A world-systems analysis as a framework for global health inequalities

Djiwo Weenas

MASTERPROEF SOCIOLOGIE

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Abstract

Goal The aim of this research is to support the world-systems perspective as a framework to understand global health inequalities. World-systems culminate not only at an international level, but can also influence intra-national processes that have an effect on health outcomes.

Methods First, a network analysis will be performed to define the role of a country in the world system. Then a recursive path model will be tested to investigate direct and indirect effects of the position of a country in the world system on the health outcomes of a nation.

Results The position of a country in the world system has a strong effect on the child mortality rates, which is mediated by the levels of GDP/cap and levels of income inequality. Healthcare expenditure does not mediate the effect of GDP/cap on child mortality. There is no direct effect of the position of a country in the world system on child mortality.

Conclusion Dependency relations between countries have an influence on the child mortality rates. Reducing these dependency relations and promoting trade relations amongst peripheral countries could reduce these inequalities in child mortality rates. Furthermore, this research implies that efforts should be made to ameliorate general living conditions such as sanitation, hygiene and reliable food supplies rather than focusing on healthcare expenditure.

Doel Dit onderzoek gaat na of het wereldsysteem perspectief gebruikt kan worden als theoretisch kader met betrekking tot internationale gezondheidsverschillen. De globale processen van het wereldsysteem kunnen namelijk ook intra-nationale processen beïnvloeden, die op hun buurt een invloed uitoefenen op de publieke gezondheid.

Methodes Eerst werd een netwerkanalyse uitgevoerd op internationale handelsgegevens om het positie van een land in het wereldsysteem te bepalen. Vervolgens werd een padmodel getest om de direct en indirecte effecten van de positie van een land op de niveaus van kindersterfte na te gaan.

Resultaten De positie van een land in het wereldsysteem heeft een sterke invloed op het niveau van kindersterfte in dat land, een invloed die wordt gemedieerd door het GDP/cap en de inkomensongelijkheid van een land. Er is geen direct effect van de positie van een land in het wereldsysteem op kindersterfte.

Conclusie Het patroon van handelsrelaties dat een land heeft, heeft een invloed op de niveaus van kindersterfte van een land. Door afhankelijkheidsrelaties af te bouwen, en door het promoten van handelsrelaties tussen verschillende periferielanden zouden deze ongelijkheden in kindersterfte gereduceerd kunnen worden. Daarnaast impliceert dit onderzoek ook dat inspanningen die algemene levenscondities, zoals het sanitair, de hygiëne en betrouwbare voedselvoorzieningen, verbeteren een grotere invloed hebben op kindermortaliteit dan het verhogen van uitgaven in de gezondheidszorg.
1. Introduction

In recent years, there has been a mounting interest on the topic of worldwide inequity in health (e.g.: Foege, 1998; World Health Organization, 2010; United Nations, 2010a). In spite of the raised awareness and efforts, reducing these worldwide inequities has proven to be very difficult to accomplish (United Nations, 2010a). This research shall more specifically focus on child mortality rates. Child mortality is one of the major health issues the WHO focusses on (United Nations, 2010b). Almost nine million children still die each year before reaching the age of five (UN Department of Public Information, 2010). One of the Millennium Goals which the United Nations strives to accomplish is to decrease the under-five mortality rates by two-thirds between 1990 and 2015 (United Nations, 2010b).

This proposed research is societally relevant because it can deepen the understanding on the causes of these global health inequities, and thus might provide information on how to tackle these inequities. The goal of this research is to provide a framework that goes beyond national level causes of health.

The aim of this paper is to answer the following research question: Does the role of a nation within the modern world-economy have an influence on the health outcomes of a nation? A world-systems approach will be used to determine the role of nations within the world-economy. If the role of a country in the world system does have an effect on its health outcomes, the following research question shall also be addressed: How big (if any) are the direct and indirect effects (through gross domestic product per capita, healthcare expenditure and/or income inequality) of the position of a country in the world system on its health outcomes?

These research questions are academically relevant because there has been limited research on the effect of the world system on global health inequalities. None have applied path analysis to explore the strength of the possible direct and indirect effects of the position of a country in the world system on the health outcomes of a country.

This research shall first address the current perspectives used to investigate international health inequalities in chapter two, followed by why a world systems perspective can be a valid alternative. Next the world-systems theory shall be briefly explained in chapter three. In chapter four the hypotheses shall be explained, as well as the conceptual model. Chapter five covers the methods and the research design, whilst chapter six will show the results of the analyses. Conclusion with regard to these results will be drawn in chapter seven, followed by a discussion in chapter eight.
2. Background

Even though the literature is constantly talking about health inequalities, most of them are in fact addressing health inequities (Gatrell, 2002). There will always be, to a certain extent, differences and variation in health outcomes, whether in time, in place, or on another dimension. The term ‘health inequities’ however implies that these differences in health can be avoided and that the existence of these inequities is unethical (Gatrell, 2002). Nonetheless, most researchers are unwilling to use the term ‘health inequity’ as it is linked to terms such as ethics and social justice.

Here I shall briefly introduce the main perspectives that are used in academic literature to look at international health inequalities, followed by arguments on why this particular research shall look at global health inequalities from the perspective of world-systems theory.

