

## Article

# Energy Costs Impact on Disabled Children's Rehabilitation Opportunities in Kazakhstan

Tatyana Pritvorova <sup>1</sup>, Yelena Petrenko <sup>2,\*</sup>  and Nikolay Gelashvili <sup>1</sup>

<sup>1</sup> Department of Economics and International Business, Karagandy Buketov University, Universitetskaya Street, 28, Karagandy 100028, Kazakhstan; pritvorova\_@mail.ru (T.P.); denor1980@mail.ru (N.G.)

<sup>2</sup> Academic Department of Management Theory and Business Technologies, Plekhanov Russian University of Economics, Stremyanny Lane 36, 117997 Moscow, Russia

\* Correspondence: petrenko.es@rea.ru

**Abstract:** This article examines the costs for families raising disabled children, who, in world social policy, belong to socially vulnerable groups of the population. The purpose of this article is to assess the impact of energy consumption on the ability of a family to provide rehabilitation for a disabled child in the present and the possibility of his independent life in the future. A sociological survey was administered to respondents in five regions of Kazakhstan, with subsequent processing of the results obtained by statistical methods. The survey was based on a methodological approach in accordance with the identification of four types of restrictions: direct childcare costs; indirect family costs, i.e., losses (household energy consumption aspect); assessment of the opportunity to work; and assessment of the parents' ability to stay healthy. The PLS-PM model-based structural modeling was carried out. In the model, four types of constraints as dependent variables were accepted. In the course of the model application, three hypotheses regarding energy costs were confirmed. The significance of energy costs in the system of restrictions for families with disabled children was determined. In conclusion, the qualitative characteristics of the relationships allowed identification of the problems in the current support system for families with disabled children in Kazakhstan, which is focused on the partial compensation of direct costs. Energy consumption was determined to be sufficiently important. This results in the misuse of benefits for the rehabilitation of a child because parents, especially from incomplete and low-income families, are forced to choose between paying utility bills and rehabilitating a child. Energy costs also limit the family's ability to meet the direct costs of the child and long-term savings related to the child's future. We propose the subsidization of energy utilities for families with disabled children, partially replacing targeted social assistance with vouchers for the purchase of household electrical appliances and rehabilitation equipment with energy-saving characteristics. In further studies, issues regarding the use of tax deductions and tax credits as an alternative support measure, which is currently not used in Kazakhstan, will be investigated.

**Keywords:** families with disabled children; PLS-PM model; direct costs; energy costs; social innovation; Kazakhstan



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## 1. Introduction

Over the past decades, households with disabled children have been the focus of research by scientists and international organizations. However, many difficulties have been identified in statistically measuring the number of disabled people for international comparisons. These difficulties have not yet been overcome for the social group of children under 15 years of age. The criteria used for adults are not suitable for this social group [1–3].

According to Mitra and Yap, who conduct research for the Fordham Disability Research Consortium, empirical measurements typically use questions from the Washington Group's (WG) short-set, tested internationally, covering six areas, such as vision, hearing, walking,

cognition, self-care, and communication. Although WGSS was originally developed for the censuses of persons aged 5 years and older, methodologists believe that the 6 domains may not be sufficient for covering disability among children. For this reason, disability rates are calculated only for adults aged 15 years and older [2,3]. Similarly, the reports of international organizations and WHO contain research data for people aged 15 years and older [4].

According to the research estimates in the field of medicine, in different countries, the proportion of disabled children can vary from 0.4% to 12.7%, which confirms the incompatibility of national criteria for the actual recognition of disability and, accordingly, access to benefits fixed in national law [5].

The Interstate Statistical Committee of the CIS is working to unify statistical research according to the best international standards in these countries, but so far, the Kazakh statistics have determined only basic indicators. In the last 3 years, the share of disabled children in Kazakhstan has been estimated at 1.5%, which is about 90,000 households. In the medium term, this value may increase [6,7].

Since the end of the 20th century, a special type of household in the social policy of developed social states has been identified. This household is identified as a “family with a disabled member”. Social policy measures are being implemented to support the quality of life of such households and promote the development of the household members’ human capital [8]. Nevertheless, the gap in the poverty rate between households with disabled children and households without children with disabilities is 11.5% on average in 22 OECD countries, and in some countries, it reaches 20% (the USA, Latvia) [9].

In 2018, the UN released a flagship report on the Sustainable Development Goals for people with disabilities (households whose members are people with disabilities) [10]. The report highlights a number of restrictions that households with disabled members face. Based on the results of international comparisons, it was revealed that there is a gap between in countries with energy access and housing maintenance for households with disabled members and those without disabled members. The maximum gap in energy access is 10% (44 countries), and the maximum gap in housing maintenance is 8% (34 countries).

### 1.1. Literature Review

Scientific research in the field of family policy distinguishes two phases of its development. According to the first phase, there is investment in cash allowance and tax benefits. In the second phase, the diversification of care services, family leave, and preschool education for children and other measures are carried out [11–13]. Since the range of problems for a family with disabled children is quite large, in modern countries, a whole range of interrelated measures aimed at compensating, neutralizing, or preventing restrictions (which can be considered as risky situations) are provided [14,15].

The dominant explanatory theory in the development of the research approach and subsequent policy decisions form the concept of human capital. The methodology includes the following range of applied methods:

- Most modern studies compare families with or without disabled children by average income per capita, modeling a family of approximately the same composition and basic income but without emphasizing the severity and type of disability [16–18].
- Some studies are devoted to the social rights of disabled children and their families [19,20].
- There are studies that compare the availability of rehabilitation services, especially public ones, if the necessary databases are available [21]. Other comparative reviews assess the importance of childcare services for equal starting opportunities for children in the future, and the effectiveness of services and their impact in the long term [22–24].
- The deepest level of insight into the analysis of the problem is to assess the final long-term results for the family. Quantitatively, an attempt is made to measure these results through the average per capita income of a family and the employment of its members, but specifically, the well-being of children in the long term is not monitored [25–28].

