



Worlds of long-term care: A typology of OECD countries

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ABSTRACT

Providing long-term care (LTC) to the elderly is a major challenge for the welfare state. LTC systems differ widely among countries. Due to recent maturation, economization, and marketization processes, earlier LTC comparisons and typologies are no longer suitable to give a comprehensive overview of LTC systems and their major characteristics. In this paper we introduce a new typology of LTC systems in the OECD world, based on most recent OECD data and a unique set of institutional indicators. This typology aims to make LTC systems more comparable to welfare state and healthcare system typologies and thereby improve our understanding of how LTC is embedded in the wider welfare state and how it is related to other welfare state institutions. Based on 24 cluster analyses, we identify six (method-driven) and nine (content-driven) LTC types, which can be adapted in future studies according to the needs. In the six-types solution, we suggest a public supply type (e.g., Sweden), a private supply type (e.g., Germany), a residual public type (e.g., Poland), an evolving public supply type (e.g., Korea), a need-based supply type (e.g., Switzerland), and an evolving private need-based type (e.g., United States).

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1. Introduction

The provision of long-term care (LTC) for the elderly is a major challenge for developed welfare states, and is highly affected by increasing longevity and the ageing of the baby boom generation [1]. The rising number of elderly people in need of LTC increases the financial pressure on LTC systems [2]. At the same time, demands for better access and higher-quality services are growing [3]. To cope with these pressures, many countries have started to reform their LTC systems, e.g. by changing eligibility criteria or altering the financing of LTC. These measures altered the scope and functioning of many established LTC systems [4,5]. As a consequence, it has become increasingly difficult to describe and categorize existing LTC systems, which however is essential to analyze their effects with respect to coverage, access, social security, quality, and other factors.

This paper aims to provide a new and updated LTC typology that considers recent LTC reforms. This typology makes two methodological advancements compared to existing ones. Earlier typologies use either quantitative data [6,7] or standardized infor-

mation on institutional and regulatory aspects of LTC systems [8,9]. We integrate both approaches by analyzing quantitative data on supply, public-private mix, and performance as well as institutional information on the accessibility of systems. Second, unlike most LTC typologies that select only one cluster analysis to categorize countries [6,7,9], for our LTC typology we calculate several cluster analyses to account for the internal consistency of clusters. This method, which has already been used to classify healthcare systems [10], has so far not been applied in LTC typologies.

We first describe dimensions and indicators of earlier LTC typologies and summarize their results. Then we explain the indicators and sample composition of our study. In the results section, we provide a detailed method-driven cluster solution comprising nine clusters. On this basis, we develop a condensed content-based clustering solution with six distinct system types. In the discussion we compare the clusters we found with clusters in earlier typologies, and in the conclusion, we discuss our results in light of further usage.

1.1. LTC classifications

Typologizing welfare states and welfare state systems is a common endeavor in welfare state research since Esping-Andersen's [11] seminal study. His work and the following adaptations and discussions [e.g. 12–14] still provide a basic template for case selection and evaluation in all areas of welfare state research [15–17]. Since

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then, a vast amount of issue- and area-specific typologies have been developed, not least in healthcare [10,18–20], a field that is particularly close to that of LTC.

LTC is defined as:

“Range of services required by persons with a reduced degree of functional capacity, physical or cognitive, and who are consequently dependent for an extended period of time on help with basic activities of daily living (ADL). This “personal care” component is frequently provided in combination with help with basic medical services such as “nursing care” (help with wound dressing, pain management, medication, health monitoring), as well as prevention, rehabilitation or services of palliative care. Long-term care services can also be combined with lower-level care related to “domestic help” or help with instrumental activities of daily living (IADL).” [1].

This definition does not consider LTC recipients' age. However, most recipients are older than 65 years. Typologies that capture the institutional structure of LTC systems or facets of LTC systems can be divided into three major groups. A first group focuses on social services in general, where LTC is just one part of a larger social service picture [21–25]. A second group concentrates on LTC for the elderly, although they often include disability as well for data reasons [6–9,26–28]. A third group focuses on special aspects of LTC and zooms in on migration in the context of LTC [28–31], cash for care schemes in LTC [32], and informal care by families [24,31,33,34].

Our focus lies on building a typology of LTC system types. We have therefore identified the second group of typologies as most relevant for our analysis. These typologies include a huge variety in the (number of) included country cases, data, methods, and results. Regarding dimensions and indicators, most studies have repeatedly analyzed four central dimensions and thus created a certain standardization and comparability.

