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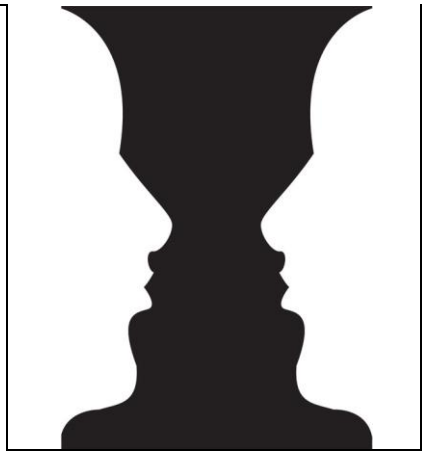

Theorizing the relationship between welfare state regimes and health using comparative national-level health measures

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Abstract
Welfare state regime typologies have proven useful in analyzing the impacts of various social policy structures on health. Recently, several welfare state regime typologies have been identified as having relevance for the study of health. However, comparative research examining the relationships between population health and welfare states has relied disproportionately upon child-based health measures – in particular, infant mortality rate, under-5 mortality and low birthweight. Using hierarchical cluster analysis, eta, and ANOVA, this paper demonstrates that these commonly-used child-based health measures are more strongly correlated with welfare state regime typologies than other measures of population health. Adult mortality, life expectancy and disease measures are not strongly correlated with welfare state regime typologies, and greater use of such measures in comparative research may problematize the often-observed correlations between welfare states and health. The paper argues that the disproportionate use of child-based health measures may therefore present an incomplete picture of the connections between welfare state regimes and population health. Implications for theorizing the relationship between welfare states and health are discussed.

Keywords
Population health, welfare state, cluster analysis, child health, adult health, disease

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Since their conception by Esping-Andersen in 1990, welfare state regime typologies have proven useful as comparative tools for examining the impacts of various policy structures on diverse aspects of social welfare. The study of the relationship between welfare states and population health, however, has tended to focus on a narrow range of summary population health measures – most commonly focusing on measures that are child-based, like infant mortality, under-5 mortality and low birthweight. This raises important questions about the ways in which population health has been conceived, including whether child-based health measures represent the overall health of a national population. This also raises questions about the applicability of welfare state regimes typologies to population health, since health measures like adult mortality and disease prevalence may not reflect different regime types to the extent that child-based measures do. This disproportionate use of child-based health measures is important since the measures used can have critical implications for findings, like the support or refutation of a theory being tested (Brennenstuhl et al., 2012).

Further complicating the relationship between welfare states and health, welfare state regime typologies do not reflect health inequality within populations (Beckfield et al., 2015). Beckfield et al. (2015) point out that even welfare state types with better average population health contain considerable health inequality. To address this, Beckfield et al. lay the groundwork for an institutional theory to explain how welfare states distribute health. According to this approach, states affect the distribution of health by shifting resources between groups and/or people, setting thresholds, and influencing other factors that might affect health and its distribution. Beckfield et al. (2015) also make the distinction between two levels of population health measurement. The "first moment" of the distribution are summary measures of average population health, like national infant mortality rates. The "second moment" are relative measures of health inequality within states, like different infant mortality rates between groups within a country (2015: p. 229).

Importantly, Beckfield et al.'s theory begins from the assumption that there is a strong correlation between the welfare state and the first-moment measures, stating "(s)ince we know that there is a strong correlation between the welfare state and the first moment of the distribution, the pressing question becomes how we should theorize the relationship between the welfare state and the distribution (rather than the on-average level) of health." (2015, p.229). Their institutional theory, therefore, is designed to address the more ambiguous relationship between welfare states and the second-moment (health inequality). In this way, the institutional theory draws a line between the first- and second-moment aspects of the relationship between population health and welfare states. However, Beckfield et al.'s (2015) starting assumption, that there is a strong correlation between welfare state types and first-moment summary measures, is predicated on research primarily using child-based health measures.

This paper investigates this issue by employing a wider range of first-moment summary health measures in an examination of the relationship between welfare state regime typologies and health. Findings suggest that first-moment measures such as adult mortality and disease prevalence, which have been used far less frequently in welfare

state research, do not reflect welfare state regime typologies. Coupled with the ambiguity of the relationship between welfare state regimes and health inequality (second-moment measures), this finding raises questions about the extent of the connection between welfare state regime typologies and population health generally. Beckfield et al.'s (2015) institutional theory may therefore provide a more promising approach from which to study the relationships between welfare states and population health, whether using first- or second-moment measures.

Welfare state regimes typologies and population health

Although some researchers have questioned the nature and usefulness of welfare state regime typologies and emphasized the need for caution (for example, Kasza, 2002), many authors have recently argued that welfare state regime typologies present reliable and well-tested descriptions of national policy orientations that can be used to help explain health outcomes at the macro level (for examples, see Chung & Muntaner, 2006; 2007; Saint-Arnaud & Bernard, 2003; Navarro et al., 2006; Macinko et al., 2004; Lundberg et al., 2008). Brennenstuhl et al. (2012) argue that international comparisons are becoming more significant for building evidence as governments turn toward addressing social determinants of health, and that regime typologies remain central to such research.

However, such work has been restricted to a relatively narrow range of summary health measures. In an extensive review of existing research on the connections between welfare states and population health, Muntaner et al. (2011) found that most studies have used child-based health measures of population health. They found that among the 73 studies examined, infant and child mortality measures were used the most (in 35 studies) with life expectancy the second-most used measure (24 studies). Muntaner et al (2011) also point out that many studies use more than one outcome measure. Looking specifically at the measures used (rather than the number of studies that use them), Muntaner et al. found that child-based measures (infant mortality, low birth weight, and under-5 mortality rate) made up almost half (47.9%) of all health measures used in the examination of the impacts of welfare states, politics, and globalization on population health. The second most used measure was life expectancy, which made up 32.9% of health measures used. Longstanding illnesses are largely neglected, appearing in only 8 of the reviewed studies and making up just 11% of health measures. No other health outcome measures make up more than 10%. Adult mortality, a comparative measure that is widely available alongside infant mortality measures, was used in only one of the 73 studies reviewed by Muntaner et al. (2011).