The overwhelming majority of studies have expressed concern that even in developed countries, the financial costs associated with children's health and upbringing are insufficient to enable full participation in society, despite the various forms of economic and social support for families with children [29–32].

Due to the birth of a disabled child, the family faces significant restrictions. These restrictions affect the family's well-being. At the same time, well-being is understood quite broadly. This is not only the financial resources of the family but also social and psychological ones, and the health and self-realization of all family members. Thus, the concept of human capital development should be mentioned [33,34].

The restrictions on the development of the family members' human capital include the following provisions:

1. Direct costs related to the child's disability. These costs include expenses for medical, psychological, educational, and other rehabilitation services. The amount of services required is related to the type of disability and its severity. The availability of services is affected by their price, family income, and benefits (including disability allowance). Housing costs and the availability of therapeutic equipment are associated with direct costs [35–40];
2. Indirect costs are most often considered as losses incurred by parents due to the inability to maintain full-time employment and health, which they would have had in the case of a child without developmental disabilities [41]. In our study, we will consider indirect costs as the family's energy consumption and housing maintenance costs, which will be discussed in detail in the materials and methods and results sections;
3. The possibility of realizing the family members' potential (both the parents and the child) in employment [42–44];
4. Deterioration of the parents' health caused by complex problems arising after the birth of a disabled child [45–47].

Energy costs are recognized as being significant for children with disabilities, primarily from a medical point of view [48]. There is a wide and diverse range of factors that determine the increased need for energy compared to ordinary people. Some diseases slow down the production of heat and determine the frequent need for washing clothes and household items. Dishwashers are indispensable if you need to sterilize dishes. In some cases, noiseless devices are necessary, but they are much more expensive than conventional ones [49,50].

Disabled people and low-income families are particularly vulnerable to fuel poverty, which nominally have priority under the fuel poverty policy, but their difficult situations are not always fully assessed [51–54].

The concept of double energy vulnerability has been proposed. According to this concept, people are at an increased risk of energy and transport poverty at the same time, which can be considered as a particularly serious form of energy injustice [55,56].

According to research [57], disability allowance benefits are often insufficient to cover the additional energy costs that many households with a disabled person face. At the same time, about 34% of households suffering from fuel poverty include disabled people. These arguments are used to account for energy costs when determining the amount of benefits [57].

In studies specifically devoted to the problem of fuel poverty, different methods are used. According to Aristondo [58], three indicators of energy availability are used to measure energy poverty: the ability to maintain sufficient heat in the house, arrears on utility bills (electricity, water, and gas), and the presence of a leaking roof.

In another study [59], a calculation method is used. According to the calculations, the annual burden of childhood disability varies in the range of 450–69,500 US dollars worldwide. This is related to the methods used for calculating the costs (list and absolute method of fixing) and the time horizon. The logistic regression method is often used to determine the probability of falling into the vulnerable group due to energy costs [59].

In our study, we used structural equation modeling. This is a set of multidimensional analysis methods that allow the study of the relationship between observable and unobservable, i.e., latent, phenomena or variables [60]. The use of regression, variance, and factor analysis methods in structural modeling determines the expansion of its explanatory and predictive capabilities. The method's advantage is the model's complex multidimensionality and the ability to visualize complex systems of connections that allow the testing of many hypotheses within a single model, previously tested for its suitability [61].

Structural modeling is recognized as a productive methodology for testing a variety of parallel hypotheses about cause-and-effect relationships. Adequate consideration of possible indicators affecting a specific object (phenomenon, process) allows conclusions to be drawn and the measurement of latent variables, and further proposes methods of influencing them [62,63].

The method allows consideration of the family's restrictions as a holistic structural pattern and reflects the opinion about energy costs as part of all family costs associated with the child's disability.

### *1.2. Scientific Novelty and Research Purpose*

The scientific novelty of this study is as follows. The international methodology for the study of financial and non-financial constraints for the human capital development of family members with disabled children was adapted to the conditions of Kazakhstan. Based on the PLS-PM structural model, the factors that have the greatest impact on the resources of families with disabled children were identified. This made it possible to identify the impact of energy costs on the direct and long-term costs of the family for the child's rehabilitation.

The research purpose was to assess the impact of energy costs on the family's ability to provide rehabilitation for a disabled child in the present and the possibility of his independent life in the future.

## **2. Materials and Methods**

The research methodology was based on a sociological survey of 306 families raising disabled children.

The sample included 306 families from 5 regions of Kazakhstan: Karaganda, Akmola, East Kazakhstan, Pavlodar, and Almaty. Telephone and focus group surveys in the offices of psychological and pedagogical correction visited by all respondents were conducted.

To analyze the results of the empirical study, the PLS-PM structural modeling method and SmartPLS software were used.

The following latent variables (Y) were considered: direct family costs for the needs of a disabled child, indirect costs (energy costs), parents' opportunity to work, and parents' ability to stay healthy (considering the family member who spends most of the time with a child).

The following observed variables (X) were chosen (Table 1):

- Child's disability allowance;
- Available state services for the child's rehabilitation (five types);
- Available public services for the family related to the child's disability;
- Childcare time;
- Family characteristics.

The questionnaire included the following blocks and elements rated on a 5-point scale (Table 1).

Energy costs were estimated as a percentage of the average monthly income. The estimation of three types of energy costs as a percentage of the average monthly income was suggested, which is perhaps less accurate than in absolute terms. The three types of energy costs are as follows: general utility's costs, maintenance costs of rehabilitation equipment, and personal transportation costs. The authors adopted a relative scale because the vast majority of respondents operated better with relative values. If the respondents gave absolute values, then they were subsequently recalculated into relative ones.

**Table 1.** Questionnaire structure and symbols of latent variables  $Y_n$  and observed variables  $X_m$  in the PLS-PM model.