Income inequality

The income inequality hypothesis is one of the most frequently used approaches in research on health inequalities within and between nations (Coburn, 2004). A lot of studies point out that income inequality within a nation has a significant influence on health inequalities (e.g.: Petrie, Allanson, & Gerdtham, 2011; van Doorslaer & Koolman, 2004).

According to the income inequality hypothesis, the importance lies not so much in absolute income or poverty, but in status hierarchies (Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997). The claim is that people who are higher up in the status hierarchy have a higher self-esteem and have higher degrees of social cohesion, which makes them less prone to disease (Coburn, 2004). Another way the income inequality of a nation has been linked to health has been through trust and social cohesion, or in other words through social capital (Kawachi et al., 1997). Social cohesion, social trust, networks and norms are factors that enhance social interaction in ways that provide mutual (health) benefits (Idrovo, Ruiz-Rodriguez, & Manzano-Patino, 2010). It is though a negative impact on these factors that income inequality has a negative impact on health.

The major problem with applying the income inequality hypothesis to global health inequalities is that it doesn’t fully apply to the less developed countries (Wilkinson, 1996). Wilkinson claims that for these countries the gross national product (GNP) per capita is the most important factor to explain average health outcomes, whilst for countries with a GNP/capita higher than $5 000 - $10 000, income inequality becomes the most important variable to explain differences in health outcomes between countries. The major focus of research based on the health inequality hypothesis thus lies only on the
health status within and between the most developed countries (Wilkinson, 1996; Coburn, 2004).

(Welfare) state typologies

Welfare state typologies provide another perspective which has been used to explain health inequalities between nations (Kim et al., 2012). A welfare state regime influences health by mediating one's position in the labour market and one's health, by means of welfare provisions such as e.g. healthcare provisions, income maintenance and work regulations (Bartley, Blane, & Montgomery, 1997; Bambra & Eikemo, 2009). Welfare state regimes are usually classified based on decommodification levels, political tradition or social expenditure levels of a nation (Bambra, 2007).

Even though several researchers have tried to widen the scope of (welfare) state regime typology beyond Esping-Andersen’s original welfare state typology within Europe (Witvliet, Arah, Stronks, & Kunst, 2011; Kim et al., 2012), studies based on welfare state typologies have mainly focused on Western countries (Witvliet et al., 2011), and only a few of them include low-income nations in their studies (e.g.: Witvliet et al., 2011; Chung, Muntaner, & Benach, 2010). Literature on welfare states has not yet provided a satisfactory global typology.

Neoliberalism

Yet another branch of literature on health inequalities focuses on the role of neoliberalism. Neoliberalism claims that individual choice is a very important aspect of economics, and that the role of the government in the economy should be as small as possible (Tracy, Kruk, Harper, & Galea, 2010). Politics of neo-liberalism are said to go hand in hand with both income inequality and health inequality (Coburn, 2004). Coburn (2000) argues that neoliberalism causes lower levels of social cohesion, as well as higher levels of income inequality. But not all research suggests that neo-liberalism necessarily has a negative influence on health outcomes (Tracy et al., 2010).

Present literature and their theoretical perspectives based on either the income inequality hypothesis, welfare state typologies or neoliberalism all have their drawbacks when trying to apply them to global health inequalities. The income inequality hypothesis is a major factor in the higher income countries only (Wilkinson, 1996; Coburn, 2000; Coburn, 2004), and is mostly tested only in richer countries (Idrovo et al., 2010). Literature on welfare state regime is promising, but has also mostly been applied to Western countries. Furthermore, the few global typologies that have been suggested seem to roughly follow the distinction between core and (semi) periphery (e.g.:
Chung et al., 2010). The influence of neo-liberalism on health is not clear (Tracy et al., 2010), and on top of that, I believe that whether or not a country will turn towards a more liberal regime also depends on the constraints and opportunities that country is faced with, caused by its position in the world system. For example, the International Monetary Fund (IMF), one of the most influential global financial institutions, can provide loans for countries with financial difficulties. But in return, it requires those countries to make (often liberal) structural adjustments, such as a decrease in government spending, the freezing of wages and currency devaluation (Bradshaw & Huang, 1991; Broome, 2010).

I believe Wallerstein’s (1974) world-systems analysis can prove to be an meaningful alternative approach to study global health inequalities, as countries within the same world system role might cluster similar values on macro-level variables which have an impact on health (including, but not necessarily limited to factors such as regime state typologies, levels of (neo)liberalism and income inequality).

3. World systems theory

According to Wallerstein (1974), sociology, as well as other social sciences, gives far to much credit to the notion of the nation-state. All organizations, including the nation-states, form part of a bigger political, legal and economic framework. To understand the mechanisms that are taking place within a certain nation-state, one has to take in account the position, or the role, of the nation-state within the modern capitalist world-system, also known as the modern world-economy. The capitalist world-system encompasses multiple political entities, such as nation-states, colonies and empires (Wallerstein, 1974, p. 15). Wallerstein claims that next to structural systems of inequality within nation-states based on inter alia gender, ethnicity and class, there also are inequalities within the world-system between different political units.