1.1.1. Supply

Most typologies under analysis incorporate the dimension of supply [7,9,26]. Indicators in this dimension include financial resources [6–9,26], staff and staffing levels [26], and bed density in institutional LTC [6,26]. Furthermore, the type of provision is often included in the supply dimension and operationalized via the percentage of people in ambulatory or residential care settings [6,7,26].

1.1.2. Public-private mix

The second dimension, the public-private mix, which is often part of healthcare typologies [10,20], operationalizes the role of the state and private actors. Only LTC typologies that specialize on specific aspects or take a broader view on social services have integrated this dimension so far [29] by focusing on the intensity of informal care by families [22], the scope of public funds [28], the proportion of for-profit providers [30,31], and the expenditure on respectively the use of uncontrolled cash benefit schemes [30,31].

1.1.3. Access regulation

Restrictions in LTC systems may pose barriers to access care, especially for groups with lower social status. Common barriers are means-testing of benefits and limitations of choice [1,35]. The access dimension has been highly relevant in the development of healthcare typologies [10,36] and has been implemented to a lower extent in LTC typologies due to a lack of comparable institutional indicators. Kraus et al. [9] incorporate this dimension by using own gathered data on means-testing for benefits, entitlement to residential care, home care benefits, cash benefits, and choice restrictions.

1.1.4. Performance

The performance of LTC systems has so far hardly been studied in international comparisons, while performance has already been incorporated in healthcare typologies [10]. Indicators for measuring the quality of LTC service provision, such as the share of institutional and home-based LTC patients with pressure ulcers or unintended weight loss, are not available in many countries [37]. Hence, only few typologies include performance or quality indicators. Damiani et al. [6], for example, use the share of people over 80 reporting good or very good health and the perceived limitations in activities in daily living (ADLs) for people aged 65 or older. Kraus et al. [9] take institutional indicators of mandatory quality assurance systems and the degree and functioning of integrated services into account.

When summarizing existing LTC typologies, we see that most are solely based on quantitative (usually OECD and Eurostat) indicators [6,8,9,26]. Sometimes, also micro data (SHARE data) are used [27]. Only Kraus et al. [9] adopt both quantitative and institutional indicators, covering the rules for access to the system based on an own primary data collection. The results of these typologies are influenced by their focus and aim but also by the (number of) included countries. Some studies include only about ten European/OECD country cases [7,26,27] while others analyze 20 and more European [6,9] or OECD [8] cases.

Despite the large variety in the number of clusters and the composition of those clusters in the different typologies, some similarities exist. The most robust system type is the Scandinavian or Northern European cluster, which generally includes Sweden, Norway, Denmark, Finland, and often also the Netherlands [6,8,9,26,27]. Clusters which comprise only Eastern European countries can be found in the typologies by Damiani et al. [6], Halásková et al. [7] and Kraus et al. [9]. Often, Bulgaria, Hungary, Czech Republic, Estonia, and Slovakia are included, while other Eastern European countries, for example Slovenia, Romania, and Lithuania, only sometimes join this cluster. In some studies, a cluster incorporating Eastern and Southern European countries is identified [1,6,9], including Poland, Italy, Spain, and Greece. The three latter countries are also represented in a genuine Southern European cluster by Pommer et al. [27]. In many typologies, continental European countries such as Germany, France, Austria, Belgium, and Luxembourg are combined into one system type, however mostly together with some Eastern or Northern European countries [6,7,9,26,27]. Non-European countries are rarely included in LTC typologies. The typology by Colombo [8] categorizes countries based on financing indicators and includes Japan and South Korea in a cluster with Germany, Luxembourg, and the Netherlands due to their common social insurance approach. In the same study, New Zealand and Canada are clustered with Greece, Spain, and Switzerland due to their universal but means-tested financing approach [8]. The study by Halásková et al. [7] identifies a cluster with Australia and South Korea.

This overview shows that there is a need to advance LTC typologies. First, many typologies have a European focus or only use a small sample of countries. We extend these typologies by using a OECD sample with a large number of countries. Second, most typologies use quantitative indicators only, in particular concerning financing data. We also include institutional indicators focusing on access to LTC and therefore combine both aspects of LTC systems.

2. Materials and methods

2.1. Quantitative and institutional indicators

The indicators for our typology of LTC systems come from one quantitative data source and several data sources with institu-

Table 1
Overview of LTC typology indicators¹.