No.		Variables	Symbols	Five-Point Scale Ranking
1	Y1	Parent's ability to stay healthy	Y13health Y14health Y15health	Psychological consultations General health services Medical procedures
2	Y2	Parent's opportunity to work	Y10oppwork Y11oppwork Y12oppwork	Full employment Part-time employment Self-employment
3	Y3	Energy costs	Y7idlos	Utility bills (electricity)
			Y8idlos	Child's equipment electricity costs (training devices, wheelchairs, electronic technologies, other equipment)
			Y9idlos	Transportation costs (including own car) to receive the basic package of services for a child
4	Y4	Direct costs on child's rehabilitation	Y1costs Y2costs Y3costs Y4costs Y5costs Y6costs	Financial burden Medical products and services Educational services (hobbies) Psychological services Special social services Additional services (according to the individual rehabilitation programme)
5	X7	Disability allowance	X1benefits X2benefits X3benefits	One Two Three
6	X1	Long-term family expenses per child	X19longexp X20longexp X21longexp	Expenses for secondary education Expenses for vocational education Living expenses in the future
7	X2	Additional public free of charge family services	X16govserv X17govserv X18govserv	Parent's rest provided by paying for short-term care services Parent's rest provided by paying for long-term care services Employment assistance
8	X3	Availability of medical services	X 4, 5, 6 medservice	Assessment of the volume, quality, and provision
9	X4	Availability of special social services	X 7, 8, 9 socservice	
10	X5	Other services for a child	X 10, 11, 12 otherservice	
11	X6	Childcare time	X 13m, 14f, 15other	
12	X8	Family characteristics	X22 fam	Hours spend by different family members
			X23 fam	Number of children in families
			X24 fam	Per capita income Child's diagnosis

Source: own elaboration.

The model made it possible to identify the most significant dependencies between energy costs and the child's rehabilitation in the present and resources for his future life.

### 3. Results

#### 3.1. Construction of the Structural Model

Based on the results of the survey, a model for a social group of families raising children with disabilities, sometimes significantly differing in the character and degree of restrictions, was built.

The SmartPLS program built a structural model based on variances using the least squares partial simulation method. This model demonstrates the numerical expression of the relationships between variables (Figure 1). The symbols adopted for the model parameters are given in Table 1.

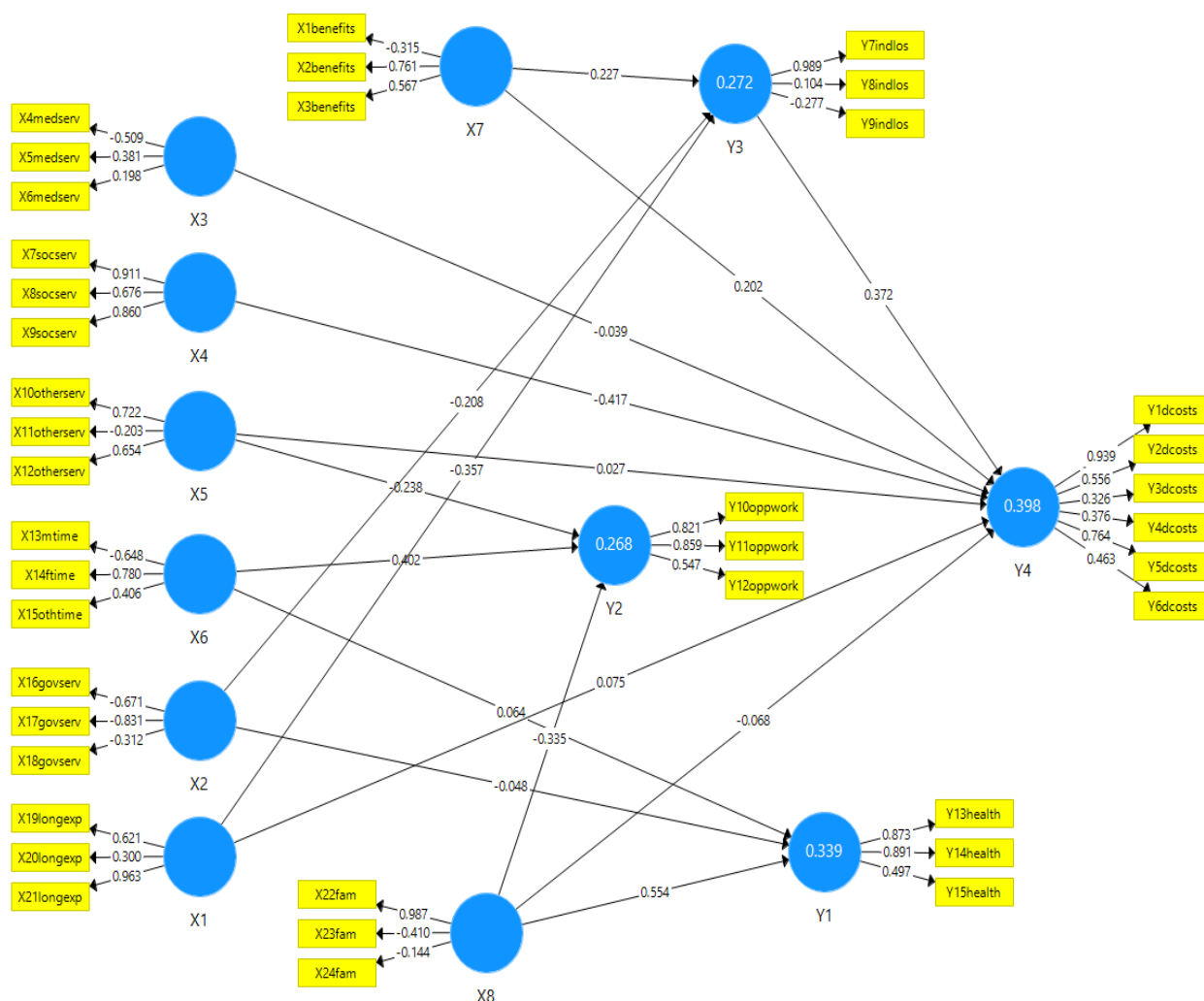


Figure 1. Structural model. Source: own elaboration based on SmartPLS program analysis.