Wallerstein then goes a step further, claiming that the context in which the nation-states interact also has an impact on the intra-national mechanisms. In other words, to understand e.g. mechanism of class struggle or gender inequality within a country, one has to take into account the position of that country in the world system (Wallerstein, 2000). Even though there are many differences between their lines of thought, I feel that in this particular point made by Wallerstein,, one can find a prelude to the globalization thought of Sassen, who would claim that globalization and international processes manifest themselves not only on an supra-national level, but also on a national level, and even much smaller scales (Sassen, 2007). This research aims to put intra-national mechanisms that have an impact on the
health outcomes of a nation into such a global framework.

In the modern world-economy, there is a distinction between the core and peripheral areas (Wallerstein, 2000). Why certain areas became core or periphery is not a straightforward matter, but what it essentially comes down to is that historical contingencies caused rigid state mechanisms to develop in northwest Europe, whilst peripheral areas had very weak political structures during the period from 1450 to 1640 (Wallerstein, 1972). On top of having stronger political structures, core countries also have greater military and economic strength (Wallerstein, 1974, p. 349). This contrast in strength between core and periphery has lead to ‘unequal exchange’, which was coerced by the stronger core states onto the weaker periphery states (Wallerstein, 2000).

Next to the core and the periphery, there exists a third structural position in the modern capitalist world-system, namely the semi-periphery. This semi-periphery has a dubious role in the world-economy: Whilst core states extract surplus from them through means of ‘unequal exchange’, the semi-periphery also extracts surplus from the periphery. But most of all, Wallerstein coins this concept of the semi-periphery on theoretical grounds, and it “is not the result merely of establishing arbitrary cutting-points on a continuum of characteristics” (Wallerstein, 2000, p. 89). Wallerstein argues that the importance of the semi-periphery is not so much economic of nature, but rather political. Without the existence of a semi-periphery, there would be a direct opposition between the core and the periphery, which would lead to instability. “The existence of the third category means precisely that the upper stratum is not faced with the unified opposition of all the others because the middle stratum is both exploited and exploiter” (Wallerstein, 2000, p. 91). There is a lot of empirical support for the existence of a semi-periphery (e.g.: Van Rossem, 1996; Shandra, Nobles, London, & Williamson, 2004; Snyder & Kick, 1979).

An important aspect of the world system is that the position of a country in the world system is not fixed (Moore, Teixeira, & Shiell, 2006). In time, countries are able to move from one structural position to another. However, even though individual countries can take on another role in the world system, the structural hierarchy between core, periphery and semi-periphery remains (Moore et al., 2006).

It is important to realize that dependency within the world economy encompasses more than the relationship between specific countries (Van Rossem, 1996). The role a country has in the world system, and therefore the pattern of relationships a country has, provides that country with opportunities (or imposes constraints) that countries in another world system role don’t have (Van Rossem, 1996).
How then does the position of a country within the world system influence the health of the inhabitants of a country? One of the key aspects of world systems is that they are linked to a geographical division of labour (Wallerstein, 1974). For example, peripheral countries are often economically overspecialized and dependent from foreign capital (Moore et al., 2006; Wallerstein, 1974), and since the colonization, most colonies have been forced into a path of primary export dependency (D’Costa, 2004).

This global division of labour is the first major consequence of the world system that I want to highlight. Those jobs which are most work-intensive and are most likely to have a negative impact on health are overrepresented in the peripheral strata (Taylor, 2008).

A second major aspect of world systems that I want to highlight is that intra-national conditions can be linked to global processes, such as the world system. A lot of the research on (health) inequalities between countries has focused either on intra-national, or on global variables to be the most important factor (Shandra et al., 2004; Moore et al., 2006). However, I feel that this debate on whether intra- or international factors are crucial for explaining global health inequalities is misplaced. Following the logic of Wallerstein (2000) and Sassen (2007), global processes are not only reflected on an international, but also on an intranational scale. More specifically, it is possible that the position of a country in the world system not only effects the trade possibilities of that country and aspects such as the global division of labour, but also intra-national aspects such as income inequality levels, the forms of (welfare) state regime, social expenditure levels and levels of neoliberalism. Therefore, I believe that analyzing global health inequalities from a world-systems perspective not only studies the effect of global trade on population health (Moore et al., 2006), but can also provide a theoretical perspective which allows national-level factors and their consequences on health to be understood within a global context (Chase-Dunn & Grimes, 1995).

**4. Hypotheses and conceptual model**

The first set of hypotheses of this proposed research is as follows:

H1a: Core countries have lower levels of child mortality than peripheral and semi-peripheral countries.

H1b: Semi-peripheral countries have lower levels of child mortality than peripheral countries, but higher levels of child mortality than core countries.

H1c: Peripheral countries have lower levels of child mortality than core and semi-peripheral countries.

As explained earlier, I believe that the position of a country in the world-system has both a direct, as well as an indirect effect on health. This indirect effect is caused because the
position of a country in the world system has an influence on several nation-level determinants of health. This leads to the following set of hypotheses of this proposed research:

H2: The position of a country in the world-system has an indirect effect on child mortality through the variables income inequality, gross domestic product per capita and health expenditure.