Other work has also shown that most summary, on-average health measures used in welfare state research have been child-based. In a comprehensive review, Brennenstuhl et al. (2012) found that research on population health, health inequality and welfare state regimes, particularly those examining contextual explanatory variables such as benefit levels, coverage, and decommondification, relied heavily on child-based health measures. Brennenstuhl et al.'s review also found that summary measures of adult health and disease, like adult mortality, Potential Years of Life Lost and incidence of

disease are used much less often, a finding that reflects that of Muntaner et al. (2011). The reliance on child-based health measures extends to the evaluation of the relationship between non-governmental organizations (NGOs) and health (see, for example, Shandra et al., 2010, who used infant mortality rate).

It is critical to point out that child-based health measures are not necessarily measures of child health. For example, infant mortality rate is an indicator of things like child health, maternal health, fertility rates, availability of proper health care, nutrition and many other factors. The same is the case for under-5 mortality and low birthweight. Several studies have argued that child-based health measures are more sensitive to political and welfare state factors and require only a short lag time (see Chung & Muntaner, 2006). However, it cannot be assumed that child-based measures cover all aspects of population health and that other kinds of first-moment health measures will reflect welfare state regime typologies.

Welfare state regimes typologies Included in the analysis

Esping-Andersen (1990) identified three "typical" clusters of welfare states in his analysis of sickness, unemployment, and pension benefits. It is crucial to emphasize that these welfare state regime types are *ideal* types, and that no existing welfare state perfectly embodies any one of them. National welfare states have been classified based on the ideal characteristics they most closely resemble. *Liberal* welfare states are dominated by the logic of the market. Benefits that do exist are modest, often means-tested and stigmatizing. *Conservative/Corporatist* welfare states grant access to social supports is based on social security contributions, which are typically paid through employment. These welfare states emphasize distinctions between occupational areas, and support gender role distinctions (Korpi, 2000). *Social Democratic* states can ideologically be conceived to be opposites of liberal regimes, in that they emphasise public responsibility for welfare and universal access to services and support. A main objective of policy is to ensure that individuals have access to support independently of market forces.

Subsequent work has sought to identify new regimes and include a wider range of welfare state areas and measures (Danforth, 2014). A wide range of welfare state regime typologies have been established, and some of them have survived the "test of time" (Bambra, 2007). Bambra (2007) reviewed 12 welfare state regime typologies that seek to capture the income maintenance aspects of welfare state policies to determine which typologies are currently the most useful (and which should therefore receive greater attention in the literature). Bambra tests each of the typologies for their ability to predict social expenditure (as % of GDP) as well as employer and employee contributions to social security (in other words, how social expenditure is financed). Bambra (2007) concludes that the most useful welfare state configurations are Leibfried (1992), Castles and Mitchell (1993), Kangas (1994), Ferrera (1996), Bonoli (1997), and Obinger and Wagschal (1998). Therefore, those six typologies are included in this analysis.

In another review, Brennenstuhl et al. (2012) found that three regime typologies have dominated the measurement of welfare state regime typologies in recent research

(although many of the applications used modified versions). One of the three, Ferrera (1996), was also identified by Bambra (2007), further confirming its importance for this analysis. The other two identified by Brennenstuhl et al. are Esping-Andersen (1990), and Huber and Stevens (2001) Because Esping-Andersen's typology is based on two separate dimensions (decommodification and stratification), in some cases the classification of welfare states is debatable. For example, Belgium exhibited high levels of decommodification (a social democratic characteristic) but also high levels of stratification (which would suggest a conservative welfare state). Ireland is another example of a difficult-to-classify state, being liberal with regard to decommodification and conservative in terms of stratification (for a good review of this issue, see Ebbinghaus 2012). Brennenstuhl et al.'s (2012) configuration of Esping-Andersen's typology is used here since that is the configuration they used when identifying it as a critical welfare state typology. The third dominant regime typology identified by Brennenstuhl et al. (2012) is that of Huber and Stephens (2001).

The welfare state regime typologies chosen for this analysis are those that the above reviews have found to be the most relevant moving forward. In this sense, this analysis responds to these calls from Bambra and Brennenstuhl et al. More specific to the objectives of this paper, however, is the extent to which the typologies used here are relevant to population health in the current context. Bambra (2007) and Brennenstuhl et al (2012) have identified the most relevant welfare state typologies generally, and the analysis performed in this paper will help to determine the extent to which those typologies are currently relevant for the study of health in particular. By setting the agenda for future welfare state research these reviews also impact future population health research by influencing the kinds of typologies that are available to those who study population health. Since these typologies have been found to be relevant for the comparison of welfare states going forward, an analysis of their applicability to population health is needed.

Further, each of the typologies included here is based on the examination of measures that are of current concern to population health (for example, poverty, inequality, unemployment, market influence, worker unionization, political orientation, and various institutional characteristics). These remain central to the study of the determinants of population health, and comparisons of health characteristics across regime types promise to provide important insight into how those welfare state characteristics impact health. Although the typologies were initially identified during the 1990s and early 2000s, it is nevertheless possible that they are correlated with population health today. If an older typology correlates with current health outcomes, its underpinning measures may represent aspects of welfare state policies that have enduring connections to health.

In short, the growing application of welfare state regimes to population health underuses a wide range of health measures and may also be overlooking typologies that could produce valuable insight because of it. This analysis will help determine whether such typologies, which have been identified as generally relevant, are currently helpful to

the study of population health in particular. Table 1 shows each of the typologies used in this analysis.

Table 1: Typologies in the analysis (part I)

Leibfried (1992)			
Bismarck	**Anglo-Saxon**	**Scandinavian**	**Latin Rim**
Austria	Australia	Denmark	Spain
Germany	New Zealand	Finland	Portugal
	UK	Norway	Italy
	US	Sweden	Greece
			France
Castles and Mitchell (1993)			
Non-Right Hegemony	**Liberal**	**Conservative**	**Radical**
Belgium	Ireland	Germany	Australia
Denmark	Switzerland	Italy	New Zealand
Norway	United States	Netherlands	United Kingdom
Sweden	Japan		
Kangas (1994)			
Social Democratic	**Liberal**	**Conservative**	**Radical**
Denmark	Canada	Austria	Australia
Finland	United States	Germany	Ireland
Norway		Italy	New Zealand
Sweden		Netherlands	United Kingdom
		Japan	
Ferrera (1996)			
Scandinavian	**Anglo-Saxon**	**Bismarck**	**Southern**
Denmark	Ireland	Austria	Greece
Finland	UK	Belgium	Italy
Norway		France	Portugal
Sweden		Germany	Spain
		Netherlands	
		Switzerland	
Bonoli (1997)			
Nordic	**Continental**	**British**	**Southern**
Denmark	Belgium	Ireland	Greece
Finland	France	UK	Italy
Norway	Germany		Portugal
Sweden	Netherlands		Spain
			Switzerland