	Abbreviation	Mean	SD	Min.	Max.
<i>I: Supply</i>					
Expenditure per capita in US\$, PPP	Expenditure	709.89	524.81	9.48	1745.09
Number of beds per 1,000 inhabitants	Beds	47.73	18.27	12.2	85
Number of recipients in institutions, % of all people aged 65+	Recipients	3.88	1.66	0.43	7.17
<i>II: Public-private mix</i>					
Share of private expenditure, % of total expenditure	Private expenditure	15.84	11.09	0.19	34.56
Availability of cash benefits (only in-kind, bound, unbound)	Cash benefit	1.08	0.81	0	2
<i>III: Access regulation</i>					
Choice Index (Unlimited - Limited)	Choice Restrictions	1.64	0.5	0	4
Choice of home care provider	Choice home care	0.4	0.49	0	1
Choice of institutional care provider	Choice institutional care	0.36	0.83	0	1
Choice between cash and in-kind benefits	Choice cash	0.88	1.25	0	2
Means-testing for any benefit (No/Yes)	Means-testing	0.56	0.51	0	1
<i>IV: Performance</i>					
Life expectancy 65+	Life expectancy	19.77	1.35	16.48	21.85
Self-perceived health status (very) good, % of the population 65+	Self-perceived health	46.11	21.83	8.6	86.9

¹ Sources: OECD health data (extracted on 2018-12-10), MISSOC (2018), European Observatory on Health Systems and Policies (2018), European Commission (2018); own coding scheme.

tional data (Table 1). First, we use six quantitative measures from the OECD health data [38]. Values relate to the mean of the years 2014–2016. Furthermore, five institutional indicators are developed by information from the Missoc database (MISSOC, 2018), the Health in Transition reports (European Observatory on Health Systems and Policies, 2018), and the ESPN reports of the European Union [39] and relate to the year 2016. Institutional indicators relate to specific measures and rules of the LTC system (cash benefits, choice, and means-testing). All values of the institutional indicators reflect national or dominant rules in place, since in some countries either regional or municipal rules prevail. To double-check our values, we contacted national LTC policy experts with a questionnaire containing the description of indicators and values including our own country-specific assessment. Based on the questionnaires, we received from May to July 2019 for all countries in the sample answers and comments from the experts on our coding (see Table 5 in the Appendix).

As a measure of financial input into the system, we use LTC (health) expenditure per capita in US\$ of purchasing power parities (expenditure). It includes all expenditure on body-related LTC, mainly on (basic) Activities of Daily Living (ADLs) such as bathing, dressing or eating. We did not include LTC (social) expenditure covering Instrumental Activities of Daily Living (IADLs) [7], because data were extremely limited in this dimension. Institutional supply of services is measured by the number of LTC beds per 1,000 population aged 65 and older (beds), and the actual supply of spots in these facilities is reflected by the number of LTC recipients in institutions measured as the percentage of all people aged 65 years and older (recipients).

To capture the public-private mix of LTC systems, we use two indicators. First, we use the private (voluntary and out-of-pocket) expenditure as a percentage of total expenditure (private expenditure) to measure public and private involvement in payments for care. We would have chosen to include an indicator on the public-private provision of care, but comparative quantitative data is not available for many countries. Second, we include the availability of cash benefits (cash benefit) as an approximation of formal and informal care provision. We define informal care here as de-commodified care by family or informal migrant care workers (migrant care in the family). Research has shown that the availability as well as the unrestricted usage of cash benefits fosters family and migrant care [30,32]. In our setting, the cash benefit indicators may take the value 0, describing a system in which only in-kind benefits are available. If the use of cash benefits is bound to spe-

cific services and aids, the indicator is coded as 1, while unbound benefits, for which the use of the benefit is at the beneficiary's own discretion, are coded as 2.

To capture access to LTC systems, we use three choice indicators and one means-testing indicator. Limitations in choice are defined as restrictions in the kind of benefit or provider that can be chosen and that can relate to regional restriction or to insurance or benefit plans. The indicators are choice of home-care provider (choice home care), choice of institutional care provider (choice institutional care), and choice between cash and in-kind benefits (choice cash). We constructed a cumulative index from these three choice indicators (choice restrictions) because cluster analysis improves when a small number of variables is included while multicollinearity might weight individual variables too strong, biasing the derivation of meaningful clusters [40]. Moreover, this prevents findings from being biased by a strong overweighting of choice within the cluster analysis. This index (choice index) may take values between 0 and 4, with 0 representing absolute freedom of choice and 4 strong restrictions. Furthermore, we use means-testing for any benefit (means-testing), which includes cash benefits, in-kind benefits, and other care-related benefits. A country system was coded 0 if it applies no means-testing in LTC systems at the stage of LTC provision at all and 1 if means-testing takes place.