More specifically, core countries are thought to be the richest, and peripheral countries to be the poorest (Wallerstein, 1974). This leads to hypothesis H2a: Having a core role in the world system leads to higher levels of GDP/cap, whilst having a peripheral role leads to lower levels of GDP/cap.

The effect of the wealth of a nation on child mortality is thought to be both direct (Moore, 2006) as indirect, because it can be expected that wealthier countries will spend more on healthcare, and more healthcare will in turn lead to better health outcomes (Hall, Swamy, & Tavlas, 2012). Because of this, the following hypotheses are made:

H2b: Higher levels of GDP/cap lead to lower levels of child mortality.
H2c: Higher levels of GDP/cap lead to higher levels of healthcare expenditure.
H2d: Higher levels of healthcare expenditure lead to lower levels of child mortality.

Research on the link between the world system and income inequality is scarce and outdated (e.g.: Nolan, 1983; Snyder & Kick, 1979), but does suggest that core countries have lower levels of income inequality than peripheral and semi-terminal countries. Furthermore, income inequality is expected to have a negative influence on health (Coburn, 2004), but literature does not point out a clear link between income inequality and the wealth of a nation. This leads us to the following hypotheses on the concrete causal pathways.

H2e: Having a core role in the world system leads to lower levels of income inequality, whilst having a peripheral role leads to higher levels of income inequality.
H2f: Higher levels of income inequality lead to higher child mortality rates.

Apart from that, it is expected that the position of a country in the world system will also have a direct effect on health, due to the process of a global division of labour (Dyches, 1996; Moore et al., 2006; Moore 2006). When regarding a core position as a high value and a peripheral position as a low value, it is expected that the position in the world system has a positive direct effect on health outcomes

H3: The position of a country in the world system has a direct effect on health; where a core position leads to lower child mortality rates whilst a peripheral position leads to higher child mortality rates.
The conceptual model, shown in figure 1, shows a summary of the causal hypotheses on the indirect effect of the position of a country in the world system on child mortality rates.

It is necessary to take into account several control variables which can have an effect on these health outcomes, regardless of the position of the country in the world system. A set of control variables shall be used to control for the effect of the population pyramid. Population pyramids represent the age structure and the sex ratio and are usually differentiated into an expansive model (with a growing population), a shrinking model (with a shrinking population) and a stationary model (Hinde, 1998). The percentage of urban population and the incidence of HIV shall also be used as control variables.

5. Methods and research design

To determine the position of a country in the world system, the atlas method identifies the position of a country in the world system based on the gross national product per capita (e.g.: Chung et al., 2010). But these kinds of measures reflect modernization thinking and measure ‘development’ versus ‘underdevelopment. A far better way to distinguish between core, periphery and semi-periphery is by analyzing the relationships between the countries (Snyder & Kick, 1979; Van Rossem, 1996; Moore et al., 2006).

To perform a network analysis to distinguish between core, periphery and semi-periphery, trade data will be used from the United Nations Commodity Trade Statistics Database (UN COMTRADE). The network data covers over 95% of the World trade. The data is classified according to the fourth revision of the Standard International Trade Classification (SITC 4). The goal of this classification is to provide comparability of international merchandise trade statistics (United Nations Statistical Office, 2006).

For the regression analyses, this research shall draw from data from the Global Health Observatory (GHO) (World Health Organization, 2012), The World Bank (2012), the 2006 Demographic Yearbook (United Nations Department of Economic and Social Affairs, 2009) and the World Income Inequality Database (WIID) from the United Nations University World Institute for Development Economic Research (UNU-WIDER) (United Nations University, 2008).
Network analysis

The trade data that will be used will come from trade in the following commodities: non-electrical machinery, plastics and synthetics, transportation equipment and metal manufactures. These four commodities will be used because they are capital intensive and production based commodities, which makes them suited for a world systems analysis (Moore et al., 2006). For the commodity ‘non-electrical machinery’ trade data will be selected for steam generating boilers (SITC #711), Steam turbines (SITC #712), Internal combustion piston engines (SITC #713) and non-electric engines and motors (SITC #714). For the commodity ‘plastics and synthetics’ trade data on plastics in primary form (SITC #57) and plastics in non-primary forms (SITC #58) will be used. Data for the commodity ‘transport equipment’ will consist out of trade data for road vehicles (SITC #78) and ‘other transport equipment’ (SITC #79), which comprises railway vehicles, aircrafts and ships. The fourth and last commodity is ‘manufactures of metals’ (SITC #69). Trade data will be used for 2010, and if not available from 2009 or 2008. Links between countries will be based on the occurrence or absence of trade (e.g.: Moore et al., 2006), but with a slight nuance. Only when the trade value of a commodity between two countries exceeds 25000$ will they be linked in the analysis. This will be done to reduce the influence of very small trade relations on the network. This has resulted in a square asymmetric matrix. The matrix is asymmetric because certain export relations are not reciprocal.