Table 1: Typologies in the analysis (part II)

Obinger and Wagschal (1998)				
Social Democratic	**Conservative**	**Liberal**	**European**	**Radical**
Denmark	Austria	Canada	Belgium	Australia
Norway	France	Switzerland	Finland	New Zeeland
Sweden	Italy	United States	Germany	
		Japan	Ireland	
			Netherlands	
			UK	

Esping-Andersen (1990)		
Social Democratic	**Conservative**	**Liberal**
Austria	Finland	Australia
Belgium	France	Canada
Netherlands	Germany	Ireland
Denmark	Japan	New Zealand
Norway	Italy	UK
Sweden	Switzerland	US

Huber and Stephens (2001)			
Social Democratic	**Christian**	**Liberal**	**Wage-Earner**
Sweden	Austria	Canada	Australia
Norway	Belgium	Ireland	New Zealand
Denmark	Netherlands	UK	
Finland	Germany	US	
	France		
	Italy		
	Switzerland		

Countries included in the analysis

This analysis includes the 21 countries that are represented in at least one of the eight regime typologies. This ensures that each typology is fully represented.

First-moment measures of population health

The population health measures used in this analysis include the child-based health measures that have, according to the reviews by Brennenstuhl et al. (2012) and Muntaner et al. (2011), been used most often in population health and welfare state regime analysis. The other measures used in this analysis include measures of adult mortality (Life Expectancy at Birth and Adult Mortality, which is the probability of dying between the ages of 15 and 60) and disease (AIDS and Tuberculosis incidence and Potential Years of Life Lost to diabetes and communicable disease). Table 2 shows each measure and the concepts into which they are divided.

Table 2: Population health concepts

Measure	Concept measured
Under-5 Mortality Rate (per 1,000 live births) Infant Mortality Rate (per 1,000 live births) Low Birth Weight Rate (% of total live births)	Child-Based Measures
Life Expectancy at Birth (years) Adult Mortality Rate (probability of dying between age 15 and 60)	Adult-Based Measures
AIDS incidence (per 100,000 population per year) Tuberculosis incidence (per 100,000 population per year) PYLL to communicable diseases (per 100,000 population aged 0-69) PYLL to diabetes (per 100,000 population aged 0-69)	Chronic and Infectious Diseases

Table 3: Population health measures for each country

Country	IMR	U-5 MR	LW BRTH	Life Exp	Adult Mort.	PYLL Diabetes	PYLL Disease	AIDS	TUB
Australia	3.6	4.0	6.3	82.2	6.9	40	54.4	0.3	6.0
Austria	3.1	4.0	6.9	81.2	12.4	40	48.9	0.4	8.0
Belgium	3.5	4.0	6.8	80.7	11.2	22	63.6	0.8	9.0
Canada	4.8	5.0	6.1	81.5	42.2	55	65.5	0.8	5.0
Denmark	3.5	4.0	7.0	80.4	26.5	61	41.2	0.7	7.0
Finland	1.8	2.0	4.1	81.1	8.0	42	29.0	0.4	6.0
France	3.6	4.0	6.5	82.3	26.6	29	62.3	1.2	9.0
Germany	3.3	4.0	6.9	80.9	24.1	39	56.5	0.5	6.0
Greece	3.7	5.0	9.8	81.4	15.7	21	28.9	1.1	5.0
Ireland	3.5	4.0	5.2	81.1	5.6	21	44.1	0.8	7.0
Italy	2.9	4.0	7.2	82.8	13.9	37	69.4	1.8	6.0
Japan	2.1	3.0	9.6	83.4	11.4	21	33.8	0.4	18.0
Netherlands	3.8	4.0	6.4	81.4	6.6	32	38.9	1.5	6.0
New Zealand	5.2	6.0	5.9	81.4	15.8	68	54.1	0.5	7.0
Norway	2.4	3.0	4.6	81.8	10.0	33	35.2	0.5	8.0
Portugal	2.9	4.0	8.4	80.8	6.7	46	175.9	5.0	25.0
Spain	2.7	4.0	7.8	83.2	12.9	19	85.2	2.0	12.0
Sweden	2.7	3.0	4.4	82.0	5.3	34	34.8	0.7	8.0
Switzerland	3.9	4.0	6.4	82.9	9.5	20	39.0	1.1	6.0
U.K.	3.8	4.0	7.0	81.1	27.9	26	53.7	0.7	12.0
U.S.	6.0	7.0	8.1	78.8	11.3	104	168.8	8.9	3.0

Sources: Infant Mortality, Low Birth Weight, Life Expectancy at Birth, AIDS Incidence, PYLL Diabetes and PYLL Communicable Diseases: OECD Statistics Database. Under- 5 Mortality, Tuberculosis Incidence: World Bank. Adult Mortality: World Health Organization Health Statistics Database.

The four measures of chronic/infectious diseases attempt to assess the extent to which welfare state policies influence healthy behaviour and support those with ongoing illness. Specifically, incidence of tuberculosis reflects how living conditions impact health, given that the disease is associated with poor living conditions. AIDS incidence is also connected to conditions of living, as it relates to factors such as intravenous drug use. The Potential Years of Life Lost measures are based on the idea that better social support

is likely to extend the lives of those with the illnesses. Table 3 shows the scores for each measure for each of the 21 countries.

Data analysis

There are two aspects to this analysis. The first uses hierarchical cluster analysis. Four dendrograms are generated using all 21 countries. The first includes all nine measures together to cluster countries based on a wider range of health outcomes. The next three dendrograms each use the measures from one concept, creating one for child-based health, one for adult-based health and one dendrogram for chronic and infectious disease-based measures. The dendrograms allow for a general assessment of the extent to which emerging clusters reflect each of the welfare state typologies.

Because there are only 21 cases in the cluster analyses, the number of variables entered into each analysis must be less than four (Dolnicar, 2002). Therefore, for the first cluster dendrogram, which must account for all nine of the health measures, the cluster analysis was done using three compounded measures – one for child-based health, one for adult-based health, and one for chronic and infectious diseases (see table 2). Each of these three variables was created by averaging the scores for each of the specific measures within that concept. For example, the child-based health variable was obtained by combining the average scores for infant mortality, under-5 mortality and low birth weight rates. Values were standardized to ensure that each of the individual measures held equal weight.