For the performance dimension [6,9], we use data that indicate the quality of LTC services. We include life expectancy of people aged 65 and older (life expectancy) and the percentage of the population who are 65 years and older and perceive their health as good or very good (self-perceived health).

2.2. Data

After extraction, we excluded 11 countries from the total OECD sample because data was missing on single indicators for the whole observation period (Austria, Canada, Chile, Greece, Hungary, Iceland, Italy, Lithuania, Mexico, Portugal, and Turkey), resulting in an analysis sample of $N = 25$ countries. To handle missing values within quantitative indicators, we conducted a three-step process: First, we estimated a multiple imputation by chained equations (MICE) regression model using predictive mean matching (PMM) for 20 cycles. Following the findings and recommendations of White et al. [41] and Kleinke et al. [42], we imputed missing mean values of indicators by predictive mean matching of the next neighbor, here the next year. If, for example, the value was missing for 2015 for a specific country, we estimated the model with the full

information from 2014 and aggregated the values of 20 cycles to the yearly mean. Second, we aggregated imputed data to the yearly mean of the specific indicator if the true value was missing. Finally, we calculated an overall mean of the observation period between 2014 and 2016 for our analysis (see Table 5 in the Appendix).

2.3. Cluster analysis

Cluster analysis is the standard method in welfare state [43–45], healthcare [18,36,46], and LTC typologies [7,9,23,25] to classify and develop system types. The innovative approach with multiple cluster analyses within the same methodological framework [10] has several advantages over classical approaches, which often lack accepted standards and statistical rules [47]. Since researchers must make technical decisions that potentially shift findings in different ways of interpretation, a single cluster analysis is not appropriate for classifying complex LTC systems. The flexibility of the multi-cluster analysis allows for combining results from different specifications “using the variability across those results as measure of confidence about the membership of two observations in one cluster” [10]. This increases the reliability of the method itself.

Following the proposed framework, we specified k-means partitioning and agglomerative cluster analysis in Stata 16. Thereby we used either z- and range-standardized variables, Gower and squared Euclidian distance as measures of dissimilarity, as well as average and Wards algorithm as linkage methods. We then selected the first and second-best result determined by stopping rules of Calinski-Harabasz and Duda/Hart and Dendrograms for each of the 24 separate cluster analyses.

Findings from 8 k-means and 16 hierarchical cluster analyses went equally in the calculation on how often each country was in the same cluster with every other country. To classify as full membership within this network of LTC systems, a connection between two countries must show up in $\geq 66\%$ of all cluster analyses and a country needs to have such strong ties with at least half of all countries in the cluster.

3. Results

Based on 24 cluster analyses we present two solutions. First, nine clusters can be distinguished, using a purely methodological solution and applying the full membership rule (see Table 2). Second, six cluster can be distinguished on methodological and content-based grounds, applying full and partial membership rules (see Table 2, Fig. 1).

The nine clusters consist of one to five countries:

- 1) The first cluster comprises Czech Republic, Latvia, and Poland, which form a distinct and highly consistent cluster, with all ties between these countries $\geq 90\%$. No other country has a partial membership in this cluster.
- 2) Finland and Germany form another distinct cluster with a strong tie (94%). Both countries do not have any partial membership in other clusters.
- 3) Denmark, Ireland, Norway, and Sweden show a high internal consistency. All countries can be found in the same cluster in all performed cluster analyses.
- 4) Japan and Korea have a strong tie (94%) and join the previous cluster as partial members.
- 5) Australia, Belgium, Luxemburg, the Netherlands, and Switzerland form a dense cluster, in which each country shares strong ties to all other included countries.

- 6) Slovenia and Slovakia have a strong tie (72%), yet less strong than the other two-country clusters. The countries have strong and weak ties to Clusters 5 and 7.
- 7) France, Israel, Spain, the United Kingdom, and the United States constitute a cluster in which the tie between the US and France is the only weak one.
- 8) Estonia and 9) New Zealand are one-country clusters. Estonia has weak ties to France and the US and is hence considered a partial member of Cluster 7. New Zealand has three weak ties to Cluster 7 and is hence considered a partial member in this cluster, too.