A lot of network analysis that has been done has used structural equivalence to perform positional analysis (Wasserman & Faust, 1994). Structural equivalence between two actors requires them to have identical ties to and from identical other actors, which can be a severe limitation when identifying roles within a network (Wasserman & Faust, 1994). When a research wants to grasp the theoretical notion of social role, a more general form of equivalence is preferred, which emphasizes the general features of an actor’s ties over the identity of an actor that is tied with (Wasserman & Faust, 1994). Therefore this research shall use automorphic equivalence to study the position of the countries in the world system. To be automorphically equivalent, two countries do not need to have identical ties to and from identical other actors, but need to have ties to and from actors that have the same role within the world system. For more information on automorphic equivalence I would like to refer to Hanneman and Riddle (2005: chapter 14).

To obtain the automorphic equivalence matrix, the ‘NETWORK > ROLES & POSITIONS > AUTOMORPHIC EQUIVALENCE > MAXSIM’ procedure in UCINET 6 (Borgatti, Everett, and Freeman, 2002) was used. This procedure first converts the binary matrix into a matrix of distances, or near-nesses (Hanneman &
Riddle, 2005). Next, this matrix is used to calculate a 'similarity' matrix, based on the pattern of relations of an actor. Once this similarity matrix was obtained, a correspondence analysis is performed on it by using the TOOLS > SCALING/DECOMPOSITION > EIGENVECTORS OF NONSYMMETRIC MATRIX procedure. The resulting graphic is used as an indication of the amount of clusters that will be distinguished. Once the decision is made on the amount of clusters that will be distinguished, the TOOLS > CLUSTERING > OPTIMISATION procedure is used, which runs a heuristic algorithm to divide the data into the chosen amount of clusters.

Path analysis

After the network analysis has yielded an outcome of different clusters, these clusters will be used as independent (dummy) variables in a path analysis, also known as causal modeling. To test the whether the position of a country in the world system has both an indirect and a direct effect on health outcomes, a recursive path analysis will be tested, using AMOS 18. A recursive path model is a path model where there is a unidirectional causal flow, meaning there are no loops and no reciprocal relations.

The coefficients of the regressions will not be tested for significance, even though other research (e.g.: Dyches & Rushing, 1996; Moore et al., 2006) which used world system role as a variable to explain health differences between countries has done so. The sample of countries that will be used in this research is far from random, depending on the availability of data. Therefore, it would be a mistake to try to extrapolate the findings of this research to other countries. As a result, conclusions shall only be drawn regarding the countries that have been used in the analysis. Since the coefficients will only be used to represent differences within the sample of countries, there is no need for statistical significance testing.

Operationalization of the variables

Child mortality is operationalized as under-five mortality rates. These under-five mortality rates are defined by the GHO as “The probability of a child born in a specific year or period dying before reaching the age of five, if subject to age-specific mortality rates of that period.” This paper shall use the 2010 estimates of under-five mortality. Because the variable follows an exponential distribution, the natural logarithm of this variable was computed in order to comply with the assumption of a normal distribution. The resulting variable has a range from 0.69 to 5.18, a mean and median of 2.83 and a standard deviation of 1.16.

The wealth of a nation is operationalized by using the gross domestic product per capita, provided by The World Bank database (The World Bank, 2012). This variable also had to be logged to comply with the assumption of
normality. The resulting variable ranges between 5.25 and 11.57, has a mean of 8.70, a median of 8.74 and a standard deviation of 1.50.

Income inequality will be operationalized by using the Gini coefficient of the countries, also provided by The World Bank. The Gini coefficient can theoretically vary between 0 and 1 (Willis, 2005). 0 means that there is perfect income equality, in other words, everybody has the same income. A Gini coefficient of 1 represents perfect inequality, which would mean that one person has all the resources, whereas all other people have nothing. Countries with a Gini coefficient between 0.20 and 0.35 are said to be relatively equitable, whilst countries with a Gini coefficient between 0.50 and 0.70 are said to be inequitable (Willis, 2005). For more details on the Gini coefficient I refer to the technical note of The World Bank (2011). This variable has a range between 0.24 and 0.75, a mean of 0.40, a median of 0.40 and a standard deviation of 0.10.

The variable health expenditure (̄ = 7.07, ̅ = 6.86, SD = 2.59) has a range between 0.01 and 16.21, and is operationalized as gross health expenditure, a combination of public and private health expenditure. “It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation” (The World Bank, 2012). The variable represents health expenditure as a percentage of GDP.

The population pyramid shall be operationalized by controlling the regression for the following variables: the population proportion under 15 years (̄ = 26.49, ̅ = 25.00, SD = 10.18, ranges from 13.00 to 49.00) and the population proportion over 60 years (̄ = 12.43, ̅ = 10.00, SD = 7.11, ranges from 2.00 to 30.00). These data from WHOSIS originate from the UN Population Division’s "World Population Prospects" (United Nations Department of Economic and Social Affairs, 2010), and are estimates for the year 2010. Furthermore, the percentage of females in a country (̄ = 50.20, ̅ = 50.48, SD = 2.89) will be added as another control variable, derived from data from the Demographic Yearbook (2009). Finally, there will be controlled for the percentage of the population living in rural areas (̄ = 58.66, ̅ = 61.00, SD = 22.46).