The second aspect of the analysis uses eta^2 correlations to specify the correlation between each typology and the measures in the dendrogram. Eta^2 calculates the extent to which knowing a country's regime type improves the ability to predict each health measure. For example, the reduction in prediction error is calculated by comparing the accuracy of predicting a country's infant mortality rate (IMR) using the average IMR across all 21 countries to the accuracy of using the average IMR within that country's own cluster. In this way, the eta^2 correlation shows the extent to which knowing a country's regime type helps predict each of the health measures. At its core, eta^2 is a non-parametric correlation measure suitable to correlations between interval level variables (the health measures) and nominal variables (regime type). Because it is based on theoretical distinctions between regime classifications, the eta^2 correlation provides a good supplement to the hierarchical clustering, which inductively determines how states cluster regardless of theoretical assumptions. The correlation therefore expresses how "useful" a typology is for predicting the health variables. It is important to note that eta^2 correlations are calculated for each typology using only the countries that are included in that typology, while the cluster analyses include all 21 countries. For this reason, the eta^2 correlations are stronger than what is indicated in the clustering, particularly for typologies where the inclusion of additional countries "waters down" the within-regime similarities.

Eta² will be calculated for each of the typologies for overall population health (all measures combined), each of the three concepts, as well as each health measure separately. Statistical significance for correlations was calculated using Analysis of Variance (ANOVA).

Cluster analysis 1: All population health measures

Figure 1 shows the cluster analysis dendrogram emerging from the inclusion of all nine health measures (grouped into the three concepts as described above). To examine the extent to which the emerging clusters reflect each typology, eta² correlations are given in table 4.

Figure 1: Cluster analysis dendrogram: All population health measures

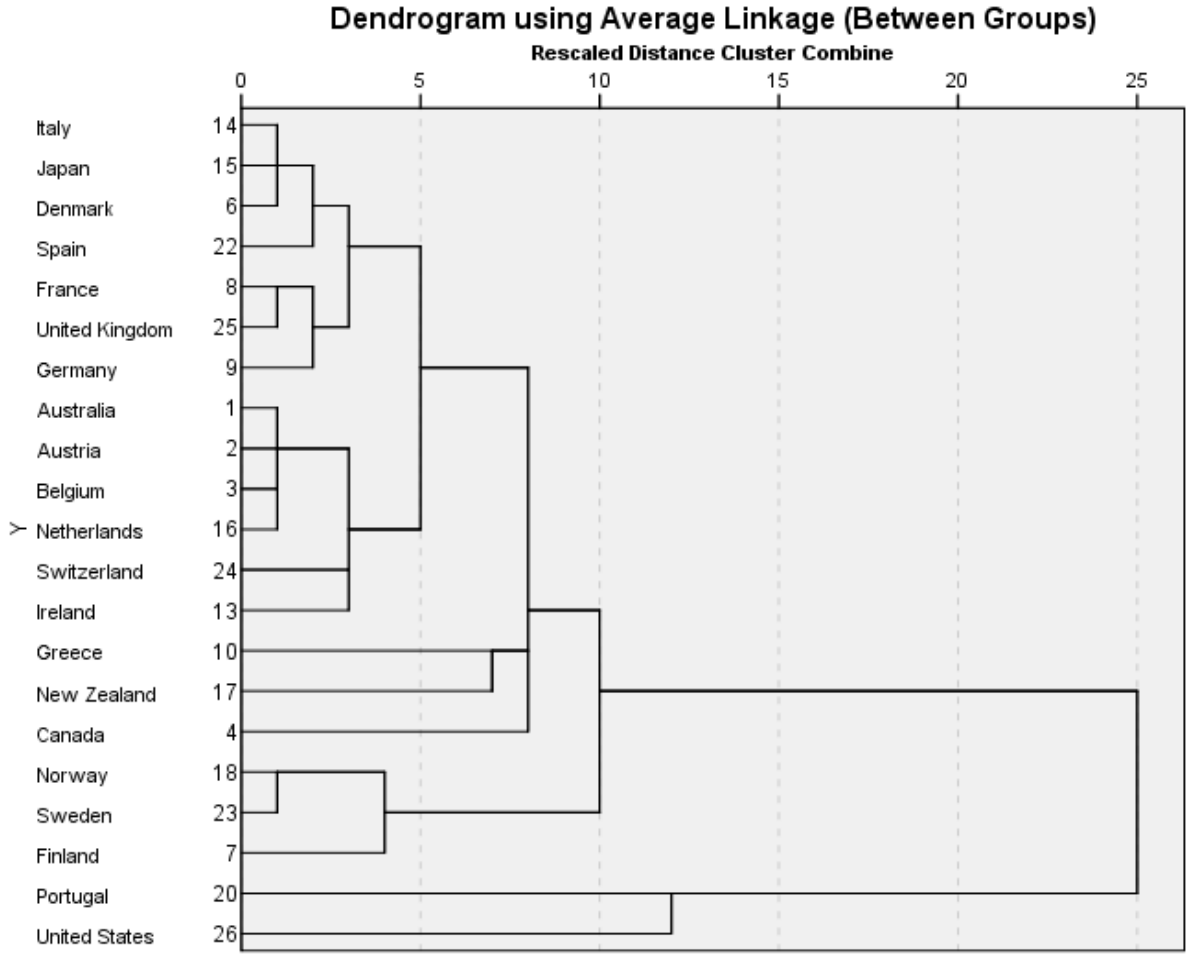


Table 4: Eta Correlations for Population Health

Typology	Eta^2
Liebfried (1992)	.427
Castles and Mitchell (1993)	.171
Kangas (1994)	.675*
Ferrera (1996)	.467*
Bonoli (1997)	.394
Obinger and Wagschal (1998)	.363
Huber and Stephens (2001)	.370
Esping-Andersen (1990)	.256

* Significant F < .05

The clusters emerging in Figure 1 show some evidence of common clustering. For example, Norway, Sweden and Finland, which are commonly grouped together in the typologies, cluster closely. Germany and France are combined early, as are Austria, Belgium and Netherlands, which are often classified together. Table 4 shows that the typology that best improves prediction accuracy for the combined population health measures is that of Kangas (1994) (eta^2=.675, meaning a 67.5% reduction in prediction error). Looking at Figure 1, however, it appears that clusters emerging when all 21 countries are included (rather than just the 15 in the typology) illustrate a much weaker correlation. Kangas' regimes are scarcely visible, with the minor exception of the clustering of Norway, Sweden and Finland, all of which are within Kangas' Social Democratic regime. Therefore, Kangas' analysis could be taken to suggest a significant correlation between welfare states and population health and yet the connection does not stand up when other countries are included. Results are similar for each typology: the apparent correlation between each typology and population health weakens (or disappears) when all 21 countries are included in cluster analysis. This suggests that findings of typological research may be largely restricted to the set of countries that are included in each typology.