### 3.2. Testing the Model

The evaluation process of the resulting model consisted of two steps:

1. Validation of the measurement model;
2. Testing of the structural model.

The first step is based on confirmatory factor analysis. The second step is implemented through path analysis.

Confirmatory factor analysis was used to quantify the data structure in the model. In the considered model, for all variables, at least 1 factor has a value higher than 0.7, which indicates its adequacy in describing the variable. For variables Y4 “Direct childcare costs”, Y1 “Ability to stay healthy”, and Y2 “Opportunity to work”, there are 2 such variables. Further, the internal consistency of the test questions was checked and the influence of each question on the latent variable was measured. To carry out these calculations, Cronbach’s Alpha was used. Cronbach’s Alpha should preferably be 0.6 or higher (Table 2).

**Table 2.** Reliability and validity coefficients.

Variables	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
The ability to stay healthy	0.691	0.801	0.810	0.601
Opportunity to work	0.607	0.659	0.794	0.571
Long-term family expenses per child	0.825	0.761	0.771	0.564
Additional public free of charge family services	0.568	−0.042	0.651	0.413
Availability of medical services for children	0.852	−2.814	0.002	0.148
Availability of social services for children	0.768	0.890	0.860	0.675
Other services for a child	0.792	0.721	0.732	0.529
Family members' time on childcare	−2.020	0.084	0.138	0.398
Indirect family costs, i.e., losses (household energy consumption aspect)	−0.190	0.956	0.256	0.355
Disability allowance	−0.320	−0.046	0.339	0.333
Direct childcare costs	0.718	0.750	0.757	0.512
Family characteristics	0.721	1.283	0.771	0.534

Source: own elaboration.

The data in Table 2 show a satisfactory level of internal consistency of the test elements and their influence on the factors. The following factors are the exception: “The ability to stay healthy”, “Opportunity to work”, “Additional public free of charge family services”, “Family members' time on childcare”, and “Indirect family losses”. This is explained by the large spread of values and the heterogeneity of the responses received or excessive similarity in the case of the variable “Disability allowance”. In general, Cronbach's Alpha, AVE, and CR have average values, which indicate acceptable statistics.

### 3.3. Collinearity Check

Table 3 shows the collinearity statistics obtained. To detect multicollinearity, the VIF indicator was used. The maximum allowable value of this indicator is 5, and the minimum threshold is 0.2.

**Table 3.** Collinearity statistics (VIF).

Variables	The Ability to Stay Healthy	Opportunity to Work	Indirect Family Losses (Household Energy Consumption Aspect)	Direct Childcare Costs
The ability to stay healthy				
Opportunity to work				
Long-term family expenses per child			1.017	1.411
Additional public free of charge family services	1.020		1.192	
Availability of medical services for children				1.341
Availability of social services for children				1.411
Other services for a child		1.015		1.680
Family members' time on childcare	1.077	1.085		
Indirect family costs, i.e., losses (household energy consumption aspect)				1.389
Disability allowance			1.178	1.216
Direct childcare costs				
Family characteristics	1.096	1.078		1.309

Source: own elaboration.

The data in Table 3 are in the acceptable range of values. This indicates the absence of multicollinearity between variables.

Bootstrapping testing characterizes the results of the study (Table 4). Bootstrapping testing is a means of verifying the results of the PLS analysis and formulated hypotheses.

Table 4. Path coefficients.

No.	Hypothesis	Original Sample (O)	T Statistics ( O/STDEV )	p Values	Hypothesis Status
Y4—Direct costs of child's rehabilitation					
1	Long-term family expenses per child -> Direct childcare costs	0.075	0.523	0.601	Rejected
2	Availability of medical services for children -> Direct childcare costs	−0.039	0.328	0.743	Rejected
3	Disability allowance -> Direct childcare costs	0.202	1.976	0.048	Accepted
4	Other services -> Direct childcare costs	0.027	0.244	0.807	Rejected
5	Availability of social services for children -> Direct childcare costs	−0.417	3.087	0.002	Accepted
6	Energy costs -> Direct childcare costs	0.372	2.690	0.007	Accepted
7	Family characteristics -> Direct childcare costs	−0.068	0.686	0.493	Rejected
Y3—Energy costs					
8	Long-term family expenses per child -> Energy costs	−0.357	1.995	0.049	Accepted
9	Additional public free of charge family services -> Energy costs	−0.208	0.932	0.352	Rejected
10	Disability allowance -> Energy costs	0.227	1.969	0.047	Accepted
Y2—Parents' opportunity to work					
11	Other services -> Opportunity to work	−0.238	0.930	0.353	Rejected
12	Time commitment -> Opportunity to work	0.402	3.549	0.000	Accepted
13	Family characteristics -> Opportunity to work	−0.335	1.986	0.046	Accepted
Y1—Parents' ability to stay healthy					
14	Additional public free of charge family services -> The ability to stay healthy	−0.048	0.327	0.743	Rejected
15	Time commitment -> The ability to stay healthy	0.064	0.574	0.566	Rejected
16	Family characteristics -> The ability to stay healthy	0.554	5.231	0.000	Accepted

Source: own elaboration.

Hypotheses were formed by the SMART-PLS program, and it is advisable to group them by the dependent variables  $Y_n$ .