6. Results

Figure 2 shows the results of a correspondence analysis on the automorphic equivalence matrix. The results of the correspondence show no big differences with the correspondence analysis that was made on 2004 trade data by Moore, Teixeira and Shiell (2006). This implies that the world system had not undergone fundamental changes in the period from 2004 to 2010. This is not unexpected, because even though individual countries can change their position
in the world system, the structural hierarchy remains (Moore et al., 2006). The 6 groups that have been distinguished on the correspondence analysis, from left to right, have been named periphery 2, periphery 1, semi-periphery 2, semi-periphery 1, core 2 and core 1. The choice of the amount of clusters remains an arbitrary choice, a problem that all clustering methods have (Van Rossem, 1996). Table 1 shows the results of the cluster analysis, which was performed on the automorphic equivalence matrix. This means that the roles of countries within these clusters are similar to each other. However, this does not mean that all countries within the same cluster have exactly the same role in the world system. There are differences in power and dependency within each cluster. For example, even though Belgium and China are both core 1 countries they do not have exactly the same role in the world-system. But their roles are more similar than the roles between China and Peru, which is a Semi-periphery 1 country. Even though this research distinguishes world-system roles as separate clusters, on a conceptual level, the position of a country in a world system should still be understood as a core-periphery continuum (Chase-Dunn, 1998). The cluster analysis was rather balanced with regard to the amount of countries that were assigned to each cluster. 26 countries were classified as Core 1; 22 countries as Core 2; 22 countries as Semi-periphery 1; 23 countries as Semi-periphery 2; 22 countries as Periphery 1 and 19 countries as Periphery 2.

A remarkable outcome of this network analysis is the presence of several non-western countries in the core 1, more specifically Brazil, China, Hong Kong, India, Indonesia, Malaysia, South Africa and Thailand. In other words, 8 out of 26 (30.8%) of the core 1 countries are not Western. If South Korea and Japan would also be considered as non-Western, 38.5% of the core 1 countries are not Western. This points out that the World-system has gone through a shift since colonial times. It is no longer true that only Western countries are core countries, and that all ex-colonies are dependent on these Western countries. Once again, this indicates that even as individual countries move to higher or lower positions in the world-system, the structural hierarchy that is embedded in the world-system stays intact. On the other side of the spectrum, however, it can be seen that no Western countries are found in the periphery.
Table 1: Position in the world system based on trade patterns of selected commodities

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<th>Core 1 (26)</th>
<th>Core 2 (22)</th>
<th>Semi-periphery 1 (22)</th>
<th>Semi-periphery 2 (23)</th>
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Table 2 and Figure 3 show the results of the path analysis. The position of a country in the world system was operationalized as either core, periphery or semi-periphery. Core countries were withheld from the analysis as the reference category. The coefficients that are shown here are the standardized direct effects.

The results indicate that a semi-peripheral world system role leads to a decline of 0.417 standard deviations for ln(GDP/cap) in reference to a core world system role. Likewise, peripheral countries have a lower GDP/cap than semi-peripheral countries. Next, it appears that both peripheral and semi-peripheral countries have a greater income inequality than the core. But the difference in income inequality between periphery and semi-periphery appears to be negligible. The standardizes direct effects of the position in the world system on ln(child mortality) are very small (-0.027 and -0.062).

The ln(GDP/cap) of a country has a negative direct effect on child mortality. This means that a higher levels of GDP/cap leads to lower levels of child mortality. Furthermore, higher levels of GDP/cap lead to higher levels of health expenditure. Because the standardized regression coefficient of health expenditure on child mortality is negligible (0.013), the standardized indirect effect of ln(GDP/cap) on child mortality through health expenditure is close to nothing (0.487 * 0.013 = 0.006). This indirect effect can be found by multiplying the effect of ln(GDP/cap) on health expenditure with the effect of health expenditure on ln(child mortality).

With regard to the last theoretically important variable in this model, income inequality, it appears that countries with a higher Gini coefficient report higher levels of child mortality.

The $R^2$ measures that are shown for the endogenous variables in the path analysis indicate that the predictors of ln(child mortality) explain 83 percent of its variance. This also implies that the error variance of ln(child mortality) is approximately 17 percent of the variance of ln(child mortality) itself. This

**Table 2: Standardized Direct Effects**

<table>
<thead>
<tr>
<th></th>
<th>GDP/cap$^a$</th>
<th>Health expenditure</th>
<th>Gini</th>
<th>Child mortality$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periphery$^b$</td>
<td>-0.552</td>
<td>-</td>
<td>0.340</td>
<td>-0.027</td>
</tr>
<tr>
<td>Semi-periphery$^b$</td>
<td>-0.417</td>
<td>-</td>
<td>0.322</td>
<td>-0.062</td>
</tr>
<tr>
<td>GDP/cap$^a$</td>
<td></td>
<td>0.487</td>
<td>-</td>
<td>-0.800</td>
</tr>
<tr>
<td>Health expenditure</td>
<td></td>
<td></td>
<td>-</td>
<td>0.013</td>
</tr>
<tr>
<td>Gini</td>
<td></td>
<td></td>
<td>-</td>
<td>0.096</td>
</tr>
<tr>
<td>HIV$^a$</td>
<td></td>
<td></td>
<td>-</td>
<td>-0.019</td>
</tr>
<tr>
<td>Urban population</td>
<td></td>
<td></td>
<td>-</td>
<td>-0.013</td>
</tr>
<tr>
<td>Population over 60</td>
<td></td>
<td></td>
<td>-</td>
<td>-0.241</td>
</tr>
<tr>
<td>Population under 15</td>
<td></td>
<td></td>
<td>-</td>
<td>0.232</td>
</tr>
<tr>
<td>Percent women</td>
<td></td>
<td></td>
<td>-</td>
<td>0.001</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.478</td>
<td>0.237</td>
<td>0.219</td>
<td>0.830</td>
</tr>
</tbody>
</table>