Although from a methodological point of view we can clearly distinguish nine clusters, a solution with clusters covering only one or two countries is not suitable for most purposes. Our typology, however, allows us to go beyond this interpretation. Based on their partial memberships, the clusters can be condensed. A partial membership is defined as a connection of two countries in $\geq 50\%$ of the cluster analyses. Accordingly, we identify four distinct clusters. These clusters have no ties $\geq 50\%$ to countries from other clusters, and all countries within the four clusters have ties $\geq 50\%$. We map this condensed cluster solution by a network graph modelled by UNICNET6/Netdraw. The graph visualizes groups of countries and shows how likely it is that two countries belong to a similar LTC system type. Furthermore, it displays the internal consistency of LTC systems, allowing for an in-depth analysis of the composition of clusters (Fig. 1).

The graphic representation shows four distinct clusters, of which two (bottom right and bottom left) can each be split up into two further clusters, resulting in a total of six clusters. Based on their tie strength, Cluster 1 (CZ, LV, PL), 2 (DE, FI), 3 (DK, IE, NO, SE), and 4 (JP, KR) remain as types. In addition, Cluster 5 (AU, BE, CH, LU, NL) and 6 (SI, SK) are added as well as Cluster 7 (FR, IL, ES, UK, US), 8 (EE), and 9 (NZ). This LTC typology of six system types, can be characterized as follows (see Tables 3 and 4):

3.1. The residual public system

The residual public system, which includes the Czech Republic, Latvia, and Poland, is marked by low levels of supply. It has by far the lowest overall expenditure, beds, and recipients of all system types. However, access barriers seem low, by applying no means-testing and a low level of choice restrictions. Cash benefits are mainly bound. The share of public LTC expenditure is the highest of all system types. Performance of these systems measured by life expectancy and subjective health status are by far the lowest of all system types.

3.2. The private supply system

The private supply system, which consists of Germany and Finland, has a medium to high level of supply. Yet, this system shows one of the lowest shares of public expenditure, and cash benefits are unbound. Access restrictions are among the lowest of all systems, with no means-testing and limited choice restrictions. Performance levels are medium.

3.3. The public supply system

The public supply system comprises the countries Denmark, Ireland, Norway, and Sweden and is defined by high supply and above-average public expenditure. Benefits are mainly available in kind only. Furthermore, choice is limited in these systems; yet, no means-tests apply. The performance indicators of this system are above average.

Table 2
Clustering based on benchmark percentages of same cluster solutions.

	1	2	3	4	5	6	7	8	9
≥ 0.66 and ≥ 0.5 cluster ties	CZ, LV, PL	DE, FI	DK, IE, NO, SE	JP, KR	AU, BE, CH, LU, NL, FR, UK, IL, SI, SK	SI, SK	FR, IL, ES, UK, US, AU, BE, CH, EE, LU, NL, NZ, SK, SI	EE	NZ
≥ 0.5 cluster ties			JP, KR	DK, IE, NO, SE					FR, UK, US
Strongest tie in full cluster	LV.PL (1,0)	FI.DE (0.94)	DK.IE (1,0) DK.NO (1,0) DK.SE (1,0) IE.NO (1,0) IE.SE (1,0) NO.SE (1,0)	JP.KR (0.94)	LU.NL (1,0)	SI.SK (0.72)	ES.US (0.94)		
≥ 0.9 cluster ties	CZ.LV CZ.PL LV.PL	FI.DE	DK.IE DK.NO DK.SE IE.NO IE.SE NO.SE	JP.KR	BE.LU BE.NL LU.CH LU.NL NL.CH		ES.US		
# of ties in full cluster	3/3	1/1	6/6	1/1	10/10	1/1	9/10		