### 3.4. Development of an Energy Management Model

Direct costs (Y4) are the most significant dependent value with a coefficient  $R^2 = 0.398$ . The coefficient of determination shows that all variables considered in this model affect the direct costs by 40%. The ability of the model to describe the direct costs is quite high since it considers factors that lie on the side of family income and expenses, its characteristics, and public services. This is far from a complete list of influencing factors. The introduction of additional variables (for example, parents' education and motivation, etc.) complicates the structural model and does not allow the correct results to be achieved.

Almost 100% of families indicate direct out-of-pocket costs for the child. The additional costs associated with medical services; the services of social educators of various profiles; and the costs of related services, such as the purchase of equipment and the adaptation of housing to the needs of the child, are the most significant ones.

How are the direct costs of a child (Y4) related to the availability of public, i.e., free of charge, services for a child?

For this social group, the most significant relationship with the negative impact is the shortage of available special social services for children: X4 (x7s–x9s). The coefficient characterizing the strength of the relationship is −417. Hypothesis 5 about the negative impact of the availability of special social services for the family on the direct childcare costs is confirmed, where  $p$  values = 0.002, which is close to the minimum value.

How are the disability allowances received by the family X7 (x1b–x3b) related to the direct childcare costs Y4?

The relationship is positive and significant. Hypothesis 3 about the positive relationship between disability allowance and direct childcare costs is confirmed, where  $p$  values = 0.048.

It should be noted that disability allowance and direct childcare costs have a correlation coefficient of 0.202, which is less than the coefficient of the disability allowance and energy costs (0.227). Thus, when assigning or increasing the amount of disability allowance, the money received by the family is more directed to energy costs than to direct childcare costs.

Indirect family costs (Y3) are related to energy consumption. There are three confirmed hypotheses concerning the indirect costs in the model.

Long-term family expenses per child are negatively associated with indirect costs, i.e., if families postpone financial resources for the child's future, this negatively affects his capabilities in the present time. Hypothesis 8 about the impact of long-term family expenses on the child's future on the family's energy costs is confirmed since  $p$  values = 0.049. This means that the family has difficulties paying for utilities and does not have the opportunity to buy and operate rehabilitation equipment with energy costs. The possibility of convenient transportation by individual transport is reduced despite the fact that many children, due to their health characteristics, find it difficult to cope with public transportation trips. At the same time, there is no specialized taxi for disabled people in many localities or its services are in short supply.

The actual question is about choosing between the present and the future of the child but choosing in favor of the future may lead to missed opportunities for rehabilitation in the present.

Hypothesis 10 confirms the impact of disability allowance on indirect costs. It is proved that part of the disability allowance, which consists of allowance for a disabled child and allowance for the care of children less than 18 years of age, is spent on meeting the energy-related needs. The  $p$  value for this hypothesis is 0.047. For single-parent families, whose share in the sample was 25%, the majority of whom live only on disability allowance, this relationship is obvious because utility bills are a necessary part of family expenses. Among full families, another 7% only live on the disability allowance. In total, this is 32%.

Hypothesis 6 is the most convincingly confirmed. The coefficient  $p$  value is 0.007. It indicates a significant relationship between the energy costs of the family and the direct costs of the child's needs. It is obvious that the possibility of increasing indirect costs (large-area housing, more expensive rehabilitation and other equipment, own transportation) indicates the ability of a family to bear more costs for targeted rehabilitation programs for a child. Since free public services for a child are currently limited to a minimum package, which is also provided irregularly, families try to increase the volume and improve the quality of rehabilitation services at the slightest opportunity, including inviting specialists to their homes.

The dependent variables Y1 and Y2 in the structural model have no relation to the indirect costs of meeting household energy needs.

The negative relationship ( $-0.208$ ) between additional public services X2 (purchase of special technical means and services) and indirect costs Y3 reflects the current public procurement system, which often contains cheap and often simple mechanical devices (prosthetic devices, shoes, invalid's wheel chairs, etc.). However, the relationship has no significant impact on indirect (energy) costs, and hypothesis 9 was not verified and was rejected.

#### 4. Discussion

According to Rimmerman [8]; Giulio, Philipov, and Jaschinski [64]; and Anderson et al. [43], families with disabled members in Kazakhstan are largely characterized by the same difficulties.

Studies conducted in different countries around the world show that such families bear additional rehabilitation costs to ensure the development of the human potential of disabled children, comparable with their peers' one. These questions have been repeatedly

raised to assess the level of expenditures for various needs, both directly for children and for the family as a whole. As mandatory elements of the expenses in the surveys, electricity costs were recognized, both for general purposes, such as utility bills, and personal, such as rehabilitation equipment and transportation costs. Econometric models for comparing the costs of ordinary families and families with disabled children were used to estimate costs. It should be noted that currently, there is no unified methodology for cost accounting at the international level [1,10,35,37].

These studies have confirmed additional costs, both in developed and developing countries. The level of estimated costs varied depending on the country. The biggest costs have been observed in the UK. In the UK, the direct costs for a child range from 11 to 69% [65]. In our study, the direct costs for a child ranged from 13% to 33%, and the energy costs of a family ranged from 15% to 23% of the average monthly family income.

We agree with Snell et al. [66] that studies on the extent of fuel poverty among households with disabled children are needed to explore the relationship between support for fuel poverty policies and people with disabilities.

However, at the same time, our study focused not so much on determining the amount of additional costs but also on identifying the relationship between energy costs and the family's ability to provide rehabilitation for the child in the present and his living conditions in the future.

## 5. Conclusions

A family raising a disabled child incurs additional direct costs to receive rehabilitation services and indirect costs, which are considered as energy costs in the suggested model. This block of costs includes utility bills, electricity costs for children's equipment (training devices, wheelchairs, electronic technologies), and transportation costs (including own transport) to receive the basic services for the child.

The PLS structural model allowed confirmation of several hypotheses about the relationship and mutual influence of energy costs and the possibilities of a child's rehabilitation in the present and his independent life in the future.