$^a$ natural logarithm  
$^b$ reference category: core
Figure 3: standardized regression coefficients of the path analysis
high value of $R^2$ is not unusual when modeling global health inequalities (e.g.: Dyches and Rushing, 1996; Moore et al., 2006). This model also predicts 47.8 percent of the variance in log(GDP/cap), 23.7 percent of the variance in health expenditure and 21.9 percent of the variance in income inequality.

The direct effects on child mortality have been controlled for several demographic variables and for the prevalence of HIV. The effects of the prevalence of HIV, the percentage of urban population and the gender ratio do not appear to have an influence on child mortality. The relative amount of people over 60 years or under 15 years there are in a country does have an effect on the child mortality rates of a country. Countries with relatively more people aged over 60 have lower rates of child mortality, whilst countries with relatively more people under 15 years of age have higher rates of child mortality.

These results should not and cannot be interpreted at the individual level. Even though the results of this model suggest that countries with a higher prevalence of HIV do not have higher levels of child mortality. These results by no means imply that HIV positive children have the same chance of reaching the age of five than HIV negative children, nor does it imply the opposite.

The standardized total effects are shown in table 3. To find the total effect the direct and indirect effects are summed up. These indirect effects can be found by multiplying the different regression coefficients in the causal pathway (Alwin & Hauser, 1975). For example, to find the total effect of periphery (in reference to the core) on the natural logarithm of child mortality, the direct effect of periphery (= -0.027) is added to the indirect effect through ln(GDP/cap) (= -0.552 * -0.800 = 0.442), than added to the indirect effect through ln(GDP/cap) and health expenditure (= -0.552 * 0.013 * 0.487 = -0.003) and finally added to the indirect effect through Gini (= 0.340 * 0.096 = 0.033). This results in a total effect of 0.444.

The most important results in this table are the total effects of periphery and semi-periphery on child mortality. This model implies that having a semi-peripheral role in the world system leads to higher rates of child mortality in reference to having a core role in the world system. Having a peripheral role leads to even higher rates of child mortality.

<table>
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<tr>
<th>Table 3: Standardised total effects</th>
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<tr>
<td>Periphery b</td>
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<tr>
<td>Semi-periphery b</td>
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<tr>
<td>GDP/cap a</td>
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<tr>
<td>Gini</td>
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<tr>
<td>Health expenditure</td>
</tr>
</tbody>
</table>

* natural logarithm

* reference category: core
7. Conclusion

The purpose of this paper has been to answer to the following research question: Does the role of a nation within the modern world-economy have an influence on the health outcomes of a nation? If the role of a country in the world system did have an effect on its health outcomes, the following research question would also be addressed: How big (if any) are the direct and indirect effects (through gross domestic product per capita, healthcare expenditure and/or income inequality) of the position of a country in the world system on its health outcomes? To investigate these research questions this research has focused on child mortality as health outcome. A path analysis was conducted to analyze both the direct and indirect effects of the position of a country in the world system on the child mortality rates.

This path analysis cannot be used to ‘prove’ certain causal relations, because certain causal assumptions are inherent to causal modeling. However, this method can be used to falsify certain assumptions.

The main goal of this research is to provide a perspective which can be used to better understand the global health inequalities. National level factors such as income inequality, gross domestic product per capita, and healthcare expenditure have already been investigated as causes for better or worse health. A world-systems perspective could possibly shed more insight on the causes of these national-level causes. In other words, international trade relations and the resulting limitations or opportunities that result from the position in this trade network could explain international variation in these national level variables.

The first set of hypotheses that was posed was: ‘Core countries have lower levels of child mortality than peripheral and semi-peripheral countries’ (H1a), ‘Semi-peripheral countries have lower levels of child mortality than peripheral countries, but higher levels of child mortality than core countries’ (H1b), and ‘Peripheral countries have lower levels of child mortality than core and semi-peripheral countries’ (H1c). Based on the total standardized effects these hypotheses are supported.

A second set of hypotheses was made to describe the indirect causal relations of the position of a country in the world system on health outcomes through GDP/cap, income inequality and healthcare expenditure.

Hypothesis 2a, which states that ‘having a core role in the world system leads to higher levels of GDP/cap, whilst having a peripheral role leads to lower levels of GDP/cap’ was supported by the results of this analysis. This coincides with Wallerstein’s (1974) theoretical connection between the wealth of a nation and world system position, as well as with previous analysis (Dyches & Rushing, 1996).
The hypotheses that ‘higher levels of GDP/cap lead to lower levels of child mortality’ (H2b) and that ‘higher levels of GDP/cap lead to higher levels of healthcare expenditure’ (H2c) were supported by this research. That the hypothesis that ‘higher levels of healthcare expenditure lead to lower levels of child mortality’ (H2d) was rejected by this analysis leads to the interesting conclusion that although there is a direct effect of the wealth of a nation on child mortality, there is no indirect effect of the wealth of a nation on child mortality through health expenditure. This can be attributed to the notion that macro level improvements in health are facilitated by better living conditions such as sanitation, hygiene and food supplies, rather than by improvements in medicine (Caldwell, 1933; Mckinlay & Mckinlay 1977; Mckeown, 1979; Dyches & Rushing, 1996).