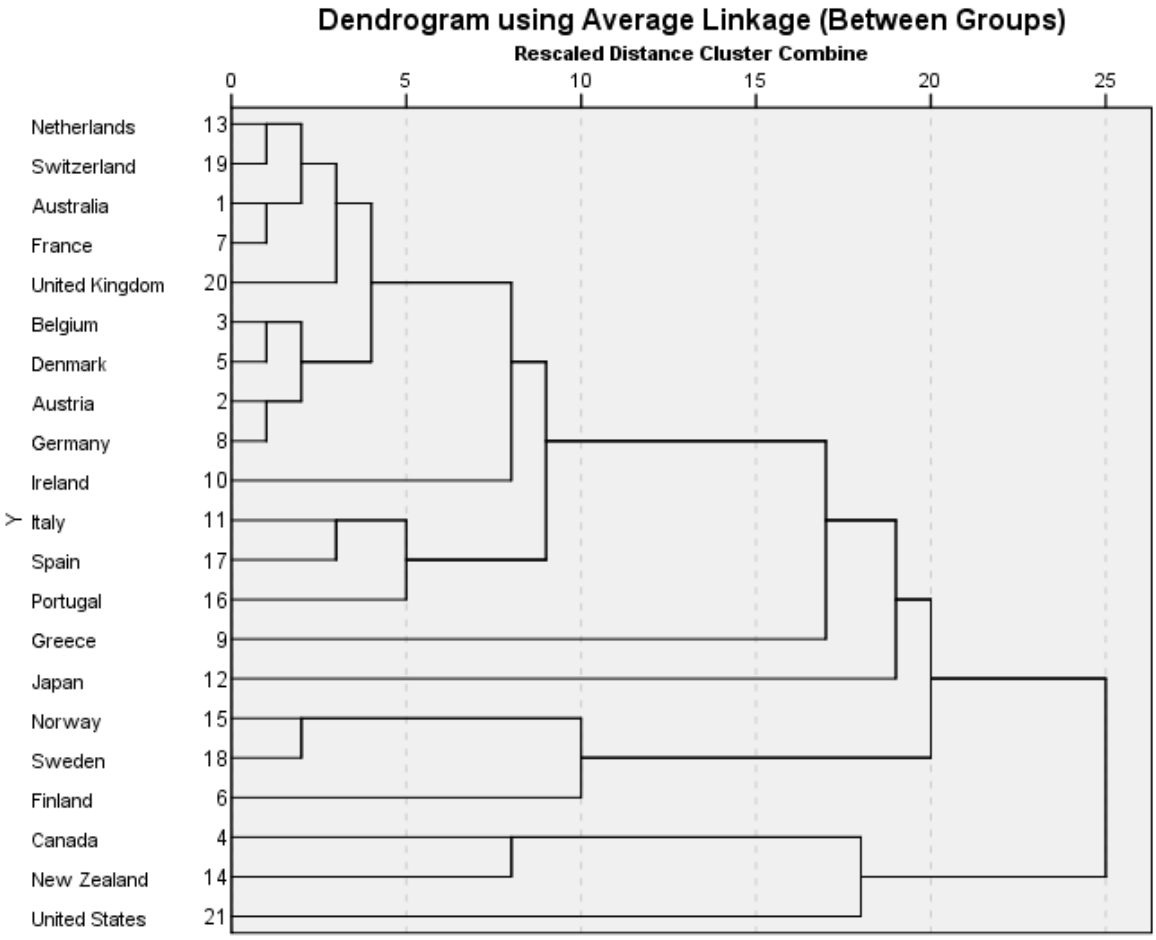
The second finding of this part of the analysis is that, according to Table 4, many of the typologies seem to have a considerable correlation with population health when there are no additional countries in the analysis (which, as noted earlier, is the case for the eta^2 calculations). The exception here is Castles and Mitchell (1993), which only reduces prediction error by 17.1%. Those clusters are also scarcely visible in Figure 1. Only two typologies – Kangas (1994) and Ferrera (1996) – are significantly correlated with population health as measured here.

Notwithstanding the seeming weakness of the typologies when other countries are added to the clustering analysis, the key question is whether the apparent correlations in Table 4 represent a correlation between the typologies and all of the health measures, or whether the correlations are being driven disproportionately by the child-based, adult-based, or disease-based health measures.

Cluster analysis 2: Child-based health measures

Figure 2 shows the cluster dendrogram including only the three child-based health measures. Here we see more evidence of the basis for each typology. Some of the countries that are commonly grouped together tend to cluster.