The following hypotheses were verified in the model:

1. Savings (long-term expenses) for the child's future are negatively related to energy costs. The family resources are limited. Thus, saving part of the financial resources for the child's future causes difficulties in paying the utilities bills, and limits the ability to buy and operate rehabilitation equipment with energy costs and use individual transport services (in some cases, the child with special needs has difficulties with public transport). Parents are forced to make a choice between the present and the future of the child. The priority of the second choice will lead to missed opportunities for rehabilitation in the present;
2. A child's disability allowance is partially spent on utility bills. For families who live only on these two transfers, utility bills undoubtedly make up a significant part of their income;
3. There is a significant positive relationship between energy costs and direct costs for the child. The availability of energy costs (large-area housing, more expensive rehabilitation equipment, own transport) indicates the ability of the family to bear more costs for targeted rehabilitation programs for the child. The minimum package of state rehabilitation services and interruptions in its provision allow the family to expand the package and improve the quality of services, including by inviting specialists to the house.

In connection with the identified dependencies, it is advisable to propose a number of support measures. Some of these measures are social innovations:

- It is necessary to subsidize utility energy services for families with disabled children if the standard of living and floor space per man is not exceeded;

- Partial replacement of a cash subsidy of targeted social assistance for household electrical appliances with energy-saving characteristics for a low-income family with disabled children should be provided;
- Rehabilitation facilities with energy-saving characteristics should be provided within the framework of social assistance in the form of vouchers that can only be used for their intended purpose. This will encourage the purchase of modern devices with minimum power consumption since the nominal value of the voucher cannot be cashed out.

The last two measures are social innovations for families with disabled children in Kazakhstan.

In addition, when conducting official statistical studies of household consumption expenditure, it is advisable to establish statistical accounting of the energy costs for families with disabled children by expense items, taking into account special needs.

Further research will focus on tax deductions and tax credits as an alternative support measure that is not currently being used.

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## References

1. Mitra, S.; Yap, J. Disability Data Report 2021. p. 69. Available online: <https://disabilitydata.ace.fordham.edu/reports/disability-data-initiative-2021-report/> (accessed on 19 February 2022).
2. Loeb, M. Creating Disability Severity Indicators Using the WGSS. Washington Group on Disability Statistics. 2020. Available online: [https://www.washingtongroup-disability.com/fileadmin/uploads/wg/Documents/WG\\_Document\\_\\_5E\\_-\\_Analytic\\_Guidelines\\_for\\_the\\_WG-SS\\_Severity\\_Indicators\\_\\_1\\_.pdf](https://www.washingtongroup-disability.com/fileadmin/uploads/wg/Documents/WG_Document__5E_-_Analytic_Guidelines_for_the_WG-SS_Severity_Indicators__1_.pdf) (accessed on 19 February 2022).
3. Loeb, M.; Mont, D.; Cappa, C.; De Palma, E.; Madans, J.; Cialesi, R. The development and testing of a module on child functioning for identifying children with disabilities on surveys. I: Background. *Disabil. Health J.* **2018**, *11*, 495–501. [CrossRef] [PubMed]
4. Disability and Health. World Health Organization. 2021. Available online: <https://www.who.int/news-room/fact-sheets/detail/disability-and-health> (accessed on 13 March 2022).
5. Maulik, P.; Darmstadt, G. Childhood disability in low- and middle-income countries: Over view of screening, prevention, services, legislation, and epidemiology. *Pediatrics* **2007**, *120*, S1–S55. [CrossRef]
6. Official Website of the Interstate Statistical Committee of the CIS. Review of the Statistical Practice of the CIS Countries and Other Countries of the World on Disability Issues. Available online: [http://www.cisstat.org/life\\_quality/obzor\\_inv\\_2020.pdf](http://www.cisstat.org/life_quality/obzor_inv_2020.pdf) (accessed on 19 February 2022).
7. Official Website of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. Bureau of National Statistics. Available online: <https://bala.stat.gov.kz/chislennost-detej-invalidov-ot-0-do-17-let-vklyuchitelno/> (accessed on 19 February 2022).
8. Rimmerman, A. *Family Policy and Disability*; Cambridge University Press: Cambridge, UK, 2015; p. 226.
9. OECD Family Database. Available online: <https://www.oecd.org/els/family/CO1.9%20Child%20disability%20FINAL.xls> (accessed on 19 February 2022).
10. UN Disability and Development Report. Available online: <https://social.un.org/publications/UN-Flagship-Report-Disability-Final.pdf> (accessed on 19 February 2022).
11. Daly, M.; Ferragina, E. Family policy in high-income countries: Five decades of development. *J. Eur. Soc. Policy* **2018**, *28*, 255–270. [CrossRef]