The next hypothesis (H2e) claims that ‘having a core role in the world system leads to lower levels of income inequality, whilst having a peripheral role leads to higher levels of income inequality’. This assumption was only partly supported by the analysis. Even though having a core position leads to lower levels of income inequality compared to both semi-peripheral or peripheral positions, having a peripheral position doesn’t lead to higher levels of income inequality compared to the semi-periphery. It appears that there is a core/non-core divide in levels of income inequality. Although this research confirms that world system role affects income inequality (Nolan, 1983; Snyder & Kick, 1979), it adds the nuance that it is mostly a core/non-core discrepancy.

The hypothesis that ‘Higher levels of income inequality lead to higher child mortality rates’ (H2f) was confirmed by the analysis. This is in accordance with the existing literature regarding the income inequality hypothesis.

Hypothesis 3, which states that ‘The position of a country in the world system has a direct effect on health where; a core position leads to lower child mortality rates whilst a peripheral position leads to higher child mortality rates’, was rejected by the analysis. These coefficients were very small. This goes against the previously stated expectation that there would be a direct effect of the position in the world system on child mortality, as the result of a global division of labour, after controlling for GDP/cap, income inequality and healthcare expenditure.

8. Discussion

A strength of this research is that it has tried to distinguish between the direct and indirect effect of the position of a country in the world system on the child mortality rates of a nation. No research has applied path analysis to investigate the causal pathways between world system role, income inequality, GDP/cap, healthcare expenditure and child mortality.
To determine the role of a country in the world system, this research has focused on (capital intensive) trade data. Even though this method has been used in the literature to determine the position of a country in the world system (e.g.: Moore et al., 2006), it would theoretically be more adequate to implement data on cultural and political ties as well (e.g.: Van Rossem, 1996; Snyder & Kick, 1979) when performing the network analysis.

With this research, I hope to provide a framework on how the position of a country in the world system can influence the health outcomes of a nation. More specifically, by stating that a core position in the world system leads to higher levels of wealth and lower levels of income inequality. And that in turn, these higher levels of wealth of a nation lead to better health outcomes (not because of higher levels of healthcare expenditure), whilst the lower income inequality levels also result in better health outcomes.

One of the main critiques that one could have about this research is that it takes on a rather structuralistic approach, and as such does not leave any room for human agency. I would like to emphasize that, although no attention has been given to human agency in this paper, I do believe that it can play a great role. According to my point of view, an individual being can indeed consciously make decisions that will have an influence on his health (be it positive or negative). However, following Giddens’ thought on structuration (Giddens, 1979) one must be aware that the choices and actions that an individual makes (agency) takes place within a context of constraints and opportunities (structure). In other words, the goal is not to provide an explanation which denies the role of human agency, but rather to provide a framework which makes it possible to understand other research on health (be it qualitative or quantitative) within a broader context.

Furthermore, the use of aggregated health data on the nation level can be a methodological issue. All of the results should be interpreted at the aggregated level. Because this research reveals a negative correlation between GDP/cap and child mortality, implies neither that richer parents will be faced with less child mortality, nor the opposite, only that a country with a higher GDP/cap will have lower levels of child mortality. Global (health) data containing information on the individual level as well as on the country level would provide the possibility of multilevel analysis. By using such analysis, interpretations could be made on both the individual and the aggregated level. This would be a very big methodological improvement, and would allow for interpretations at the individual level without problems of ecological fallacy. Therefore the results of this analysis should be interpreted with care. These aggregated data have also been controlled for factors such as the...
population pyramid, the urban population and the gender ratio of the country.

Another result of the lack of international data is that it was not possible to include all the countries of the world in this analysis. However, this is a hurdle that cannot be easily overcome, and research on global health inequalities is forced to use the data which is available. Because of the select availability of data, the sample was in not ‘completely at random’. Therefore, the interpretations of the analysis only apply to the countries that were involved in the analysis. However, within this sample, there are strong indications that the world system plays an important role with regard to the health outcomes of a nation.

Apart from the theoretical considerations, this research also implies that in order to reduce global inequities in health, the focus should not solely lie on healthcare, but also on reducing the dependency relations between the core, periphery and semi-periphery. Since the pattern of trade relations a country has exerts an influence on the health outcomes of a nation, these global health inequalities could also be reduced by promoting trade relations amongst peripheral countries, which currently have disproportionally more trade relations with the core countries than with other peripheral countries.

On a more practical level, to reduce child mortality rates, and probably to improve other health outcomes as well, there is a need for more than an increase in health services. Investments should be made to facilitate a broader improvement of general living conditions, such as sanitation, hygiene and reliable food supplies.

Reference list


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