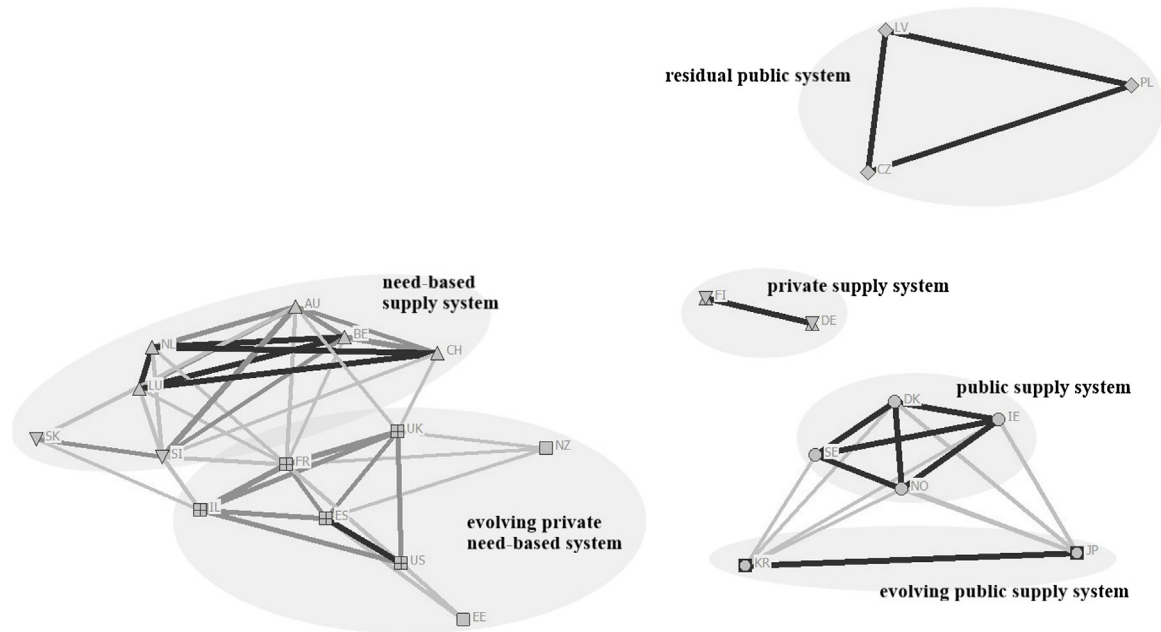


Fig. 1. Network of OECD LTC systems.

Light grey: ≥ 50 %; Full grey: ≥ 66 %; Black: ≥ 90 %.

AU = Australia, BE = Belgium, CZ = Czech Republic, DK = Denmark, EE = Estonia, FI = Finland, FR = France, DE = Germany, IE = Ireland, IL = Israel, JP = Japan, KR = Korea, LV = Latvia, LU = Luxemburg, NL = Netherlands, NZ = New Zealand, NO = Norway, PL = Poland, SK = Slovakia, SI = Slovenia, ES = Spain, SE = Sweden, CH = Switzerland, UK = United Kingdom, US = United States of America.

3.4. The evolving public supply system

Japan and Korea can be defined as evolving public supply systems, marked by medium to low supply and public financing and provision. Expenditure and the number of recipients in institutions are at a medium level, the supply of residential beds is below average. Public expenditure is medium, and benefits are only provided

in kind. Access to the system is granted without means-testing, but medium to high choice restrictions apply. Performance is highest concerning life expectancy but among the lowest concerning self-perceived health. Our study indicates that the two countries share a number of characteristics with the North European public supply type.

Table 3
Means of quantitative indicators of six LTC types.

	Residual public system	Private supply system	Public supply system	Evolving public supply system	Need-based supply system	Evolving private need-based system
Cluster composition	CZ, LV, PL	DE, FI	DK, IE, NO, SE	JP, KR	AU, BE, CH, LU, NL, SK, SI	EE, ES, FR, IL, NZ, UK, US
Cluster size	3	2	4	2	7	7
Expenditure	161.82	811.33	1369.15	603.97	819.81	459.42
Beds	21.76	56.33	53.21	24.28	64.28	43.43
Recipients	1.18	4.4	4.16	2.63	5.51	3.46
Private expenditure	5.77	23.94	10.49	18.17	11.81	24.25
Cash benefit	1.67	2	0.25	0	1.57	0.86
Choice restrictions	1	1	3	2	0.57	2.29
Means-testing	0	0	0	0	1	1
Life expectancy	17.49	19.84	19.93	21.06	19.90	20.15
Self-perceived health	16.08	42.73	63.43	22.68	49.99	52.88

Table 4
Overview of cluster labels and characteristics of 6 LTC types.

	Residual public system	Private supply system	Public supply system	Evolving public supply system	Need-based supply system	Evolving private need-based system
Cluster composition	CZ, LV, PL	DE, FI	DK, IE, NO, SE	JP, KR	AU, BE, CH, LU, NL, SK, SI	EE, ES, FR, IL, NZ, UK, US
<i>I: Supply</i>						
Expenditure	Low	Medium	High	Medium	Medium	Low
Beds	Low	High	High	Low	High	Medium
Recipients	Low	High	High	Medium	High	Medium
<i>II: Public-Private Mix</i>						
Private expenditure	Low	High	Medium	Medium	Medium	High
Cash benefit	Medium	High	Low	Low	High	Medium
<i>III: Access Regulation</i>						
Choice restrictions	Low	Low	High	High	Low	High
Means-testing	Low	Low	Low	Low	High	High
<i>IV: Performance</i>						
Life expectancy	Low	Medium	Medium	High	Medium	High
Self-perceived health	Low	Medium	High	Low	High	High