Figure 2: Cluster analysis dendrogram: Child-based health measure

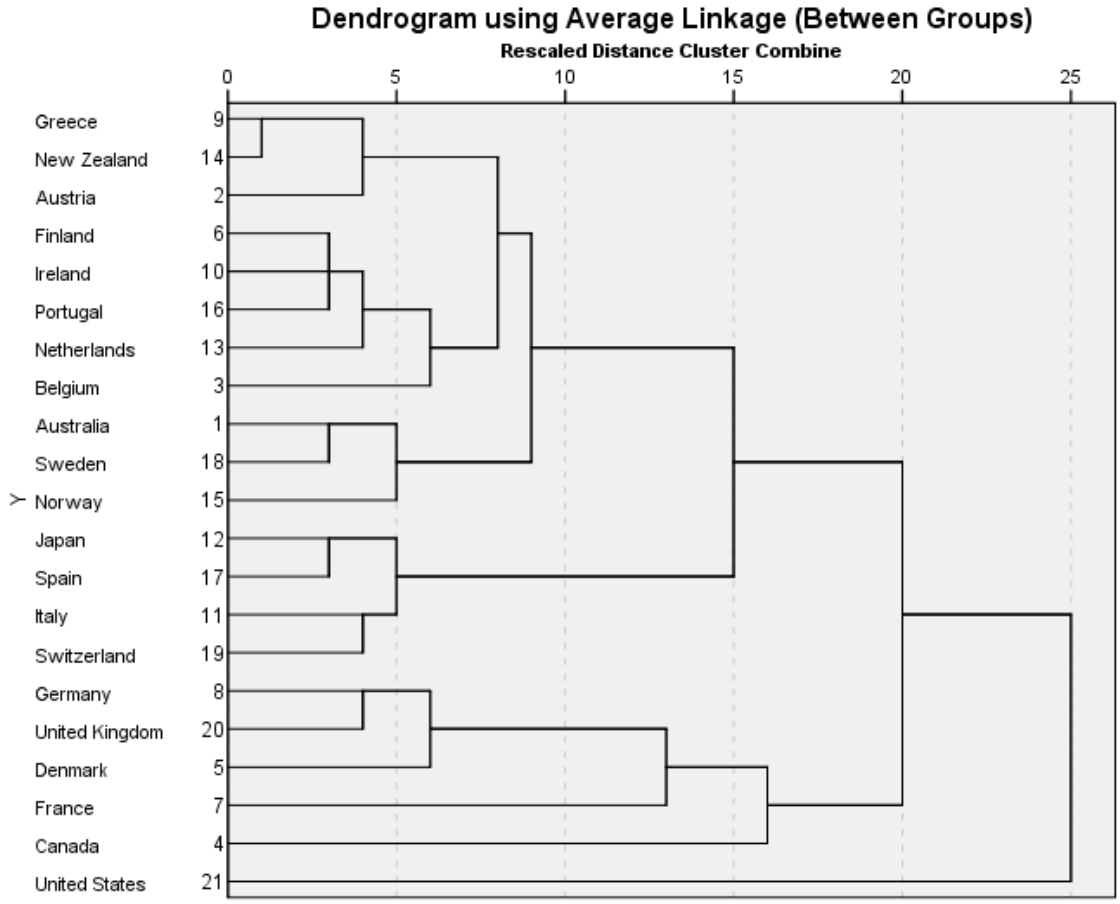


Canada, United States and New Zealand, which tend to be categorized together among the typologies, remain together separately from any of the other countries. The same is true for Norway, Finland and Sweden. Furthermore, the countries often grouped together as the "Latin Rim" or "Southern" regime tend to be close, particularly Italy, Spain and Portugal. Finally, many of the countries that have been categorized as "Conservative", "Bismarck", "European" or "Continental" cluster relatively closely with one another.

Cluster analysis 3: Adult-based health measures

Figure 3 shows the cluster dendrogram for the two adult-based health measures. The results of this cluster analyses bring into question the assumption that findings based on the analysis of child-based health measures can be generalized to make conclusions regarding welfare state regimes and population health overall. This cluster analysis included only the two adult-based measures (life expectancy at birth and adult mortality). Looking at the dendrogram (figure 3), none of the regime typologies are easily identifiable.

Figure 3: Cluster analysis dendrogram: Adult-based health measures

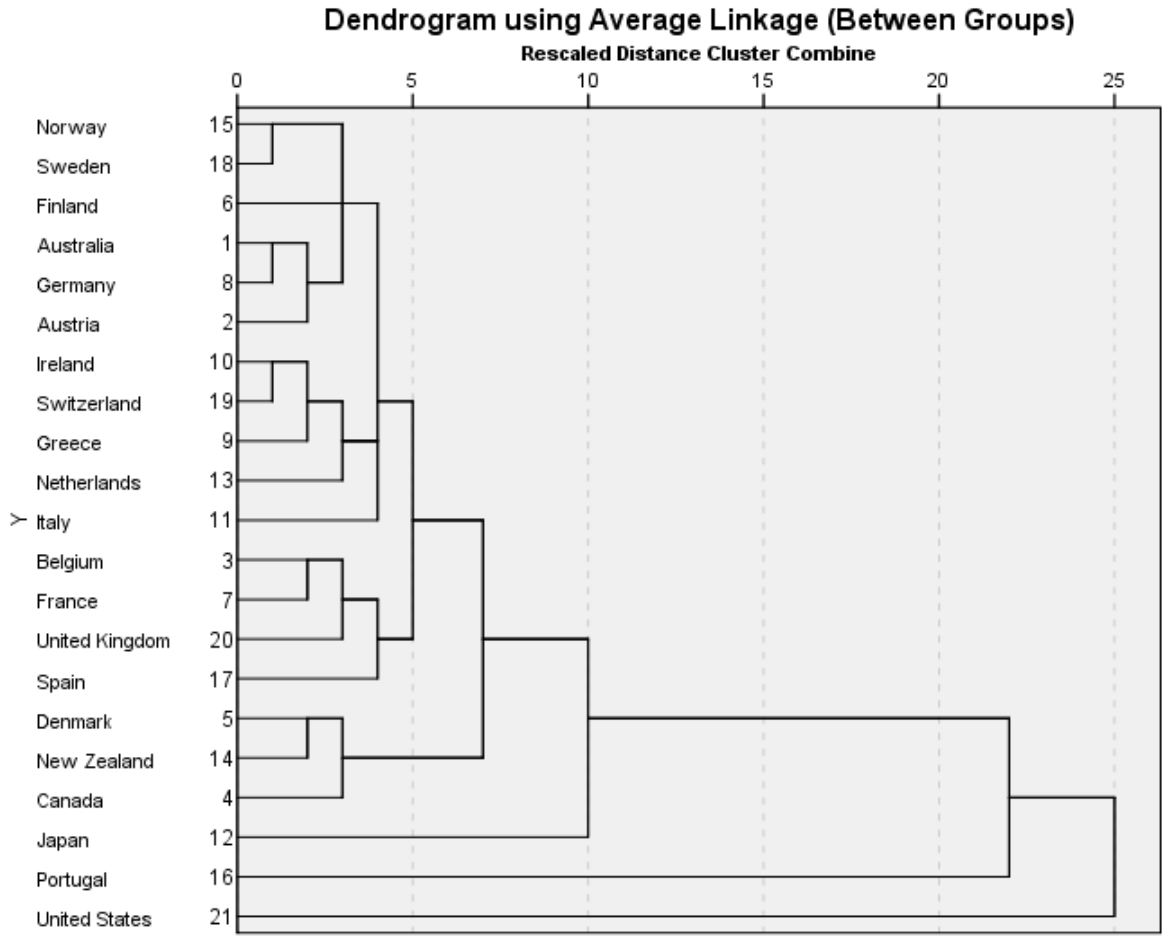


Cluster analysis 4: Chronic and infectious disease measures

The cluster analysis using only the four measures of chronic and infectious disease is shown in Figure 4. It can be seen again that emerging clusters do not resemble any of the typologies clearly. Australia and New Zealand, often grouped together, are distant from one another, as are the common Latin Rim (or Southern) countries. Common market-oriented states (U.S., Canada, New Zealand, Australia, and U.K.) are also widely

distributed across the clusters (except for Canada and New Zealand, which cluster together).