12. Blum, S.; Dobrotić, I.; Koslowski, A.; Macht, A.; Moss, P. International Network on Leave Policies & Research. Cross-Country Comparisons. Available online: <https://www.leavenetwork.org/annual-review-reports/cross-country/> (accessed on 19 February 2022).
13. Thévenon, O. Family Policies in OECD Countries: A Comparative Analysis. *Popul. Dev. Rev.* **2011**, *37*, 57–87. [CrossRef]
14. World Health Organization. *Assistive Technology for Children with Disabilities: Creating Opportunities for Education, Inclusion and Participation, a Discussion Paper*; World Health Organization: Geneva, Switzerland, 2015.
15. Graham, L.; Moodley, J.; Selipsky, L. The disability-poverty nexus and the case for a capabilities approach: Evidence from Johannesburg, South Africa. *Disabil. Soc.* **2013**, *28*, 324–337. [CrossRef]
16. Mitra, S.; Palmer, M.; Kim, H.; Mont, D.; Groce, N. Extra costs of living with a disability: A review and agenda for research. *Disabil. Health J.* **2017**, *10*, 475–484. [CrossRef]
17. Daly, M.; Grace, K. *Families and Poverty: Everyday Life on a Low Income*; Policy Press: Bristol, UK, 2015; 272p.
18. Melnychuk, M.; Solmi, F.; Morris, S. Using compensating variation to measure the costs of child disability in the UK. *Eur. J. Health Econ.* **2018**, *19*, 419–433. [CrossRef]
19. International Labour Organization. *World Social Protection Report 2014/15: Building Economic Recovery, Inclusive Development and Social Justice*; International Labour Organization: Geneva, Switzerland, 2014; p. 55. Available online: [www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms\\_245201.pdf](http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_245201.pdf) (accessed on 13 March 2022).
20. International Labour Organization. *World Social Protection Report: Universal Social Protection to Achieve the Sustainable Development Goals*; International Labour Organization: Geneva, Switzerland, 2017; Available online: [https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms\\_604882.pdf](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_604882.pdf) (accessed on 13 March 2022).
21. DeRigne, L. The employment and financial effects on families raising children with special health care needs: An examination of the evidence. *J. Pediatric Health Care* **2012**, *26*, 283–290. [CrossRef]
22. Petitclerc, A.; Côté, S.; Doyle, O.; Burchinal, M.; Herba, C.; Zachrisson, H.D.; Boivin, M.; Tremblay, R.E.; Tiemeier, H.; Jaddoe, V.; et al. Who uses early childhood education and care services? Comparing socioeconomic selection across five western policy contexts. *Int. J. Child Care Educ. Policy* **2017**, *11*, 1–14. [CrossRef]
23. Wells, M.; Bergnehr, D. Families and Family Policies in Sweden. In *Handbook of Family Policies across the Globe*; Robila, M., Ed.; Springer: New York, NY, USA, 2014; pp. 91–107. [CrossRef]
24. Preston, G. Families with disabled children, benefits and poverty. *Benefits* **2006**, *14*, 39–43.
25. Vinck, J.; Lebeer, J.; Van Lancker, W. Non-take up of the supplemental child benefit for children with a disability in Belgium: A mixed-method approach. *Soc. Policy Adm.* **2019**, *53*, 357–384. [CrossRef]
26. Mont, D. Childhood Disability and Poverty. *Labor: Demogr. Econ. Fam. eJournal* **2019**, 1–26. [CrossRef]
27. Claessens, E.; Mortelmans, D. Challenges for child support schemes: Accounting for shared care and complex families. *J. Eur. Soc. Policy* **2018**, *28*, 211–223. [CrossRef]
28. Ou, J.-J.; Shi, L.-J.; Xun, G.-L.; Chen, C.; Wu, R.-R.; Luo, X.-R.; Zhang, F.-Y.; Zhao, J.-P. Employment and financial burden of families with preschool children diagnosed with autism spectrum disorders in urban China: Results from a descriptive study. *BMC Psychiatry* **2015**, *15*, 3. [CrossRef]
29. Penne, T.; Hufkens, T.; Goedemé, T.; Storms, B. To what extent do welfare states compensate for the cost of children? The joint impact of taxes, benefits and public goods and services. *J. Eur. Soc. Policy* **2020**, *30*, 79–94. [CrossRef]
30. Adema, W.; Clarke, C.; Frey, V. Paid parental leave and other supports for parents with young children: The United States in international comparison. *Int. Soc. Secur. Rev.* **2016**, *69*, 29–51. [CrossRef]
31. Oldfield, N.; Bradshaw, J. The Costs of a Child in a Low-Income Household. *J. Poverty Soc. Justice* **2011**, *19*, 131–143. [CrossRef]
32. Eekelaar, J.; George, R. *Routledge Handbook of Family Law and Policy*; Routledge: London, UK, 2021; p. 464.
33. Claessens, E.; Mortelmans, D. De toegankelijkheid, werkbaarheid en transparantie van Belgische methoden ter berekening van onderhoudsbijdragen voor kinderen. *Belg. Tijdschr. Voor Soc. Zekerh.* **2017**, 213–258.
34. Family Policy in the 28 EU Member States. Taskforce on European and International Relations and Cooperation Country Overview. July 2015. Available online: [https://www.caf.fr/sites/default/files/cnaf/Documents/international/fiches%20pays/Compil%20fiches%20pays%20pays%20UE\\_01%202018\\_English.pdf](https://www.caf.fr/sites/default/files/cnaf/Documents/international/fiches%20pays/Compil%20fiches%20pays%20pays%20UE_01%202018_English.pdf) (accessed on 19 February 2022).
35. Shahat, A.; Greco, G. The Economic Costs of Childhood Disability: A Literature Review. *Int. J. Environ. Res. Public Health* **2021**, *18*, 3531. [CrossRef]
36. Cullinan, J.; Gannon, B.; Lyons, S. Estimating the extra cost of living for people with disabilities. *Health Econ.* **2011**, *20*, 582–599. [CrossRef]
37. Morris, Z.A.; McGarity, S.V.; Goodman, N.; Zaidi, A. The Extra Costs Associated with Living with a Disability in the U.S. Working Paper 2020. Available online: <https://www.nationaldisabilityinstitute.org/reports/extra-costs-living-with-disability/> (accessed on 19 February 2022).
38. Stabile, M.; Allin, S. The economic costs of childhood disability. *Future Child* **2012**, *22*, 65–96. [CrossRef] [PubMed]
39. Okon, M.; Henderson, A.; Kinnear, D.; Cooper, S.-A. Trends and variations in per capita expenditure on adult intellectual disabilities health and social care across Scotland, and by urban/rural class. *J. Appl. Res. Intellect. Disabil.* **2019**, *32*, 121–130. [CrossRef] [PubMed]
40. Mizunoya, S.; Mitra, S.; Yamasaki, I. Disability and school attendance in 15 low- and middle-income countries. *World Dev.* **2018**, *104*, 388–403. [CrossRef]