3.5. The need-based supply system

The fifth LTC system type can be defined as need-based supply system and includes Australia, Belgium, Switzerland, Luxembourg, the Netherlands, Slovakia, and Slovenia, with the latter two having only weak ties to the other countries. Cash benefits are available in almost all countries and are often unbound. Public expenditure is about average. On the other hand, supply is high. In contrast to the private supply type, access is restricted by a high level of means-testing. Like in the private supply countries, choice restrictions rarely apply. Performance is above average.

3.6. The evolving private need-based system

The sixth LTC type is labeled evolving private need-based system and shares important characteristics with the need-based supply type. France, Israel, Spain, the United Kingdom, and the United States belong to this type, and Estonia and New Zealand have weak ties as well. The public-private mix is oriented towards private financing. Performance is rather high. Access is restricted by both means-testing and high choice restrictions. The main difference to the previous system type is low supply, especially low expenditure, but also the provision of beds in residential care and the number of recipients of residential care are at a lower level.

4. Discussion

Focusing on the countries in the six systems, we find expected patterns based on earlier studies but also unanticipated patterns and countries joining these types. The public supply system is led by

the Nordic countries Sweden, Norway, and Denmark. This group of countries is found in several studies [6,8,26]. However, most studies find Finland and the Netherlands in this cluster as well [6,8,9,27]. According to our analysis, Ireland joins this group. Furthermore, the residual public system is made up by Poland, Latvia, and the Czech Republic—three Eastern European countries [6]. The Eastern European countries Slovenia and Slovakia, in contrast, join the need-based supply system, and Estonia the evolving private need-based supply system (all three, however, with weak ties). With regard to the Southern European countries, only Spain is included in the typology, hence the results cannot confirm nor negate the existence of a Southern European cluster of LTC systems. Continental European countries mainly belong to the need-based supply system. Japan and Korea were classified alongside Germany and the Netherlands in earlier typologies due to their social insurance model in LTC [8]. Yet, our results show that these two Asian countries have a distinct type of LTC system, which is closer to that of Northern European countries. Only one prior study finds Finland and Germany together in one cluster [6]. However, Austria might also be classified in this group, a country that was not included due to data limitations.

Comparing the six LTC types to earlier typologies and their clusters, several developments can be determined. First, earlier typologies often have a regional component, such as those that distinguish a Northern European [6,8,26] or Eastern European type [6]. We can show that regional clustering exists, such as in the case of the public supply system and the residual public supply system, but not exclusively. The former type includes three Northern European countries, Denmark, Sweden, and Norway. However, Ireland also belongs to this cluster. Furthermore, the type shows similar-

ties to the evolving public supply type including Japan and Korea. Moreover, the residual public supply system includes only Eastern European countries (Poland, Latvia, and Czech Republic). Yet, the three other Eastern European countries in the sample do not join this type. Slovenia and Slovakia have weak ties to the need-based supply type and Estonia to the evolving private need-based type. These cluster compositions show that regional proximity is no definite indication of similarity of LTC system. One possible explanation for this might lie in the transformation of LTC systems in recent years. Focusing on Eastern European countries, especially Slovenia, Slovakia, and Estonia show that they have reformed and invested in their LTC systems, which moves them further away from the residual public supply system. A further point concerns public financing mechanisms (social insurance contributions, tax-financing), which are often used to differentiate system types [8]. In LTC, only few countries adopted social insurance (Germany, the Netherlands, Luxembourg, Japan, and Korea). These five countries belong to three different kinds of system types. Hence, how LTC is financed does not seem to strongly influence other dimensions of the LTC system.

These results still have to be considered in the light of the used indicators and methods. Of course, result reflect the indicators that are used. Choosing other indicators, for example indicators on quality such as the percentage of LTC recipients with pressure ulcers or unintended weight loss could reveal further insights and more nuanced evaluations on the dimension of performance [48]. Accordingly, measuring the public-private mix by the share of public-private providers instead of or additionally to public-private financing could lead to more distinctions, for example within the public supply system or the need-based public supply system.