Figure 4: Cluster analysis dendrogram: Chronic and infectious disease-based measures



Taken together, the above cluster dendrograms raise questions about whether welfare state typology groupings remain distinct from one another when additional countries are studied. At least in the case of predicting population health measures, this does not seem to be the case. It is important to note, however, that regime typologies may maintain their distinctions if only the original defining measures (rather than population health measures) are used. Nevertheless, this is an important question in the study of the relationship between welfare states and population health. Importantly, regime typologies are most evident in the clusters that emerge when using child-based health measures (figure 2). It seems that child-based health measures have a uniquely strong correlation with welfare state typologies. This suggests that the disproportionate use of child-based measures in welfare state regimes research may have led to overestimated correlations between population health and welfare state structure.

Eta² correlations and ANOVA

Table 5 gives the eta² correlations for each typology relative to each health concept (as well as the correlations with overall population health from table 4 for ease of reference). As noted earlier, these correlations are calculated using only the specific countries included within each typology, eliminating the impact of adding additional countries to the analysis.

Table 5: Eta correlations for population health, child-based measures, adult-based measures, and disease-based measures

Typology	Population Health	Child-Based Measures	Adult-Based Measures	Disease-Based Measures
Liebfried (1992)	.427	.549*	.102	.158
Castles and Mitchell (1993)	.171	.286	.150	.112
Kangas (1994)	.675*	.663**	.071	.517*
Ferrera (1996)	.467*	.572*	.035	.243
Bonoli (1997)	.394	.566*	.046	.136
Obinger and Wagschal (1998)	.363	.381	.121	.213
Huber and Stephens (2001)	.370	.513*	050	.207
Esping-Andersen (1990)	.256	.291	.103	.154

Here, we see that for every typology, child-based health measures are the strongest correlation. In other words, child-based health measures are driving the correlation between welfare state regimes and population health – in particular, the measures most often used in recent research. In the case of Liebfried (1992), for example, the correlation with population health is relatively strong (eta2=.427), but this is based on a significant correlation with the child-based health measures (eta2=.549, F<.05). By contrast, Leibfried's typology does not correlate significantly with either the adult-based measures (eta2=.102) or the measures of disease (eta2=.158). As noted earlier, Castles and Mitchell (1993) does not correlate strongly with population health when all of the measures are included (eta2=.171), but even this minimal correlation is driven by a higher correlation with the child-based measures (eta2=.286). Kangas (1994) and Ferrera (1996) are the only ones with significant correlations to population health when using these nine health measures.

All the typologies correlate more with child-based measures than with adult- or disease-based measures. Looking only at significant correlations, five of the eight typologies are correlated with the child-based measures while none are correlated with adult-based measures. Only one typology (Kangas, 1994) is significantly correlated with the disease-based measures. Although Kangas (1994) is even more strongly correlated with child-based measures, the significant correlation with disease measures suggests that heavy reliance on child-based health measures may be neglecting important connections between welfare state structures and health outcomes. This raises questions surrounding why some welfare state typologies predict disease measures better than others. The subtle differences in how each typology operationalizes welfare state policy may highlight important policy implications for those with various illnesses.

While Kangas (1994) correlates strongly with child-based health measures as well as disease measures, it has little correlation with the combined adult-based health measure (eta^2=.071), which suggests that there may be stark differences between the underpinnings of child-based health measures versus adult-based ones. Three of the typologies (Liebfried, Ferrera and Huber/Stephens) are significantly correlated with child-based health measures but not with adult- or disease-based measures. In the cases of Liebfried and Huber/Stephens, there is a significant correlation with child-based measures but not with the combined population health measure. In these cases, the adult- and disease-based measures hide the correlation with child-based measures when the combined measure is used.

Table 6: Eta correlations for each health measure

Measure	Liebfried (1992)	Castles and Mitchell (1993)	Kangas (1994)	Ferrera (1996)	Bonoli (1997)	Obinger & Wagschal (1998)	Esping-Andersen (1990)	Huber & Stephens (2001)
IMR	.593*	.214	.690**	.501*	.451	.289	.455*	.545*
U-5 MR	.516*	.194	.627**	.573*	.563*	.296	.387*	.494*
Low BW	.569*	.238	.474	.667**	.582*	.346	.060	.434
Adult MR	.057	.138	.203	.045	.094	.063	.069	.135
Life Expectancy	.242	.025	.299	.149	.286	.138	.266	.238
Tuberculosis Incidence	.167	.077	.201	.187	.108	.018	.057	.018
AIDS Incidence	.167	.196	.464	.474*	.389	.208	.084	.204
PYLL Diabetes	.292	.021	.486	.304	.339	.193	.189	.201
PYLL Comm. Diseases	.240	.103	.602*	.348	.247	.202	.189	.300

The above findings emphasize the importance of continuing to broaden the range of health measures used in welfare state research regardless of the specific typologies or policy areas under study. Table 6 shows the eta correlations between each typology and each of the nine health measures independently. Here, the relatively strong correlations with child-based health measures are not driven by any one or two of those measures. All three child-based measures show very strong correlations relative to the other measures, and in almost every case, the three child-based measures are the most strongly correlated of the nine measures. It is clear again that Kangas (1994) is the best overall predictor of population health measures – most strongly for child-based measures but also for the

disease measures. In general, the typologies do not predict adult mortality, and life expectancy is weakly correlated, especially relative to the child-based measures. None of the disease-based measures are significantly correlated with any of the typologies, and only two typologies are significantly correlated with a disease-based measure. Two typologies (Obinger and Wagschal, 1998 and Castles and Mitchell, 1993) are not significantly correlated with any of the measures, although their strongest correlations are with the child-based measures as well.

Discussion

Findings of this analysis suggest that there is a distinction in the context of welfare state regimes between child-based measures and other population health measures. The overrepresentation of child-based measures in welfare state research may therefore be leading to overestimates of the correlation between welfare states and population health.

