046/T/D20162046L.pdf>.
- Dz.U. 2017 poz. 1383, (2017). Obwieszczenie Marszałka Sejmu Rzeczypospolitej Polskiej z dnia 7 lipca 2017 r. w sprawie ogłoszenia jednolitego tekstu ustawy o emeryturach i rentach z Funduszu Ubezpieczeń Społecznych, *Dziennik Ustaw*.
- Dz.U. Nr 47 poz. 277, (2010). Ustawa z dnia 4 marca 2010 r. o narodowym spisie powszechnym ludności i mieszkań w 2011 r., *Dziennik Ustaw*.
- Ehlis, (2015). European Health and Life Expectancy Information System, Retrieved from [https://www.bridge-health.eu/sites/default/files/BRIDGE Health EHLEIS_SHORT.pdf](https://www.bridge-health.eu/sites/default/files/BRIDGE%20Health%20EHLEIS_SHORT.pdf).
- Fihel, A., (2011). Płeć a trwanie życia: analiza demograficzna. Warszawa: Wydawnictwa Uniwersytetu Warszawskiego: Uniwersytet Warszawski. Wydział Nauk Ekonomicznych.
- GUS, (2011a). Kwestionariusz NSP 2011. Badanie reprezentacyjne. Ludność, Retrieved from https://stat.gov.pl/download/gfx/portalinformacyjny/pl/defaultstronaopisowa/5781/1/1/nsp_2011_badanie_reprez_ludnosc_wykaz_pytan.pdf.
- GUS, (2011b). Stan zdrowia ludności Polski w 2009 r. (N. Koehne, B. Lednicki, M. Piekarzewska, R. Wieczorkowski, & A. Zajenkowska-Kozłowska, eds.), Retrieved from <https://stat.gov.pl/obszary-tematyczne/zdrowie/zdrowie/stan-zdrowia-ludnosci-polski-w-2009-r,6,5.html>.
- GUS, (2012). Osoby niepełnosprawne na rynku pracy w 2011 r., Retrieved from <https://stat.gov.pl/obszary-tematyczne/rynek-pracy/pracujacy-bezrobotni-bierni-zawodowo-wg-bael/osoby-niepelnosprawne-na-ryнку-pracy-w-2011-r,24,1.html>.
- GUS, (2013a). Ludność, stan i struktura demograficzno-społeczna, Narodowy Spis Powszechny Ludności i Mieszkań 2011, Warszawa.
- GUS, (2013b). Ludność i gospodarstwa domowe. Stan i struktura społeczno-ekonomiczna. Część I. Ludność – NSP 2011, Retrieved from <https://stat.gov.pl/spisy-powszechne/nsp-2011/nsp-2011-wyniki/ludnosc-i-gospodarstwa-domowe-stan-i-struktura-spoleczno-ekonomiczna-czesc-i-ludnosc-nsp-2011,11,1.html>.

- GUS, (2016). Stan zdrowia Ludności Polski w 2014 r. (M. Piekarczyńska, R. Wieczorkowski, & A. Zajenkowska-Kozłowska, eds.), Retrieved from <https://stat.gov.pl/obszary-tematyczne/zdrowie/zdrowie/stan-zdrowia-ludnosci-polski-w-2014-r-6,6.html?pdf=1#%5B%7B%22num%22%3A1%2C%22gen%22%3A0%7D%2C%7B%22name%22%3A%22XYZ%22%7D%2C0%2C841.89%2Cnull%5D>.
- Loeb, M., (2016a). Development of Disability Measures for Surveys: The Washington Group Extended Set on Functioning. In *International Measurement of Disability*, pp. 97–122, https://doi.org/10.1007/978-3-319-28498-9_7.
- Loeb, M., (2016b). *International Census/Survey Data and the Short Set of Disability Questions Developed by the Washington Group on Disability Statistics*, https://doi.org/10.1007/978-3-319-28498-9_15.