41. Banks, L.M.; Polack, S. *The Economic Costs of Exclusion and Gains of Inclusion of People with Disabilities: Evidence from Low and Middle Income Countries*; International Centre for Evidence in Disability: London, UK, 2014.
42. Coleridge, P. Disabled people and 'employment' in the majority world: Policies and realities. In *Working Futures? Disabled People, Policy and Social Inclusion*; Roulstone, A., Barnes, C., Eds.; Policy Press: Bristol, UK, 2005; p. 368.
43. Anderson, L.; Hewitt, A.; Pettingell, S.; Lulinski, A.; Taylor, M.; Reagan, J. *Family and Individual Needs for Disability Supports. FINDS Community Report 2017*; Research and Training Center on Community Living, Institute on Community Integration, University of Minnesota: Minneapolis, MN, USA, 2018; Volume 2, p. 25.
44. Olsson, M.; Hwang, C. Well-being, involvement in paid work and division of child-care in parents of children with intellectual disabilities in Sweden. *J. Intellect. Disabil. Res.* **2006**, *50*, 963–969. [[CrossRef](#)] [[PubMed](#)]
45. Lindqvist, R. Swedish Disability Policy: From Universal Welfare to Civil Rights? *Eur. J. Soc. Secur.* **2000**, *2*, 399–418. [[CrossRef](#)]
46. Chaplinskaya, E.V. Social rehabilitation of families with disabled children as a technology of social work. *Sci. Mod.* **2013**, *21*, 108–113.
47. Emerson, E.; Hatton, C.; Llewellyn, G.; Blacher, J.; Graham, H. Socio-economic position, household composition, health status and indicators of the well-being of mothers of children with and without intellectual disabilities. *J. Intellect. Disabil. Res.* **2006**, *50*, 862–873. [[CrossRef](#)]
48. George, M.; Graham, C.; Lennard, L. *The Energy Penalty: Disabled People and Fuel Poverty*. Centre for Consumers and Essential Services. University of Leicester, 2013. Available online: <http://www2.le.ac.uk/departments/law/research/cces/documents/the-energy-penalty-disability-and-fuel-poverty-pdf> (accessed on 13 March 2022).
49. Marmot, M. The health impacts of cold homes and fuel poverty. *BMJ.* **2011**, *342*, d2807.
50. Fuel Poverty Advisory Group (for England). *Tenth Annual Report, 2011–2012*; Department of Energy and Climate Change: London, UK, 2012.
51. Gillard, R.; Snel, C.; Bevan, M. Advancing an energy justice perspective of fuel poverty: Household vulnerability and domestic retrofit policy in the United Kingdom. *Energy Res. Soc. Sci.* **2017**, *29*, 53–61. [[CrossRef](#)]
52. Snell, C.; Bevan, M.; Thomson, H. Justice, fuel poverty and disabled people in England. *Energy Res. Soc. Sci.* **2015**, *10*, 123–132. [[CrossRef](#)]
53. Kemp, R.; Vasseur, V.; Abujidi, N.; Vroon, Z.; Broers, W. Justice in social housing: Towards a people-centred energy renovation process. *Energy Res. Soc. Sci.* **2022**, *88*, 102527. [[CrossRef](#)]
54. Christine, L.; Chris, M. Fuel poverty and human health: A review of recent evidence. *Energy Policy* **2010**, *38*, 2987–2997. [[CrossRef](#)]
55. Simcock, N.; Jenkins, K.E.H.; Lacey-Barnacle, M.; Martiskainen, M.; Mattioli, G.; Hopkins, D. Identifying double energy vulnerability: A systematic and narrative review of groups at-risk of energy and transport poverty in the global north. *Energy Res. Soc. Sci.* **2021**, *82*, 102351. [[CrossRef](#)]
56. Bouzarovski, S. Energy poverty in the European Union: Landscapes of vulnerability. *WIREs Energy Environ.* **2014**, *3*, 276–289. [[CrossRef](#)]
57. Cantillon, B.; Goedemé, T.; Hills, J. *Decent Incomes for All: Improving Policies in Europe*; Oxford University Press: Oxford, UK, 2019. [[CrossRef](#)]
58. Aristondo, O.; Onaindia, E. Inequality of energy poverty between groups in Spain. *Energy* **2018**, *153*, 431–442. [[CrossRef](#)]
59. Legendre, B.; Ricci, O. Measuring fuel poverty in France: Which households are the most fuel vulnerable? *Energy Econ.* **2015**, *49*, 620–628. [[CrossRef](#)]
60. Bentler, P.M.; Chou, C.-P. Practical Issues in Structural Modeling. *Sociol. Methods Res.* **1987**, *16*, 78–117. [[CrossRef](#)]
61. Danelyan, T.Y. Structural modeling. *Econ. Stat. Comput. Sci.* **2014**, *6*, 166–169.
62. Weijters, B.; Davidov, E.; Baumgartner, H. Analyzing factorial survey data with structural equation models. *Sociol. Methods Res.* **2021**. [[CrossRef](#)]
63. Gana, K.; Broc, G. *Structural Equation Modeling with Lavaan*; John Wiley and Sons: Hoboken, NJ, USA, 2018. [[CrossRef](#)]
64. Giulio, P.; Philipov, D.; Jaschinski, I. Families with disabled children in different European countries. *Fam. Soc.* **2014**, *23*, 1–44. Available online: <http://www.familiesandsocieties.eu/wp-content/uploads/2014/12/WP23GiulioEtAl.pdf> (accessed on 19 February 2022).
65. Zaidi, A.; Burchardt, T. Comparing incomes when needs differ: Equivalization for the extra costs of disability in the UK. *Rev. Income Wealth* **2005**, *51*, 89–114. [[CrossRef](#)]
66. Snell, C.; Bevan, M.; Thomson, H. Welfare reform, disabled people and fuel poverty. *J. Poverty Soc. Justice* **2015**, *23*, 229–244. [[CrossRef](#)]