The low correlation found here between welfare state regimes and life expectancy is interesting, given that, according to the review by Muntaner et al. (2011), life expectancy has been used in about a third of studies examining welfare states and population health. Most of those studies, however, analyzed life expectancy simultaneously with other policy and health measures, making it difficult to determine whether their analysis revealed a correlation between life expectancy and welfare state regime policies (for an example of this issue, see Saint-Arnaud & Bernard, 2003). Navarro et al. (2006) found correlations between life expectancy at birth and public health expenditure, but life expectancy was not strongly correlated with public health care coverage. IMR was more strongly correlated with both public health expenditure and coverage. Further, Navarro et al. found that pro-redistributive government policies were strongly correlated with IMR (negative correlation) but not with life expectancy. The findings of the analysis performed here generally supports Navarro et al.'s finding that child-based health measures are more strongly related to welfare state regimes than life expectancy, although Navarro et al. (2006) do not explicitly examine the distinction between the measures and conclude that there is a correlation between welfare states and general population health. If there is a systematic difference between these measures in the context of welfare state regimes, however, it is important to pay attention to such distinctions in drawing conclusions when more than one measure is used in an analysis.

The finding that adult mortality rates do not reflect welfare state regimes does not mean that welfare state policies have negligible impact on adult health. Some studies using self-rated health have found correlations with welfare state regimes (for example, Theorell & Vogel, 2003; Eikemo et al., 2008). Despite the weaknesses in using self-rated health in comparative research (as pointed out by Beckfield & Krieger, 2009 as well as Brennenstuhl et al., 2012), it may nevertheless be one of the best ways to assess aspects of health that may not be recorded in formal comparative data (like mortality and classified illness), and it has been argued that it is a reliable measure for comparative

analysis (de Bruin et al., 1996). The fact that the current analysis nevertheless found little correlation between adult mortality and welfare state regimes indicates that focusing in detail on a wide range of adult-based health measures is likely to reveal a complex relationship with welfare state regimes that will require close examination and careful interpretation at the objective level as well.

Although adult health is just one of the factors accounted for by adult mortality and life expectancy measures, the findings here may nevertheless have implications for adult health. The finding that the adult-based health measures used here do not cluster along welfare state regime lines while child-based measures do may indicate the existence of historical cohort effects. In a review of recent research addressing the connections between political rule, welfare states and population health, Beckfield & Krieger (2009) note that there needs to be a greater examination of birth cohort effects, life-course implications, timing of exposures, and possible period effects. They also argue that in the case of mortality measures, more attention to etiologic period is necessary, since they are likely not fully attributable to concurrent conditions. If this is the case, it could partly explain the findings of the analysis performed here.

Findings of this analysis support the suggestion that welfare state regime policies impact chronic and infectious diseases, but in less consistent (or maybe more nuanced) ways. At the same time, however, the analysis of population health and welfare states would benefit from more research using measures of somatic disease and health behaviour as well as mental health (Beckfield & Krieger, 2009).

Future research should closely examine the specific policy measures and aspects underlying each welfare state regime typology considering these findings. For example, Ferrera (1996) identifies several characteristics of the southern welfare model, including a historically divided left and the impact of mass unemployment. Given the correlations found here between Ferrera's typology and child-based health measures, it may be fruitful to further examine the relationships between mass unemployment, a divided political left and aspects of population health accounted for by child-based measures. Moreover, Ferrera (1996), which is most strongly correlated with the measures used in this analysis, was also identified by both Brennenstuhl et al. (2012) and Bambra (2007) as carrying current relevance. Therefore, Ferrera's typology may be particularly fruitful when applied to current population health characteristics. The same approach could be taken regarding the underpinnings of Kangas' (1994) typology regarding long-term illness and disease, given that typology has relatively high correlations with the disease-based measures used here.

Such work should be part of the research agenda proposed by Muntaner et al. (2011), who suggest that "research on the empirical relations between politics and health represents an interesting development and opportunity for medical sociology and social epidemiology to better integrate complementary theories and methods" (p. 959). Following their review of recent welfare state research, Muntaner et al. (2011) raise concerns regarding the shortcomings of existing research, but do not focus on the imbalance in the types of population health measures that have been used. They note:

> The strongest and most consistent associations with improved population health are advanced levels of democracy and egalitarian political traditions while the health effects of the welfare state are inconsistent. This emerging field of study is limited by a dearth of globalisation studies, over-reliance on high-income core countries, infrequent use of longitudinal and times-series designs, few sensitivity analyses, and limited conceptualisations of political variables (959).

Beckfield et al.'s (2015) institutional theory of welfare states and health facilitates analyses of the complexities raised by Muntaner et al. (2011). The findings of the analysis performed here suggest that such an approach may be favourable for examining not only health inequality (as Beckfield et al. illustrate) but national-level, "on-average" health as well. Beckfield et al. (2015) illustrate three "channels" through which welfare state policies distribute health (p. 238). First, states redistribute determinants of health like wealth and income using taxation and transfers. Second, states "compress" (set lower and higher limits for health) using, for example, health-care access and wage replacement rates. Third, states mediate the determinants of health, for example by providing access to education. Beckfield et al. (2015) also illustrate the concept of "imbrication", which is "the overlapping of two or more institutions, such as when the educational system distributes resources that are themselves important within the health-care system" (p. 233). Importantly, these channels distribute health by facilitating it to various extents within different segments of the population, across which there is an overall average level of health. In this way, for Beckfield et al., the distribution of health causes the population's average health. The lack of correlation found in this analysis between welfare state regimes and a range of average health measures supports the thesis that such a more complex theoretical approach is needed. Seeing health as a sort of "currency" that is produced and distributed by welfare state institutions may assist in the application of the institutional approach.

Another interesting question arising from this analysis concerns why child-based health measures show a uniquely strong correlation with welfare state regimes. Future research should examine the fundamental uniqueness of these measures and the social aspects they capture. The agenda suggested by Muntaner et al. (2011) should also include a concerted effort to broaden the range of measures used to represent population health, and the findings of the analysis performed here suggests that such an effort may expand upon conclusions about the welfare state-health connection. In the same way that welfare states have often been broken down into separate policy areas for more detailed analysis (for example, analysis of family policies, education policies or health policies), the number and types of available health measures should be explored to broaden the operational definition of health and account for a wider range of potential policy outcomes.

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