However, our approach reveals that clusters of different size can be identified based on the strictness of applied methods and benchmarks. This might be interpreted as a weakness of the study in that no definite result is achieved. At the same time, it is a strength of the study and an advancement. Regardless of the clustering method applied, a cluster will always include cases which are similar to the other cases in the cluster but diverge more from the cluster means than other cases. Instead of neglecting this, we make this particularly clear by describing that four, six, and nine clusters are all viable solutions and might be adopted based on the later usage of the typology. The six-cluster solution might prove more useful for e.g. quantitative outcome analysis, whereas researchers might find the more nuanced nine-cluster typology more useful for e.g. the case selection in comparative qualitative studies. Furthermore, the fact that four, six, and nine clusters can be differentiated shows that system types are not rigid and ‘frozen’. Rather, a countries’ belonging to a cluster can be weaker or stronger, and reminds that system types in every welfare state typology are under continuous (re-)construction by changing institutions [10,11]. On methodological reasons *and* with regards to contents the six-cluster solution is the one which is highlighted.

Typologies always imply generalizations. For example, in many countries LTC service provision and access have a high regional fragmentation [49], which cannot be displayed on a broad basis in an internationally comparative typology. Furthermore, LTC systems have not as clear boundaries as other welfare state systems such as healthcare, unemployment, or pension systems. LTC can be provided via a separate LTC system or partially integrated in healthcare, social assistance, or pension systems, in which different access and provision rules apply [50]. This difficulty also applies to some of the used indicators. For example, the number of LTC beds only applies to those in LTC nursing and residential facilities, but in some countries also hospitals provide LTC beds. Furthermore, sometimes acute care beds in hospitals are used to care for non-acute LTC

patients [3], and could thus compensate for low supply of residential care beds and unburden families from care duties. Moreover, the typology includes performance indicators on life expectancy at age 65 and self-perceived health of the elderly. Indicators on outcome quality such as pressure ulcers or unintended weight loss might be available in the future and extend these indicators of the performance dimension. Finally, in many countries LTC is still a new welfare state issue, because the provision was traditionally devolved to families [1,32]. Today, such services are increasingly provided by migrant care workers [30]. Indicators on informal care, however, are not available or not reliable. As an approximation, we have included cash benefits (especially unbound) that can be taken as an institutional measure to increase informal family and migrant care [30,32].

Despite many reforms of LTC systems in OECD countries in recent years, our results reveal certain patterns of LTC system types. We find a residual public system of Eastern European countries and a public supply system of Northern European countries. However, the membership of Eastern European countries in other system types, the inclusion of Ireland in the public supply system, and the fact that Finland and Germany form a distinct system indicate that reforms in OECD LTC systems [2,4] might have led to a convergence of countries with similar LTC reforms.

5. Conclusions

In the last century, various reforms have changed LTC systems all over the world [4], which makes a new and updated LTC typology necessary. In this study, we provide an updated LTC typology, because we use the latest available data from the OECD database as well as a unique institutional dataset. Furthermore, earlier typologies rely mainly on quantitative indicators, especially when a larger country sample is included [6–8]. Only in cases of smaller country samples, which more often use qualitative comparisons, institutional indicators are considered. A larger country sample and a mix of quantitative and institutional indicators has only been adopted by Kraus et al. [9]. Compared to Kraus et al. [9], the advantages of the six LTC types proposed in our study are, first, the use of newer data and, second, the methodological innovation with multiple cluster analyses resulting in a flexible use of the typology.

On purely methodological grounds, we identified nine LTC clusters. These nine clusters can form a basis for future studies that require information on groups with countries that are highly similar (see Table 2 and the visualization in Fig. 1). Such comparative studies might exclude countries from the analysis such as New Zealand, Estonia, Slovenia, and Slovakia, which have only weak ties to other (groups of) countries. They may also take into consideration that the US and France, despite being in the same cluster, are only weakly related. Other studies could make use of the six-cluster typology proposed in our study and, with future data, analyze, for instance, whether the “evolving” systems are moving towards the public supply or the need-based supply type. A third group of comparative studies might use the four-type solution shown in Fig. 1. Such studies might be more interested in the question of private vs. public supply and less in other characteristics such as the level of expenditure and choice restrictions, which distinguishes countries such as Belgium, Switzerland, Luxembourg, and the Netherlands from Spain, the United Kingdom, and the United States.

Overall, this article provides an innovative and updated LTC typology, which can extend our understanding of the composition and design of different LTC systems. Lastly, this flexible typology can be of use to welfare state and LTC scholars and is also of relevance to LTC policy officials, who face the challenges of ageing societies.

Declaration of Competing Interest

The authors report no declarations of interest.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.healthpol.2021.02.009>.

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