- Madans, J., Mont, D., & Loeb, M., (2015). Comments on Sabariego et al. Measuring Disability: Comparing the Impact of Two Data Collection Approaches on Disability Rates. *Int. J. Environ. Res. Public Health*, 2015, 12, pp. 10329–10351. *International Journal of Environmental Research and Public Health*, 13(1), p. 65, <https://doi.org/10.3390/ijerph13010065>
- Meltzer, H., (2016). The Challenges of Conducting National Surveys of Disability Among Children. In *International Measurement of Disability*, pp. 137–149, https://doi.org/10.1007/978-3-319-28498-9_9.
- Molden, T. H., Tøssebro, J., (2010). Measuring disability in survey research: Comparing current measurements within one data set. *Alter*, 4(3), 174–189, <https://doi.org/10.1016/j.alter.2010.05.003>
- Mont, D. (2007). Measuring Disability Prevalence. *Social Protection, World Bank*, (0706), pp. 1–54.
- Sabariego, C., Oberhauser, C., Posarac, A., Bickenbach, J., Kostanjsek, N., Chatterji, S., Cieza, A., (2015). Measuring disability: Comparing the impact of two data collection approaches on disability rates. *International Journal of Environmental Research and Public Health*, 12(9), pp. 10329–10351, <https://doi.org/10.3390/ijerph120910329>.
- Slany, K., (2014). Osoby niepełnosprawne w świetle Narodowego Spisu Powszechnego Ludności i Mieszkań z 2011 r. – wybrane aspekty. *Niepełnosprawność*, (11), pp. 44–62, Retrieved from <http://www.pfron.org.pl/download/5/503/04-KrystynaSlany.pdf>.

- Sullivan, D. F., (1971). A Single Index of Mortality and Morbidity. *HSMHA Health Reports*, 86(4), pp. 347–354. <https://doi.org/10.2307/4594169>.
- Szukalski, P., (2018). Nadumieralność mężczyzn w Polsce w układzie regionalnym. *Demografia i Gerontologia Społeczna – Biuletyn Informacyjny*, (8).
- UN, (2008a). *Principles and Recommendations for Population and Housing Censuses Revision 2*, New York: United Nations.
- UN, (2008b). *The measurement of Disability Recommendations for the 2010 Round of Censuses*.
- UN, (2015a). Principles and recommendations for population and housing censuses - Revision 3. In *Statistical Papers Series M.No.67/Rev.3*. New York: United Nations.
- UN, (2015b). *Przekształcamy nasz świat: Agenda na rzecz zrównoważonego rozwoju 2030*, Retrieved from [http://www.unic.un.org.pl/files/164/Agenda 2030_pl_2016_ostateczna.pdf](http://www.unic.un.org.pl/files/164/Agenda%202030_pl_2016_ostateczna.pdf).
- UN WG, (2006). *The Washington Group Short Set of Questions on Disability*. Retrieved from <http://www.washingtongroup-disability.com/wp-content/uploads/2016/01/The-Washington-Group-Short-Set-of-Questions-on-Disability.pdf>.
- US CENSUS BUREAU, (2017). *Measuring Disability in a Census*.
- Van Oyen, H., Bogaert, P., Yokota, R. T. C., & Berger, N., (2018). Measuring disability: A systematic review of the validity and reliability of the Global Activity Limitations Indicator (GALI). *Archives of Public Health*, 76(1), pp. 1–11, <https://doi.org/10.1186/s13690-018-0270-8>.
- WBG, (2018). World Bank Group Announces New Commitments on Disability Inclusion.
- WBG, (2018). World Bank Group Commitments on Disability-Inclusive Development.
- WHO, (2002). Towards a Common Language for Functioning, Disability and Health *ICF*, Retrieved from <https://www.who.int/classifications/icf/icfbeginnersguide.pdf>.
- WHO, & The World Bank, (2011). World report on disability 2011, 91, Retrieved from http://www.who.int/disabilities/world_report/2011/report.pdf.